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Coconut Industry in Malaya

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COCONUT PALM (*Cocos nucifera*).

PREFACE TO SECOND EDITION

WHEN the first edition of this brochure was published, there was then no thought that a great and terrible war was at hand, and that a critical shortage of fats in the United Kingdom would shortly create a much keener demand for the edible parts of the coconut, or that the people of this country would be compelled patiently to take their individual turn in queues for the purchasing of nut butter on coupons limiting the supplies to five ounces per head. Yet such has been the common experience, and the once banned margarine is now a household necessity.

Whilst the war is responsible for the way in which prejudices have been thrown overboard, it must not be overlooked that the introduction of vegetable fats in lieu of animal fats has made for the purity of the article, the coconut having completed the revolution begun by Science and Hygiene in the manufacture of what is now a popular item of food, and a really sound substitute for dairy butter. It is generally known that coconut oil is largely utilised in the manufacture of margarine and lard, etc., and to so remarkable an extent have imports increased into the United Kingdom that English butter firms that scarcely used an ounce of it a decade ago now import several thousand tons annually.

For years prior to the war, much was written in support of the cult of the coconut, partly by those who believed in its future, and who claimed for Britain a greater share in the home side of the industry, and partly by the capitalist, who predicted a boom. Those familiar with this class of agriculture are of opinion that a boom might be regrettable, and must assuredly entail loss and disappointment to the inexperienced investor, and would ultimately reflect ad-

PREFACE TO SECOND EDITION

the industry in general. In support of this view, he explained that, unlike plantation rubber, are not confined to countries easy of access, but y distributed throughout the tropical belt. To ts they have been ocean-carried and self-sown. her places they take the form of regular plantings natives of the country. A boom, therefore, would o existence a host of propositions from the remote the earth; and unless such places were favoured p and plentiful labour, as well as ready marketing the enterprises would be doomed to failure. Also, tant commercial fact to be borne in mind is that few coconut-growing districts like Malaya, where e 4,000 nuts are necessary to the ton of copra, ority of other districts requiring probably some 8,000 nuts. Whilst, therefore, the coconut may anywhere in the tropics where rain is plentiful. should take into calculation important factors ke for commercial success, such as soil, labour, t, government and markets. In this respect the eninsula stands unrivalled.

H. L. C.

er 31, 1919.

PREFACE TO THIRD EDITION

IS pamphlet, originally written by Mr. H. L. L. oglian and revised by him in 1919, has been further revised and brought up to date by officers of the ment of Agriculture, Federated Malay States and Settlements.

y 1, 1924.

COCONUT INDUSTRY IN MALAYA

INTRODUCTION

COCONUT cultivation is one of the oldest of the agricultural industries in Malaya, and of the country's suitability for it no better evidence can be offered than the groves of vigorous old palms in some of the senior Settlements, where trees of sixty years and upward continue, with unfailling regularity, to bear heavy clusters of large nuts, and, moreover, show good promise of fulfilling their allotted span of fivescore years and more.

Copra was first shipped from the Straits to Europe about the year 1850, but it is said not to have become an important article of export till 1870.

In the light of modern requirements, however, the coconut industry may be said to be in its infancy. It is by no means in the experimental stage; indeed, as an industry it is certain and lasting, and with the enlightened methods now being adopted for the preparation of copra, the extraction of oil and the manufacture of fibre, it is bound to expand far beyond its present limits. In the past, it has assured comfort and prosperity to millions of the human race; in the future, it is safe to predict, it will bring benefit to millions more. Nothing that grows on earth has so many uses for humanity as this wonderful Coconut Palm. To the natives it provides food and drink, and most of the necessaries of life.

Gibbon, the historian, writing of the palm tree, adds that the Asiatic celebrated, either in verse or prose, the three

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and sixty uses to which the trunk, the branches, the juice and the fruit were skilfully applied. He refers to its use in the domestic economy of the natives; but the value of the coconut has long been appreciated by Europeans and Americans, and at the present time goes on being put to an increasing number of purposes in the manufacturing world.

Coconut oil is utilised in the manufacture of nut butter, margarine, lard, soap, candles and other articles. It is used both as a lubricant and as an illuminant, and is also used for embrocation and for perfumery. The coir, or fibre, is used in the manufacture of rope, matting, brushes, felt and mattresses, and, by an artificial dyeing process, the selected "bristles" from the husk make a splendid substitute for horsehair for stuffing.

The kernel is used in confectionery, and the pressed (or dried kernel), after the oil has been expressed, is made use of in the preparation of feeding stuffs for pigs, sheep and poultry, and is also an extremely valuable fertiliser. The oil is particularly suitable for making marine soap, which will lather in salt water. Coconuts saponified in heat with strong lye, but there is a "leakage out"; a hard soap is formed, although the percentage of water is high.

As one can judge, the fear of over-production need not enter into present calculations for many years to come, especially as the planting of new areas during the war years is still limited.

Even from all these uses in countries where the coconut is not grown, the fruit of the tree is indispensable to the millions of natives, who for generations have relied upon it for food, drink, cooking oil and for all the other numerous household purposes. This demand, of course, has to be satisfied before a single coconut is sold to the foreign manufacturer, or other outsider. With such populations ever on the increase, particularly in the Malay Peninsula, an excellent argument against the probability of over-production is offered.

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The terms of his holding in most cases prevent the Malay from disposing of his plantation: therefore, if the foreign consumer of coconut oil is not content with less than half the Malayan outputs, with possible further shrinkages coupled with famine prices, the only possible remedy lies in fresh planting.

Out of the hurricane belt, as is the Malay Peninsula,



MALAY KAMPONG, WITH COCONUT PALMS.

Coconut cultivation is one of the safest forms of tropical agriculture, and the history of the palm makes this incontrovertible.

There is a popular belief that the coconut palm will grow only in regions near the sea, but experience has shown that the palm flourishes and produces large crops of nuts in places as remote from the seashore as several hundred miles. A great point in favour of the Malay Peninsula is that it has a more

Maritime
Climate.

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l seaboard than most tropical lands, having regard
 total area, so that if the salt sea air is essential to
 palms, then the suitability of each of the Malay
 or coconut growing is demonstrated in the following
 distances :

Name of State.	Sea coast line in miles.	Remotest bound- ary from sea- shore in miles.
Perak	100	90
Selangor	120	50
Negeri Sembilan	40	70
Malang	120	150
Kelantan	60	95
Terengganu	130	50
Kedah	60	45
Johore	300	50

Approximately, the total area of British Malaya is 51,725
 miles, the Federated Malay States comprising more
 of the total. Johore contains about 9,000 square
 Terengganu 6,000, Kelantan 5,500, and Kedah 3,000
 miles.

Total area under coconuts in the Federated Malay
 only in 1922 was, approximately, 193,256 acres,
 made up as follows :

Perak	89,662 acres.
Selangor	78,680 ..
Negeri Sembilan	10,468 ..
Malang	14,446 ..

Total area under cultivation on estates of 100 acres
 was only 70,868 acres at the end of 1917, so that
 the seen native holdings comprise about two-thirds
 total estimated area under coconuts. The value of
 the crop is estimated roughly at over £5,000,000. The
 output of copra from the Federated Malay States in 1922
 was approximately, 43,333 tons, valued at £1,020,316.

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compared with 36,211 tons in 1921, valued at £883,132, and 24,999 tons in 1920.

The exports of Copra from the Straits Settlements ports for three years were as follows :

	Tons.	Value.
1920	118,696	£5,337,868
1921	134,501	3,221,811
1922	166,192	3,442,988

Appended are comparative statistics showing the export of Coconuts and Coconut Oil :

	Coconuts. Value.	Tons.	Coconut Oil. Value.
	1920	£54,662	8,435	£676,397
1921	42,575	8,172	369,132
1922	38,826	6,252	238,430

The comparative average prices per ton of copra during 1922 were, Malabar £26 9s., Ceylon £25 18s., Straits (Federated Malay States) £24 13s., South Sea *Prices.* £23 16s. and East Africa £23 15s. Comparative average prices of coconut oil per cwt. during the same year were, Cochin £2 3s. 2d. and Ceylon £1 18s. 5d.

Tracts of suitable land may be obtained by the enterprising capitalist, and not necessarily the large one, either in the Federated Malay States or in the Native States that have more recently come under British control.

In order to encourage the cultivation of coconuts in favourably situated districts on the east coast of the Peninsula, the Government of Pahang grants land in blocks of 2,000 acres, on specially low terms to approved applicants. Titles in perpetuity are granted, and the initial quit rent is 10 cents (2·8 pence) per acre per annum, rising in ten years to the maximum rent per acre of \$1 (2s. 4d.). Formerly the rent started at 50 cents (1s. 2d.) and rose in six years to \$2 (4s. 8d.). The new advantageous terms will be further appreciated when it is noted that no premium is charged on the land

Available Land.

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out merely the cost of survey and setting up stones. In other parts of the Peninsula, the premium chargeable by Government for land solely for coconut cultivation is \$2 per acre for out road frontage, and \$3 per acre for land with tige. The present export duty throughout the Malay States is $1\frac{1}{2}$ per cent. *ad valorem*. It is by the reason why planting proves so attractive



RIVER SCENE, KINTA (PERAK).

of the open-air life of the planter, its constant and varied occupation, the opportunities for excellent shooting in leisure moments and, in due course, the splendid returns on initial outlay. A large proportion of Malayan planters are old school boys, who, owing to the overcrowding of the professions, recognised the fact that for young men stability and ambition new fields of occupation were necessary. To take up planting in Malaya, however, one must do so on somewhat prepared ground, with capital, not necessarily large, but sufficient to buy (say) 500 acres, and the cost of bringing a coconut estate to the bearing

stage may range from £35 to £45 per acre, according to the district, labour and administration. In this figure no allowance is made for London administration or commercial agents' charges.

Much, of course, depends upon soil, sound planting, economy and close personal supervision. Given these, the sixth year should be the flowering year.

A reason for the higher figure given above may be found

Cost per
Acre to
Bearing
Stage.



RIVER SCENE, PERAK.

in the charge for absolutely clean weeding. For rubber, this is necessary, but it is not so essential with coconuts, and is often a waste of money.

The principal maxims to apply to coconut cultivation, especially in the early years, are: (1) Keep out lalang; (2) Look to your drainage; and (3) Generously fork your trees.

Messrs. Munro and Brown, in their *Practical Guide to Coconut Planting*, published in 1916—which is associated primarily with conditions in the Malay Peninsula—give the following estimate for bringing a coconut estate to the producing stage, or six years from date of planting:

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er fairly normal conditions the cost of opening and
nce up to the sixth year (taking an estate of, say,
s) where cheap labour and transport facilities are
le, exclusive of drying kilns, should be approxi-
s under :

1st year	£10 per acre.
2nd	5 ..
3rd	4 ..
4th	3 ..
5th	3 ..
6th	3 ..
	<hr/>
Total	£28 ..

re closing capital account, another £2 or £3 [per
ust be allowed for permanent buildings, drying
s."

experienced coconut planters consider the above
re too low for present conditions, and prefer to
e cost of bringing a coconut plantation into bearing
o £45 per acre, which includes the cost of permanent
s, drying kiln, copra store, etc.

ame authors quote the following estimated output

" Estimates of Revenue may be roughly calcu-
lated as follows :

6th year	500 nuts per acre.
7th	1,000
8th	1,500
9th	2,000
10th	2,000
11th	2,350
12th	2,500

above figures indicate that seven and a half years
allowed before the estate reaches the self-supporting
ssuming the net profit is £3 per 1,000 nuts)." "

Chief Secretary's Report of the Federated Malay

States for 1922 gives the total number of plantation labourers as 195,564, comprising Tamils, Chinese, Malays and Javanese.

Coconut planting is popular with the real native of the country—the Malay—and he thoroughly understands it. Thus local labour is often available, where for other agri-



DWARF COCONUT TREE.

cultural pursuits Tamil or Chinese labour would have to be imported.

The tall variety of the palm known as *Cocos nucifera*, is the common type grown in the plantations, but of late years an interesting feature of coconut planting has been the introduction on a large scale of several types of dwarf coconuts. These palms

Species of
Coconut
Palms.

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bearing in the fourth year, and consequently give turns on capital invested. The nut, however, is smaller, and the kernel less in weight, but as 90 trees per acre can be planted to the acre, it remains to be seen whether an increased yield of copra will not counterbalance the cost of dealing with a greater number of nuts.

ESTABLISHING THE PLANTATION

Factors to be considered in selecting land there are, apart from the requisite qualifications of the site, a number of commercial considerations, all of which are important factors in the cost of the plantation and its produce. Briefly, they are as follows: Transport facilities, such as roads, railways, canals, rivers or railways, adjacency to towns or villages, and the availability of a sufficient labour force.

The Malay Peninsula is admirably served by roads and railways, and ocean liners, coasting steamers and local cargo craft, so that excellent facilities are afforded for the transport of produce; therefore, given ordinary circumstances, the intending planter should not materially err in choosing his land.

The conditions for successfully growing coconuts are well met in the Malay Peninsula. Its geographical position is north of the Equator, extending from about the first to the seventh parallel. Its annual rainfall is about 90 to 120 inches evenly distributed throughout the year, and its mean temperature is about

outside of the hurricane zone, and the "Sumatra" hurricanes that occur occasionally have never been known to devastate a plantation. As evidence in support of this, it is mentioned that insurance against this form of natural calamity is practically unknown.

The length of the Malay Peninsula is approximately 1,000 miles. On its east side it is favoured for six

months of the year by the N.E. Monsoon, and during the remainder of the year, on its west coast by the S.W. Monsoon.

The best site for the cultivation of coconuts is found in the low alluvial flats in the neighbourhood of rivers that overflow from time to time, the loam being usually rich and deep. The coast districts of the Malay States offer these advantages, and it would be difficult to find the palm growing under more

Soil and
Locality.



RICE FIELDS WITH COCONUTS.

favourable conditions than prevail in these localities. Owing to the fertility of the soil, little or no manuring is required for many years.

On very low-lying land peaty soil often exists, and before it can be turned to successful account it needs considerable care and attention. Drainage is the work of first importance, and this must be followed by complete turning of the top soil. The land must then be thoroughly lined so as to destroy the deleterious acids formed from stagnant water lying on or close to the surface for a long period.

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to be particularly avoided is that which has inert heavy retentive soil and areas underalang grass, especially such large abandoned tracts as have been formerly planted with tapioca or gambier. Old pineapple plots, are not recommended as a home for the coconut, the intention be first to restore to the soil by way of what the pines have taken from it. Such lands are procurable on exceptionally cheap terms from the owners, but, in the long run, they are likely to be disastrously dear, due to retarded growth and destructiveness of the palm, caused by soil deficiencies and insect pests.

The coconut palm can be grown successfully up to an altitude of 2,000 feet, provided the temperature requirements are fulfilled, i.e. a mean of about 75° to 85°, but it does not develop into a fruit-bearing tree on steep slopes of inclination greater than one in fifteen. Its position should not be too shaded or sheltered; freely moving currents of air, especially sea-breezes, seem to impart much vigour to the palm.

To the planter of coconuts the locality must be his first consideration and the soil his next. Fortunately the soil throughout the Malay Peninsula is so fertile that even the ordinary precautions outlined above, a successful crop is scarcely possible.

For additional safety, however, and also to make sure of success, the newcomer is advised to consult the Department of Agriculture Federated Malay States and Straits Settlements, with its headquarters at Kuala Lumpur, where such excellent and free advice is available. Another valuable source of information, through its Secretary at Kuala Lumpur, is the Planters' Association of Malaya.

The soils in order of merit are placed thus: (1) alluvial soils near streams; (2) deep brown gravelly loam; and (3) loamy sand.

The proportion of vegetable matter, or humus, in the soil should be readily ascertained, and on the result of the analysis the soil should be classified as under:

1. Rich - If they contain $1\frac{1}{2}$ to 5 per cent. of humus.
2. Medium - If they contain $\frac{1}{2}$ to $1\frac{1}{2}$ per cent. of humus.
3. Poor - If they contain less than $\frac{1}{2}$ per cent. of humus.

The palm is well known to residents of the tropics, but as this treatise is intended to interest others also who have not yet visited the warmer climes, a short description of the tree may be appropriate. The palm, *Cocos nucifera*, most generally known, has a simple, unbranched trunk which attains a height of about 80 feet, and its diameter is from 12 to 18 inches. It is marked along its entire length by the scars of fallen leaves. These marks are said to be an indication of the age of the tree, the total number divided by two representing the years. Though expert opinions differ in this respect, the lay investigator will find it a fairly reliable method of ascertaining approximate ages.

The stem is surmounted with a crown of from 20 to 30 leaves, with the youngest nearest the centre. When full grown, these leaves measure about 18 feet in length. From the central stalk of each, on both sides, narrow leaflets about 3 feet in length are thrown out at right angles.

The roots, red in colour, and near their origin as thick as a man's finger, form an almost compact mass some feet thick around the trunk of the tree at its base.

The Roots. While some of them penetrate the soil for a considerable depth—there is no tap-root—the majority spread out laterally in all directions, a foot or so below the surface. The active ends of these lateral or primary roots, and the young secondary roots arising from them, are found to a distance of about 50 feet from the tree. This is a point to be borne in mind when applying fertilisers to the soil. Further, the plant being a surface feeder, the utility of disturbing the top soil by mechanical appliances is manifest.

The flowers are of two kinds, male and female. They are borne on the same stalk, and when young are enclosed in the spathe, or leaf wrapper, which unfolds as the flowers open. The male flower is yellowish in colour, and the female flower of a greenish hue.

The Flowers.

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fruit is ovoid in shape, and, in the husk, is somewhat bigger than a football. Malay nuts, which are recognised as about the best grown, weigh in all from 5 to 6 lb. Of this weight, about 30 per cent represents husk. This is from 2 to 3 inches thick,



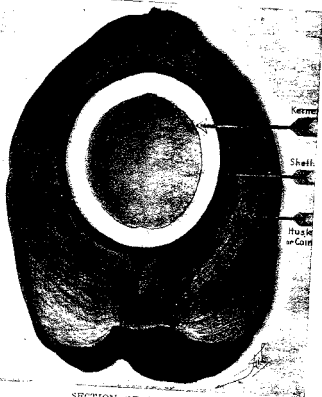
INFLORESCENCE OF THE COCONUT PALM.

a fibrous mass, lying between the smooth outer and the shell.

Inside the shell is the hollow white kernel or nut flesh. When dried, it is known commercially as copra. Its value lies not only in the oil it contains, but in the

important residue after the oil has been expressed. The latter is known in the East as "poonac," and commands high prices, either as cattle food or as a fertiliser of the first grade.

When young, the flesh is very thin and soft, and the



SECTION OF COCONUT.

Showing Husk, Shell and Kernel.

kernel completely filled with liquid—that sweet, refreshing beverage which the visitor to a Malay kampong knows so well. As the nuts grow older, this moisture, known as the milk, is partly absorbed, and the cavity remains about half filled.

PREPARING THE LAND

First operations are to clear the selected land of growth, which, when dry and withered, should be entirely burnt off. This should be done during the dry months, and about a month before the rain. The debris must not be fired until it is in a state of tinder, which should be in a month or so after the first firing must not be delayed until all the leaves are fallen, or the undergrowth, and possibly lalang, will have made some progress. A good burn is of paramount importance. It saves much after-labour and expense. In the intervening weeks, special precautions must be taken to prevent a premature burn. The careless coolie and the careless match have in the past been the direct cause of increased expense to the plantation owner. The work is usually done on contract, and before letting out the job it is advisable to inquire strictly into the past work of the contractor—references are easily obtainable—and whether he has good terms with his labour. One may thus avoid a premature burn at the hands of a spiteful coolie paying high prices against the contractor.

Terms of a clearing contract should include, apart from general felling, provision for collecting and stacking timber of over five inches in diameter, prior to burning, and for the cutting, shaping and transport of uprights for

It ought not to be any doubt in the planter's mind as to the advisability of rooting up all tree stumps, for such work has for its object the prevention of the development of fungi, termites and other insects, and the decaying timber may become the future food of the dreaded black beetle.

An ideal plantation is, of course, freed from stumps and all wood before planting is begun. Some planters do not take the risk of disease, and allow the timber to rot away, but the greatest danger is said to be during the first year. After

that, the stumps appear to be immune from the attacks of pests, except beetles, and may be left to rot away.

The cleared land must at all costs be kept free from lalang, an obnoxious grass, which not only retards the growth of the young cultivation, but, even with mature trees, is the cause of meagre and disappointing fruit yields. The writer attributes the smallness of West Indian nuts to the Pará or Guinea grass that is allowed to thrive unchecked in the plantations.

The popular space for planting the coconut palm, *Cocos*



DWARF COCONUTS.

nucifera, is a space of 30 feet by 30 feet, which gives forty-eight trees to the acre. The Dwarf Coconut,

Lining. *Nyor gading*, is planted 20 feet by 24 feet, which gives 90 trees to the acre. The stakes must be put in with accuracy and with due regard to an alignment.

When the land is cleared and lined, pits or holes are dug for the planting out of the seedlings which, for the previous

Holing. six months or so, have been growing in the nursery. The pits cannot be too large, but a cube of 2 feet is generally considered sufficient. The soil removed from the holes is replaced by good surface

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within 6 inches of the top. When this is done, the nuts are put in with the nut of the seedling slightly above and about 6 inches to a foot below the level of the ground. Later, when the plant has come well away with about a dozen well-grown leaves on it, the pits are filled up to the top with more surface soil. The advantages of these partly filled pits or hollows are that they prevent from catching surface rain water and the plant carries with it, the young plant, being counter-protected from wind, and thus takes firmer root in the soil.

Generally, the most favourable seasons in Malaya for planting are during April and May, and again from September to the end of October. On undulating land little or no artificial drainage is necessary, but on low-lying flat country drainage is of considerable importance. In many cases the planter would be well advised to initiate his drainage schemes before felling the jungle growth. This is especially necessary with ground of a peaty nature. The trenches should be wide and deep, and afford every facility for the carrying off of stagnant water. When this is done, the fresh rain water, carrying with it the salts in solution from the top soil, passes freely through the ground, and as the water passes off, the air takes its place, thus energising the mechanical and chemical processes of the ground generally. By generous trenching, heavy, compact and sodden soil can be converted into a porous one. An intelligent person acquainted with the elementary principles of agriculture will soon discover for himself what amount of drainage is necessary for his

plantation. A planter cannot exercise too much care in the selection of seed nuts, remembering that weak parents produce weak offspring with a tendency to weakness, whereas, in planting good seed from strong mature trees, a robust palm is produced which should prove a robust source of wealth production for half a century, the nuts



CARDONUT ISLAND, SULAWESI.

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thick-fleshed copra and the husk full quantities of nuts should be taken from healthy heavily-bearing mature age, i.e. about thirty years, and should be selected, roundish nuts, ripe but not dry, with a thin

gathering for seed, nuts should be lowered from the tree and on no account allowed to drop. The planter should, as far as practicable, personally supervise the selection of his seed nuts, and thus become acquainted with their family history. Good bearing trees, destined to be used for seed, can be given a distinctive mark in the form of a spot of paint of striking colour.

In selecting seed nuts it is a sound principle to take those from a district where general conditions are similar to those of the district to be planted. It is an advantage not to select seed nuts until the outer skin is thoroughly dry and the husk hardened. This occurs in a month or so after ripening.

The nursery must be a carefully prepared piece of land with good soil, light and free, not far from the permanent water supply, and in a locality where the planter can give it constant observation. The soil should be thoroughly "changkolled," i.e. hoed to a depth of 18 inches, and all large stones or roots removed. The soil should then be made to a depth of about 6 inches, in straight rows at regular intervals. The nuts are then laid in the rows at an angle of 45°, stalk ends slightly raised, the nuts set apart. The reason for this slanting position is that at the stalk end there is a depression around the stalk or germ seats in which water is likely to settle if the nut is planted vertically. In the slanting position it drains off.

The nuts are then covered with good top soil, and, if necessary, with an additional thin layer of sand until about an inch or quarter of each projects. They should be well watered so as to settle the soil round them, and the beds should be covered with grass or straw. In dry weather it is

very important that the nuts be watered from time to time. This also applies to the young seedling.

It is advisable to plant in the nursery 50 per cent. more nuts than are actually required, in order to allow for those that do not germinate, and further, to give a wide range for the selection of plants that show vigour. Those that are tardy in germinating should be rejected, as they are weakly plants. Germination occurs in three or four months. At the sixth or seventh month, when the leaves are a foot or so high, the young seedlings may be transplanted to the permanent field.

When the young plants have been put in the permanent field and are firmly rooted, very little cultivation is required beyond keeping them free from weeds and the lalang pest. They should be forked round every three months and ploughed or disc-harrowed down the avenues. As the trees advance in age, the circle forked round the tree should be extended, commencing with a radius of 3 feet from the stem for a one-year-old tree, 4 feet for a two-year-old and so on till the tree is in bearing, when the radius from the stem is about 8 feet.

The Cultivation. Clean weeding is of great importance during the first four years, for the simple reason that during that period the roots will have undisputed possession of the soil and the available plant food during their tender years. When the trees are older, their huge leaves create shade, which to a certain extent keeps weeds in check. Many planters do not favour absolutely clean weeding for coconuts. Except for the 3-foot circle around the tree, and provided lalang has been kept out, it is not necessary and is very expensive.

In the West Indies, the writer saw young seedlings put out in cleared lines through the bush or blukar, the latter forming a shade to the young plants. The same system is adopted with coconuts planted in sugar canes. The young palms seem to thrive well, and the cost of planting is very considerably reduced.

COCONUT INDUSTRY IN MALAYA

ood soil, the young palm requires little or no
except in cases of a backward plant; and a
field should be allowed to demonstrate what
the soil can do for the plants before attempting
em.

nd of the first year, plants that are of weakly
should be taken out and replaced by more
nes from the original Nursery. These being of
ge, a uniform growth in the permanent field is

waiting years, or from the second to the sixth
planter may derive benefit, both in soil and
pocket, by the planting of leguminous Catch
Crops. One of these in particular, which seems
likely to continue in public favour, is the Ground
his hypogaea). This is better known in Java
e Malay Peninsula, and its produce, from which is
another edible oil, is of considerable commercial

led only as a green manure, they should be cut
before they commence to flower, and either
rot as a surface mulch or lightly forked in. They
orse, planted away from the trees, down the lines
s. If the crop is to be utilised, then the bush
fter the crop is removed, should be buried in
This is one way of returning humus to the soil,
ecessary tillage of the land for the second crop
neficial. This may be repeated for three years.

ne fourth year, the treatment of the coconut
t depend on circumstances, but it must be re-
membered that, as the trees come into bearing,
they require potash and phosphates, as these
elements largely represent what the fruit is
from the soil. They may be supplied as sulphate
and kainit for potash, and as superphosphate,
osphate or bone meal for phosphorus. When
sed as fuel, the residue ash is a useful manurial
t, as is also the residue from the husk after

the extraction of the fibre. Of course, cattle manure is, when obtainable, the most efficient fertiliser.

Every plantation, according to the state of its soil, is a law unto itself, and to meet its requirements the individual planter must study such local conditions. He should have the soil analysed periodically, and, as he takes from it, so in due proportions must he return to it. Much can be written on the important subject of fertilisers, and to treat of it as it deserves is beyond the scope of this brochure. Suffice it to say that any manuring scheme adopted must be thorough and systematic, must be in accordance with the ascertained requirements of the soil and bear a close relationship to the elements absorbed by the crops. The cost of manuring an estate is very considerable, and, unless the conditions are studied, the outlay may be a waste of money, to say nothing of loss of time and labour and the disappointment of the investors.

A common method is to dig round the tree semicircular trenches into which the manure is placed. The trench forms a crescent to the tree - half its root area being dealt with one year, the remaining half in the following year, and so on alternately. These trenches are dug approximately at the extremities of the roots. Here the lateral feeders are most vigorous, diminishing gradually in strength towards the stem. The trenches should be dug a foot in depth and 9 inches wide. They may be left open for some time, as the aerating of the soil is very beneficial. The manure is then put in and the excavated soil replaced. The "avenue" system is another way of applying manure, the latter being placed in ploughed furrows between two lines of trees, equidistant from the stems.

No tropical plant responds more generously than the coconut palm to high cultivation at the proper period, and, for every dollar spent in feeding it, the tree returns treble the output even in its first producing year. As the planter would care for his human family, so he must care for his palms, and they reciprocate far more than could be expected from any human alliance.

COCONUT INDUSTRY IN MALAYA

markation of property in the Federated Malay States is done by Government surveyors, and details of the survey are kept in the records of the Land Office, the plan of the property being inscribed in the Deeds.

For out buffaloes, cattle, wild deer and hog, it is to erect a strong five-strand wire fence all round the plantation, and, as this is intended as a permanency, should be well done. On page 20, reference is made to the hardwood uprights, which the felling contractor would supply. These uprights should be of good timber, firmly fixed from 2 to 3 feet in the ground. Particular attention should be given to corner posts, end posts and turning posts, all of which should be sunk a foot or more than the ordinary ones. A wood preservative applied to the base of the posts adds considerably to their

value. Excellent fencing is a galvanised welded wire mesh. This is more costly at the outset than the ordinary five-strand wire fence, it lasts five times as long as the ordinary one, and the cost of maintenance is very small.

HARVESTING THE CROPS

Coconuts are harvested when ripe, and usually during the night, which accounts for so few accidents to people on the plantations.

Climbing the tree for the collection of the fruit is the best method of gathering. Past records in the Malay Peninsula show that the average coolie picks about 100 nuts a day, whereas in the West Indies 1,000 is an ordinary task. This remarkable difference in yields is attributed to the different styles of climbing adopted by the coolies and the method by which they obtain their hold. The Malayan method (as illustrated on page 21) is by means of cut notches in the stem. Holding the trunk with one hand, the picker has only one hand free for his work on the crown of the palm. The West Indian method (as

illustrated on page 31) is by means of a rope loop which encircles the stem and the picker, a gunny bag taking the strain, where the rope rests in the small of the back. By this means a much more rapid ascent is made and both hands are free, not only for picking the nuts, but for the removal of dead leaves, moss, and lichen; the picker, too, is enabled to make a more thorough search for beetles and pests.

The practice of using a knife attached to a long pole for cutting down nuts is to be deprecated, for by this means insufficiently ripe nuts are brought away in the cut bunches. Old habits die hard, but the Malay, with his stem notching, and the Chinaman with his pole-knife, must be taught to appreciate the many advantages the rope-loop system of climbing has over present Malayan methods.

Yields, of course, vary according to the cultivation. In the Malay Peninsula, the coconut palm is known to fruit in the fourth year; this is especially so with the dwarf variety. On the other hand, many of the palms may not flower till the seventh year, so that to arrive at a fair average, the sixth year should be reckoned as the one on which returns can be based. It should be noted that the term "maturity," as generally applied to fruit-bearing trees, has a wider interpretation when associated with the coconut tree. For instance, though the latter does not arrive at maturity till about its thirtieth year, it has for the previous twenty years or so borne fruit. This is mentioned to correct a common idea that "bearing" and "maturity" are synonymous terms. Instances are common in the Malay Peninsula of full-grown trees bearing as many as 300 nuts, of which about half may mature. It would not be advisable, however, to take such figures as a basis upon which to calculate revenue.

The following is the generally adopted estimate:

At the end of 6th year	.	average 10 nuts per tree, per ann.
" 7th "	"	30 " "
" 8th "	"	40 " "
Thereafter	"	50 " "

COCONUT INDUSTRY IN MALAYA

reasonable cultivation, an average of 80 nuts in the tenth year is readily obtainable, but for a safe estimate it is deemed advisable, when calculating from a mature estate, to keep the maximum



CLIMBING THE PALM.
Malayan method.

per tree at 50 nuts. This allows a wide margin to meet contingencies—drought in particular. In extensive plantations, nuts are picked monthly, but on a well-organised estate there should be but five to six seasons in a year. The husk is usually removed by hand, by bringing the

whole fruit down on a sharpened iron stake fixed upright in the ground and giving a dexterous twist to the fruit, and

Husking.

thus tearing the husk away. The shell is then cracked, usually in two parts, and the clear "water" or "milk" thrown away. The split nut is then



CLIMBING THE PALM.
West Indian method.

exposed to the sun until the kernel or "meat" contracts and can be easily removed from the shell. A curved knife has also been devised and is used on some estates for removing the kernels from the shell immediately after cracking. The kernel or "meat" after drying is known as "copra."

COCONUT INDUSTRY IN MALAYA

most economical method of drying the kernel in the field is by spreading the pieces of fresh meat or kernel in a single layer in the sun, preferably on a concrete or cement floor or on sand. Low corrugated iron roofs on rollers can be used in case of rain, in order to dry the copra quickly.

Another method of drying, in which the broken kernels are exposed to racks or frames to heat and smoke produced by burning shell and husk in open fires beneath, is practised



SPLITTING COCONUTS.

by small holders and produces a copra of inferior quality. One of the most economical and most common methods of drying the copra is to spread the broken pieces on a large cement floor, which is warmed beneath by a fire in a chamber through which the products of combustion from a fire at one end are passed to a chimney at the other end. Artificial driers such as the Chula Dryer of the Colombo Commercial Company, or C.C.C. Dryer, are used on one or two estates. In these artificial driers the air is drawn or forced over the copra contained in metal trays or ovens by means of suction or force fans. On



DRYING GOPHA.

COCONUT INDUSTRY IN MALAYA

a drier, formerly used for the drying of tapioca in which the copra is placed on an endless conveyor and passes slowly through a hot-air chamber heated by steam pipes, is employed.

This method of artificial drying from the point of economy, quality of copra and rapidity of drying has been thoroughly investigated. The use of sulphur dioxide (sulphur dioxide), to prevent fermentation and to produce copra of better colour, has not been tried in Malaya. Well-dried copra should contain less than 10 per cent moisture and must be stored in a dry place; otherwise it absorbs moisture, becomes mouldy and consequently rancid.

The first factory for the preparation of desiccated copra was started. For the manufacture of this product, the shell has to be removed carefully, so that the kernel remains whole. The brown skin, or testa, of the kernel is then removed and the fresh kernel washed and passed through special shredding machines. The shredded product is dried at about 160° F. The dried material containing not more than 5 per cent of moisture is then pressed to produce two or three grades of different products. The final product is packed for export in tins and wooden boxes.

Untinned coconut products are at present prepared locally although the emulsion of water and oil, obtained by treating the fresh kernel with water, is used for household and medicinal purposes locally.

There are at least three fairly large hydraulic oil presses in Malaya for the manufacture of coconut oil from copra. The greater part of the copra, however, is exported as such and the oil expressed in Europe, America or other foreign countries.

In the manufacture of coconut oil, the copra is first broken up into small fragments in disintegrators, ground between heavy rolls, heated to a suitable temperature

in special steam kettles, and then expressed while hot in cage presses or open Anglo-American hydraulic presses under a pressure of about 3 tons per square inch. Recently automatic Oil Expellers have been introduced into one mill for the preliminary expression of the copra, removing about 40 per cent. of oil. In copra of good quality about 62 per cent. of oil can be expressed in hydraulic mills, leaving about 7-8 per cent. in the residual cake or poonac. In Malaya, hot expression is employed both for first and second pressings. In the case of good copra, the oil has a pale colour and contains only a small amount of free fatty acids. No solvent extraction process has yet been introduced into Malaya. Although it is undoubtedly desirable on economic grounds to express the oil on the spot, there does not appear to be much profit at normal times, the margin of price between the value of oil and copra being small.

The residual cake, after the expression of the oil in hydraulic presses, is used almost entirely as a cattle food, being too valuable to use as a fertiliser. The
Copra Cake, or Poonac. cake represents about 35 per cent. of the dried copra.

Although coconut matting, rope, coir mats, etc., can be made from the fibre contained in the husk, there is at present no industry in Malaya. Some years ago
Coir. a coir factory was started in connection with one of the oil mills, but was only operated for a short period. The fibre is obtained from the husks by soaking the latter in water. The soaked husks are then passed through crushing mills and thence through extracting machines, combing machines, etc., and the fibres of different length separated for various uses. At present coir fibre mats, rope, etc., from such fibre are made almost exclusively in the gaols in Malaya. On estates the husks are used largely as fuel and are also spread to rot in the field.

The shell of the nut produces an excellent
Coconut Charcoal. absorptive charcoal, which has not hitherto, however, been in commercial demand.

COCONUT INDUSTRY IN MALAYA

of the unopened flower spathe of the palm a saccharine juice, which is usually fermented naturally to an alcoholic beverage known as toddy, is practised chiefly on small holdings on any extent, on large estates, although a few be kept for this purpose, in order to provide



TODDY COLLECTOR.

the estate labourers. Experiments have shown that tapping for toddy does not appear to affect the yield of the copra subsequently obtained. It is believed to stimulate the yield of nuts, but whether the stimulation is sufficient to balance the period during which tapping is carried on when no nuts are produced is not stated.

In the past, the Malayan plantations have been singularly free from insect pests.

The Rhinoceros or Black Beetle (*Oryctes rhinoceros*) and the Red Stripe Weevil (*Rhynchophorus schach*) are well-known pests of the coconut, but, with ordinary preventive measures, they should not cause anxiety to the planter. The caterpillars of the moth *Brachartona catoxantha* occasionally in certain districts do considerable damage to the leaves of coconuts, and the grubs and beetles of *Plesispa reichel* are injurious for the most part to the leaves of seedling coconut palms. The caterpillars of the moth *Batrachedra arenosella* have been found recently damaging the male and female flowers of the coconut spike before the spathe has opened. The insect has probably been generally distributed for some time throughout the Malayan plantations.

Diseases commonly met with are Bud-rot and Leaf-disease caused by *Pestalozzia palmarum*. Coconut diseases are but imperfectly known and require much further investigation.

The Federated Malay States Government has drafted an Enactment to provide for the protection of trees, plants and cultivated products from disease and pests. The aims of the Enactment are to provide statutory means of combating the introduction of disease and pests, and to create power to make official inspection of estates.

The estimates in the appendix endeavour to give figures which apply to plantations where normal conditions exist.

Much must depend on the organising power of a manager and his study of economy.

To bring a coconut estate to the producing stage in pre-war days £30 per acre should have been ample; but at the present time the sum to be allowed should be from £35 to £45 per acre, probably over £50 per acre if it is desired to remove jungle stumps during the first year of planting.

Of the important ingredients of the soil, 1,000 nuts remove approximately as on the following page:

COCONUT INDUSTRY IN MALAYA

	Husk. lb.	Shell. lb.	Kernel. lb.	Milk. lb.	Total. lb.
	3.70	0.54	4.41		8.65
Acid P ₂ O ₅	0.84	0.07	1.40	0.12	2.43
	13.52	0.71	3.73	0.77	18.73
	1.82	0.09	0.21	0.16	2.28
oxide					
	20.23	0.24	0.35	0.54	21.36
	40.11	1.65	10.10	1.59	53.45

Comparison of the coconuts grown in the Middle East and West Indies gives the composition of each as follows:

	Malay Nuts. Per cent.	West Indian Nuts. Per cent.
Husk	34	57
Milk	24	12
Shell	12	13
Fat	30	18
	<hr/> 100	<hr/> 100

APPENDIX

To bring into bearing an estate of 500 acres. Planting
distance 30 ft. \times 30 ft. = 48 trees per acre.

(Exchange \$1 = 2s. 4d.)

1st year.

		\pounds	<i>s.</i>	<i>d.</i>
Lands and Buildings :				
Land premium to Govern- ment, 500 acres at \$5	\$2,500 =	291	13	4
Survey fees	500 =	58	6	8
Quit-rent	500 =	58	6	8
Manager's bungalow and fur- niture	1,250 =	495	16	8
Coolie lines	2,000 =	233	6	8
Tools and implements	500 =	58	6	8
Development, etc. :				
Felling, 500 acres at \$12	6,000 =	700	0	0
Burning, 500 acres at 50 cents	250 =	29	3	4
Collecting and stacking trees up to 5 in. diameter, 500 acres at \$12.50	6,250 =	729	3	4
Lining, 500 acres at \$1.50	750 =	87	10	0
Holing, 500 acres at \$2	1,000 =	116	13	4
Planting and filling in 500 acres at \$1.50	750 =	87	10	0
Nurseries, 500 acres at 25 cents	125 =	14	11	8
Selected seed, 40,000 at 10 cents	4,000 =	466	13	4
Roads and drains, at \$10 per acre	5,000 =	583	6	8
Bridges, at \$1 per acre	500 =	58	6	8
Bunds and watergates, at \$6 per acre	3,000 =	350	0	0
Fencing, at \$4 per acre	2,000 =	233	6	8
	<hr/>	<hr/>	<hr/>	<hr/>
	\$39,875 =	£4,652	1	8

COCONUT INDUSTRY IN MALAYA

		£	s.	d.
Brought forward	\$39,875 =	4,652	1	8
water supply, at \$1				
500 =		58	6	8
tionery, etc.	264 =	30	16	0
quirements	500 =	58	6	8
ndence, 1 European				
per month	4,800 =	560	0	0
allowance:				
at \$20 per month	240 =	28	0	0
servant, at \$15 per				
180 =		21	0	0
an, at \$18 per month	216 =	25	4	0
weeding for 9 months				
at \$1.50 per acre				
th	6,750 =	787	10	0
nt and recruiting				
1,000 =		116	13	4
500 =		58	6	8
1,250 =		145	16	8
	\$56,075 =	£6,542	1	8
7 per cent. interest	3,925 =	457	18	4
	\$60,000 =	£7,000	0	0
of upkeep, develop-				
ed all-in charges should				
eed (including 7 per				
terest)	\$30,000 =	3,500	0	0
st (weeding put at 80				
including 7 per cent.				
)	24,000 =	2,800	0	0
st (weeding put at 50				
(including 7 per cent.				
)	18,000 =	2,100	0	0
	\$132,000 =	£15,400	0	0

COCONUT INDUSTRY IN MALAYA 41

		£	s.	d.
	Brought forward	\$182,000 =	15,400	0 0
<i>5th year.</i>	All-in cost (weeding put at 40 cents) (including 7 per cent. interest)	18,000 =	2,100	0 0
<i>6th year.</i>	All-in cost (weeding put at 30 cents) (including £1,000 for Drying Kiln, Copra Store, etc., and 7 per cent. interest)	21,429 =	2,500	0 0
	Grand Total	\$171,429 =	£20,000	0 0
			or £40 per acre.	

COST OF ONE TON OF COPRA TO PLANTATION OWNER

Basis of 4,000 Large Nuts = 1 Ton Copra

Estate upkeep—based on 500 acres = 25,000 trees at 40 nuts per tree = 1,000,000 nuts = 250 tons of copra per annum.

	Administrative charges	\$4,200	
	Quit-rent	1,000	
	Management	5,000	
	Servant allowances	420	
	Medical requirements	500	
STANDING CHARGES	Weeding (30 cents per acre per month)	1,800	
	Manuring (allowing partly for use of poonac and fibre residue)	1,000	
	Cattle food, factory hands and cattle drivers	1,700	
	Sundries	880	
	Depreciation on buildings and machinery	1,000	
		<hr/>	
		Total	<u>\$17,500</u>

CONUT INDUSTRY IN MALAYA

The foregoing output of 1,000,000 is added

	Nuts per 1,000.
Picking . . . . .	.60
Collecting in field . . . . .	.25
Carting from field to shed, wear and tear of rolling and live stock . . . . .	.35
De-husking . . . . .	.55
Splitting nuts and extracting copra . . . . .	.45
Sacking and weighing . . . . .	.15
Charging and discharging Drier . . . . .	.15
Fuel (reduced if husks are consumed)	.20
Gunny sacks and tools . . . . .	.90
Export duty (1½ per cent. <i>ad valorem</i>)	.60
Transport . . . . .	.60
Sundries and renewals at factory . . . . .	.20
Total	\$22.50

$$\$22.50 \times 4 = \text{£}10 \text{ } 10\text{s.}$$

This cost of production as affected by Standing could be reduced as the output increases, approximately follows :

	Per 1,000 nuts.	Per ton of Copra.
Costs per tree, 1,000,000 nuts	\$17.50	
Crop charges	5.00	

	\$22.50	£10 10 0
.. .. 1,250,000 nuts	13.80	
Crop charges	5.00	

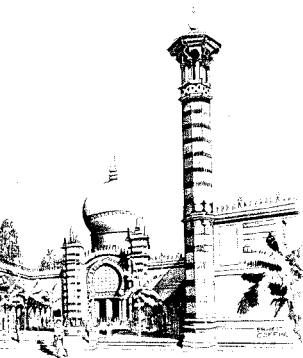
	\$18.80	8 15 6
.. .. 1,500,000 nuts	11.50	
Crop charges	5.00	

	\$16.50	7 14 0

EQUIVALENTS

- 1 Ton of Copra = 2,240 lb., or 16.8 Pikuls, or 150 gall. of oil.
 1 Ton of Copra = 3,696 Malay Coconuts (for estimating,
 adopt standard of 4,000 large Nuts).
 1 Pikul of Copra = 133½ lb., or 220 Nuts.
 1 Ton of Oil = 240 gallons, or 5,913 Nuts.

1 Pikul	=	61.76125 Kilos.
1 Cwt.	=	50.84 Kilos.
1 Kattie	=	1½ lb.
1 Kilo	=	2.203 lb.
1 Maund	=	80 lb.
1 Kandy	=	560 lb.
1 Square Mile	=	640 Acres.
1 Acre	=	43,560 Square Feet.
1 Acre	=	4,840 Square Yards.
1 Acre	=	10 Square Chains.
1 Bouw	=	1½ Acres.
1 Hectare	=	2.471 Acres.

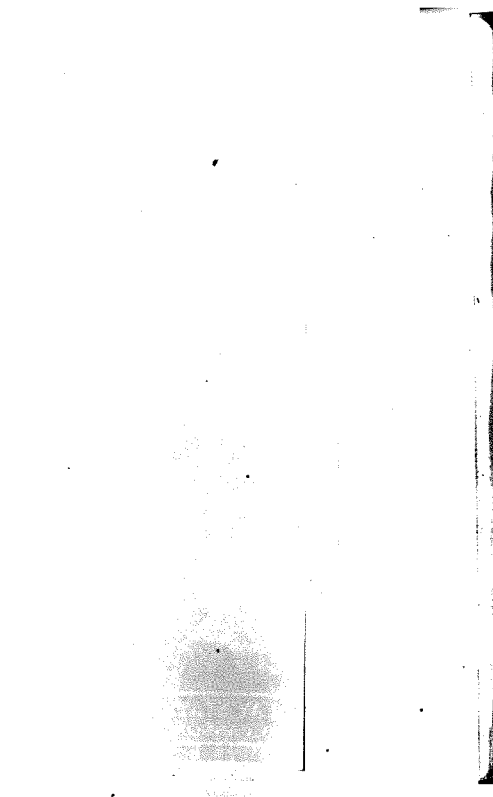


*Malaya Pavilion
British Empire Exhibit
Wembley, 1924*

MINING ^{2s} IN MALAYA



MALAY STATES INFORMATION AGENCY
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Mining in Malaya

BY

G. E. GREIG, A.R.S.M.

ACTING SENIOR WARDEN OF MINES, FEDERATED MALAY STATES

WITH PREFACE BY

FRANK E. MAIR, A.R.S.M., M.I.M.M.

MALAY STATES INFORMATION AGENCY

88 CANNON STREET, LONDON, E.C.4

1924



HYDRAULIC MONSTERS AT WORK.
(Société Française des Mines d'Etain de Fochville.)

P R E F A C E

THE Federated Malay States have been for many years now the largest producers of tin ore in the world, but the metal obtained therefrom is known on the Metal Market as "Straits tin."

The country also holds the distinction of having the largest hydraulic tin-mine in the world and one of the largest tin-lode mines.

The extraordinary progress of the Protectorate within the last few decades is intimately related to the exploitation of the tin-fields, for the revenue obtained from the mining industry directly and indirectly has been utilised by the Administration for the development of the country.

At one time the working of the mines was almost entirely in the hands of the Chinese and the country owes much to their energy and enterprise in the past. Even now they are responsible for approximately 60 per cent. of the country's total production.

It is well known that the tin deposits of the world are very limited and restricted, and the Federated Malay States have been fortunately circumstanced in possessing deposits which enabled them to compete successfully with other fields in the cost of production.

The deposits worked are for the most part alluvium, and as a natural consequence the richer deposits were exploited first, when only hand labour was available.

It has been fully realised by the Administration, however, that if production is to be maintained and ore produced at a profit, lower-grade deposits must be worked, and that this is only possible by the use of machinery and labour-saving appliances.

British, Australian, French and American capitalists

PREFACE

ly recognised the attractive possibilities of these
and a number of companies have been formed for
the purpose of systematically working these lower-grade

mining industry in the Federated Malay States may
now be in a transitional state. The primitive
methods which were so effective for the working of the
deposits can no longer produce tin ore at a profit.
Therefore it is possible to work economically the lower-
grade tin fields, considerable initial capital expenditure must be
incurred for necessary equipment.

Under these circumstances, the publication of this memoran-
dum by the Acting Senior Warden of Mines, detailing
the methods of working and local legislature, etc., is opportune
and will prove of inestimable value to those whose
interest is directed to the future possibilities of these
tin-fields.

FRANK E. MAIR, A.R.S.M., M.I.M.M.

CE,
November 10, 1923.

MINING IN MALAYA

TO speak of mining in Malaya is to speak of tin-mining. There are other minerals mined, such as gold and coal, but tin-mining preponderates to such an extent that it almost completely holds the field. Similarly, when tin-mining is spoken of, it is assumed generally that mining in alluvium is implied, owing again to the fact that by far the greater part of the mining is and has been of that nature.

Introduction.

Conditions have altered very considerably since the inception of mining in Malaya. The gradual increase in the use of machinery, combined with its ever-increasing efficiency, has enabled the miner to tackle successfully deposits which, owing either to their depth, poverty of content, or wetness, could not be worked in the past at a profit. The introduction of machinery has, however, been gradual, and little or no attempt has been made in the past to supply power to mining localities through central power-stations. There are several reasons for this, such as the temporary nature of a great number of the Chinese mines, and the consequent uncertainty of the continuance of the demand for power.

As the richer and more easily worked deposits are becoming worked out, greater care has to be taken to mine efficiently and economically. The result of this is that the proportion of ore won by European methods as against Chinese methods is continually increasing.

The conditions above expressed call for mining on a large and comprehensive scale adequately capitalised in order that the ground may be mined cheaply and efficiently.

The occurrence of tin in the Malay Peninsula appears