



THE
NATURAL RESOURCES
OF
SARAWAK.

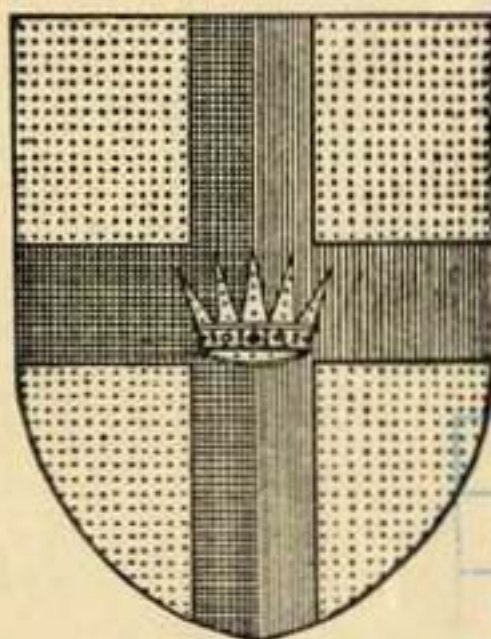
THE NATURAL RESOURCES OF SARAWAK



COMPRISING ACCOUNTS PREPARED BY MEMBERS OF THE
NATURAL RESOURCES BOARD TOGETHER WITH
GENERAL INFORMATION OBTAINED FROM
OFFICIAL RECORDS AND COMPILED

By

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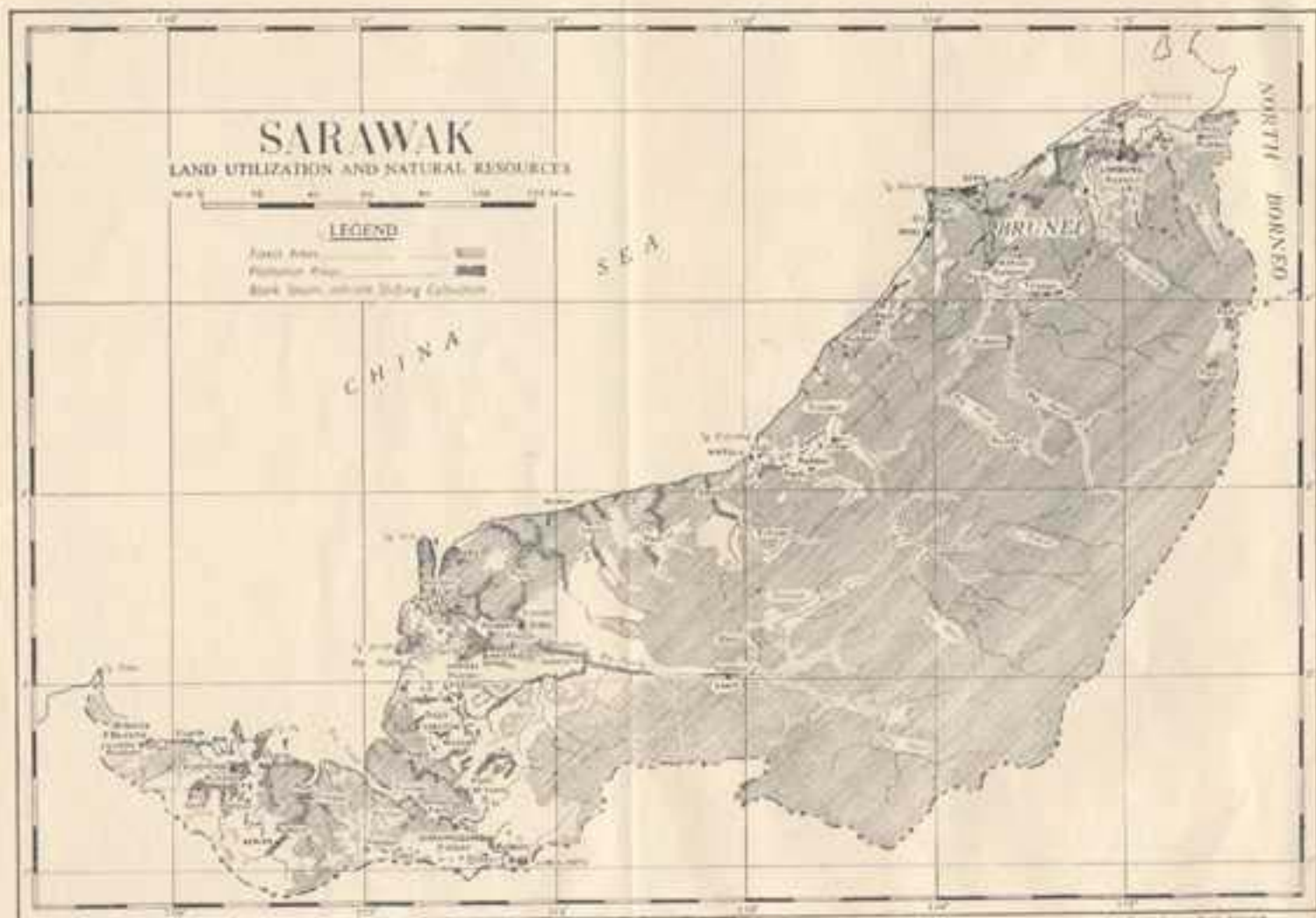
INTRODUCTION.

Sarawak has a history of over one hundred years of steady progress. The keynote has been to attune the development of the country's resources to that of its inhabitants. The basic principle of this policy was well summed up by the first Rajah, Sir James Brooke, in the words "Sarawak belongs to the Malays, Sea Dyaks and Land Dyaks, Kayans, Kenyahs, Milanos, Muruts, Kadayans, Bisayahs, and other tribes, and not to us. It is for them we labour, not for ourselves."

Today modern science has speeded up development, but the old principle is still held that sound progress can only be achieved when it is in tune with the feelings of the people of the country. The work being undertaken by the Lands and Surveys, Geological, Forestry and Agricultural Departments, and which is co-ordinated with Native Affairs, will in the fullness of time help to provide a sure foundation on which lasting development can be made. For many years to come economic progress is likely to depend on the country's natural resources, as this first publication of the Natural Resources Board well illustrates.

R. G. AIKMAN,
*Chief Secretary,
Sarawak.*

KUCHING,
1st January, 1952.



SARAWAK.

Sarawak, situated on the northwest coast of the island of Borneo, lies on the shores of the China Sea. The territory is just north of the equator and occupies some 47,000 square miles. It consists of coastal lowlands, which border mountain ranges that form much of the interior. The climate is monsoonal with the heaviest rain falling between October and March; along the coasts it averages 100 inches, and on the inland mountains exceeds 200 inches. Kuching, the capital, has an average annual rainfall of over 150 inches.

The population in 1947 totalled 546,385, and consisted of several races and numerous cultural groups. Most of Sarawak's people live in small communities in the country; towns are few in number and small in size. The capital, Kuching, stands on the banks of the Sarawak River about 18 miles from the sea, and has approximately 38,000 inhabitants. The second largest town, Sibul, is situated some 80 miles up the Rajang River and has a population of about 10,000. Miri, an oil centre on the coast, has a population of 9,000. There are a few other small towns such as Simanggang, Limbang, Sarikei, Bintang and Bintulu, but all are settlements of only a few thousand persons.

POPULATION.

The population was shown in 1947 to total 546,385, this being the first accurate census held. The 1871 census showed an estimated population of 142,000. The main indigenous cultural groups are Malays 97,469, Melanaus 35,560, Sea Dayaks or Ibans 190,326, Land Dayaks 42,195, and other indigenous races 29,867. Of the non-indigenous cultural groups, only the Chinese are numerically important; they numbered 145,158. The balance, just under 6,000, consists of Europeans, Indians and other non-indigenous Asian races. Many of the races have their own language. This causes considerable difficulty, and even though Malay is a lingua franca, it is quite common for a Land Dayak or a Kayan for example, to be unable to speak it. Economically the Chinese are the most important group and control a large part of the export trade. They also comprise a labour pool from which most of the skilled or heavy labour is drawn.

THE MAIN CULTURAL GROUPS.

(1) **MALAYS.** The Malays number about one fifth of the population of Sarawak. Their exact origin is obscure, some claiming to have migrated from Sumatra, some from the Celebes, others claiming to have been members of indigenous races, others belonging to Islamic invaders who originally entered Sarawak after the break up of the Majapahit Empire. There is a strong tendency to regard converts to Islam as Malays, this being particularly evident amongst the Melanaus. Malays are mostly found on the coastal plains of the five Divisions, with a large majority in and around Kuching.

As the original supporters of James Brooke, Malays have been predominant in the Government Service for many years, and assisted the Rajah's Officers in the administration of the indigenous races. For long they have also had the additional advantage over such races and tribes, of a written language and superior culture of their own. They appear, however, to be more conservative than the Sea Dayak and are often suspicious of change or development. On the coast they are mainly engaged in fishing and a certain amount of subsistence farming. Further inland they tap rubber, farm, and provide a limited amount of skilled labour.

They are pleasant and friendly people with charming manners, but are not, by nature, suited to continued arduous employment, and are rather inclined to the improvident philosophy of "take no heed for the morrow".

(2) SEA DAYAKS OR IBANS. The Sea Dayak, or Iban as he prefers to call himself in the Third Division where the majority now live, is not indigenous to Sarawak. His exact origin is still a matter of some doubt; probably he came from Sumatra and migrating through West Borneo entered Sarawak via the interior of the Second Division. Thence he has spread with great rapidity over the territory, though still found predominantly in the Second and Third Divisions. During the early days of Brooke rule, he appears to have been fierce and warlike, addicted to head hunting, and a willing assistant of Malay pirates. He has, however, proved amenable to civilising influences, and is now a virile and progressive person with a strong strain of independence in his character.

Shifting padi cultivation on the hill sides has long been practised by Ibans, and these people are responsible for the extensive forest denudation in the Second and Third Divisions. The resultant erosion and flooding is now one of the major problems that has to be dealt with by the Government. For many years the Iban was content to farm, hunt, and collect jungle produce, in search of which he would wander far afield. In recent times there has been a tendency to settle down and plant and tap rubber, but his wandering instinct still leads him to seek employment on the oilfields, in the timber industry, or elsewhere. It cannot, however, be said that the Iban makes a satisfactory commercial employee, for though he likes to accept work for a limited period during the off season in farming, he is still inclined to wander off or to return home. He is also superstitious, and dreams and omens play an important part in his life, often to the dislocation of commercial enterprise and sometimes to the detriment of his own farming.

Mission influence, both Roman Catholic and Church of England, has long been felt in the Sea Dayak areas, and an ever increasing desire for education has been noticeable since the end of World War II. The results of this demand are showing in the admission of Sea Dayaks into all branches of Government Service, and there is no doubt that in local affairs they will play a part which will increase steadily. A virile and pleasant person, the Sea Dayak is one of the most important factors for Sarawak's future development.

(3) LAND DAYAKS. These people live almost entirely in the First Division. They are some of the earliest inhabitants of Sarawak and indications of Hindu influence appear in their customs. They have however often been the victims of the various invasions, and of persecution, and thus have become a

timid and retiring people, suspicious of change and progress, and asking little but to be left alone. For many years prior to the 1840's the Land Dayaks appear to have been the slaves of Brunei nobility, and the chief source of heads for Iban hunters. They still have a strong inclination to site their long houses on the tops of steep hills for protection from their enemies, though they were freed from persecution many generations ago.

The Land Dayaks are mostly rice farmers using the shifting cultivation system; many of them refuse to plant rubber, or any other cash crop, fearing that accession of wealth would undermine their way of life. For the same reason many of them show a suspicion of education, and there are regrettably few in Government Service, or in any other form of employment where an education is needed. Even though much of their land is now barren and useless for farming, they refuse Government help to migrate to new land, and are even unwilling to accept work away from their homes. Though there are signs of an awakening and an appreciation of modern ideas among some of the people in the more accessible areas, the Land Dayak can hardly yet be regarded as a real asset to his country. The problem of raising the standard of living and development of these people is under continual and anxious examination.

(4) MELANAUS. The Melanaus live mostly along the coast of the Third and Fourth Divisions. Pagans in the early days, they proved ready converts to the Mohammedan Religion with its superior culture, and since being converted many have called themselves Malays. Their language is however quite dissimilar from Malay, and their culture, physical characteristics and occupations place them as a different race. The Roman Catholic Mission has also found them receptive, and today few pagan or "Likoh" Melanaus remain.

The cultivation of sago has long been one of the main Melanau industries and sources of food. They are excellent seamen and skilled fishermen. An artistic people, they make attractive baskets, hats and mats, and are also friendly by nature and possess considerable intelligence. It is hoped that in the future they will play an increasingly important part in the country's economic life.

(5) OTHER INDIGENOUS RACES. The other indigenous races consist mostly of Kayans and Kenyahs with their numerous tribal sub-groups. These people mostly live in the interior where they practise shifting hill padi cultivation. Most have a great deal of charm and a culture of their own, and are, as yet, little influenced by modern development, though there are indications of an awakening interest in such things as education.

(6) CHINESE. Over one quarter of the population of Sarawak is of Chinese race. Although contacts with China go back at least 1,500 years, and settlements have existed in some places for centuries, the main centres of Chinese population have been established since the inception of Brooke rule and are in the First and Third Divisions. There are a number of linguistic groups in Sarawak of which the five largest are Hakka, Foochow, Hokkien, Cantonese and Teochew.

Chinese play a vital part in the economy of the territory. Import and export trade is largely in the hands of the Hokkiens and Teochews, the latter specialising in foodstuffs. Other groups are mostly smallholders, or employees on small estates producing pepper or rubber. As a race they are shrewd businessmen, hard workers, and have an almost superstitious faith in education. Their donations to charities are most generous, their enterprise in initiating profitable undertakings enabling them to prosper and make such donations. No occupation is too lowly, or too exacting in its demands, but a Chinese will be found to fill it. On the other hand most of the skilled labour in Sarawak is Chinese, and no position is too exalted for it to be filled by a Chinese with confidence, dignity, and ability.

The number of societies, guilds, trade unions, clan groups, and chambers of commerce, of which Chinese are entirely or principally the members, far exceeds that of any other section of the community. A sense of tolerance, combined with a dogged perseverance, ensures that problems of human relationships are frequently solved without much apparent yielding on either side, and in a manner which preserves the self-respect of both parties. The maintenance of such traits of industry and tolerance can make these people most valuable citizens.

SARAWAK EXPORTS.

MAIN EXPORTS.	VALUES IN STRAITS DOLLARS OF MAIN EXPORTS.					
	1870	1940	1947	1948	1949	1950
Betelnuts	---	1,141	5,432	1,056	3,113	2,303
Beeswax	13,301	716	5,814	553	2,880	1,665
Birds-nests edible	40,438	19,209	74,908	74,904	61,893	51,238
Canes	509	18	30,164	33,718	62,024	72,915
Copra	---	70,029	30,448	1,040,412	1,676,702	2,031,431
Cutch	---	475,778	189,423	607,371	1,480,257	1,183,354
Damar	1,832	88,080	487,143	389,339	416,544	301,305
Fish, dried and salted	16,034	79,551	875,924	876,522	268,190	153,195
Gutta-Jangkar	---	113,470	119,931	24,935	17,338	51,209
" Jelutong, raw	---	51,080	1,554,781	885,829	169,739	158,033
" " refined	---	700,540	1,131,076	1,300,011	649,124	835,683
" " pressed	---	20,783	1,505	6,039	352,811	804,336
" Percha	820,803	62,042	711,317	338,383	230,180	214,645
Nipah sugar	---	16	18,924	21,918	35,028	118,905
Oil—Vegetable	---	473	209,033	144,956	1,021	1,213
Crude Petroleum	---	---	23,726,764	49,320,417	72,114,965	136,855,326
Refined Petroleum	---	11,472,193	27,508,090	62,453,479	62,002,886	93,432,759
Pepper	1,581	362,569	3,215,497	1,139,242	2,025,997	4,167,106
Prawns, dried	---	669	50,201	146,781	171,101	224,211
Rattans	151	12,237	180,554	126,225	289,926	287,599
Rubber, Plantation	---	26,187,189	26,094,389	34,332,924	31,545,400	113,941,617
Sago	144,930	2,184,907	10,398,863	11,124,325	4,699,629	9,277,842
Timber	153	89,840	233,508	1,138,315	2,018,800	2,839,725
Treasure	306,805	---	---	---	---	---
Tobacco, India Rubber, Vegetable	---	---	---	---	---	---
Tallow, Gambier, Camphor, Indigo,	---	---	---	---	---	---
Coconuts and Oil, Mangrove Bark	48,924	---	---	---	---	---
Antimony ore, Quicksilver, Cinnabar,	---	---	---	---	---	---
Gold, Diamonds, Pearls	99,469	---	---	---	---	---
Opium, Salt, Cloth, Sugar, Crockery-	---	---	---	---	---	---
ware, Iron, Brassware, Rice and Paddy,	---	---	---	---	---	---
Bezoar stones, Sundries	62,681	---	---	---	---	---
TOTAL VALUE OF ALL EXPORTS	\$1,404,241	\$43,770,407	\$103,128,575	\$171,250,887	\$187,028,559	\$374,586,491

ECONOMY.

Sarawak is one of the few territories in the World without income tax and free also of public debt. In fact in 1951 out of an estimated revenue of Straits \$60,000,000* the country had a surplus of \$36,000,000, bringing the revenue reserve to Straits \$54,500,000. The key to this happy position lies in a long period of enlightened rule and a wise development of the natural resources, features which have characterised successive Administrations since the establishment of law and order was commenced in 1841 by the Brooke family.

The whole economy of the territory depends on its natural resources; this is demonstrated by the exports, listed in the table on page 5 for various years typical of the period under review. Exports today, as a hundred years ago, comprise essentially agricultural, forest, and mineral products. That the prosperity of the country has increased with the development of these resources, can well be seen from the way in which rises in exports are accompanied by increases in revenue; representative figures are given below:

YEAR	EXPORTS (Straits dollars)	REVENUE (Straits dollars)
1855	304,764	not available
1860	400,226	"
1870	1,494,241	122,842
1880	1,193,195	229,718
1890	1,700,142	413,123
1900	6,865,861	915,966
1910	8,152,293	1,407,360
1920	18,067,121	2,646,265
1930	23,020,456	5,562,035
1940	45,770,407	7,463,314
1950	374,586,491	30,170,616

The trade is mainly done by Chinese merchants, most of whom are carrying on businesses established by their forefathers. There are also a number of Indian traders. The merchants take an active part in the life and welfare of the country and are playing an increasingly important part in its administration. Registered in 1856, the Borneo Company Limited was for many years the only European firm; but there are now a number of representatives of other firms trading in the Far East.

Manufacturing has not yet developed to any extent in Sarawak; there are however a few industries but these are all essentially processing natural products. Treatment of the mineral product oil, in the refinery at Lutong, is the most important industrial undertaking in Sarawak. Mangrove bark, a forest product, is used by The Island Trading Company to manufacture cutch (a tanning extract) at Selalang in the Third Division. Rural products are used by the Raga Chemical Works near Kuching which manufactures acetic acid and alcohol. There are also a few minor industries such as the manufacture of matches, soap, vermicelli, aerated waters and the curing of fish; the output is small.

Imports are mainly foodstuffs and manufactured goods, paid for by the exports of the country's natural products.

* Straits \$1 equals Sterling 2s. 4d.

COMMUNICATIONS.

Communications still depend almost entirely on water transport, and movement is mainly by small steamers plying along the coast, and launches on the rivers. Navigation is often difficult; the coastal waters are shallow and harbours few and poor, while entrance bars close numerous rivers. The lower courses of many rivers have frequent shallows, mud banks, swift currents, some even tidal bores, while upstream rapids and falls are common. Although coastal steamship services also serve some river ports, much of the trade and inter-communication is by means of small, locally owned, craft. In the interior, where rapids prevent the operation of even small launches, outboard boats are used, and near the sources where the rivers are shallow, communication is still usually by water, long boats being paddled or rafts employed.

Roads in the 47,000 square mile territory total 457 miles, of which only 70 miles have an all weather surface; there are also about 250 miles of foot-paths. Most roads are in west Sarawak, mainly in the district around Kuching. Seven miles of metre-gauge railway are maintained between Kuching and the quarries to the south near the airfield. The roads consist essentially of local networks radiating from the small towns e.g. Kuching or Miri. No lines of land or air communication link even the main settlements. Sarawak has one main airfield situated 7 miles from Kuching. There are also three small landing grounds; one on the coast near Kuching, the other outside Sibü, and one at Lutong close to Miri.

AGRICULTURAL RESOURCES.

The agricultural resources of Sarawak are described below, together with short accounts of livestock husbandry and fisheries. The country has an area of about 47,000 square miles, yet the 1947 census showed that the population was only about 546,400 people in all. The population density is therefore low, averaging only 11.4 people per square mile. It has been estimated that on the basis of existing methods of subsistence farming—which is the only sound method on which to base potentialities for agricultural development on a short term basis—the country could only safely support a rural population of approximately 2½ million people. There is therefore no immediate prospect of Sarawak accepting surplus population from other parts of tropical Asia. A vastly different picture unfolds for the long term potentialities of the country, if one visualises the widespread employment of suitable modern agricultural machinery, fertilisers and pesticides. This section will cover mainly short term possibilities for rural development based on present methods, but in the chapter on Development are outlined the far greater potentialities that exist if modern methods can be widely adopted.

Preliminary surveys show that approximately 5,600 square miles of the flat deltaic and coastal regions consist of deep peat swamp, at or near sea level, which is unsuitable in its present condition for agriculture. It is probable that reclamation for wet padi cultivation of most of this deep peat swamp land would be impracticable and uneconomic by normal methods of empoldering. There are, however, considerable areas of good average wet padi land, estimated at a total of not more than 2,000 square miles, situated mainly on the riverbanks in the deltaic areas.

The remainder of the country, that is the hinterland and interior, consists largely of steep sided hills and mountains. Occasional flat areas occur in the valleys between the hills, but such areas form only a very small proportion of the whole. The soils of the hinterland and interior are generally extremely thin and poor by ordinary standards, and their poverty has frequently been accentuated by severe erosion and leaching. The physical properties of the soils are usually poor, consisting as they often do of coarse sands, or of coarse sands mixed with very fine unkind clays in which sodium clays probably predominate. The content of divalent bases (calcium particularly) is often low, and the content of trivalent bases (iron and aluminium particularly) is generally high. The high iron and aluminium content leads to marked phosphate fixation. There are limited outcrops of basic and intermediate igneous rocks, and of limestones; where these do occur there is a marked improvement in the physical properties and fertility generally of the alluvial soils in that area.

Favourable climatic conditions do to some extent counteract the general poverty of the soils, and wherever there is even a moderate depth of reasonably friable soil (but not necessarily fertile soil on the basis of a chemical analysis) vegetative growth is often surprisingly vigorous. The average annual rainfall is of the order of 150 inches. In the southwestern part of the country there is a definite period of maximum rainfall during the months of December, January and February. In the northeastern part of the country the maxima and minima are not so pronounced, and the distribution of rainfall is more uniform. Shade temperatures average 80°F and there

is little variation from this average, minima below 70°F or maxima above 90°F not often being recorded. Atmospheric humidity is generally high; though sometimes, particularly during a dry spell, there is a marked drop in relative humidity in the forenoon that has a disastrous effect on newly planted seedlings. Sunshine records have only recently been started, but it would appear that the general average for the country will only be about 5 hours bright sunshine per day.

Pest damage on crops can be extremely serious at times; observations suggest insect pests may be more serious than fungoid pests, though it is possible that as more intensive cultivation is practised fungoid pests may become a greater menace. Small animals particularly rats and squirrels, are a major pest; and wild pigs, monkeys and deer also can do considerable damage. Giant snails are also becoming a pest of increasing importance.

Apart from five large rubber estates, small farms are responsible for most of the agriculture of the country. The policy is to encourage the native farmer to develop the country's agriculture by working a mixed system of farming, rather than development by the large specialised plantation. It is now generally agreed that some control over the farmer will be necessary, if progress is to be made in accordance with this policy, and that this control can best be exercised through the establishment of "group farming" units. The prospects for development of Co-operative Societies for the country's rural industries are promising.

THE PRINCIPAL AGRICULTURAL PRODUCTS.

The chief crops in Sarawak are briefly described below:

(1) **PADI.** This is the main crop. There is no doubt technically that Sarawak could be self supporting in rice, its staple foodstuff. In fact, when prices for the main export products are low and there is little money available in the rural areas for purchase of imported rice, the country does of necessity approach self sufficiency in this commodity. When however, prices of export products are high (as in 1950 and 1951 when record prices were being received for rubber and pepper) interest in padi planting wanes and Sarawak may become dependent on imports for as much as half its rice requirements. A destructive method of shifting hill/dry padi* cultivation, which is bringing very serious problems in its train, accounts for a considerable part of the padi produced; powers to control and rationalise this practice are now available under the Natural Resources Ordinance. Swamp/wet padi*, is cultivated in the deltaic and coastal areas, but the methods employed are generally primitive and yields are often low; there is great scope for intensification of cultivation on the wet paid land, particularly as far as improved water control is concerned. Even in the wet season, short dry periods that can have a disastrous effect on the padi, are liable to occur, and provision of some irrigation water is generally necessary. The terrain makes construction of gravity fed canals generally difficult or impracticable, but considerable success is being obtained with small, diesel driven, pumping plants raising water from the rivers which are usually adjacent to the padi land; this method is being developed as fast as the limited resources of trained staff allow.

* These terms are used as wet padi which is not necessarily a swamp variety can be planted on terraced undulating land.

(2) **RUBBER.** Rubber is the chief tree crop and Sarawak's most important agricultural export. It was estimated in 1941 that there were approximately 240,000 acres under rubber, of which 10,580 acres were on five large estates, the remainder being accounted for by small holdings each less than 5 acres in extent. It is possible that the acreage increased during the war. Most of the acreage is occupied by old seedling rubber in very poor condition which must be regarded as a wasting asset. Technique of management, tapping and sheet manufacture is generally of a very low standard. Rubber prices in 1950 reached a phenomenal level and remained high during 1951 and the industry is extremely prosperous. There is now considerable interest in planting and replanting of rubber with high yielding material and suitable budwood and clonal seed are being supplied by the Department of Agriculture. In order to guard against rubber being planted on land needed for swamp/wet padi and suitable for that purpose it has again become necessary to control planting by reimposition of certain sections of the Rubber Regulation Ordinance which had been suspended in 1946. A small modern factory for processing latex collected from surrounding smallholders has been recently erected near Kuching and is operating successfully; the success that is being obtained with this pilot scheme suggests that such small centralised factories may well be the answer to the problem of the generally low quality of the rubber exported from Sarawak.

(3) **SAGO.** It is estimated that there are about 150,000 acres used for sago cultivation, the major part being concentrated in the Mukah, Oya and Dalat regions of the Third Division and mainly worked by Melanaus. No detailed information as to the number of palms and their age and condition is at present available but, taking account of land under fallow and of land occupied by young, immature palms, it is estimated that about 75,000 acres can at present be regarded as under productive sago. For a time after the liberation production of sago flour was at a high level and there is no doubt that the plantations were being overworked as a result; the quality of the product too was often very poor. Production is now more in accord with rates of regeneration and replanting. Since the passing of the Sago flour (Control of Exports) Ordinance, 1948, export of sago flour that does not reach a specified minimum standard of quality has been prohibited; the more progressive sections of the trade have on the whole co-operated quite well in the matter and there has been some improvement in the general quality of the sago flour exported from Sarawak.

Investigations that are being made into the technical properties of sago flour suggest that its potentialities as a source of industrial starch may not yet be fully appreciated and the matter is being pursued as far as available facilities allow.

(4) **PEPPER.** This was an important export product before the war; quality was generally good and the best grades commanded the highest prices offered in the world markets. Unfortunately most of the gardens were abandoned during the Japanese occupation but considerable replanting has taken place recently and there is little doubt that the number of tended vines is now at least equal to the pre-war total and is still increasing rapidly owing to the excellent prices being obtained for produce. All the vines are planted in small gardens, mostly less than half an acre in extent and often very much smaller. Unfortunately most of the pepper in Sarawak is still cultivated under a pernicious system of shifting cultivation but it is hoped that it will

be possible to minimise the worst effects with powers available under the Natural Resources Ordinance, 1950. Exports of all types of pepper will be of the order of 20,000 piculs in 1951; quality is not yet up to pre-war standard but is improving. It is expected that exports in 1952 may be as high as 40,000 piculs.

(5) COCONUTS. These are mainly a smallholder's crop, largely confined to the First Division. The total acreage occupied by the crop is estimated at 21,000 acres, though many of the palms are known to be old and in very poor condition. Some copra and coconut oil are exported.

(6) TUBA ROOT (Derris) has been cultivated in the past, but production and export are now small. Planting is being encouraged as there is a good export demand.

(7) GAMBIER was an important product many years ago, but production is now negligible.

(8) PINEAPPLES of high quality and exceptional flavour are produced in small quantities on drained peat soils.

(9) TOBACCO. Small areas are planted by the natives for their own use. The quality of the product can probably be improved.

(10) COFFEE is cultivated to a small extent round the villages.

(11) COCOA is not yet cultivated by farmers in Sarawak but some observation plots recently established by the Department of Agriculture show promise particularly on the better types of land. About 500 seedlings raised in quarantine in Malaya from clean selected seed obtained from the Gold Coast were recently imported by the Department of Agriculture and are being used as the basis of a seed production station.

(12) FRESH FRUIT AND VEGETABLES are produced near the towns by Chinese market gardeners.

ECONOMIC RETURNS.

The following table shows the quantities and values of the main agricultural products exported in 1950.

MAIN AGRICULTURAL EXPORTS IN 1950.

PRODUCE	QUANTITY (in Pikuls)	VALUE (In Straits dollars per pikul during December 1950 for average quality produce)
Plantation Rubber	932,980	197 (R.S.S.)
Sago Flour	642,487	20
White Pepper	4,487	806
Black Pepper	240	405
Copra	71,063	38

LIVESTOCK HUSBANDRY.

Livestock husbandry at present plays but a small part in Sarawak's rural economy. Bullocks are rarely seen. Some herds of buffaloes, estimated at a total of 5,600 head, are kept in the Fifth Division and are used for meat and for cultivating the swamp padi fields, but elsewhere the number of buffaloes is negligible. Small herds of cows are kept mainly by Indians near the towns. Owing to the need for increasing the number of cattle and buffaloes, control is now exercised over the slaughter of cows and female buffaloes suitable for breeding. Pigs are kept by Chinese smallholders and are also generally found in and around Dayak villages. There is scope for the development of pork production provided the supply of feeding stuffs can be improved, and this matter is being given increased attention; some pure bred Middle Whites have been introduced by the Agricultural Department and are proving very suitable for crossing with local pigs. Ducks are easy to keep in Sarawak and fit in well with local farming systems; farmers are being encouraged to keep more ducks. Some domestic fowl are found in the villages, but they do not do well in Sarawak except in the hands of the really skilled and experienced poultry keeper; however some success is being obtained with flocks made up with Rhode Island Red day-old chicks imported from Australia by air. Goats are kept to a small extent by the Malays. Disease is probably an important factor limiting development of livestock husbandry in Sarawak and full scientific investigation of the matter will eventually be necessary; considerable success has already been obtained by inoculating poultry against Ranikhet disease.

FISHERIES.

Both marine and freshwater fisheries are of considerable importance to Sarawak. Marine fishing is the main source of supply, most of the catch being obtained from the shallow, coastal waters by Malay, Melanau, and Chinese (Henghuas) fishermen. Fish forms a staple food for many of the country's inhabitants, thus adequate supplies are a matter of significance. A surplus of certain varieties occurs; in 1950 exports of these totalled approximately 100 tons valued at about \$153,200. Production of other types that are widely consumed is insufficient to meet local needs, and imports of dried, salted, and tinned fish in 1950 totalled approximately 2,800 tons valued at about \$3,132,700.

The fishing methods used along the coasts may appear crude to the casual observer, but anyone acquainted with sea fishing is soon impressed by the simplicity, ingenuity, and suitability for local conditions, of the fish catching contrivances employed. The fishermen also display skill and a high standard of seamanship. A survey of local sea fisheries has recently been completed, and the results confirm that there are not the concentrations of fish in Sarawak waters to justify large scale fishing. Nor have indications yet been obtained of any large fish concentrations worth serious attention in the deeper waters further off shore. Experiments with modern temperate water methods also suggested that they were unlikely to be successful in the waters off Sarawak coasts. However there seems to be scope for some mechanisation of existing local methods, and this on even a limited scale might lead to Sarawak becoming self supporting in fish and increasing exports of certain varieties.

Improvements in the industry are possible, mainly in the transport of produce to consuming and processing centres, and in its marketing. These aspects are to receive further attention, particularly as subjects for co-operative development.

Freshwater fish farming is carried out and conditions are generally suitable for this industry. Some Chinese farmers successfully obtain large yields of fish, but unfortunately some of the most important species do not breed in Sarawak and fry have to be imported from China. Recent investigations suggest however that the rate of breeding, and of growth of small edible indigenous fish in the smaller streams, can be increased by methods that are cheaper and simpler than the elaborate fish ponds used by Chinese farmers. Feeding at selected points seems to increase breeding and help growth considerably, although it does not appear to be essential to the existence of the fish. The native population already make considerable use of indigenous freshwater fish for food, and an increase in local supplies would be of considerable value.

FOREST RESOURCES.

THE NATURE AND EXTENT OF THE FORESTS.

Practically the whole natural vegetation of Sarawak can be included in the term Lowland Tropical Rain Forest if areas of scrub forest subject to shifting cultivation, and relatively small areas of poor 'Moss Forest' on the exposed ridges of the higher hills, are omitted. The forests are in general characterised by evergreen trees, and by their very mixed nature; it is estimated that the number of indigenous tree species is more than 2,500, and over 100 of these may occur on a single acre; however, not more than about 250 of these species can be considered of commercial importance as timber. The whole area of lowland tropical rain forest covers approximately 34,000 sq. miles, or 72 per cent of the land area of the Colony; about 7,000 sq. miles have been constituted as permanent forest, but the setting aside of land to be managed as forest in perpetuity is still far from complete. Much of this forest is still inaccessible but, if the internal communications of the Colony can be improved, most of it must be regarded as potentially productive.

This great stretch of rain forest can be divided into a number of classes dependent mainly on soil types. The principal classes are described below.

(i) **MANGROVE SWAMPS.** These are tidal swamps situated in sheltered places at the mouths of some of the larger rivers. The forest is similar to other mangroves occurring throughout the eastern tropics and their most valuable products are firewood, charcoal and cutch. Their total area is estimated at 466 sq. miles, but only about half of this contains true mangrove, the remainder being occupied by *nipah* palm or by very poor forest in the drier parts of the swamp.

(ii) **PEAT-SWAMP FOREST.** The greater part of the coastal belt of Sarawak consists of swampy land with a deep peat soil. These swamps at places extend for as much as 50 miles inland, and cover over 6,000 sq. miles. About 5,770 sq. miles of this is forest of a very valuable type which, owing to its accessibility, now forms the chief source of the Colony's timber supplies. Various distinct sub-types of swamp forest occur. Of these the most important can best be described as Mixed Swamp Forest, in which the principal timber trees are usually *ramin*, various species of *meranti*, *medang jongkong*, *semayur*, *kapur paya* and *jelutong*. Another very interesting type is *alan* forest, often almost pure and estimated to cover an area of approximately 800 sq. miles.

(iii) **"KERANGAS" OR "HEATH FOREST".** This type of vegetation occurs on areas of very poor, acid soil scattered throughout the country and probably not aggregating more than 3,000 sq. miles. Much of this forest is of very poor quality and even in the better parts the trees are of comparatively small size. Nevertheless these forests are often of considerable value. In places they contain almost pure stands of *ru ronang*, which is one of the world's best fuel woods; and they also carry fairly rich stands of the conifers *bindang* and *sempilor*, which are not otherwise available except on steep and inaccessible hills.

(iv) **RIPARIAN FOREST.** Rather narrow strips of riverine alluvial soils, rarely more than half a mile wide, carry a special type of forest which varies mainly in accordance with the nature and speed of the rivers. In the upper reaches

of fast-flowing streams, the forest often consists chiefly of various species of *engkabang*, which are the main source of the valuable, oil-bearing illipe nut. Where the streams first change to comparatively slow-flowing rivers, however, the nature of the forest changes too, and *belian* usually becomes the most important species. Riparian forests of this type probably do not total more than a few hundred square miles.

(v) OTHER TYPES. The remaining forest, covering about 25,000 sq. miles, is found on various less specialised soils. It is very mixed, containing a multitude of species, dominated, however, by those belonging to one botanical family, the Dipterocarpaceae. The forest is very dense, and the trees reach a considerable size, the forest roof being generally about 150 feet above the ground. Below this roof, formed by the larger species, there are numerous layers of smaller, shade-bearing trees, but small herbaceous vegetation is scanty because very little light reaches the ground. On the other hand, climbing plants, such as lianes and canes, are fairly abundant.

THE PRINCIPAL TIMBERS.

The more important timbers are briefly described below. For more detailed information, inquiries should be addressed to the Conservator of Forests, Kuching. Timbers available in fair quantity for export are marked with an asterisk.

*1. ALAN (*Shorea albida* Sym., fam. Dipterocarpaceae). Rather similar to Red Meranti but heavier; wt. about 50 lb. per cu. ft. A strong, hard-wearing timber, suitable for flooring and heavy construction not in direct contact with the ground. Supplies very large. As the trees are almost invariably hollow, the timber cannot generally be exported in log form. Also known as Seringawan, Sengawan and Empenit.

2. BEDARU (*Cantleya corniculata* Becc., fam. Icacinaceae). A hard, heavy, strong, durable timber, suitable for most forms of heavy construction. Supplies very small.

3. BELIAN (*Eusideroxylon zwageri* T. & B. fam. Lauraceae). A heavy, very strong, very durable timber; wt. 60-70 lb. per cu. ft. This remarkable wood is the standard primary hardwood of Sarawak, and is also used for shingles, house-posts and floors. Export is not permitted.

*4. BINDANG (*Agathis alba* (Lam.) Foxw., fam. Coniferae). One of the strongest of the softwoods. Not durable in contact with the ground in the tropics but suitable for interior work; also for tanks and vats and for pattern-making. Small quantities are exported, but supplies are limited and still mainly inaccessible.

5. BINTANGOR (*Calophyllum* spp, fam. Guttiferae). Wt. 38-48 lb. per cu. ft. An excellent light hardwood for general construction, but not durable in contact with the ground in the tropics. Usually remarkably free from defects. The trees are very common in most forests, but rarely attain a large size.

6. DUNGUN (*Heritiera littoralis* Dry., fam. Sterculiaceae). Wt. about 54 lb. per cu. ft. Hard, tough and durable; difficult to saw, as it contains silica. Suitable for piles, posts, bridges, wooden tools and other uses where strength and toughness are required. The tree is fairly plentiful along tidal streams.

7. **DURIAN BURONG** (*Durio* spp. fam. Bombacaceae). Wt. about 30 lb. per cu. ft. air dry. Suitable for general construction and also popular for wooden shoes. Not durable in contact with the ground. Supplies moderate.
- *8. **GERONGGANG** (*Cratogeomys arborescens* (Vahl). Bl., fam. Hypericaceae). Wt. about 30 lb. per cu. ft. Soft and light; not durable in contact with the ground; works easily and finishes well, and has a pleasing colour and texture. A general utility timber where great strength and durability are not required. Available in fair quantities. Also known as Serungan.
- *9. **KAPUR** (*Dryobalanops* spp., fam. Dipterocarpaceae). Wt. 45-50 lb. per cu. ft. A good secondary hardwood, which can be used for heavy construction where there is no danger of termite attack. Moderately easy to work, but some care is necessary in seasoning to prevent checking and end-splitting. Some species are liable to be attacked by a minute pinhole borer which infects the living tree but does not live in seasoned timber. Large supplies available. Also known as Borneo Camphorwood.
- *10. **KAPUR PAYA** (*Dryobalanops rappa* Becc., fam. Dipterocarpaceae). This is the lightest and weakest form of Kapur, and is more or less similar to Red Meranti in strength properties. Logs frequently have very spongy heart. Available in fair quantity.
11. **KELAMPU** (*Sandoricum* spp. fam. Meliaceae). A light hardwood of pleasing texture and colour, suitable for most types of interior construction. Not durable in contact with the ground in the tropics. Supplies rather small.
- *12. **KERUING** (*Dipterocarpus* spp., fam. Dipterocarpaceae). Wt. varying considerably with species, 40-57 lb. per cu. ft. One of the principal secondary hardwoods available in Sarawak. Not durable in contact with the ground, but absorbs preservatives readily. Some species contain much oleo-resin, and are difficult to saw. Care is required in seasoning to prevent splitting. Suitable, especially when creosoted, for most types of heavy construction, sleepers, waggon-planks, etc. Large supplies available in most parts of the country.
13. **MEDANG** (Fam. Lauraceae). The name Medang is applied to many species of the Lauraceae and frequently, though usually in error, to other species as well. True Medangs can usually be recognised by their greasy feel. Most are general utility light hardwoods, but the properties of different species vary considerably and some have a high reputation for durability. Medangs are very common in most forests, but are usually rather small trees.
- *14. **MEDANG JONGKONG** (*Dactylocladus stenostachys* Oliv., fam. Melastomaceae). Wt. about 30 lb. per cu. ft. A soft, light hardwood generally rather similar in mechanical properties to Geronggang. The peculiar dark specks or "birds'-eyes", which at first sight give the appearance of damage by pinhole borers, are a constant feature. The tree is common in most swamp forests and large supplies are available. Also known as Medang Tabak and Merubong.
- *15. **MENGRIS** (*Koompassia malaccensis* Maing., fam. Leguminosae). Wt. about 55 lb. per cu. ft. Very hard and strong, but not durable in contact with the ground unless treated with preservatives, which it absorbs very readily. Difficult to saw, but seasons well. Logs often contain zones of abnormal tissue, and the sapwood is very liable to attack by Lyctus beetles. Suitable for tanks and vats used in the chemical industry, plywood, shingles

and, when treated, for heavy construction. A common tree throughout the lowland forests, and reasonably large supplies are available.

*16. MERANTI (RED) (*Shorea* spp., fam. Dipterocarpaceae). This well-known light hardwood is the standard general utility timber of Sarawak and the neighbouring countries. It is produced by numerous, similar species, the colour varying from very light to very dark and the weight from 25 to 45 lb. per cu. ft., the darker forms being the heaviest and strongest. Not durable in contact with the ground in the tropics, but suitable for all forms of light construction; special uses include boat-building, furniture and plywood. Also known in Sarawak as Perawan, Sasak, Engkabang, Sengkajang, Abang, Majau and Binatoh. Very large supplies available.

*17. MERANTI (YELLOW) (*Shorea* spp. fam. Dipterocarpaceae). This wood is rather similar in properties to Red Meranti. The sapwood is very liable to powder-post beetle attack. Also known as Lun Kuning or Yellow Lun. Large supplies available.

18. MERRAU (*Instia palembanica* Miq., fam. Leguminosae). Wt. about 50 lb. per cu. ft. Hard, strong and durable; fairly easy to work; seasons well but rather slowly. The sapwood is perishable and should be discarded. Suitable for all forms of heavy construction, bridges, sleepers, panels, floors and joinery. Only rather small supplies are available in Sarawak.

*19. NYATOH (*Palaquium* spp. and other species of Sapotaceae). There is considerable variation in the weight and strength properties of the different species, but most are general utility, light hardwoods, slightly superior in strength to Red Meranti. Not durable in contact with the ground in the tropics but very suitable for all forms of interior construction and fittings. Usually very free from defects, though logs occasionally show large holes made by longhorn beetles. Seasons well. Moderately large supplies available. Also known as Jangkar; heavy, durable forms are usually known as Nyatoh Kelalang.

20. NYIRIH BATU (*Xylocarpus granatum* Koenig, fam. Meliaceae). A moderately hard and strong wood; liable to split in seasoning; works easily and takes a high polish. A fine furniture wood. Supplies small, and the timber is rarely obtainable in large dimensions.

*21. PELAI (*Alstonia* spp., fam. Apocynaceae). Wt. about 25 lb. per cu. ft. A light, soft, white wood; easy to saw and peel; shrinks very little in seasoning, and holds its shape well; liable to stain and powder-post beetle attack. Suitable for pattern making, plywood and packing cases. Supplies are rather limited and, owing to the presence of latex pockets, large clear pieces are rarely obtainable. Known in other Malaysian countries as Pulai, and in Australia as Milky Pine.

22. PERUTOK (*Lophopetalum* spp., fam. Celastraceae). Wt. about 40 lb. per cu. ft. A general utility, light hardwood. Not durable in contact with the ground, and resistant to impregnation. Only rather small supplies available.

*23. PETIR (*Sindora* spp., fam. Leguminosae). Wt. about 40-45 lb. per cu. ft. A general utility, light hardwood, usually very free from natural defects; seasons well and shrinks little. Makes excellent furniture, especially when figured, but liable to attack by drywood termites. Moderate supplies available.

24. PUDAU (*Artocarpus* spp., fam. Moraceae). A general utility, light hardwood, different species showing considerable variation in weight and other properties. The trees are common but usually only of small size.

*25. RAMIN (*Gonystylus bancanus* (Miq.) Kurz., fam. Gonystylaceae). Wt. about 40 lb. per cu. ft. A whitish, featureless, light hardwood of rather fine texture and fairly straight grain; usually free from natural defects but liable to sap-stain; saws easily, seasons well, and planes to a smooth finish; peels easily; not durable under tropical conditions. Ramin is at present the principal export timber of Sarawak, and is used mainly for plywood, light interior construction, boxes, joinery, shop fittings and furniture. Large supplies available.

26. RENGAS (*Melanorrhoea* spp., and other species of Anacardiaceae). Wood moderately hard and heavy, varying with species. The best qualities are among the finest furniture woods of the region, ageing to a warm, reddish brown striped with a darker figure. The green wood contains a poisonous principle that causes severe dermatitis, and careful seasoning is necessary. Some species are difficult to saw. Fairly large supplies are available, but the timber is seldom worked.

*27. RESAK (*Vatica* spp., fam. Dipterocarpaceae). Hard, strong woods, but the species vary considerably in natural durability; the best qualities are more or less equivalent to Selangan Batu. Similar timber is obtained from the genera *Upuna* and *Cotylelobium* of the same family. The trees are fairly common in most forests but usually of rather small size.

28. SELANGAN (*Hopea* spp., fam. Dipterocarpaceae). A light or medium hardwood produced by numerous species, averaging 45-50 lb. per cu. ft. Saws and works easily, and planes to a smooth finish; seasons well but slowly, with a tendency to warp; resistant to fungi but not to termites. The trees are fairly common in most forests, but usually of rather small size.

*29. SELANGAN BATU (*Shorea* spp., fam. Dipterocarpaceae). Wt. 55-70 lb. per cu. ft. A heavy, hard, strong, durable timber, although the sapwood is very liable to powder-post beetle attack. Moderately easy to saw. Care is needed in seasoning as the shrinkage is rather high. Suitable for most forms of heavy construction, and also for boat building, but for the latter purpose the sapwood should be discarded. Fairly large supplies available.

*30. SEMAYUR (*Shorea inaequilateralis* Sym., fam. Dipterocarpaceae). The timber is generally similar to Alan but is reputed to be more durable. It is equivalent to Selangan Batu Merah of North Borneo. Moderate supplies available.

31. SEMPILOR (*Dacrydium elatum* (Roxb.) Wall., fam. Coniferae). A softwood very similar to Bindang. It is exported in small quantities but supplies are very limited.

32. SIMPOH (*Dillenia* spp., fam. Dilleniaceae). Wt. about 45 lbs. per cu. ft. Moderately hard and heavy; texture coarse; moderately durable; some species rather difficult to saw; seasons fairly well though some care is necessary. A good general utility timber, but little worked at present. The trees are fairly common in most forests.

33. SOMAH (*Archytaea* spp., fam. Ternstroemiaceae). The timber is produced by two species, one of which, however, never grows to a large size

and is used only as a pole. The wood is strong and durable, and is locally held in high esteem, being used mainly for fencing and pepper posts.

34. TEKAM. (*Hopea* spp., fam. Dipterocarpaceae). Wt. 60-66 lbs. per cu. ft. The timber is in most respects similar to Selangan Batu, but is even more durable and must be considered among the best of the primary hardwoods. Moderate supplies available. Also known as Giam and Chengal, and in North Borneo as Selangan Batu No. 1.

35. TERENTANG (*Camptosperma* spp., fam. Anacardiaceae). Wt. about 27 lb. per cu. ft. Texture rather fine but woolly; apt to split and stain in seasoning, but not very subject to powder-post beetle attack. Rather weak, but suitable for packing cases, shuttering and interior joinery; in Malaya it is the most favoured wood for matches. Supplies not very large, although the tree is common in some localities.

36. TERUNTUM (*Lumnitzera littorea* (Jack) Voight, fam. Celastraceae). Wt. about 49 lb. per cu. ft. Wood with straight grain and very fine texture; heavy, hard and strong; works to a high finish and seasons well; only moderately durable in contact with the ground in the tropics. Locally used mainly for wharf construction, and probably very suitable for cabinet work. Supplies rather small.

OTHER FOREST PRODUCE.

A complete list of the many products that can be obtained from the Sarawak forests would fill a fairly large volume. Most of them, however, are collected locally in small quantities for domestic use. The following notes cover the more important commercial products.

1. CANES. Canes or rattans are the stems of climbing palms, and are abundant in most of the forests. They have a wide local use mainly as a tying and building material, and are also exported in fairly large quantities for the manufacture of furniture, walking sticks, cricket bats, etc. The most valuable form is the well-known Malacca Cane.

2. CUTCH. Cutch is an extract of mangrove bark, used in the tanning and dyeing industries. All the cutch manufactured in Sarawak is exported. For local use (tanning of fishing nets, etc.) much more primitive methods are used.

3. DAMARS. Dammar or Damar is the name usually given to resins produced by trees of the family Dipterocarpaceae. It may be obtained either by tapping the trees or, more frequently, by collecting lumps of hard resin from the ground. The name is also applied to the more valuable Manila Copal, which is the resin of the *bindang* (*Agathis alba*) tree. These dammars are used mainly in the manufacture of varnishes, but locally also for torches and for caulking boats.

4. JELUTONG OR GETAH JELUTONG. This product is the latex of the *jelutong* trees of the genus *Dyera*, and is the principal ingredient of chewing gum. The trees are tapped in the same way as Para rubber, and practically the whole production, after refinement, is exported either direct or via the Singapore refineries to the United States of America.

5. GUTTA PERCHA is usually known in Sarawak as *getah rian*, and is the latex of *Palaquium gutta*, a rather small tree that is fairly common in most

of the inland forests. The trees cannot be tapped continuously; the latex is collected by tapping in herring bone fashion all up the stem and along the main branches in a single day, after which the tree must be allowed to rest for at least a year. This latex has peculiar properties that distinguish it from other rubbers; when heated in water it can be easily moulded and it is also an excellent insulating material. Its chief use is for the casing of electric cables, but it has many minor uses such as the outer covering of golf-balls.

6. OTHER WILD RUBBERS. The minor wild rubbers of Sarawak are *getah jangkar* (produced by various trees of the family Sapotaceae) and *getah pelai* (produced by two species of *Alstonia*). They are used mainly as substitutes for Para rubber, but the latter also may possibly serve as a *jelutong* substitute.

7. ILIPE NUTS. These are the seeds of various species of the family Dipterocarpaceae, and contain a high percentage of valuable vegetable fat. The trees fruit only at rather long intervals, usually about once in four years, so that the industry is not a steady one; the last big "nut-year" was at the turn of 1946-47. Cooking oil is prepared locally from these seeds, but fairly large quantities are exported, mainly for use in the manufacture of chocolates.

8. INCENSE WOODS. The principal incense wood of Sarawak is *akar laka* (*Dalbergia parviflora*), a climber belonging to the family Leguminosae. It is exported to China and other oriental countries.

9. NIPAH SUGAR. The *nipah* palm (*Nipa fruticans*) grows in abundance along the banks of many tidal rivers. It provides many useful products, and a factory at Kuching is engaged on their manufacture. The principal product is sugar, some of which is exported.

10. EDIBLE BIRDS'-NESTS. The "edible swift" is common in Sarawak, and nests in thousands in lime-stone caves in various parts of the country. The more or less semi-circular nests, which are held in very high esteem by the Chinese for the making of a delicately-flavoured soup, are made of saliva secreted by the parent birds. Their collection from the high walls and roofs of the caves is done once a year, after the flight of the young birds, and is a very skilled and dangerous task.

FOREST INDUSTRIES.

Until 1947, the timber industry of Sarawak was a small one, and the produce was almost entirely sold on the very restricted and rather erratic local market. There were, at that time, 18 sawmills in the Colony, compared with 46 mills at the end of 1951. Most of these mills, however, are still small and not very efficiently equipped.

The post-war demand for tropical hardwoods has made a very sudden call on the Colony's timber resources. The following table shows total timber exports for the years 1940 and 1947 to 1950.

Year.	Tons (volume).		
1940	...	...	2,450
1947	...	...	5,699
1948	...	...	19,599
1949	...	...	39,835
1950	...	...	45,846

This trade is still expanding, the rate of expansion being governed mainly by the restricted shipping, port and labour facilities. The principal markets are the United Kingdom, Australia and Hong Kong; smaller quantities are also exported to other parts of Borneo, Singapore, South Africa and New Zealand, and occasionally to Ceylon and Japan.

The principal export timber is, at present, *ramin*, which makes up at least one-third of the total exports. It is fairly closely followed by *meranti*, and *medang jongkong* is also high on the list. The bulk of the export is still in the form of logs, but there is a general and inevitable tendency for sawn exports to increase, and it is probable that eventually only prime plywood logs will be exported as such.

Owing to poor communications, shortage of labour, etc., the timber resources of the country are by no means being fully exploited. Allowing for timber taken free by natives of Sarawak for their own use, the total annual production probably does not exceed 150,000 volumetric tons of round timber. It is estimated that, with a good system of communications and adequate labour, the forests would be capable of producing a perpetually sustained yield of about 600,000 tons of round timber, approximately equivalent to 15 million cubic feet of sawn timber, per annum.

The collection of minor forest produce is mainly a part-time industry for the peasant population at times when their crops do not require attention. This produce is sold to numerous dealers in the main centres and fair quantities are exported. The Colony has one jelutong refinery and one cutch factory. Another factory at Kuching specialises in the products of the *nipah* palm.

FINANCIAL RETURNS.

The collection of most forms of forest produce is done under licence issued by the Forest Department, royalty being collected at fixed rates. This does not, however, apply to all forms of produce, some being taken free while others are subject only to export duties. In addition, natives of Sarawak have the right, with certain restrictions, to take forest produce free of tax for their own domestic use. It is therefore impossible to make an exact assessment of the value of annual production. In the following table, figures for minor forest produce are almost entirely confined to exports; the volume of timber produced for home consumption is an estimate and does not include produce taken free for domestic use. The figures for illipe nuts, an erratic crop, are averages for the last 5 years.

FINANCIAL RETURN FROM FOREST PRODUCE IN 1950.

PRODUCE.	Values in Straits Dollars.	Revenue receipts in Straits Dollars.		
		Royalties, etc.	Export Duties.	Total.
Timber, firewood and charcoal (exported)	2,839,725	339,373	—	339,373
Timber, firewood and charcoal (home consumption) ...	5,380,000			
Wild rubbers	2,061,835	23,967	209,075	233,042
Cutch	1,153,354	11,241	—	11,241
Dammar	501,366	—	45,557	45,557
Bamboo and canes	280,514	—	—	—
Illipe nuts	294,800	—	44,220	44,220
Other produce	171,828	7,305	4,637	11,942
Total ...	12,683,422	381,886	303,489	685,375

During the same period the Colony spent \$168,605 on the management of the forests.

MINERAL RESOURCES.

The mineral resources of Sarawak comprise oil, gold, antimony, coal, mercury, diamonds, limestone used for lime manufacture and possibly suitable for cement, clay used for bricks and some types of pottery, building stone and phosphate. Small occurrences of silver, lead, copper, gypsum, and iron ore have been recorded, sapphires are known to have been found and salt is worked by native methods in the interior; aluminium ore has recently been discovered. In 1951 oil was being produced on a large scale by modern methods; six Chinese mines were producing gold, fossicking was being carried out on the mercury deposit, lime, bricks and phosphates were being produced on a small scale, and stone was being quarried. The oil fields of northeast Sarawak and the gold in the west are the mineral deposits that have received the closest examination, but in common with the other minerals, a large amount of work remains to be carried out before the potentialities are known. Mineral occurrences, particularly of gold, coal, antimony and mercury are widely reported; but the limited information available indicates that it is doubtful if they would repay working at the present stage in the country's development, as the deposits appear to be small or difficult of access. Their investigation however is one of the first tasks being undertaken by the recently established Geological Survey Department.

Although little has been published about Sarawak's minerals and there are few production or investigation records available, the resources have received attention in the past. Between 1850 and 1900 there appears to have been an energetic search for minerals, particularly coal, and to a lesser extent for antimony, mercury and gold. Investigations were made by individuals employed by private concerns and the Government, and even administrative officers during the middle of the last century appear to have combined Dayak warfare with a search for coal or cinnabar deposits. Unfortunately, virtually none of the geological and mineral results of this work were published and few records are available for assessing the extent of the mineral investigations. The recording and correlation that is lacking, would have taken place if there had been a Mines or Geological Survey Department.

Minerals have played an important part in Sarawak's development. From 1823 onwards, when it was discovered that the antimony ore had a ready market in the newly-established trading centre of Singapore, they have figured prominently in the country's economy. Until about 1885, antimony was generally the most important mineral produced and, in the early days, often Sarawak's leading export. Mercury was the chief mineral product for five of the six years between 1874 and 1879 inclusive, but after 1887 output declined and became negligible ten years later. Coal was the main mineral export between 1889 and 1898, after which gold took its place and headed the list continuously from 1899 until 1920. From this time onwards oil has been the leading mineral export.

The position of Sarawak's mineral exports during the last eighty years is summarized in the table below :

SARAWAK MINERAL PRODUCTION.

YEAR	Value of Sarawak Produce Exported.	Value of Mineral Exports.	Percentage of Mineral exports to export of Sarawak Produce.	Mineral Royalties Paid to the Sarawak Government.	REMARKS. (Mineral exports in their order of value; the most valuable export is shown first.)
1868	N.A.	38,001	—	N.A.	Antimony, quicksilver, gold, diamonds.
1878	800,325	83,086	10	13,333	Antimony, quicksilver, gold, diamonds.
1888	1,322,325	118,915	09	8,889	Antimony, coal, quicksilver, gold.
1898	3,089,017	323,230	10	10,177	Coal, antimony, gold quicksilver.
1908	5,732,723	1,177,255	21	77,367	Gold, coal, antimony, quicksilver.
1918	9,221,459	N.A.	—	98,109	Gold, oil, coal.
1928	53,302,340	39,302,340	74	770,835	Oil.
1938	23,244,066	12,482,134	54	387,636	Oil, gold, silver.
1948	166,023,615	111,820,069	67	67,320+	Oil, gold, antimony.
All values given in Sarawak dollars, fixed at 2s. 4d. sterling since 1906. N.A.=not available. + Estimated oil royalty and mining rents and fees; most of the oil exported in 1948 was produced in Brunei.					

In 1951 oil was the only important mineral product, the output of gold being small and that of antimony insignificant. The present Government policy is to foster mining, steps already taken include the introduction of a modern mining enactment and the establishment of a Geological Survey Department.

The main features of the five minerals that have been most extensively worked, i.e., oil, gold, antimony, coal and mercury, are given below.

(1) OIL. Among the first references to oil in Northeast Sarawak are observations in the Miri area by A. H. Everett in the 1870's. A small native industry flourished in the area, oil being obtained for local use from shallow surface wells. Geological investigations on behalf of the Royal Dutch-Shell Group were first made in 1909 by Dr. Erb, drilling commenced in June 1910 at Miri, and oil was struck in September 1910 and a company with a capital of £500,000 formed. The first export of oil was the shipment of 500 tons in April 1913 and production has since been continuous. Up to December

1950 oil obtained totalled 71,627,196 barrels of 42 gallons each—this includes the production estimated to have been made during the Japanese occupation. Oil royalties paid to the Sarawak Government total \$10,028,266. Oil was found at Seria in the adjoining Brunei territory, some thirty miles north east of Miri, in 1929 and export commenced in 1931. The main production now comes from this area, the output totalling 137,057,576 barrels up to December 1950.

Almost all the oil is obtained from sands of the Upper and Middle Miocene series and comes from wells between 300 and 3,050 feet in depth in the Miri area, and between 1,600 and 6,900 feet deep at Seria. The fields themselves are at present being tested by deep drilling and geological and geophysical investigations of the surrounding country is in progress: the future appears to hold promise for the development of new oilfields.

(2) GOLD. Gold has been recorded in a number of widely separated areas in Sarawak. The best known deposits, in the Bau District of Upper Sarawak, have been the source of practically all the gold produced; the output from other localities has been small and comes almost entirely from native alluvial washings. Other occurrences outside Upper Sarawak are Marup on the Batang Lupar river, Sarikei on the Rajang river, Melikin on the Sadong river, and Sirin on the Samarahan river.

The recorded export and production of gold from 1864 to 1950 inclusive is 1,210,511 Troy ounces. The stated value is 38,133,688, comprising exports between 1864 and 1926, and production from 1929 to 1950—this figure is exclusive of 2,714 ounces of unknown value obtained during the Japanese occupation. The revenue paid to the Sarawak Government has been \$2,496,763 comprising royalty, first levied in 1896, and rents and licence fees first recorded as being paid in 1932.

The most flourishing period of Sarawak gold production was from 1899 to 1921 inclusive when 983,255 Troy ounces of gold, valued at \$25,995,222 were produced and gave a direct revenue of \$1,466,462. This output is 81 per cent of the country's recorded gold production during the last eighty five years and was obtained in twenty two years. This prosperous period of mining followed the introduction of the cyanide method of gold extraction in 1899 by the Borneo Company Ltd. and the adoption of this method to suit the local gold ore; the enterprise closed down in early 1922. Small scale operations by Chinese miners followed and the period between 1933 and 1939 saw a brief revival of the industry, output reaching a peak in 1934 and 1935 with production exceeding 28,000 ounces yearly. Since the liberation of the country in 1945 there has been a very small, although increasing, gold production. The output in 1950 was 1,440 Troy ounces; six mines were operating, but rehabilitation has been slow, and the rise in working costs without a corresponding increase in the official price of gold has hindered development.

In 1911 Mr. J. S. Geikie described the Upper Sarawak gold deposits as follows "At Bau and Bidi gold occurs in a series of marls and shales pierced by numerous dykes, the rocks in the auriferous zone being brecciated, much altered and silicified, and retaining but little trace of their original form. These masses of altered rock are found to extend along a series of fault lines and there is little doubt that the origin of the gold is closely connected with the presence of the dykes and these faults.

The gold, which is alloyed with some 20 per cent of silver, is in an extremely fine state of division, being rarely visible; what coarse gold there is occurs in thin leaves and plates. Along with the gold are found arsenic, antimony, stibnite, pyrites, realgar, etc."

(3) **ANTIMONY.** The antimony deposits consist mostly of the sulphide, stibnite, which has been recorded at a number of widely separated localities. The main deposits are situated in Upper Sarawak and this area has been the chief source of ore production; other occurrences have been reported at Lundu, Samarahan, Sadong, the Batang Lupar, Sarikei, Bintulu and the Upper Rajang.

Antimony ore, after its discovery in 1823, played an important part in Sarawak's early history and after 1840 production soon rose to about 1,500 tons annually and the country became the chief source of European supply. The maximum output was in 1872, but the records are conflicting on the amount of ore obtained in that year and statements vary from 2,322 tons to 3,288 tons. In 1885 production declined but continued with fluctuations until 1907, since when only small quantities of antimony ore have been obtained at irregular intervals.

(4) **COAL.** Coal has been recorded at many localities in Sarawak; the best known deposits are at Sadong, the Silantek-Abok area, the Bintulu area, and Muka. Other occurrences are known at such widely separated places as Gunong Undan in West Sarawak, the Iran, Merit-Pila and Melinau areas in the Upper Rajang; Mount Dulit and Patan in the Baram river drainage basin, and the Limbang valley in East Sarawak. Certain deposits are reported to contain coal of good quality but some of the main obstacles to development in the past appear to have been inaccessibility, competition from coal exported from Europe, and the small market in the country itself.

Collieries were once operated by the Sarawak Government at Sadong in West Sarawak, and at Brooketon in Brunei territory. The Sadong mine worked from 1873 until 1931 during which period 876,345 tons of coal were sent from the colliery. The Brooketon Colliery was purchased in 1888 for £25,000 from Mr. Cowie and worked until 1924 during which period 582,412 tons of coal were exported from the mine. These production figures are exclusive of coal consumed on the mines, which in some years amounted to 5,000 tons for each working. Between 1874 and 1931 a total of 1,458,757 tons of coal were sold by the Sarawak Government; most of which was consumed by local companies and steamers, although approximately one fifth i.e. 302,899 tons was sold in markets outside the country, mostly in Singapore, Manila and Hong Kong.

(5) **MERCURY.** Mercury occurs mainly as the sulphide, cinnabar, although small amounts of the metal itself have been recorded. The main deposits are in Upper Sarawak where it was mined at Tegora and Gading; the ore has however also been found in East Sarawak in the Long Suba area on the Baram river.

The main period of production was between 1870 and 1899 when it is recorded that \$1,159,966 worth of mercury was exported; in 1877, the year of maximum output, approximately 3,000 flasks, each of 76 pounds of mercury were obtained. The output decreased and stopped after 1889 although since

that date there has occasionally been a small production e.g. in 1908 and 1909. During the Japanese occupation records show 103 flasks of mercury were obtained, but this mining appears to have been governed by strategic necessity rather than the promise of economic success.

In 1950 Sarawak had the following output of minerals and mineral products.

MINERAL.	PRODUCTION.	REMARKS.
Oil	414,196 American barrels	Exports from Sarawak totalled 4,055,953 long tons valued at \$230,308,089 and included gasoline, diesel, kerosene, and crude oil. Most of the above was oil from Brunei that was treated at Lutong Refinery, in Sarawak.
Gold	1,440 fine ounces	Produced by six mines: it was valued at Straits \$117,580.
Coal	22 long tons	Worked by Logging & Lumber Limited, Bintulu.
Antimony ore	4 long tons	Obtained as a by-product by Ban Lee Gold Mining Company.
Phosphate	643 long tons	Guano extracted from Niah Caves, Bukit Subis, Fourth Division.
Bricks and Tiles	1,506,000 bricks 50,000 tiles	Made by four concerns working in the Kuching area, and two in the vicinity of Miri.
Lime	923 long tons	Made by three companies in the Kuching area.
Stone	47,900 cubic yards	This stone was quarried in the First Division; only negligible quantities were obtained elsewhere in Sarawak.

LAND ALIENATION.

The development of natural resources is fundamentally concerned with the development of land, thus provision for the reliable recording of land tenure is important. Stability, so essential for the proper utilisation of land, depends on individual and collective land rights being fairly decided and accurately recorded, for this the existence of accurate surveys and maps are essential.

If there is not to be confusion of tenure, possession of land must be derived from some recognized authority, and titles issued supported by an official record. This is particularly important in a country where agricultural development of the land is for a great part carried on by illiterate peasants. A complete and reliable record of ownership is also essential if settlers are

to invest the capital and labour needed for permanent settlement and the proper utilisation and development of the land. The laws and regulations, necessary to give legal possession to land, to control the opening up of undeveloped Crown Land for settlement, and to protect the customary rights of the indigenous inhabitants are administered by the Lands and Survey Department.

LAWS AND REGULATIONS.

The first legislation to control the use of land was that made by the Rajah in Council in June 1863. It provided for grants of land on payment of fees, or for leases for 900 years, both of which could revert to the State in the event of non-utilisation of the land within ten years. The order also reserved the mineral rights to the State, and provided for road and river bank reserves. This order was added to, or modified by, a great number of various orders between the years 1863 and 1917.

In 1920 all previous orders were consolidated and amended by Order No. VIII 1920, which was in turn replaced by Order No. L—2 (Land) 1931, and is now generally referred to as the Land Ordinance. The Land Ordinance provides for the control and alienation of Crown Land; the classification of lands; the registration of title and transactions in land; the conditions under which land may be alienated or held; it safeguards mineral rights to the Crown; it provides for the creation of reserves; the collection of land revenue, native holdings and communal reserves, and also penalties for infringement or default. In 1933, rules made under section 96 of the Ordinance provided means for more effectually carrying out the provisions of the Ordinance. In the same year an additional order affecting land was introduced. This is now known as the Land Settlement Ordinance. It provides for the settlement of rights to land, and the creation of a new Land Register based on an accurate and fully verified cadastral survey. It closely resembles the many forms of the Torrens system in use throughout the British Commonwealth, and its provisions are extended from time to time to new areas of operation as staff and exigencies permit.

LAND ADMINISTRATION.

The grants of land made before 1920 were apparently limited to what was considered to be permanent use of the land. Prior to the Order of 1920, agricultural land in small lots for the cultivation of gambier, pepper and rubber was held under permit and registration certificate. The apparent intention was that the land should be leased for 99 years, but the issue of formal leases never caught up with the alienation of land. It is thought that the intention of issuing leases was eventually abandoned in favour of casual permits—especially when rubber came to be planted between 1909 and 1920—and consequently a great deal of land was not held under any kind of secure tenure. This was probably due to the difficulties of defining ownership by survey and thereby giving a definite title. By 1925 a great number of holdings were also held under the unsurveyed Occupation Tickets which were provided for in the Order of 1920, and which were legally replaceable by a lease after survey.

Prior to 1915 there was no Department responsible for Lands. Alienation of land was the responsibility of the Resident in each Division, and any surveys necessary for the issue of grants were carried out by the Public Works Department, then known as the Public Works and Surveys Department. A separate survey was made for each grant and no survey control or cadastral system was used. As a rule all land grants were signed personally by H. H. the Rajah.

The Lands and Surveys Department is now responsible for dealing with land applications and for the alienation of Crown Land to settlers, the registration of title to land including the settlement of existing rights, the cadastral survey on which title registration is based, and the collection of Land Revenue. Except in Divisional Headquarters all Land Work is done through the District Officer who is thus enabled to supervise the settlement of Crown Lands and the development of his district. Final approval of an application and the issue of title after survey, is the responsibility of the Superintendent of Lands and Surveys in each Division to whom the application is sent if accepted by the District Officer.

At each Divisional Headquarters there is a Land Registry for the Division, in which are registered after preparation in the District Office, attested documents for transfers, charges, and probate matters. After registration these are returned through the same channel to the parties concerned. Close liaison is thus maintained between Administrative Officers and Land and Survey Officers.

LAND TENURE AND POLICY.

The aim of the Land and Survey Department is to ensure that rights to land are fully investigated, protected by registration, and subsequent dealings made as simple as possible. The manner in which rights may be acquired is controlled by various ordinances, while general policy is the responsibility of the Governor in Council.

Land may be alienated in large or small holdings, but small holdings predominate, and the policy is one of definite encouragement for the small holder to own his own land, especially when the type of crop, or particular use of the land, suits native or immigrant economy. A few large alien holdings exist but the total area is negligible when compared with the total area of land alienated for small holders.

Native farming lands lying away from the main centres of trade and plantation industry, form the greatest area of occupied land in the Colony. They are reserved entirely for the use of the indigenous inhabitants and there is only general administrative control over the use of these lands. These are known as "Interior Areas" as distinct from the designation "Mixed Zones" where alienation under title takes place.

Within Mixed Zones land may be alienated by Crown Grant for a term up to 999 years. Grants of this kind are now rare (there have been none for many years past). They may be issued only by the Governor in Council. The usual form of alienation is by lease of Crown Land for a term not exceeding 60 years, depending on the situation, proposed use etc. Short

term leases may be issued for 7, 14 or 21 years. There are a few old grants in perpetuity which correspond to a freehold title, free of all conditions and payment of revenue. Agricultural land is alienated on direct application, while town land and land for special purposes, is alienated on such terms and conditions as the Governor in Council may from time to time decide.

The first requisite of land control, the accurate cadastral map, has been started but is yet far from complete. The cadastral survey must be as precise as possible but the degree of accuracy must be related to the relative value of the particular land and the cost of the survey. The maps are however essential in order to effectively carry out the development of lands whether on the basis of individual ownership, or communal rights based on statutory or customary right, and also to secure to the owner the proper registration of his recognised rights. In Sarawak, where the average plot of native owned rubber land is $1\frac{1}{2}$ acres, and 6 acres for non-natives, a survey of a high order of accuracy covering each plot would be uneconomic. The same applies to other agricultural holdings such as pepper, sago, coconut, and padi. In addition, the soil is generally speaking not of high agricultural value. The cadastral system adopted is a comparatively accurate and relatively inexpensive survey of individual lots, but with a survey of a higher order of accuracy of the perimeter boundaries of contiguous plots. The latter areas are from 100 to 200 acres, and the surveys of them are controlled and fixed in position by connection to the triangulation survey of British Borneo. This triangulation extends from the western portion of Sarawak through the country to Brunei and Labuan, then to the northern part of the Colony of North Borneo, and is planned to eventually cover the whole of these Territories.

Topographical maps are another aspect of survey work vital to development. Much remains to be completed although considerable information is available. The fixed points used to build up the cadastral map are used for the topographical sheets; today detail is mainly added from air photographs. By 1951 about 75 percent of Sarawak had been covered by the R.A.F. programme of air photography.

In order to properly portray the present utilisation of land, and to assist fully in future development of Sarawak's resources, it is important that the cadastral and topographical maps of the territory are completed at an early date.

DEVELOPMENT.

The development of Sarawak's natural resources is being undertaken through work of the Lands and Surveys, Geological Survey, Forestry and Agricultural Departments. The key note is a continuance of the past policy of "cautious development commensurate with the potential wealth of the country," and at present surveys are being made, experiments conducted, and inventories of the potentialities compiled. Development of a country, and the rate at which this is done, to be effective must depend on the resources available.

Historically the limitation of Bornean resources is indicated by the fact that this large island is situated close to densely populated areas of Asia, and has been visited by migrants from India, and traders from China, for over 1,000 years, yet is still one of the world's sparsely populated regions. In Java there are 316 persons per square kilometer, in Borneo 4. The small population is largely due to the fact that the natural resources are not of a type that will easily support a large population or are readily developed. However by carefully working out suitable applications of modern scientific methods, and diligence, there is no doubt that in Sarawak a larger population can live even more prosperously than at present.

Detailed surveys of Sarawak have not yet been completed but the Lands and Surveys Department is engaged on the preparation of the basic maps. Topographical sheets are being made using modern methods involving air photography, which is being done by the R.A.F. who have completed photographing about 75 per cent of the country. Using the air photographs maps are being prepared by the Directorate of Colonial Surveys, which receives financial help from Colonial Development and Welfare funds. A complete survey and the preparation of reliable maps are essential for the proper settlement of the land, for the recording of land tenure, for the presentation of most other data, and as a basis for planning the development of most resources and inland communications.

Inventories of the agricultural, forest, and mineral resources and potentialities are being compiled, but it will be some years before a complete picture is available. However, sufficient work has been done for it to be clear that the chances are small that any remarkably rich resources will be quickly available for rapid development. Most of the soils are poor agriculturally, and there are few areas with the fertility of the volcanic districts of Java, or the rich alluvium of Burma or Indo-China. The natural forests vary considerably in quality, and some quite rich timber stands occur, particularly in the north; but the average yield from all forests probably does not exceed 10 tons per acre. There is, however, no doubt that by silvicultural methods aimed at an increased stocking of commercial species, yields can be improved in future rotations, as most of the indigenous timber trees are tolerant of poor soil conditions. Most mineral potentialities are also limited, and rich ore deposits of the type forming the Malayan tinfields are unknown. Minerals have however played an important part in the country's economy since earliest times, and the oil potentialities are one of the few resources which might yield rich returns and rapid expansion. Oil possibilities are being extensively tested now by Sarawak Oilfields Limited who are spending several millions of dollars annually in an energetic search for new fields.

The Agricultural Department since 1946 has concentrated on preliminary surveys and investigational work, as so little information about local agricultural conditions was available after the war. Development work has however been commenced mainly with financial assistance from the Colonial Development and Welfare Fund, and indeed without this assistance progress in the early stages would have been impossible. Conditions are such in Sarawak that one would expect that agriculture would be largely dependent on wet padi cultivation on the lower flatter land, and on tree or shrub crops on the undulating and hill land, as it in fact is. There is considerable scope

for intensifying wet padi cultivation as has been indicated in the section on agricultural resources. The possibilities of intensifying tree and shrub crop production are however limited by the general poverty of the soils, severe transport difficulties, and the large quantities of fertilisers generally needed. Recent investigations show however, that contrary to expectations, stabilised intensive production of a number of short term crops can be increased. Even the poorest undulating and hill land can be used if it is reasonably accessible to river communications, and if rather unusual methods that are being developed locally are employed. The methods are simple and some of the operations can be mechanised and suitable light machinery used; such machinery is being obtained. The system is dependent on the use of moderate dressings of manures and soil amendments, and a quite effective dressing is being made up from materials available in Sarawak. Whilst imported artificial nitrogenous fertilisers are not essential for the success of the system, major responses are being regularly obtained by relatively small quantities of sulphate of ammonia incorporated in the dressings. The main assistance required for Sarawak's agriculture is thus;

(a) Cheap supplies of sulphate of ammonia.

or

(b) The production of synthetic ammoniacal fertilisers in British Borneo.

On the oilfields large supplies of natural gas (mainly methane) are available and should be a suitable starting material and source of power for a conventional type of plant. This possibility is being examined, as is that of utilising wood waste from sawmills for fertilizer manufacture. Provision of such a plant might well prove to be the key to the transformation of Sarawak from a country of only mediocre agricultural potentialities to one of great productivity, provided pests can be controlled—and there is no reason to expect such difficulties are insurmountable.

The Forest Department is still engaged chiefly on the examination of the country's timber resources, and on the constitution of a permanent forest estate that will be adequate to provide for local needs in perpetuity, and still leave a reasonable margin for export. In selecting areas to be reserved the principle followed is to try and combine safeguards for future timber production, with protective measures against soil erosion and excessive silting and flooding of the rivers. Increasing timber production also makes it necessary that accessible areas should be brought rapidly under planned management, which ensures that they are worked in accordance with the principle of sustained yield. It is essential that fellings in the permanent forests should be accompanied by silvicultural operations. It is hoped to retain at least one fourth of the country under permanent forest, but a considerable part of this area may lie in rugged areas unsuitable for economic timber production. Eventually these permanent forests will have to supply all the timber requirements and they must therefore produce heavier stands than are found at present if there is not to be a decrease in output.

The basic need for assessing the natural potentialities has been appreciated in Sarawak as the "1935 Blue Report" shows. This was also quickly realized in the United Kingdom, and the grants from 1946 onwards of the Colonial Development and Welfare Funds listed opposite shows a realistic understanding by the Colonial Office of the problems.

DEPARTMENT	EXPENDITURE (in Straits dollars from Sarawak revenue)	GRANTS (Colonial Develop- ment & Welfare)	REMARKS
Agricultural	926,115	355,501	Totals for the years 1947-50 inclusive.
Forestry	463,551	27,374	Totals for the years 1947-50 inclusive.
Lands and Surveys	1,703,750	Indirect assistance given.	Total for the years 1947-50 inclusive. Aerial surveys are being carried out by the R.A.F., and topographical sheets prepared by the Directorate of Colonial Surveys which receives Colo- nial Development and Welfare grants.
Geological Survey	Nil	922,644	Three year grant from April 1949 to March 1952 to Sarawak and North Borneo.

The logical approach in developing a country is to consider the creation of a permanent employment potential based on the country's own resources. This will bring with it a standard of living related to the economic strength. A country's natural resources comprise its rocks, soils, waters, forests, and minerals; thus when considering development the first step to take is to determine the location of these and their extent. It is surveys of this type that The Natural Resources Board is now concerned with through the work of the departments of Agriculture, Forestry, Geology, and Lands and Surveys. These efforts, in keeping with Sarawak's traditions, are related to the interests of the local inhabitants through the Department of Native Affairs. Two important factors limit the rate of this work. One is the poorness of the communications, roads being few, while water transport, particularly on the rivers, is often slow and difficult. The second is the great shortage of trained and experienced staff for carrying out the more routine technical tasks such as field surveys. An encouraging feature here however is the enthusiasm and loyalty of the existing locally recruited staff. The Agricultural Department have established a staff training school near Kuching which is helping to solve some of their problems.

Once the natural potentialities are known, improvements can be planned and resources showing the greatest promise developed. Sound advancement in the economy of a country can only be made on the basis of its own resources; when these are developed the establishment of social services, to a large extent, follows automatically. For a territory to develop a stable economy, expenditure on social services must ultimately be found from the country's own resources. Although there are hydro-electric potentialities and local oil and coal supplies it will be many years before much industrialization is likely, and for some time to come Sarawak's economy will depend on the natural products.

The first requirement is to complete the topographical survey of the country and make available detailed and accurate maps. Geological work will indicate the mineral possibilities, the broad divisions of soil types, situation of stone resources and possibilities of obtaining locally materials for brick, lime and cement manufacture. Forestry surveys will show and develop timber possibilities, while agricultural investigations will determine the potentialities of the agricultural land, the crops which can be successfully cultivated, and the stock that can be raised. On the basis of this knowledge, communications can be opened up in areas that have facilities for settlement and are capable of supporting population, while when towns and roads are built there will be a knowledge of the difficulties to be overcome and the resources available. One lesson that can be learnt from Sarawak's history is the wisdom of the prudent policy of basing development on the resources available, and co-ordinating the rate of advance with that of the local people.

THE NATURAL RESOURCES BOARD.

The Natural Resources Board was established by the Sarawak Government under Ordinance No. 15 of December 1949. The Board comprises:—

- (i) the Secretary for Native Affairs, who was Chairman of the Board in 1951 when the member was D. C. White.
- (ii) the Director of Agriculture; in 1951 R. W. R. Miller, B.A., Dip. Agric. Sci. (Cantab.).
- (iii) the Director of Lands and Surveys; in 1951 D. L. Leach, M.I.S. (N.Z.), F.R.I.C.S.
- (iv) the Conservator of Forests; in 1951 F. G. Browne, B.Sc., (Forestry).
- (v) the Director of Geological Survey; in 1951 F. W. Roe, Ph.D., B.Sc., F.G.S., F.R.G.S., M.A.I.M.E.
- (vi) two members appointed by the Governor; in 1951 these were Edward Jerah, M.B.E., and Francis Sirau.

When the Board was formed the objects and reasons for its establishment were defined as follows:—

1. Soil erosion and flooding, caused by bad systems of cultivation, and particularly by wasteful systems of shifting cultivation, are causing serious harm to agriculture in Sarawak and, unless checked now, it will soon be impossible further to develop the agricultural resources of the Colony or even maintain the present standard of production. There are systems of stabilised cultivation suitable for use in Sarawak which will give as good returns, if not better, than the present method of shifting cultivation and which will not squander the natural resources of the country.

2. This Bill, which will repeal and replace the Prevention of Erosion Ordinance (Cap. 34), provides for the setting up of a Board to exercise general supervision over the natural resources of the Colony, to do or cause to be done such works as may be necessary to conserve the natural resources, and to control the use of land so as to prevent soil erosion and flooding. Local Authorities are to assist the Board and the Director of Agriculture in carrying

out the provisions of the Bill, and are also given power to carry out conservation schemes and to take other measures for the conservation of natural resources.

3. The Board are obliged to communicate in writing their decisions to owners and occupiers of land who are or may be directly effected by such decisions; an appeal will lie from a decision of the Board to the Governor in Council.

4. Provision is made for the granting of advances to owners and occupiers to enable them to carry out the orders of the Board and for giving loans or grants in aid to Local Authorities in respect of conservation schemes undertaken by them.

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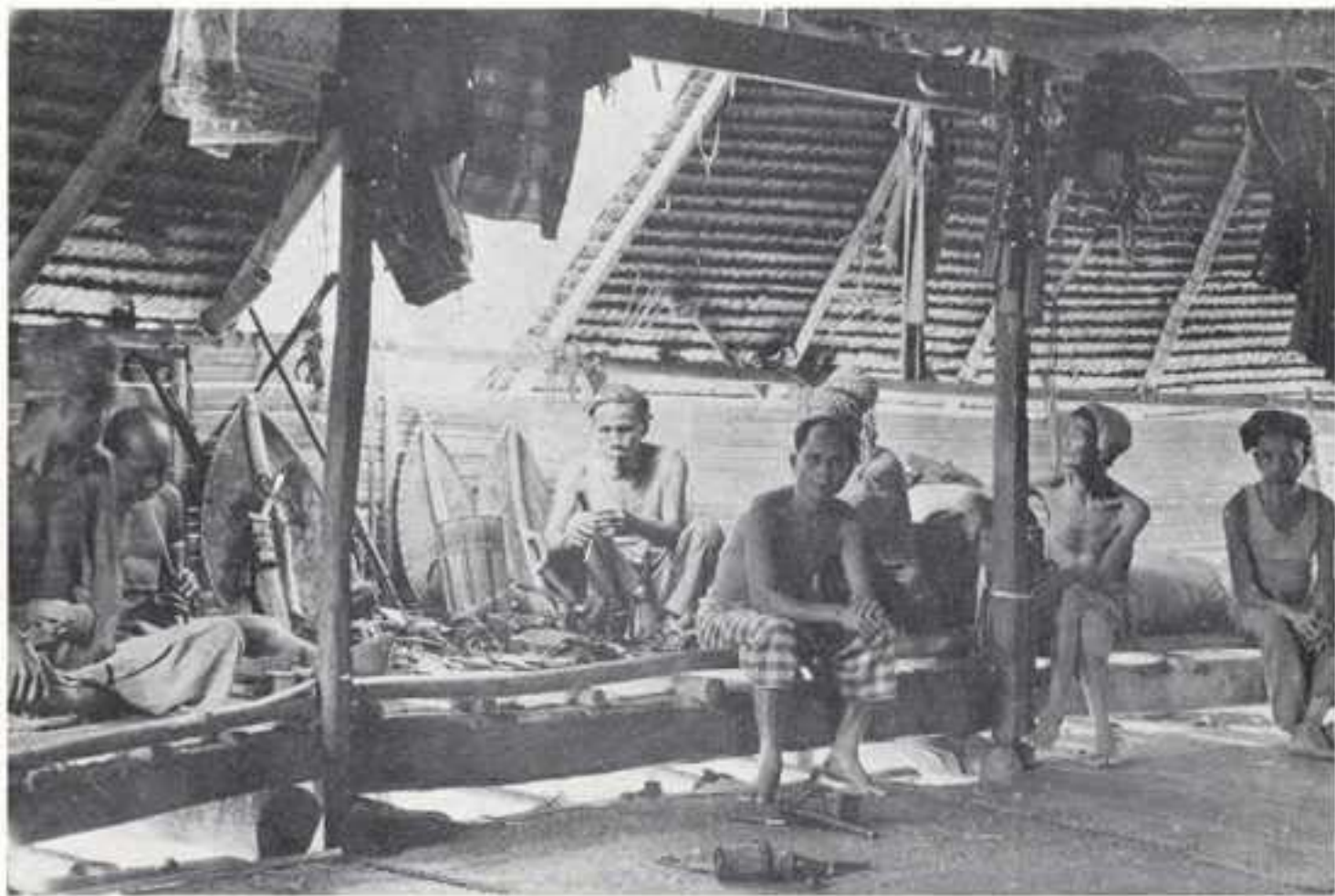
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Land Dayaks resting in the head-house at Kampong Riom, near Segu, during a stage in the rites formerly performed for the reception of new human heads.



A burial jar of a Sea Dayak on the Saratok River, Second Division. The jar is an old one, probably 17th century.



Melanau girl making hats at Kampong Ska-an, Matu.

Photograph by Hedda Morrison



Maloh mother and child in festival costume. There are two small Maloh communities of silversmiths on the Upper Rejang but they are immigrants from the Kapuas River in Dutch Borneo.

Photograph by Hedda Morrison



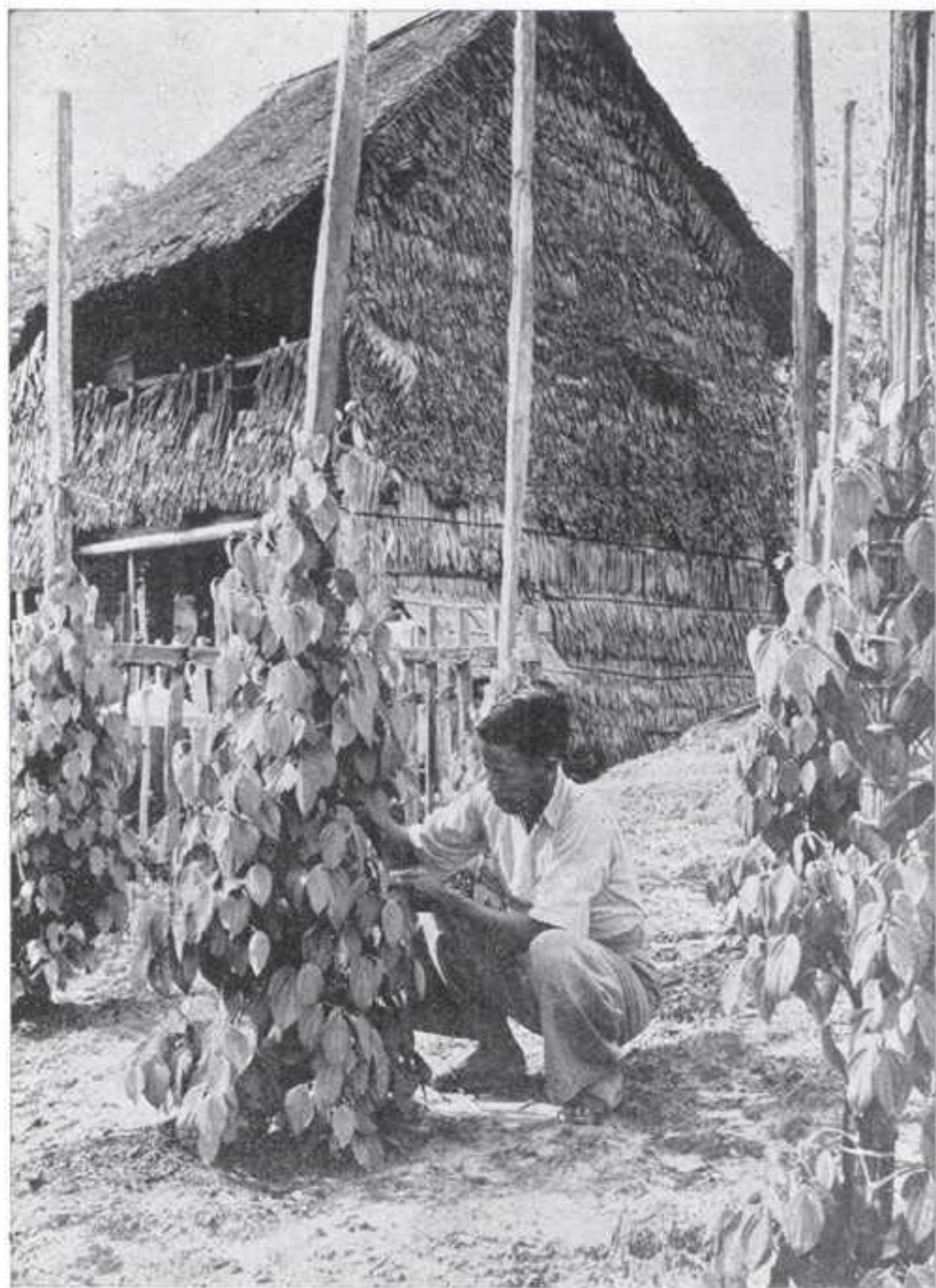
Kayans and Kenyahs hauling boat up the Bakun Rapids, Balui River.

Photograph by Hedda Morrison



A Dayak bridge across Sungai Mador near Binatang.

Photograph by Helda Morrison



Pepper gardener, Sarikei. He is taking off the unripe seeds which must not be allowed to mature on the vine until the latter has reached a certain age.

Photograph by Hedda Morrison



Chinese boy tapping rubber, Sarikei.

Photograph by Hedda Morrison



A Borneo Company log raft from the Upper Rejang awaiting shipment to Australia at Gunong Ayer on the Lower Rejang.

Photograph by Hedda Morrison



Melanaus fishing by the "Lenkong" method at Belawai. It is used during the dry season, along the shore.

Photograph by Hedda Morrison



An Iban woman.



Weaving by a Dayak girl at Rumah Sawing.

Photograph by Hedda Morrison



Logging at Loba Kabang swamp forest. Ramin logs being cut.

Photograph by Hedda Morrison



Meranti logs being tipped into the river on the Sungai Stabar.

— Photograph by Hedda Morrison



Murut rice fields at Fa Brayong in the Upper Trusan.

Photograph by Hedda Morrison



Malays harvesting rice at Sundar.

Photograph by Hedda Morrison



A Malay group in national dress.

Photograph by K. F. Wong



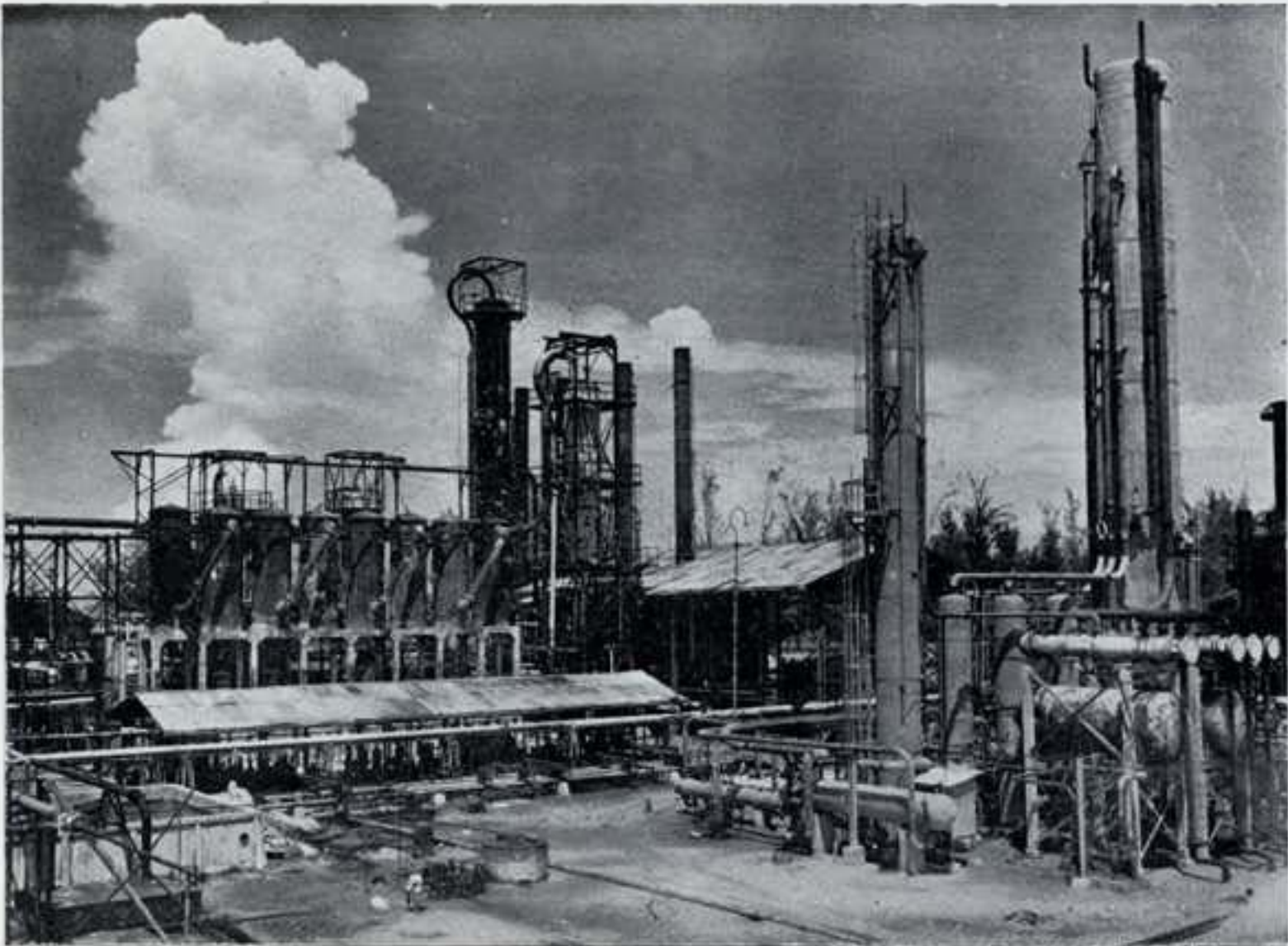
A Malay woman engaged in weaving.

Photograph by Hedda Morrison



Preparing sago at Kampong Tian, near Matu.

Photograph by Hedda Morrison



Photograph by Central Office of Information
Lutong Oil Refinery. The oil distillation plant.



Pounding padi at Kampong Pichin, Tebakang District.

Photograph by Hedda Morrison



Returning home from padi harvesting, Kampong Pichin.

Photograph by Hedda Morrison



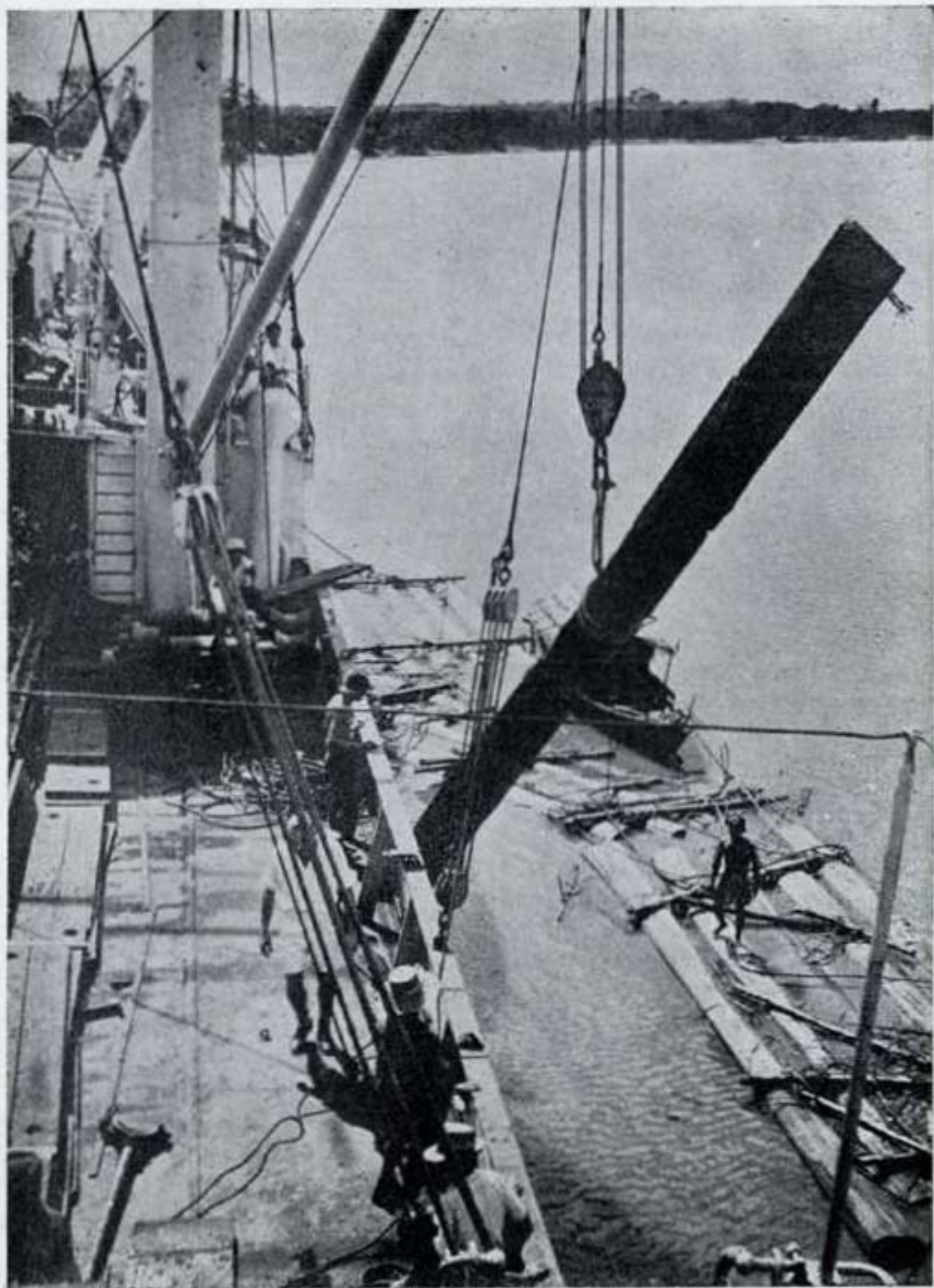
Batang bridging a torrent on the track up the Pelagus Rapids.

Photograph by Hedda Morrison



Temenggong Koh, M.B.E., Chief of the Sea Dayaks.

Photo by Anna Studio



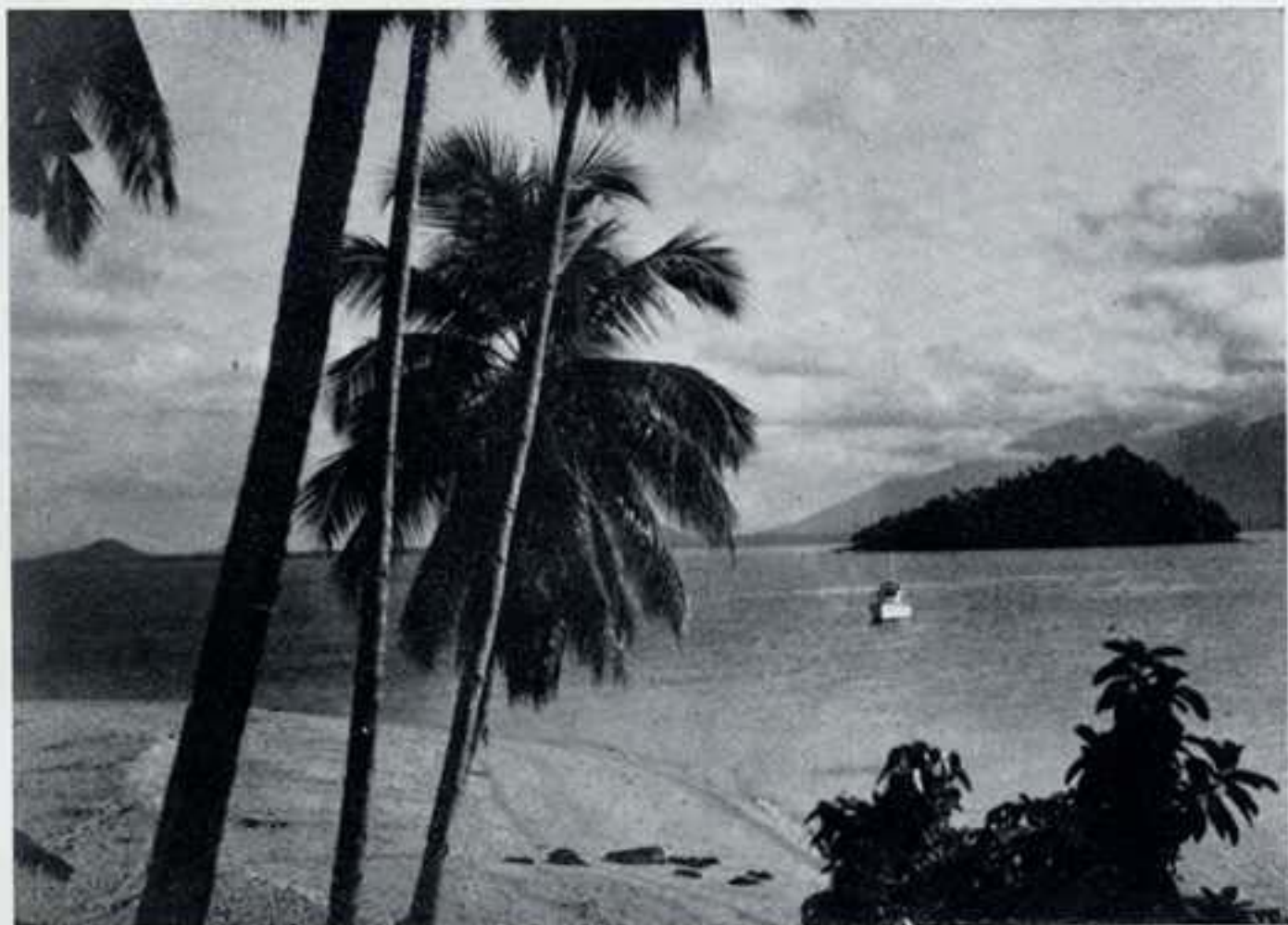
Loading logs at Sarikei on the Rejang.

Photograph by Hedda Morrison

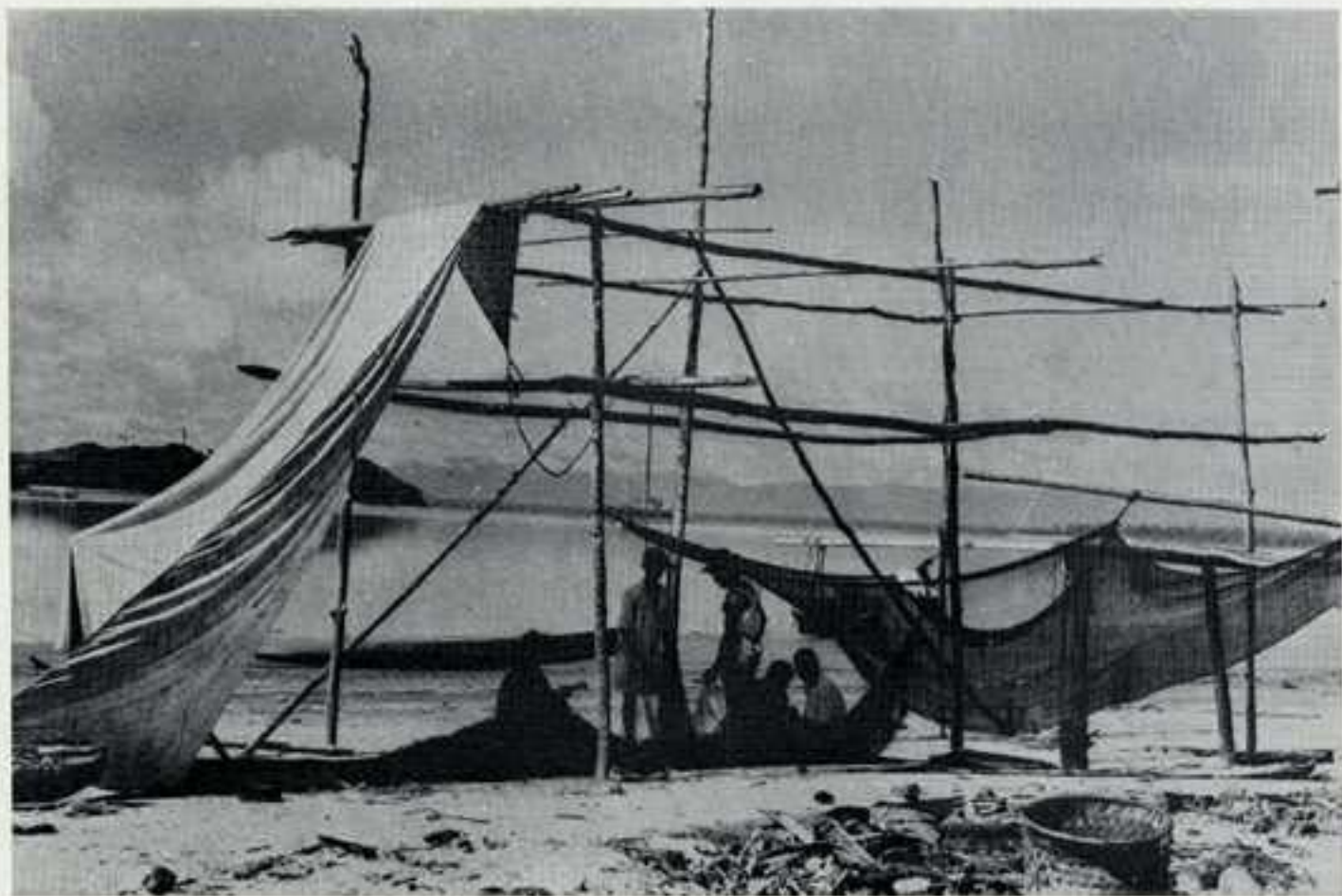


Rasping sago logs. The sago is then washed out of the pulp and later refined.

Photograph by Hedda Morrison



The Turtle Islands; Talang-Talang Besar looking over to Talang-Talang Kechil.
Copyright Sarawak Museum.



Drying fishing nets at Santubong at the mouth of the Sarawak River.