REPORT
ON A VISIT TO MALAYA, JAYA, SUMATRA AND CEYLON.
1938

by:
SIR FRANK STOCKDALE
REPORT

BY

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JAVA, SUMATRA AND CEYLON

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MALAYA.

The Malay Peninsula forms the most southerly part of the continent of Asia and lies between 1°12' and 6°50' north. In extent its area is 51,070 square miles and unlike the neighbouring countries of Sumatra and Java it contains no volcanoes nor is it liable to violent earth movements. It is a stable country built on an old quartzite bed and a carboniferous calcareous series of rocks. Through the quartzite have appeared intrusions of later granite and outcrops of these occur over large areas.

A backbone of granite mountain ranges arranged in parallel runs from north to south somewhat obliquely along the long axis of the country. This mountain mass divides the country into two unequal parts—the larger of which lies to the east. The main range extends from South Kedah in the north to North Johore in the south and contains five peaks of over 7,000 feet in height, and between the main range and the flat coastal areas there are extensive foothills.

The limestones of the carboniferous series form prominent hills in several parts of the country and one of the most striking and picturesque features of Malaya are the isolated hills of perpendicular masses of crystalline limestone. They occur frequently in the eastern portion of the country and remind one of the limestone masses which are characteristic of the landscape paintings and etchings of Chinese art. Limestone hills also occur to the westward of the mountain ranges in Perak, Selangor and Malacca and they are often riddled with caves and rock shelters. Evidence has been obtained to show that these shelters provided the places of abode for the prehistoric inhabitants of the peninsula.

A series of volcanic rocks, older than the granite, exist. These are found mainly in Pahang and are known as the Pahang Volcanic series. They also appear in parts of Negri Sembilan and Kelantan.

Recent deposits form the coastal alluvia, which consist of clays and peat in the west and sands or sandy gravels in the east. The greater part of the western coast line is clay or peat and is fringed by a belt of mangrove swamp of varying width. In the east, the seashore is sandy, the land behind being composed of a series of ridges of high ground consisting of parallel sandy beaches with swamps in between them. These alternating ridges of sand with low-lying swamp alluvium between remind one somewhat of the frontal land formation in British Guiana, but in this case little of the deposit of alluvium has been sea-borne.
Soil types agree closely with geological formations and have been produced by the rapid weathering of the rocks under the influence of high rainfall and temperatures. Rapid changes from one soil to another are to be seen in some parts of the country and not infrequently a regular patchwork of differing soils occurs within a comparatively small compass.

The *granite* soils are the least mature and contain equal portions of sand and clay. They are associated with the central mountain range and, except for areas in the Cameron Highlands plateau, they occur generally on slopes which are too steep for satisfactory agricultural development. They are characterized by being easily drained. Rainfall percolates rapidly through these soils if they are undisturbed, but the hill slopes are very liable to erosion if they are heavily cultivated and to landslides if there are any large accumulations of water in pockets or in drains artificially made.

The *quartzite* soils in the hills contain a low proportion of coarse sand and are therefore liable to close packing. In the valleys they are very variable and are not infrequently highly leached. Quartzite soils are of low fertility, especially when they have been under cultivation for a few years. Nevertheless they constitute the bulk of the land which has been developed for agriculture.

The *Raub* series soils in the hills are characterized by their deep red colour and by the occurrence of laterite at depths of 1½ to 2½ feet, whilst at lower levels they are usually found on recent inland alluvia overlying limestone. They occur mainly on the east side of the peninsula but in Malacca and Negri Sembilan these soils have been used for agriculture.

The *Pahang volcanic* soils, found mainly in Pahang and Kelantan, are formed from basalt. They are generally rich in nutrients and possess excellent physical properties. They are of relatively infrequent occurrence.

The *coastal alluvia* consist on the western side of the peninsula of clays and peats or a mixture of clay and peat. The clays are rich, but are heavy and difficult to drain whilst the peats drain readily and shrink very considerably on being drained. In fact, large areas of old rubber planted on peat now stand with roots exposed—the land level having fallen up to two feet or even more since the original planting was done. A stilt-root appearance results and is characteristic of those areas when root exposure has resulted from the soil's contraction. Some of the worst areas present a picture not very different from mangrove growth and steps are now being taken to replant the worst of these areas. Coconuts also planted on these peaty soils have been lost in Johore by sea-water inundations consequent upon land shrinkage after cultivation and drainage. The extensive
plains to the east consist of sands and gravels which have been deposited from the river floods which are not of infrequent occurrence.

Agricultural development has taken place mainly in the foothills, the coastal areas of the west and east coasts and the plains of Kedah and Johore. The foothill country is much broken and this area is devoted to permanent crops, with a certain amount of padi cultivation in the valleys.

The basic factor controlling Malayan agriculture is the general poverty of the soil, especially in the foothills and in the south. The coastal alluvial flats, the plains of Kelantan, and the soils derived from the rocks of the Pahang volcanic series are exceptions. At first sight this seems to be contradicted by the luxuriance of the vegetation but once the forest has been cleared and the land brought into cultivation fertility rapidly falls. Practically the whole peninsula was at one time covered with forest and the agricultural development which has taken place has been won from the forest. Mangrove swamps in the west have been cleared and drained for rubber, coconuts and oil palms. Swamp jungle has been cleared for the creation of padi-growing areas and the inland heavily-timbered hill lands have been cleared for the growing of rubber, oil palms and other crops. In many places this forest was very heavy. The Malayan village settlements or "kampongs", built up on lands higher than the levels of the padi fields and now shaded with fruit trees and other planted tree crops, have all been developed from lands which were at one time under forest.

Cultivations of rapidly growing crops or annual food crops soon demonstrate the rapidity with which fertility falls when the land has been cleared of the forest and brought under cultivation. After the first year or two the growth is very poor and where "kampong" lands have been planted with rubber poor growth has resulted. Low fertility is accounted for by the absence of any extensive dry season except in the east and in consequence there is insufficient time for the accumulation of readily available nutrients in the soils.

Malaya is a country of heavy rainfall, high humidity and uniform temperatures. The temperature range is only about 10° on the coast and 15° inland, but in the hills the temperature range may be up to 30°. There are three distinct regions of rainfall, each with its characteristic variation. The inland region embraces the whole of Malaya except a narrow coastal belt to the west and the east coast region. It is characterized by two wet and two dry seasons annually—the wet seasons being from September to December and from March to May. The two driest months are February and July. The west coast region has one wet and one dry season during the year following
the south-west monsoon, with maximum precipitation in August and the minimum rainfall in January; whilst the east coast region follows the north-east monsoon which extends from October to March with the heaviest rainfalls normally experienced in December. The driest month in the east is July. The annual rainfall along the east coast is heavy, being about 120 inches with a lengthy dry period from March to October during which relatively little rain falls.

The average annual rainfall varies from 85 to 100 inches in the inland region, but in the foothills averages in excess of 150 inches are experienced. The actual falls of rain during the south-west monsoon period are relatively light and usually occur during the nights. There are few days without sunshine and it is characteristic of much of Malaya that there are very few days on which agricultural operations cannot be carried on or when tapping of rubber is seriously interrupted. Frequent and light rains with abundant sunshine and a uniform temperature are the chief features of the Malayan climate, except in the eastern regions where heavy downpours during the north-east monsoon period are not infrequent and a long dry period occurs between monsoons.

Climatic conditions are more favourable to tree crops and unless these tree crops form a good canopy, the land requires to be heavily mulched or protected by shade trees or ground cover. If tree crops are not grown, an adequate provision of organic manures is essential to success and if animal husbandry with the object of providing farmyard manure cannot be introduced more extensively into the methods used for the production of foodstuffs other than rice and certain other crops, greater attention will have to be given to the preparation and use of composts.

The general low fertility of the majority of Malayan soils has not yet been sufficiently realized and the increased and continued prosperity of the population will depend upon attention being given to this problem.

**Political Divisions and Agricultural Industries.**

Malaya is divided into three political groups as follows:

(1) The colony of the Straits Settlements, consisting of Singapore Island and the settlements of Malacca, Province Wellesley, and Penang. It also includes the outlying territories of Labuan, Cocos Island and Christmas Island.


(3) The Unfederated Malay States (each under its Malay Ruler) of Johore, Kedah, Kelantan, Trengganu, Perlis and Brunei.
The total population of the peninsula is now 4½ millions of which 1½ millions are engaged in agriculture. Of these 400,000 are working on estates and about double that number of adults occupy small-holdings. The most densely populated rural area is to be found on the plain of Kelantan in the east—which significantly has a well-marked and lengthy dry period each year.

The main crops arranged in order of acreage are as follows:—rubber, rice, coconuts, oil palms, pineapples, fruits, arecanuts, tapioca, bananas, coffee, vegetables, derris, tea, gambier and tobacco. Plantation crops (rubber, coconuts, oil palms and tea) cover over 4 million acres whilst the area under padi is 739,000 acres and only 54,000 acres are devoted to food crops other than rice.

Rice was grown by the Malays from early times but it is only within recent years that attention has been directed to the extension of the area devoted to this crop and to the improvement of the types grown and the cultural methods employed. The cultivation of coconuts along the western coastal areas is also an old-established industry, and gambier has been grown as an export crop for well over a hundred years. The earlier planting enterprise interested itself in the growing of pepper and gambier, especially in Singapore and Penang, and subsequent interest was shown in nutmegs and cloves in Penang and the adjoining mainland. Tapioca also was established as an important export crop. Sugar cultivation was started in Penang and Province Wellesley and flourished for a period but with the decline in profits from sugar, coconuts were substituted and the growing of Liberian coffee was developed in Perak and Selangor. Pineapples for canning purposes were grown from about 1888 in Singapore and Penang but in the latter settlement the factories soon disappeared and in Singapore the industry was taken over and developed by Chinese. It has been considerably extended and is at present an important industry in the State of Johore.

Rubber-planting on a commercial scale started when coffee began to decline around 1890, and rubber is now the chief agricultural crop of the country. In fact the whole agriculture of the country is dominated by rubber with its total of 3½ million acres out of a total cultivated area in all crops of 5 million acres. Slightly over 2 million acres of rubber are estate-owned and 1½ million acres in holdings of less than 100 acres each. Half the estate acreage is located within the Federated Malay States, and the largest areas of rubber in small-holdings are in Johore and Perak. Two-thirds of the pineapples and three-quarters of the arecanuts are now grown in Johore, whereas one-half of the land devoted to rice cultivation is to be found in the Unfederated States of Kedah on the west and Kelantan on the
east. Oil-palms are a comparatively recently introduced plant-
tion industry—half the acreage being grown in Johore and
the other half in Perak and Selangor. Johore has the largest
acreage of any state in coconuts but its acreage devoted to rice
is still comparatively small.

Plant disease accounted for the decline of some of the crops
which have featured in Malayan agricultural history, but it
is probable that insufficient attention to soil fertility may also
have accounted for some of the difficulties experienced. There
is no doubt that many of the earlier agricultural enterprises
were ruined by poor systems of husbandry, which did not take
account of the fact that most soils in the wet tropics are of low
fertility unless their content of organic matter is adequately
maintained. By reason of high temperatures, the destruction
of organic matter is rapid under moist conditions in the tropics,
whilst minerals and nitrogen are rapidly leached if the land is
not covered by a cover of vegetation. Losses are less in the
forest or in heavily shaded and densely planted kampong
holdings as the carpet of fallen leaves decomposes more slowly.
There are, however, thousands of acres of land to be seen
to-day in Singapore and south Johore which have been ruined
by wasteful methods of exploitation.

Fortunately for Malaya, rubber thrives like a weed and grows
reasonably satisfactorily on even the poorest of soils. It pro-
vides shade for the soil and once a year a good carpet of fallen
leaves. Response to phosphatic manures has been satisfactory
in several areas and the prospects of areas showing poor growth
have in recent years been completely changed by the use of
applications of rock phosphates. The prosperity of Malaya has
in fact been built up on rubber and with the development of
that industry other estate crops including spices, tapioca, sugar
and coffee have disappeared. Small-holders also have trans-
ferred their attention to rubber. Many of the "kampong"
lands have been planted in that crop and quite a number of
areas, even padi fields, which should never have been planted,
are to be seen with rubber trees struggling to make growth.

Malays far outnumber other races as small-holders and
practically the whole of the 739,000 acres under padi is culti-
vated by Malays. Small-holdings are of two types—those con-
sisting wholly of high land (averaging 5 acres in extent) planted
with fruit trees, coconuts or arecanuts, and those consisting
partly of paddy lands (3 acres) with smaller areas (2-3 acres) of
high lands. In the coastal and riverine districts the family in-
come is frequently supplemented by fishing.

Chinese small-holders cultivate rubber, pineapples, fruit trees,
tapioca and vegetables. The two latter crops are always associ-
ated with pig-keeping—the manure being used freely for market-
gardening enterprises.
Soil Conservation.

In the rush to cultivate rubber little attention was paid to soil conservation either by estates or by small-holders, especially in the inland areas, and Malaya was for many years behind other rubber-growing countries in the adoption of anti-erosion measures and in the use of cover crops. The position has, however, greatly changed in the past ten years. Determined efforts have been made to establish cover crops and many areas of newly planted, or recently replanted areas of rubber are now to be seen, especially in hilly areas, where anti-erosion measures have been adopted. Nevertheless, much more still remains to be done in Malaya if the position is to be regarded as wholly satisfactory. The acreage under rubber where bad root exposure is to be seen is relatively small but this is probably due to the rainfall in Malaya being evenly distributed and gentle in its fall. There is, however, too great an area of bare land under old rubber in Malaya, and greater efforts in the establishment of cover crops are still desirable. Sumatra experienced in many places difficulty in the establishment of cover crops until the use of phosphatic manures became general and it was there found that with perseverance and with more frequent applications of phosphates cover crops could be established.

It is now recognised that in the wet areas of the tropics where there are no well-marked dry seasons it is essential, if soil fertility is to be maintained, for the land to be kept under a cover of vegetation. Luxuriant virgin forest growth is not necessarily an index of the suitability of land for agricultural occupation. It has been found in many parts of the wet tropics that land when cleared of its forest cover rapidly becomes leached and loses its fertility. This is particularly the case where soils are acid, as is the case in Malaya where their pH values range from 4.5 to 5.4. Soils under such conditions cannot be maintained in cultivation, except for limited periods, unless heavy dressings of manure are applied or they are planted with tree crops which provide satisfactory shade to the soil and an abundance of leaf fall. Even then it has been found in the West Indies and in certain parts of Africa that certain tree crops will only be reasonably productive for long periods if they are heavily mulched or interplanted with cover crops. In coffee, lime and cacao cultivations, the value of the use of heavy mulchings with grass and other vegetable refuse has been proved in several areas and the importance of the use of cover crops has been fully demonstrated in the case of several crops in the East and elsewhere.

Reference has already been made to the need for further attention being given to the establishment of cover crops under