

# OIL PALM.

## EXPERIMENTS WITH OIL PALMS.

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Bulletin No. 62 of this Department summarized the position in regard to the cultivation of oil palms. It was there stated that the oil palm thrives best in localities and soils which are suitable for rubber or coconuts. Sumatra experience indicates that it yields best where the rainfall is considerable, but will give fair crops when the rainfall exceeds 40 inches per annum provided that this rainfall is evenly distributed.

Towards the end of November, 1915, an area of  $2\frac{1}{4}$  acres of oil palms was planted out at the Anuradhapura Experiment Station from seed specially obtained through the Department of Agriculture of the Gold Coast. Further palms were planted along the edge of the irrigation channel in 1916. The yields of the oil palms at the Anuradhapura Experiment Station have been as follows:—

1919	...	186	pounds of fruits.
1920	...	102	do
1921	...	542	do
1922	...	575	do
1923	...	1,629	do
1924	...	929 $\frac{1}{2}$	do
1925	...	622 $\frac{3}{4}$	pounds of fruits up to August 15.

These palms are grown without irrigation, but they receive occasional ploughings and harrowings. They are divided into plots for experimental purposes. In certain plots, artificial fertilization is practised, whilst in others natural fertilization of the flowers is allowed to take place. The above yields may, however, be taken as a fair average of what might be expected from palms grown on unirrigable lands in the Dry Zone of the Colony. These yields when reduced to acre yields amount to the following:—

1919	...	80	pounds of dry fruits per acre.
1920	...	36	do do
1921	...	181	do do
1922	...	192	do do
1923	...	543	do do
1924	...	310	do do
1925	...	207	pounds of dry fruits per acre up to August 15.

These yields are by weights of dry fruits and represent two-thirds of the actual fresh weights. Even then, these yields compare unfavourably with yields which have been reported from Malaya, and clearly indicate that the dry conditions over a long period—such as prevail in the Dry Zone of Ceylon—are not suitable for prolific fruit production in the oil palm.

A consignment of these fruits was sent to England last year, and was treated in the exhibition plant of the Nigerian Products, Limited. The fruit was reported to be smaller and rounder than Nigerian, the analysis showing 22.25 per cent. of palm oil, and 18.63 per cent. of kernels as compared with 23.71 per cent. of palm oil and 14.78 per cent. of kernels in Nigerian fruit.

During July, trials were made with the preparation of palm oil by the two methods commonly employed in West Africa, and the following report by Mr. H. A. Deutrom, Manager of the Anuradhapura Experiment Station, is of interest:—

#### **THE "SOFT" OIL PROCESS.**

"Four bunches of ripe fruit were cut, and the fruits separated from the bunches with the aid of a pruning knife, care being taken to damage the fruit as little as possible. Half the quantity of fruit was put into an earthenware pot, and two gallons of water added just sufficient to cover the fruit, the remainder of the fruit was put into a pot perforated at the bottom and placed above the other pot. The top of the perforated pot was covered with a half-round chatty. The two joints were then made steam-tight with wet mud, and the pots placed on a well-built fire place and allowed to boil from 8 A. M. to 4 P. M. The boiled and steamed fruits when taken out the following morning were found to be quite soft. They were put into a wooden mortar and pounded till the pulp was separated from the nut. Water was then added to the whole mass of pulp and seed and worked by hand till the nuts with a little fibrous matter attached were separated. As a result of this hand working a yellow scum rose to the surface of the water, which was removed and heated for about two hours when a reddish oily substance was found floating. This was skimmed with a small wooden spoon and put into bottles.

#### **THE "HARD" OIL PROCESS OR FERMENTATION METHOD.**

"The fruit being small, five bunches of ripe fruit were cut and spread on the loft of the stores. On the 7th day the fruits appeared quite loose and came off readily when shaken out. The fruit was roughly picked over and put into a dummy canoe (hewn out from a log of wood), sloping down at one end and fitted with a hole and plug. Half a gallon of water was poured in, and the whole covered with plantain leaves and weighted down. On examination at the end of 24 hours the pulp was found to be hard. The fruit was turned over and left for a further 24 hours, at the end of which time the fruit which was soft was trodden with the feet by a cooly, and the mass piled at the higher end of the canoe and covered with plantain leaves. The next day a gallon of hot water was poured into the piled mass of fruit and pulp and worked with the hands as before. The mass was again heaped up at the higher end of the canoe and covered with plantain leaves and left for a further 24 hours to undergo the third fermentation. After the completion of the third fermentation, the covering was removed and two gallons of cold water were poured into the mass of fruit and pulp, mashed with hands and feet and separated into nuts and fibrous pulp. A thick scum of oil floated on the surface of the water, which was removed with a spoon and placed in a vessel for further treatment. The nuts and fibre were washed in the same water and put out to dry. The scum, consisting of oil, water, and finely divided pulp, was heated in a chatty until the water boiled, when the oil was skimmed with a spoon and put into bottles,

## OBSERVATIONS.

The 'Hard' oil process yielded more than twice as much oil as the 'Soft' oil process. The weight of fruit used in both the methods was the same although the number of fruits was more in the former due to smaller fruit being used. This high yield is, undoubtedly, due—as the writer of the Nigerian Special Bulletin says—to the fact that the time taken and labour expended in the two operations of washing and two of fermentation of the 'Hard' oil process result in better separation of the pulp from the nut, and what is more important, rupture of a greater proportion of oil cells, than occurs in the one stage of depulping or mashing in the 'Soft' oil method."

These oils have been examined by Mr. A. W. R. Joachim, Agricultural Chemist, who reports as follows:—

"I have the honour to forward herewith report of analyses of the two samples of palm oil and of the fibre sent by the Manager, Experiment Station, Anuradhapura.

As will be observed from the analyses the "Hard" oils give higher figures for all the 'values' determined, including specific gravity and melting point. This is due to the greater quantity of free fatty acid present in the 'Hard oil.' The figures for the 'acid value' show that the 'Hard oil' contains about four times as much free fatty acid as the 'Soft oil,' which can be considered very good so far as freedom from acidity is concerned.

When compared with the 'average' values as given by Lewkowitsch, the figures obtained, with the exception of the 'Saponification value' which is slightly lower in the case of the soft oil, are observed to fall within these ranges. The oils analysed are therefore average palm oils so far as their 'constitution' is concerned."

*Analyses of Palm Oil*

	Soft Oil	Hard Oil	Average values (Lewkowitsch).
1. Specific gravity at 25·5°C	·872 ...	·936 ..	·893—·924
2. Melting points	.. 39°C. ...	41°C ...	27—42·3°C.
3. Acid value	... 8·0 ...	34·9 ...	8—103·7
+ Saponification value	... 194·4 ...	196·9 ...	196·3—205·5
5. Iodine value	... 52·96 ...	54·1 ...	52—56

*Analyses of Fibre obtained by the "Soft Oil" Process.*

	Determined Percentage	Barnes (Calculation on dry matter)
Moisture	... 3·48 ...	—
*Ash	... 8·65 ..	—
Fibre	... 30·96 ...	—
†Proteins	... 13·75 ...	—
Ether extract (oil, &c.)	... 43·16 ...	42·0
	100·00	

\* Containing nitrogen 2·2 per cent.

† Containing phosphoric acid = ·805 per cent. }  
Potash = ·722 " } calculated on ash.

The results of these experiments indicate that the variety of oil palm is satisfactory, but that yields in the Dry Zone are poor. These palms, however, appear to thrive better at Anuradhapura without irrigation than the coconut, and as palm oil is an article of food which can be of quite good quality, it has to be considered whether further planting of these palms in the villages is not desirable.

There is little prospect before the oil palm as a plantation product in the Dry Zone of Ceylon, if yields larger than those which have been obtained at the Anuradhapura Experiment Station are not obtainable. In view of the forthcoming opening of the Batticaloa-Trincomalee Railway lines, I would, however, suggest that further trials be made at the various stations on these lines. In fact, I would recommend, for the consideration of the members of the Board of Agriculture, the establishment of small experimental plots at every station. These plots would be likely to yield information of value, and information which would be required if the development of the areas through which these railways pass is to be hastened.

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## **PALM OIL AND KERNELS IN WEST AFRICA.**

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### *Colonial Office Report.*

The Joint West African Committee of the Liverpool, London and Manchester Chamber of Commerce suggested some time ago that an enquiry should be held to consider the best means of securing improved and increased production of palm oil and kernels in West Africa. A Committee was appointed in September, 1923, and approved by the Duke of Devonshire, then Secretary of State for the Colonies. The results of that Committee's investigations are now published in a clear and detailed pamphlet.

The merchants and those interested in the British West African Colonies who suggested this enquiry, had in their minds the fate of the rubber industry of West Africa. This industry was at one time an important factor in the world rubber trade—now it is, to all intents and purposes, non-existent. With concern they saw the wasteful collection and non-collection of oil palm products; and the laborious native methods of manufacture, with far greater concern they saw the rapid progress of the Sumatra oil palm industry. The future for West Africa seemed black, and the report of the Committee appointed is not reassuring.

### **THE SUMATRA INDUSTRY.**

Sumatra possesses those advantages which West Africa lacks. The industry is in the hands of an extremely well-organised and equipped association of planters, the *Algemeene Vereeniging van Rubber planters ter Oostkust van Sumatra* (A. V. R. O. S.). Through this organisation the most up-to-date knowledge and the results of research work are available to the planters. Oil palm plantations in Sumatra date from 1911, when 6,500 acres were under cultivation, since then despite the intervention of the war, during which planting ceased, the area had increased to over

30,000 acres. The planters estimate that in the next ten years this area will become 100,000 acres, while it is publicly claimed that within fifteen years more palm oil will be exported than West Africa's pre-war record output. No less than sixty-two estates in Java and Sumatra have started oil palm plantations, and it is confidently expected that production will reach a figure of 20,000 tons in 1930. Moreover, this oil can be put on European market at a substantially lower price than West African oil. Trained indentured labour is available for the Sumatra plantations which are run on scientific lines, and the fruit is treated by modern machinery. It will be a hard task for the British Colonies to keep abreast of such progress.

#### **FRENCH AND BELGIAN ENTERPRISE.**

Elsewhere in West Africa steps are being taken to meet the threatened competition from the East. In 1919 the French commissioned a certain Dr. Van Pelt to investigate the means by which products from the French Colonies might compete with palm producers from Sumatra. As a result of his suggestion a substantial advance has been made in research work. In the Belgian Congo opinion is confident that the palm products industry will be able to meet this competition. The Belgians claim that up to now the palms in their territories have produced an equal quantity and as good quality fruit as the Sumatra trees. Natural facilities, much research work, good organisation and modern machinery and transport, have contributed to the success of the plantations. Special efforts are being made to improve transport communications from the Haut-Congo. As the best oil palm areas are at an average distance of 1,000 to 1,500 kilometres from the sea, Belgian enterprise is not to be despised.

#### **CONDITIONS IN BRITISH WEST AFRICA.**

Both the Gold Coast, Nigeria and Sierra Leone possess large natural areas of oil palm forest, which if scientifically worked and developed would be a great source of wealth to native and European. The palm products industry, however, if not on its last legs is sadly in need of a new pair. It suffers from almost every disadvantage

The labour is unsatisfactory and inadequate.

Regular supplies cannot be relied upon, as they depend largely on the whim of the native, who having obtained a good price for one load, rests from his labours till his earnings are spent. Organised plantations are comparatively few, the trees are scattered and uncared for, and much of the fruit is never gathered.

Collection and extraction methods are laborious and wasteful. The oil extracted in most cases is of inferior quality with a high content of free fatty acid, while the amount of oil obtained is from 8-10 per cent. the weight of the fruit—more than half the amount obtainable by machine expression.

Transport facilities are lacking, the fruit being chiefly brought in on the heads of natives.

Briefly the industry has made little progress and unless some means of reviving and developing it are found, it is bound to die out as the competition from Sumatra increases. Some progress has been made in research work through the Agricultural Departments, but it is strongly

felt that the chemical and botanical aspects of the problem may receive too much attention. Practical steps must be taken and taken quickly.

Intensive propaganda among the natives should be undertaken by all officials to encourage them to preserve and cultivate the palms, and to limit the destruction of the trees for "toddy!"

Modern machinery for the expression of the oil and removal of the kernels must be introduced, unless the industry is to decay. Most important of all, private enterprise in preference to Government enterprise must be attracted, and mills and machinery will follow. What inducements to offer to private enterprise is the question of the moment. Steps have already been taken in the Gold Coast and Sierra Leone in this direction, but they did not lead far enough, and on the whole ended in failure. The problem is intricate, and abounding in difficulties for the Governments endeavouring to promote the industry. The limit of plantation land, the length of leasehold terms, and the various rights of the mill-owner, are extremely hard to decide, and the conditions under which land may be obtained in the three Colonies vary and are not always favourable.

The Committee which has studied this problem closely has made valuable suggestions for surmounting the difficulties and for providing sufficient inducements to the capitalist. In view of the fact, however, that ten years hence the proposed inducements may be too late, they should be considered as the irreducible minimum. To attract enterprise outside the West Africa Trade is essential, and to do this the maximum possible inducements must be offered, and over-restrictive conditions avoided.

#### LABOUR SAVING IN THE GOLD COAST.

As an instance of the success possible in well-organised concessions we give the following example of a European firm on the Gold Coast:—

"Much valuable work in labour-saving methods has been done by a European Company in the Colony. A concession of palm lands was taken up by arrangement with the native owners, and a central power-driven factory was erected with a service of light railways radiating from it in all directions to facilitate transport. The palms within the concession are worked and developed by the Company, and the native owners are encouraged to collect fruit and sell it to the Company—a popular arrangement. The oil produced is of much finer quality than that produced by native methods, and it is only by multiplication of such mills, either through private enterprise or as a co-operative movement among the people themselves, that a revival of the industry can be hoped for."

The following table gives some idea of the position of exports and of palm products in British-West Africa:—

EXPORTS.					
Gold Coast,					
1922.	Oil	...	210,364 galls.	1912,	1,444,432 galls.
				1885.	6,729,000 "
Nigeria,					
1922.	Oil	...	88,000 tons	1919.	101,000 tons
	Kernels	...	179,000 "	1919.	217,000 "
Sierra Leone,					
1923.	Oil	...	3,346 tons	1992,	2,076 tons
	Kernels	...	59,543 "	1922,	49,029 "

It will be seen that in Nigeria and the Gold Coast the decrease is large, particularly in the latter where the palm is comparatively neglected for cacao cultivation. The only increase is in the exports of kernels from Sierra Leone, where palm products still form the backbone of the export trade.

#### THE MALAYAN OIL PALM INDUSTRY.

A promising industry is growing up in the Federated Malay States, but it is as yet in its infancy, and can have no hope of competing with the Sumatra industry. Only about 5,000 acres are under cultivation in comparison with Sumatra's 35,000, and of these 1,000 are in bearing. Planters, however, are benefiting from the experience and example of Sumatra planters, and the industry though young is being run on up-to-date lines. The following table of annual yields obtained in Malaya is of interest:—

#### ANNUAL YIELDS.

Age of Palm.	Fruits per palm per annum.	Fruits per acre.	Pericarp per acre.	Palm Oil per acre.	Palm Oil Output per acre (85% basis.)	Kernels per acre.
4th year ...	45	2,475	1,436	767	652	173
5th—7th year ...	90	4,950	2,872	1,534	1,304	346
8th—10th year ..	100	5,500	3,190	1,705	1,449	385
11th—15th year ...	125	6,875	3,988	2,131	1,811	481
16th—30th year ...	145	7,975	4,626	2,472	2,101	558

This is a conservative estimate.

Malaya is fully awake to the possibilities of obtaining a very small percentage of free fatty acids. Experiments are being conducted with a view to securing not more than 3 per cent. of the acids. Care in picking, storing and extracting the oil from the fruit, helps to render this percentage low. In West Africa the primitive methods of boiling the oil cut with water, makes anything up to 50 per cent. of the acids possible. In Malaya the fruit undergoes a preliminary heating to destroy fermentation; it is pressed in order to obtain as much oil as possible without cracking the nut. The pericarp is removed by a depulper and pressed again, and the residue used as fuel. Centrifugal extraction has been employed by means of which the greater proportion of the oil and moisture is removed, and the separation of the nuts from the fibrous residue facilitated, the last pressing being carried out in the same way as the previous method. Extraction of Kernel Oil is carried on, but the demand in the home-market is for the kernels, so expression is not likely to increase very greatly. The export of kernels is growing, and the industry is becoming well known. Numerous applications for land have been received, and experimental cultivation is carried on at the Government Plantation.—Empire Production and Export, August, 1925.

#### PALM OIL.

The following extract is taken from the Annual Report of the Chemical Division of the Department of Agriculture, F.M.S. & S.S. for the year 1924.

At the request of the Honourable the Chief Secretary, experiments were carried out to determine whether more palm oil could be extracted from the residual pericarp after this has been treated by the primitive methods at present in use in Malaya and Sumatra. This residue contains about 25 per cent. of oil and it was found that 5 per cent., based on the weight of the material, could be obtained by boiling the pericarp with water and subsequent pressing in a hand-screw press. Modern machinery for the extraction of the oil with a resulting higher yield of oil, has since been installed.