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FUKIEN
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Foochow, Fukien, China

Christian Herald Industrial Mission Press
Foochow
1933

THE OIL INDUSTRY
OF
FUKIEN

BY
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pages 99-126.

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Paper read before the Anti-Cobweb Society
on January 23rd, 1931
Foochow

THE OIL INDUSTRY OF FUKIEN

My intention in this paper is to take up some of the native manufacture of oils. It is impossible to tell all the oils that are produced here, because probably no one knows. Then too there is no distinction between the Chinese term for oil, as we use it, and some other products, which they call oils, but which we would not consider as oils.

I am going to limit myself to the vegetable oils produced, because the animal oils are an almost negligible quantity, and the mineral oils are not worked at all, – so far as I know, – if there are any in the province. And of the vegetable oils I wish to include some that the Encyclopedia Britannica does not include in its list of vegetable oils. An enumeration of the oils of the province as I have gathered it, and no doubt there are others which I have omitted may be given as follows:– Tung (Chinese or Japanese wood) oil, Candle nut, Hemp seed, Soja bean. some-times called soy bean and sesame. Although there is a very large industry in the growing of olives, the people of the province do not seem to have done much with the securing of the oil from this fruit. Whether it is that in their diet they do not find a use for it, or whether it is because of the variety of the olive, which is quite different from the European olives, I do not know. But it does not seem to be an industry here in Fukien. The Britannica does not include in its list of vegetable oils the

two that perhaps predominate in the province, that of tea and peanut. Why these are omitted from the list I do not understand.

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I will however select a few of the oils and go into considerable detail regarding them, but as the methods of manufacture are very similar for all of them, it will not be worth our time to consider them all in detail.

There have, from the very earliest times, been three methods in use for the extraction of oil from vegetable products, and these methods in their primitive forms, and in the much improved forms, are still used in the production of oils from fruits and nuts. These three processes are rendering, pressing, and extraction by solvents. These three processes are at present all used more or less among the Chinese, though the most of their oils are derived from the use of the second or pressing process. It may be interesting, before going into the processes as used in China, to note that the earliest method of extraction of oils by the rendering process is reported from the South Seas, where it is said that the natives would heap up the oleaginous fruits and allow them to melt by the heat of the sun when the exuding oil would run off and be collected.

The most primitive method of collecting oils from the pressing method is said to have been done by a woman who expressed olive oil by packing the olives in a sack and heaping stones on them. She was the forerunner of all the inventors of all the presses that subsequently came into use. Pliny describes in detail the apparatus and processes for obtaining olive oil in vogue among his Roman contemporaries, who already used a simple screw process, a knowledge of which they had derived from the Greeks. If I may quote a paragraph or two about

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the development of the presses in use, I will then return to the processes immediately about us at the present time, and I think you will then see more clearly how little advanced the methods here in this province are at present.

To quote, "In the East, where vegetable oils form an important article of food and serve also for other domestic purposes, various ingenious applications of lever presses and wedge presses, and even of combined lever and wedge presses, have been used from the earliest time. At an early stage of history the Chinese employed the same series of operations which are followed in the most advanced oil mills of modern time, viz. bruising and reducing the seeds to meal under an edge stone, heating the meal in an open pan, and pressing out the oil in a wedge press in which the wedges were driven home by hammers. This primitive process is still being carried out in Manchuria, in the production of soja bean cake and soja bean oil, one of the staple industries of that country." "The olive press, which was also used in the vineyards for expressing the grape juice, found its way from the south of France to the north and was employed there for expressing poppy seed and rape seed. The apparatus was then gradually improved, and thus were evolved the modern forms of the screw press, next the Dutch or stamper press, and finally the hydraulic press. The invention of the hydraulic press in 1795 by Joseph Bramah effected

the greatest revolution in the oil industry, bringing a new, easily controlled and almost unlimited source of power into play, the limit of the power being solely reached by the limit of the strength of

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the materials which the engineer is able to produce. Since then the hydraulic press has practically completely superseded all other appliances used for expression, and in consequence of this epoch-making invention assisted as it was later, by the accumulator, invented by William George Armstrong, later Lord Armstrong, in 1843 the seed-crushing industry reached a perfection of mechanical detail which soon secured its supremacy for England."

Now leaving the "perfection of mechanical detail" as it is seen in England, let us return to Fukien province in its cruder methods. And let us begin with the soy or soja bean oil industry. This is one of those oils that is not a true oil, as we consider oils, and yet it is so termed by the Chinese. Many, if not all, of you are acquainted with this by the Chinese name, of "sie-iu," that salty black sauce that is inevitably found on the table at all Chinese meals, whether in humble homes or at most elaborate banquets. For where we use salt on the table the Chinese use this soy bean sauce. And without doubt it has many advantages for table use which some of our more elaborate western food products have not.

The soy bean industry of Manchuria, which is one of the greatest of industries in that part of the country is very different from that of Fukien. There the bean is put through a different process, and the oil is extracted through pressure. Whether the bean is different from that of Fukien I cannot say, but the oil product must be very different, for the process would undoubtedly produce a very different product. And when you see these large bean cakes which are shipped out of Manchuria all over the country, it is very evident that the process is altogether

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different. These bean cakes are used through-out the country for fertilizers, and after being broken up, and soaked into a pulp, either in water or other liquids, they make a very satisfactory fertilizer, though of a more expensive variety than the modern commercial fertilizers which are finding their way into the country. However, the Chinese claim, that the bean cake fertilizer is not as hard on the soil as are the commercial fertilizers of the West. One can begin to imagine the enormous amount of beans produced in Manchuria and the extent of the product when we note the figures for the export of these cakes from the several Manchurian ports. The Customs figures for 1929 show an export from Manchurian ports of 22,495,591 pounds, though there is a very small export of the oil, only 6056 piculs for the same year.

The whole bean oil industry in Fukien is very different from that of Manchuria. The oil is secured in a combination of the rendering and the extraction of oil by solvents. While most of the oil industries of the province are pretty well localized either to the interior, and mountainous country, or to the more level and sandy country, the bean-oil industry seems to thrive in all parts of the country, and it is hard to tell where the best of the sauce

is produced. There is up the river, a little above Cui-kau, a large canning plant, where the oil is canned and this is said to be one of the best brands in the province. Some years ago when travelling through the province when we reached the Ing-tai country my coolies insisted on buying a large amount of the sauce and carrying it back to Foochow, because they claimed that the best sauce came from that section of the

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country. When living down on the coast, we were always advised to buy Hinghua sauce as that was said to be the best, and last spring in returning from Sharp Peak, we were all advised to get our sauce in large quantities at Guang-tau as the best sauce was made there. My own conviction is that there is not a great deal of difference in the sauce of these several localities, but the greatest difference in the sauce is in the several grades which may be made in one place, and also between that manufactured in large quantities for sale, and the homemade variety, which is nearly always better.

What the amount of the oil produced in the province is I suppose no one will ever know. It is produced everywhere, in larger or smaller quantities, and there is probably not a market town of any size throughout the province where it is not made. The Customs reports show an almost negligible export from Foochow, though the export from Amoy seems to be increasing, having grown from 2087 pounds in 1920 to 7975 pounds in 1929. In an investigation in the city the other day, I estimated that one place had probably more than one ton of the oil at present in process of being made, and that is but one of many plants in the city where it is made. So no estimate is better than a wild estimate of the quantity of this bean oil that is used in the province, all of which is made within the province itself.

Now for the process of rendering this sauce, for it is more of a rendering process than of anything else. When visiting one of these manufactories the other day, in a quest for information, the men in the place seemed to think that I was after the information

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in order that I might return to the United States, and establish a soy bean industry of my own. No denials would satisfy them, and every little while, I was told, "you cannot find out and learn how merely by inquiring, and looking on. You must take a workman with you and work alongside of him for a time until you learn the process from beginning to end." If I am not accurate as to the facts then, I have an alibi. I have not worked at the process along with a skilled workman. I don't know whether they thought there might be a chance for one of their men to get to the United States or not, but at any rate the description which I have for the manufacture of this delectable sauce I have gathered at first hand, by inquiry.

The soy bean from which this sauce is made is a white bean about the size of a large navy bean, and very similar in appearance. These beans are grown throughout the province in the usual manner of most of the garden truck, and in appearance are very similar to other beans. Botanically they are called "Glycine soja" and are designated as "An Asiatic leguminous herb the seeds of which are used in preparing the sauce called soy." These

beans are grown in the spring of the year, and ripen much as do other beans.

The process for the manufacture of the oil begins with taking the beans and soaking them thoroughly in water for two or three hours. Following this soaking of the beans they are steamed, and this is a process taking about twelve hours. They usually start to soak the beans when they begin work in the morning, and that means that it is about ten

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o'clock before they begin to steam them, which runs them late into the evening before the steaming process is over. When we inquired how long they steamed them they did not know and said that they had to boil three large cooking pans dry, and that it was approximately ten to twelve hours in the process of so doing.

The next morning the beans are then spread around in large bamboo trays, such as are frequently seen used for drying all manner of things in the homes, and here they are worked over by hand so that the layer of beans in these pans is not more than one half inch thick. The beans are left in these pans to dry until they are all covered with a thin white mould. How long this process takes of course depends on the weather, for certain kinds of weather will more readily produce mould on goods than will others. Those of you who enjoy a good cheese, will realize the advantages of the right kind of mould on these beans.

After the beans have properly moulded they are taken, and in these trays are worked over until every bean is separated from every other bean, after their having been held together with the mould which has worked into the bean. These hand worked beans are again placed in water, and here they are stirred either by hand or by some other means, without bruising the bean itself. The hand process is preferred, though sometimes a bamboo wrapped with cloth is used.

Then the beans, having been thoroughly worked in the water have this water poured off, and are placed in large tubs or water jars, and salt and water

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are added. About half as much by weight of salt as there are beans is put into the tub, and enough water is then added to bring it up to a level of several inches to a foot above the mixture of beans and salt. Then the whole mass is worked together again, so that the salt and water and the beans are thoroughly mixed together, and the water will have a uniformity in its saline strength.

Then comes the time of waiting. These tubs are let stand for the sauce to form. They are usually placed where they will get the sun, when it is available, and have large bamboo covers which are placed over them when the weather is inclement. The period of waiting depends both on the weather and the quality of the sauce that is to be drained off from the mixture in the tubs. The shortest time is something over one hundred days. They may be left to stand for five hundred days, or in some cases, when a special grade of the sauce is desired for several years. Whenever there is sunshine the covers are taken off the tubs,

and all the sunlight is allowed to shine on the sauce that is forming in the tubs.

When the sauce has reached the grade that is desired it is run off, and is ready for the market. After the first draining of the tubs, there is usually some of the sauce that remains in the beans, and they are sometimes placed in bags and squeezed to get all the remaining sauce out of the beans. This however is not considered as satisfactory a grade as is that that runs off without aid, and is sold at a cheaper price on the market. Those of you who have travelled to and from Kuliang may have noticed the men and women carrying bags of what appeared to be a

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sour bean mash of some sort. Those were the beans from which the sauce has been made, and have been sold as food for the pigs, and the farmers are very glad to be able to purchase it, as they say it is very good food for their porkers.

In purchasing the bean sauce there are of course many grades, and many prices, and it takes an expert to tell just which is best, and which to get. But there are two general classes which it is well to know about. In making inquiries about the sauce I frequently heard them talking about the white oil and the black oil. I asked what they meant by the white oil, as I had never seen any of the sauce that I thought could possibly be called white. One of the employees very kindly went to some of the large crocks across the shop and brought me samples of the two. The white oil was not white, but was a rather light reddish-brown, while the black, was indeed a deep almost jet black color. The so-called white sauce he explained was the sauce that had had the shorter or shortest period of evaporation, the longer it was evaporated, either under the direct rays of the sun, or even under cover, the darker the sauce became, and the longer the evaporation, of course the better the grade. I was told that for every one hundred pounds of beans they secured 150 pounds of sauce.

I tried to find out, and I suppose that this led them more than ever to believe that I was inquiring because I wanted to start a factory, whether or not they could make the sauce by artificial heat, and if so if it wouldn't be quicker, and more uniform in quality. Also whether it was the heat of the sun, or

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the brilliance of the sun which had some effect on the sauce, as they said that the sauce that had the direct rays of the sun was of a better quality. My inquiries regarding artificial heat and also artificial light brought very strong negative answers, but they finally thought that possibly if a uniform heat could be produced, with the ultra-violet rays from an ultra-violet ray lamp, that they could probably produce a good grade of the sauce in a specified time, but that the cost would be so high that they could not sell the product. However, that should not bother a foreigner.

But I have taken too much time with this one oil which is not an oil, and must pass on to some of the others, and except for the peanut oil, or ground-nut, as it is sometimes called, I will not go into much detail as to processes, for they are all about the same. And the first

of these that I want to take up for a word is the candle berry oil, from which all these Chinese candles are made, that are so beautiful in the lanterns at the time of the lantern festival, and which were the only kind of candles that were used until the foreign oil companies came in with their paraffine candles which can now be bought anywhere throughout the interior, both in the red and the white. For the native candle industry is being driven out more, perhaps, than any other of the oils, from the competition of the paraffine candles which are coming in.

In much of the province the only tree that brightens the landscape with its autumnal leaves, is the candle berry tree, which you will find almost anywhere in the province. According to the botan-

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ists there are three different candle berry trees. There is the American tree, called the *Myrica cerifera*, which is a wax bearing myrtle, and the wax from which was formerly used for hardening candles. Then there is the tree of the Pacific islands, called the *Aleurites triloba* which bears the candle nut, so-called because when dry it will burn with a bright flame, and is used for candles, and then the one which we have here, called the *Sapium sebiferum*. The tree grows easily and almost anywhere, coming up in the most unexpected places, from roots that have spread out far from the parent tree. It grows very rapidly and makes a good shade tree, if not allowed to send out branches too close to the ground.

After the autumn leaves have fallen, and even amidst the bright red and yellow of the autumn colors one will see the black and white nut – the black being the outer shell, and the white the inner shell, –hanging in clusters on the trees. It is in these nuts that we find the oil that is used by the Chinese for their candles. The Chinese are almost ruthless, in the way they gather the nuts from these trees, not being content to gather the nuts, but lopping off great sections of the branches on which they grow, until the tree appears actually riddled, and one almost feels a sympathy for such a mutilated tree. But the following year it will come out in leaf again, and I dare say, bear just as well as if it had not been so cruelly lopped off. The blossom appears in a long form, in the spring, and matures in the fall. After picking the berries they are thoroughly dried, and then the process of extraction of the oil is almost the same, as that of the other oils of which I will speak later. The oil from the berry is a little different

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from the other oils in that with a little boiling after extraction it solidifies on cooling, and it is this form in which we see it in the finished candle. Anyone who has handled these candles, will however realize that it is hardly more than semi-solidified, for it almost melts in one's hands. A very interesting characteristic of these candles however, is that as they burn, provided there is not a breeze to make them burn more on one side than the other, practically all the oil is burned up, so that there is very little candle drip to them. This is indeed an advantage at times.

The manufacture of these candles is falling off very rapidly of late due to the importation

of the paraffine product. One will see an almost wholesale destruction of these candle berry trees where formerly there were large numbers of them, and the response has always been to the inquiry as to why the destruction of these trees, that there is no longer any use for them. In time, no doubt this native industry will give way altogether to the paraffine candles.

Some years ago I landed in Cleveland, Ohio about midnight. I went to the hotel where I had been accustomed to stay when in Cleveland, and found it filled with the paint and varnishers convention, and there were innumerable signs about telling of their products, and in every one of them, practically, they were using this Chinese or Japanese tung, or wood oil, called here in Foochow " teng-iu " and with which we are all of us more or less familiar. Large quantities of this oil are shipped to the United States from the Orient, both China and Japan

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though Fukien does not produce nearly as much of it, as do some of the other provinces. Last summer I cut the following from one of the Shanghai daily papers, " Hangchow, July 30th, – With a view to improving the quality of the tung oil extracted in the province, of which \$4,000,000 worth is being exported annually, the Cheking Provincial Department of Reconstruction is making preparations for the opening of a modern oil refinery which, it is anticipated will produce a purer oil of higher marketable value." Probably more of the tung oil is exported from Kwangtung than from any of the other provinces of the country. The export from Foochow has increased somewhat in the past ten years, 1920 showing an export of 1300 piculs, and 1929 showed a total of 1614, or an increase of 314 piculs in nine years. Amoy, however, showed even a higher percentage of increase, having jumped from none at all in 1920 to five piculs in 1929. I did not get the figures for Swatow, but it may be that much of the export from the hinterland of Amoy goes out through Swatow, as the water communications from Swatow to the hinterland of Amoy may give better transportation for the oil.

However, as one travels through the interior of the northern half of Fukien, one will find the tung oil tree growing in many places and in large numbers as well. The manufacture of the oil for export has not been developed, although there are the opportunities for the same. Most of what is manufactured is consumed within the province itself, as the base of all the Chinese paints and varnishes. The tree grows rapidly, and is characterized by its straightness and its large leaves, which make splendid shade

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in the summer time, and which fall in the autumn. The Chinese say that there are both male and female trees, meaning thereby that the one bears the fruit, while the other does not. The fruit-bearing tree has a beautiful, large, white flower, and when in bloom, the hillside where the trees are grown looks almost as if it were covered with a fall of snow, the blossoms being more prominent in the early spring than the leaves which come out later. The nuts are about the size of a large English walnut, or even larger perhaps, two or three nuts growing together inside of one nut pod, the pod breaking open when ripe and the nuts falling out. After the nuts are gathered they are prepared in much the same

manner as the other oils, and the oil is shipped either in tubs, larger at the bottom than at the top, or in kerosene oil tins.

When a small boy I frequently heard of the native tea oil, and always thought that the tea oil of which people spoke was made from the little berries that grew on the tea bushes from which the leaves were picked that were used in making tea. Since then I have learned that the shrub from which the tea oil is made is an altogether different shrub, in form, size and appearance. As one travels into the interior of the province one will find many of the hillsides over-grown with what appears almost as a wild shrub, uncared for, and growing in the most out-of-the-way places. Much land that cannot be used for other purposes, such as fields, or even for the growing of pine or cunninghamia trees is turned to good account in the growing of these mountain-side shrubs from which the very useful tea oil berry is gathered.

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Both North and South Fukien seem to manufacture more of this product than is consumed locally, for both Foochow and Amoy report exports of the oil, though not in any large quantities. While the Foochow export has increased in the last decade from 223 piculs to 629 piculs, the Amoy export shows a decrease of from 805 to 544 piculs. Thus while the net total from the two ports is about the same, the whole amount is a negligible quantity, and would indicate that the production of the oil is almost entirely for local consumption. This product also has had to meet competition from the coal oil products, as this was formerly used very extensively for illuminating purposes, but is being supplanted largely by the kerosene imports, and the paraffin candles, as well.

An interesting fact in the life history of the tea plant is that the blossom and the ripe fruit are both on the plant at the same time. In the late fall of the year, the hills will show large patches of white, with a yellowish tinge to them, and these will be the tea plants in blossom. On examination it will also be seen that the berries are ripe and ready for picking. It takes a full year for the fruit to mature and ripen, so that by the time last year's blossoms have developed into a ripe fruit this year's blossoms are already on the bushes. When it comes time to gather the tea berry everybody is pressed into service and all other programs in the locality give way to the picking of the berry, for in this work the women and the children can do their full share as well as the men. A well grown bush, which may measure four feet high and about eight or nine feet in circumfer-

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ence will produce about three or four pounds of berries in the shells. So that it takes a lot of bushes to produce the requisite number of pounds of oil in the finished product.

After the berries are picked and carried home every available place for drying is sought, and here the new motor roads that are being built, but are as yet incomplete come in to good purpose, for they make a splendid drying ground, and the passers by may pick their way around at the side so as to avoid prematurely crushing the berries as they are drying. In the expressing of the oil from the tea berry the process is little different from that of the other oils, though the tea oil factory is the only place where I have seen the pressure

brought through the use of wedges, as was mentioned in the early part of this paper. All other processes have been through the lever process. And as one passes a tea oil factory the regular thud, thud, thud of the heavy sledge hammers against the hard wood blocks that are used as the wedges will tell the tale of the process going on within.

The tea oil, after it has been expressed, has been used for two primary purposes, one illumination, and the other for cooking. The use of the oil for illumination is, like some of the others, meeting competition from the kerosene industry. But the culinary use of the oil has not had to face western competition as yet, and therefore is holding its own, and is largely used in many ways.

However we find that the people also make good use of the residue after the oil has been extracted. These tea cakes have been, and still are, very largely

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used for soaps. And I am told that they are especially good for shampoos.

And now I come to the last of the oils of which I wish to speak, and I recognize fully that I have neither exhausted the number and variety of oils produced nor the subject of the oils that I have presented. But I want to close with the peanut oil industry, and with this I will go into some detail as to the process of extraction, which I have omitted in the previous three oils, because, as I have said the process is practically the same, and one description I am sure will suffice.

I was once told that the peanut, or groundnut, earthnut or groober, as it is variously called, was introduced into China from America. Frankly I don't believe it, and I have not been able to find any authority for the statement. For as near as I can find out the peanut was grown in China before America was known to the old world, and certainly long before there was commercial intercourse with China. What I do believe to be true is that a certain variety of peanut, which is grown largely in Shantung, and also to some extent here in Fukien, was introduced from America, and has found its way throughout the country.

Peanuts grow best in light soils with moderate moisture, and that is probably the reason that the semi-sandy soil of the coastal plains has proved so satisfactory for the growth of the peanut, for it is here that the greatest quantities of the peanuts are grown in the province. There are three varieties of the peanut, which goes by the scientific name of *Arachis hypogaea*, that are grown in this part of Fu -

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kien, and they are very distinct in appearance. There is the so-called Spanish peanut, which is the one more largely grown in the United States, I believe, and which is large, with two or three seeds in a pod. This is the variety that is used very largely for eating purposes, if a farmer can plant for the different tastes. Then there is the long narrow variety, which has from four to six and sometimes seven seeds in a pod. This was formerly the variety most used for eating purposes, and still is very popular in spite of the invasion

of the Spanish variety. This variety is not only roasted for eating, but it is also steamed and sometimes boiled in brine. Many people, however, have not learned to relish peanuts so prepared. I had a companion traveling with me for several years, who invariably asked at the peanut stands for the roasted peanuts, and laughed at me for asking for the steamed or boiled ones. However, frequently he could not get the roasted ones, and took the others as a second choice. He came finally to call for the boiled or steamed ones in preference to the roasted ones, as he found they did not make him so thirsty while hiking across the country. And that may account for the reason that it was easier to get that variety on the roadside stands than the roasted variety. They were more popular with the travellers.

Then there is the small variety, a little one not much larger, sometimes than a great big pea in which there will be sometimes but one seed, and sometimes but two. This is called the Filipino peanut in the Philippines, though I imagine that it is as indigenous to China as to the Philippines. This is

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also the variety that is preferred, if possible, in making the oil, for considering the bulk it has a much larger content of oil and the plant is much more prolific than either of the other varieties. It is not a variety that is pleasant to eat, because of the difficulty of extracting the seed from the pod, and because it is so small when it is extracted.

The process of planting the peanut is simple, and while the process of harvesting is not much more complicated it is more tedious. There are two ways of harvesting the nut, one in digging the nut out of the ground, and the other of flooding the ground and letting it float to the surface. The latter has its disadvantages, but also its advantages, in that it is quicker, tho it necessitates the additional work of drying after the nut is collected. Because it is essential that in the preliminary processes of making the oil, the nuts, both inside and outside should be thoroughly dry, partly as a measure to insure them from rotting in the large piles into which they are dumped, and partly to make it easier to crush them in the brittle condition.

Following the drying process the nuts are crushed under a large stone. This is called an edge stone, probably because of its thinness, and the fact that it is the edge of the stone that comes in contact with the nuts. This stone may vary in size but is usually about four or five inches thick, though sometimes running as much as eight inches, and may be five to six feet in diameter. Fastened at the center to an axle, the edge stone is connected with the motive power. This, in the peanut territory is usually an ox, and more frequently a blindfolded ox, to keep it

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from becoming dizzy in its continued round of the crushing trough. In those parts of the province where they have water power, it is used, with a mill wheel, instead of the ox as motive power, and this not only reduces the overhead but also makes it possible to use larger stones. The trough is cut in rock, and is about twice as wide as is the stone that is used to crush, and as the stone travels around in this trough, one man is kept busy sweeping the nuts back into the trough so that they will be sure to be thoroughly crushed

into a meal. This trough may be as much as fifty or sixty feet in circumference. Sometimes there is attached to the edge stone a brush to automatically brush the crushed nuts back into the trough, but this is not usual.

After the nuts are thoroughly crushed into a fine meal, and it must be remembered that in all these processes, the shells are crushed along with the nuts, this meal is placed in large tubs, with a woven open work bamboo bottom, and placed over a large Chinese cooking pan, or diang, where it is steamed from eight to twelve hours, as long as the steaming process of the soy bean sauce.

The next operation is one of the most interesting of the whole series. Each man takes his position in front of a rope that is dangling from the rafters. Placed in front of him then are two iron rings, about fifteen inches in diameter and about a half inch wide. These two rings are set, one on top of each other. Reaching out for a handful of straw, the worker with a deft twirl of the hand spreads this straw out into a large circular mat, with a thicker center, and places the center of the straw mat in the center of

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the rings. Another worker then takes a small tub of the hot and steaming mash, and dumps it into the center of the iron rings, on the straw mat. Then grasping the dangling rope with his hands, and with dexterous movements of his feet the worker turns the ends of the straw over the top of the pile of mash, and tramps it down inside of the rings.

This then goes into the press. And a cruder press it would be hard to find, though it has been devised to develop a tremendous amount of pressure. The center of the press is cut stone, made to fit the iron rings, and standing about five or six feet high. The rings are set in from the top, and one worker on either side takes hold and sets them in place. They are piled up to the very top of the stones, so high in fact that the levers which are to be placed on them cannot function at first. A few wooden wedges are at first placed on top, and the weight of the beams of the levers immediately begins to express the oil, which runs out in large quantities, even before the weights are put on the pile of meal. As the pile gets lower with the expression of the oil, the lever beams are again lifted and more wooden blocks and wedges put into place, and the lever arms again lowered.

These lever arms, usually are from twenty to twenty-five feet in length, made of tremendous logs, sometimes being as much as two or more feet in thickness at the large end, Inserted at various distances from the fulcrum of the lever are rods, adjusted so that they can be raised or lowered, there being about five of these in each lever arm. These are so fixed that with the lowering of the lever arms,

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the weights may be set at a higher lever. The fulcrum is formed with heavy iron bands, fastened from the stones of the press to the ends of the lever. On each one of the rods set in the lever a large weight of cut stone is attached, each stone weighing from two hundred to three hundred pounds. There are usually three levers, giving a total of about fifteen of these weights. The fulcrum is set about three feet beyond the center of the press, so you

can begin to see what a tremendous pressure is brought to bear on the meal of nuts in the press.

As the oil flows out of the meal it runs down the press and is caught in large tubs set in the ground for that purpose. No effort is made to insure cleanliness of the oil, and naturally from the arrangement of the press and the materials used much of the straw dust, and small particles get into the oil in its journey to the tubs. The meal is left in the press for from ten to fifteen hours, before it is felt that there is sufficient oil expressed. Additional pressure is being constantly applied, by readjusting the rods in the lever arms, and in placing additional blocks of wood under the levers and over the pile of meal.

When all the oil has been expressed that these crude presses will force out, the weights are removed, the levers are raised by a system of pulleys and the hard cakes within the iron rings are removed from the press. When inserted the rings formed a very small part of the outer protection of the meal, it being piled up several times as thick as the two one-half inch iron rings. Now the cake formed has been compressed into the thickness of these two iron rings. Each worker seats himself at a convenient

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place, where the cakes are handed to him. With a couple of strokes on a stone set in the ground the rings are removed, and the hard, almost oilless cake, covered by a thin coating of pressed straw, is free for market.

These peanut cakes are sold on the market the same as the bean cake from Manchuria, but of course are much smaller. They are very popular in their native localities for fertilizers, and where they are available the bean cake of Manchuria has little sale.

The peanut oil is used for practically the same purposes as is the tea oil, illuminating and cooking, and personally I think it is much better for cooking, not being as strong in some ways as is the tea oil. It has been highly recommended for use in making doughnuts.

For generations, and I am sure for centuries. the peanut oil has been used for illuminating purposes. There is in Futsing hsien a large pagoda, which in the first year of every Chinese cycle, that is once in sixty years, is brilliantly lighted every night for a period of two weeks. In 1924, the first year of the present cycle, the pagoda was lighted with electricity. We were told that in every previous lighting, and it was built in 1644, it had been lighted with peanut oil. Even yet, in spite of the encroachment of kerosene, electricity and other more modern illuminating materials, a large number of people in the peanut oil country use enormous quantities of the oil for illuminating purposes. Everywhere one goes in that section they will see the oil being carried from the factories to the market. It is usually shipped

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in kerosene oil tins, or in specially prepared bamboo baskets lined with oiled paper, thousands of these being made every year in the nearby bamboo country.

If one were to judge by the Customs reports one might come to the conclusion that little of the oil was exported, for the Customs reports show that none was exported from Foochow, and only 39 piculs from Amoy in 1929. However, it is known that large quantities are exported from the several peanut localities on native junks, that carry it up and down the coast, to other sections of the country, but of course there is no record as to the amount. On the other hand, it is a matter of common observation as one travels throughout the peanut country, that the industry is not as flourishing as it has been, because of the large number of fallen-down and dismantled factories seen. They can always be identified by the stone work of the presses and the edge stones and lever weights.

This would not be strange if the facts as given by the head of one of these factories were true. In trying to find out the costs of production, and the prices at which the oil and the cakes were sold, I discovered that the factory where we made the inquiries was losing about four dollars on every hundred pounds of cake and oil combined. True the manager said they were not making much money, but admitted that he was not losing money, but when it came to an analysis of costs he was losing several thousand dollars a year, and didn't know it. He needed an efficiency expert to work on his accounting system for a while. One cause for possible loss

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is that these factories work only about six months a year.

We have, then, here in the province the raw materials for a large oil industry of several kinds. We have in its crude forms a rather extensive industry in these oils. It only remains for interested capital to be invested in the business, with modern means, as is being done with the paper industry here in Foochow and with better means of transportation so that the raw product can be brought to the centers at less expense, and we may see a growth in oil industry, the tung oil for commercial purposes, and the tea and peanut as worthy competitors of other vegetable oils that find such a ready sale for culinary purposes.