MAN IN MALAYA

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Foreword

IN THIS, his first book, Mr. B. W. Hodder details the results of his studies and inquiries in Malaya over the period when he was with me as a lecturer at the University of Malaya in Singapore. He sets out to examine the two-way interaction between peoples and places which has contributed to the pattern of settlement and development of Malaya. He includes more detail of the physiological and dietetic factors than is common among geographers and this alone must command attention because of its relevance to the development of other parts of the Humid Tropics.

Malaya has given us many examples of the manner in which different cultures, each in the process of adapting to a new environment, interact. There the arid tropical culture of the Muslims merges with the wet tropical island culture of Melanesian and Polynesian origin. These have more recently been modified by the large-scale commercial activities of firms using European techniques and who mainly employ Chinese and Indian labourers, as well as by the Oriental cultural practices brought by large numbers of Chinese from the maritime evergreen environment of Kwangtung and Fukien, and by Indians from the drought-ridden areas of Tamilnad and South India. Mr. Hodder unravels these elements to indicate their impact on the surface of Malaya and on the several races exploiting it.

The wide range of references which Mr. Hodder has used is a guide to the steady stream of specific and detailed scientific literature which has come from the many earnest professional workers who have focused their skills on the study of Malaya over the last decade, to provide the basis for what Malayans may achieve in scholarly study under their new condition.

I am indeed most happy to recommend this work by one who was a sympathetic teacher and loyal colleague in the Department of Geography which he helped to make a centre of geographical teaching and research.

E. H. G. DOBBY
Professor of Geography
University College of Ghana

Preface

I HAVE TRIED in these pages to write about the characteristics of human settlement and the biogeographical background to social and economic development in Malaya. Part I describes briefly the physical environment and discusses the life and work of those who live in it. Part II analyses the interactions between the population on the one hand and certain elements of the natural surroundings—especially climate, water, soil and insects—on the other.

Malaya refers here to the Federation of Malaya together with Singapore Island. The Federation became independent in August, 1957, but elected to remain within the British Commonwealth. Singapore Island, together with its associated islands, at present constitutes a British Colony. *Malay* and *Malayan* are not used synonymously here. The usual practice is followed of using *Malayan* to refer to one who has made Malaya his home; he may be Chinese, Indian, or *Malay*, for example. *Malay* refers to one of Malay racial stock including immigrant Indonesians.

These pages are based on travel and fieldwork in the peninsula and developed out of discussions with Malayans in the Departments of Geography and Social Studies in the University of Malaya, Singapore. Some of the material was originally presented in a rather different form as a thesis at Oxford. I have drawn widely and freely from a great variety of sources, the chief of which are detailed in references and chapter bibliographies. Many of the sources referred to are not easily available, and are scattered about in professional journals of many kinds, but the reader who wishes to follow up any line of thought in more detail should find it convenient to have these references and bibliographies collected together under one cover. For geographers this book should be looked upon only as supplementary to regional studies of the country available elsewhere and cited in the *General* section of the bibliography; no attempt has been made to provide a comprehensive geography of the peninsula.

I am grateful to the Editor of the *Journal of Tropical Geography* (formerly the *Malayan Journal of Tropical Geography*) for permission to use Figs. 12, 17, 18, 19, 20 and 25.

I wish to thank all those who helped me in my inquiries in Malaya. I am especially indebted to Professor E. H. G. Dobby, under whom I worked for four and a half years in Malaya, and from whom came the suggestion and opportunity to work along these lines. Dr. Ooi Jin Bee kindly read most of the typescript and made many suggestions at an early stage. The help of other specialists is acknowledged in the appropriate places. For any errors, however, the writer alone is responsible.

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PART ONE

1

Malaya: The Land[1]

THROUGHOUT her history, Malaya has acted both as a causeway and as a breakwater. A most important link in the land bridge between Asia and Australasia, the peninsula held a key position in the early southward migrations of peoples. In the traditional contacts by sea between India and China the peninsula presented a barrier, deflecting routes several hundred miles to the south through the Straits of Malacca. To the north of Malaya, rugged mountain ranges reach down from the high plateau of Yunnan in north-south folds. They present severe obstacles to east-west movement by land between India and China and so give even greater prominence to the position of Malaya athwart sea contact between these two early developed and densely populated countries (Fig. 1).

The diversity of cultures and races made possible in Malaya by the peninsula's focal geographical position is to some extent matched by a great variety of geological, floral and faunal features. Yet Malaya is only a small country. It is little larger than England in area,[2] and no part lies over one hundred miles from the coast. Malaya has many of the characteristics of an island and in some respects is best regarded as part of the Malay Archipelago.

Landscape

Rugged mountains, rising in places to over 7,000 feet above sea-level, have helped to restrict movement and settlement in the Malayan interior. The Main Range is a particularly well marked feature (Fig. 2) and forms a watershed boundary between the west coast states of Perak and Selangor and the east coast states of Kelantan and Pahang. About three-quarters of Malaya, however, is below 1,000 feet, and moderate hilly country is really more characteristic of the Malayan landscape than are towering peaks. On the other hand, there are no very extensive lowlands,

[1] I am grateful to Mr. W. L. Dale for help on several points in this chapter.
[2] The area of Malaya is approximately 51,000 square miles.

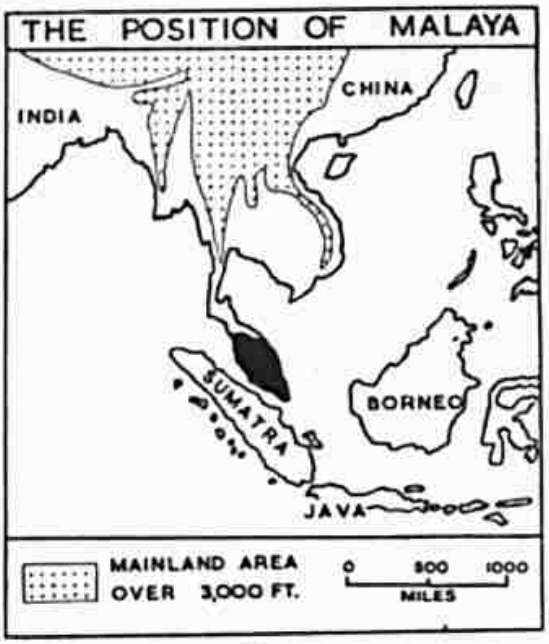


FIG. 1
The Position of Malaya.

and low-lying areas are usually coastal deltaic stretches —such as the Kedah Plain and the Kelantan Delta— or broad interior valley lowlands like the Kinta Plain of Perak. In the south of Malaya a large non-alluvial plateau stretches across Johore; this was probably fashioned by marine erosion, leaving what were once islands standing out today as isolated masses. Much of the present configuration of Malaya is thought to be due to marine erosion and raised beaches along the coasts suggest that there has been a recent relative lowering of sea-level of at least fifty feet. Along parts of the coastal plain, too, successive low ridges run parallel to the present coastline. These ridges—probably old sand banks—are most common in Kedah, Province Wellesley, Kelantan and Trengganu. Known locally as *permatang* or *gong*, they rise only a few feet above the general level of the land but may be anything up to several hundred yards broad. They are relatively free from flooding and provide better drinking water than that obtained in the surrounding swamps where well water is often very acid. Permatang are favourite sites for settlement and communication and stand out on the landscape as lines of *kampong*[1] vegetation, chiefly coconut trees, and houses.

A more formidable obstacle to human activities than the mountains and hills of the peninsula has always been the natural vegetation, only about a quarter of which has yet been disturbed. In spite of impressions gained by those who travel by road through Malaya, very large areas of tropical rain forest are still intact. A description of thirty years ago still stands: that the interior of Malaya largely consists of 'one dense mass of jungle,

[1] A *kampong* may be taken to mean a village with the surrounding mixed gardens.

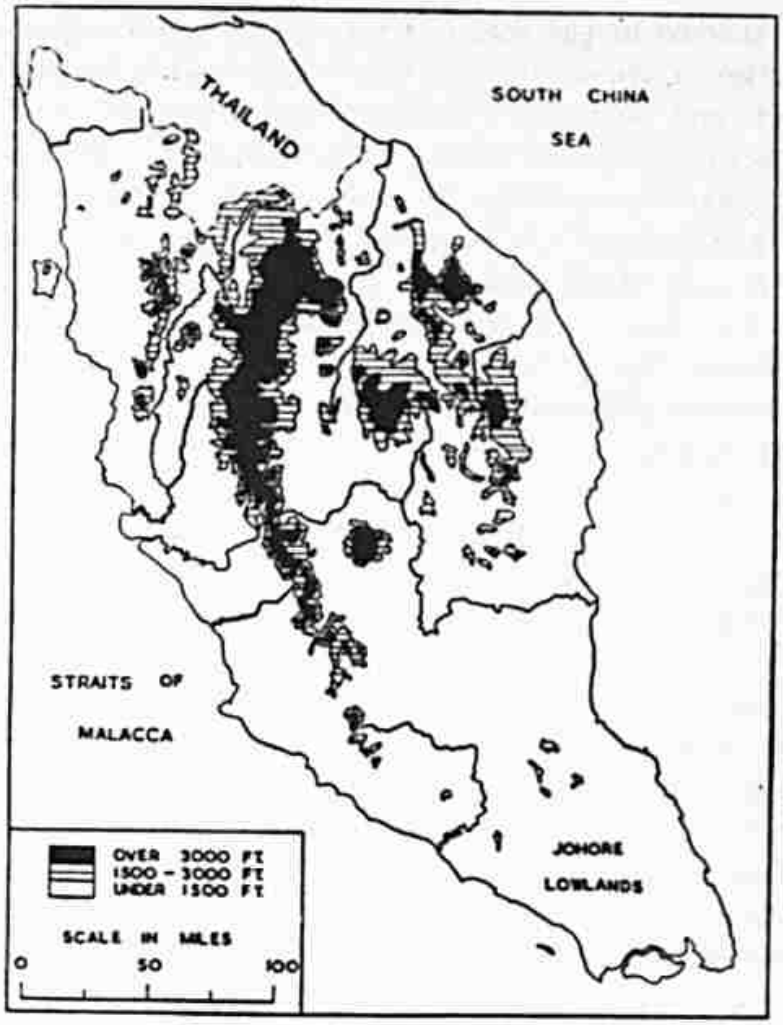


FIG. 2
Relief and Drainage.

so thick and so closely interlaced with thorny creepers that it is almost impossible to move a yard in any direction without previously cutting a *rentis*, or jungle path. Even travelling by river is difficult, for the river beds are full of snags and fallen timber: the smaller streams are generally covered by creepers from bank to bank, and the way has to be cut before a canoe can pass'.[1] Where clearings have been made or forest fires occurred, the vegetation usually consists of a type of secondary jungle known locally as *belukar*, which may be anything from *lalang* grass (*Imperata arundinacea*) to near tropical rain forest. As for the animal life popularly associated with the Malayan

[1] S. W. Kirby, 'Johore in 1926,' *G.J.*, Vol. LXXI, 1928, p. 245.

jungle, this no longer constitutes a serious problem,[1] except in the damage it can do to cultivation. This applies particularly to elephants and wild pigs. The Emergency restricts the hunting and shooting of these animals which, in Negri Sembilan for instance, have been called the chief causes of damage to cultivation, and in Perak elephants have seriously hindered progress in the Sungei Manik Irrigation Scheme.

The other important type of vegetation in Malaya is associated with swamp. Along the west coast, mangrove swamp forest is very common and inland as much as one-tenth of the surface of the peninsula is covered with freshwater swamp. Together, tropical rain forest and swamp forest dominate the landscape. Certainly they are difficult obstacles to be overcome in opening up the peninsula to human settlement. On the other hand, it must be remembered that tropical rain forest or swamp jungle formerly covered the bulk of the area now developed and settled by man. The vegetation cover in the peninsula, then, must never be looked upon as an insurmountable obstacle to human activities.

In this difficult, jungle-covered country, rivers commonly provided the only practicable lines of movement in the early stages of exploration. During the last quarter of the nineteenth century, many accounts emphasised the importance of rivers in attempts to penetrate the Malayan interior. Movement right across the peninsula, however, has never been helped very much in this way because the chief rivers run longitudinally throughout their middle courses in sympathy with the north-south trend of the mountain ranges. A notable exception was Swettenham's journey in 1885. Swettenham crossed the peninsula following rivers the whole way except when suitable vantage points for crossing the various mountain divides had to be found. He followed the Bernam to its source in the Main Range, then crossed to the South China Sea coast by way of the Lipis and Pahang Rivers. Another difficulty about Malayan rivers as lines of movement is that though in their lower courses they generally meander sluggishly over wide flood plains, in their upper courses gradients are often very steep so that rivers may drop over 4,000 feet in less than 15 miles. In the upper courses of rivers, too, rapids are very

[1] Contrast conditions in 1869, when Wallace noted that 'there are always a few tigers roaming about in Singapore, and they kill on an average a Chinaman every day.' (A. R. Wallace, *The Malay Archipelago*, London, 1877, p. 24.)

common and present real difficulties to movement, so much so that at certain rapids and waterfalls sharp changes in the distribution of aboriginal tribes have been noted.

In spite of these difficulties, the river is still almost everywhere a vital focus of human interests and activities in Malaya and in many rural areas still provides the principal means of communication.

Geology and Soils

The uplands of Malaya are generally either exposed portions of granite intrusions, or folded and disturbed quartzites, shales and limestones. The junction of the granite and sedimentaries is associated with tin, which occurs here as cassiterite in veins and stockworks, both in granite and sedimentary rocks, and in pipes in the limestone.[1] Limestone, weathering rapidly in this equatorial climate, is otherwise most noteworthy from the scenic point of view; in Perak and Selangor outcrops of limestone result in karst scenery of hills with perpendicular and overhanging cliffs. In the north of Perlis, the Nakawn Range contains great hollows in the limestone. These hollows are known locally as *wang* and are the equivalent of European *poljes*. In Wang Tangga there are Chinese mining and Malay padi villages whose only communication with the outside world is through an underground stream bed.

As for the soils of Malaya, the luxuriant jungle cover suggests great fertility. On the contrary, however, Malayan soils are generally rather poor. As Richards has noted, the lush tropical vegetation is possible only because in this climate the vegetation can itself set up processes which tend to counteract impoverishment of the soil.

Soil poverty in Malaya is due in part to intensive leaching. True *laterite*[2] is uncommon in the peninsula, but red laterised or lateritic soils are widespread and often completely blanket the underlying structure. Though it is true that laterised soils

[1] Most of the tin mining, however, is alluvial.

[2] The word *laterite* was coined by Buchanan in 1801 for an indurated clay full of cavities and pores and containing large quantities of iron in the form of red or yellow ochres, lying over the granite of Malayala in India. See F. Buchanan, *A Journey from Madras through the countries of Mysore, Canara, and Malabar*, London, 1807, Vol. II, pp. 440–441. True laterite in Malaya is perhaps best seen in Malacca.

need not necessarily be wholly infertile, in Malaya at least they are frequently so heavily impregnated with iron-oxide that their porosity is severely reduced. Moreover, on limestone, small rounded pellets of iron-oxide may impede agricultural activities by forming a continuous deposit on the soil. A further reason for soil poverty in Malaya is that much of the parent rock is granite. This rarely supports good soil in the peninsula. It weathers rapidly to a depth of thirty feet or more and the large boulders which occasionally stud the landscape are an obstruction to farming activities. Rather better soils derive from the quartzites, though even these are far from ideal, containing only a small percentage of coarse sand and suffering from close packing and inadequate aeration. Unlike neighbouring islands in Indonesia, Malaya is not a volcanic country. Nevertheless, there are ancient volcanic rocks of which the Pahang Volcanic Series are the best known; they occasionally provide agriculturally superior soils.

The most valuable soils in Malaya are usually the coastal alluvials, yet even these can present difficulties to the agriculturalist. They often suffer from restricted drainage and along the west coast may carry a deep surface layer of peat.

It is important to realise, however, that from the agricultural point of view the absence of good soils in Malaya is not necessarily a critical factor—it depends to some extent upon the crop. Thus rubber, the chief cash crop, is remarkably tolerant of a wide range of soil conditions and can thrive on poor soils as long as drainage is adequate and the climate is suitable. In this case, at least, climate helps to make up for deficiencies in the soil.

Climate

A heavy rainfall, averaging about 100 inches a year, high temperatures and high relative humidities: these are the outstanding characteristics of the Malayan climate. It is also monotonous in that there is little variation either in rainfall, temperature or humidity from month to month. This, however, is only a relative statement. Some kind of seasonal fluctuation can be distinguished almost everywhere in the peninsula, especially in rainfall (Fig. 3). This seasonality of rainfall expresses itself in many ways. The times of *padi*[1] cultivation, for instance, are fixed

[1] In these pages the term *padi* is taken in its widest sense and may apply either to the rice plant, the ear, or the unhusked grain.

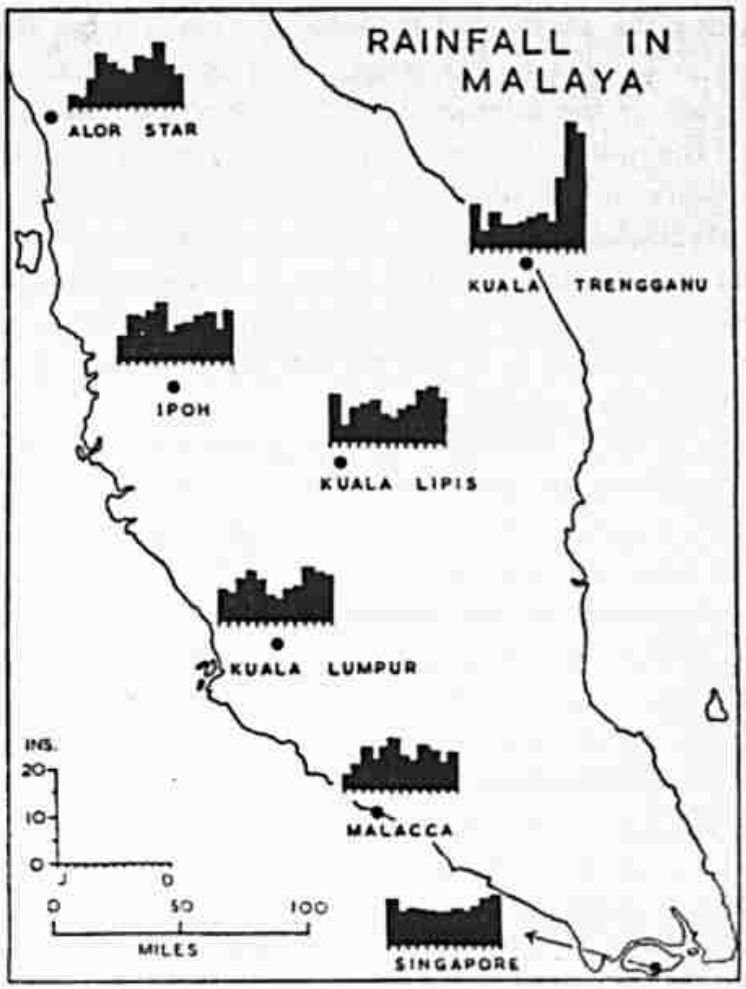


FIG. 3
Rainfall.

in accordance with the rainfall so that where people are padi planters the seasonal rhythm of ploughing, planting and harvesting affects their lives and customs very deeply. This is most noticeable in northern Malaya. Yet nowhere is there a true dry season, though it is common practice to speak of two monsoons.[1] The north-east monsoon lasts approximately from late October to March and brings heavy rains and storms to the east coast. The south-west monsoon blows from May to August, but it is not nearly so regular or so strong as the north-east monsoon and in fact brings maximum rainfall only to the stretch of coast between Port Dickson and Malacca. South of Malacca the prevailing

[1] Some signs of the transition from the evergreen rain forest to the deciduous monsoon forest are apparent in northern Malaya where typically 'Burmese' trees, some of which are completely deciduous, begin to be frequent. (See P. W. Richards, *The Tropical Rain Forest*, Cambridge, 1952, p. 328.)

wind during the south-west monsoon period is from the south-east, that is parallel to the coast. Most of the west coast, and indeed much of the interior, have their heaviest rainfalls during neither of the monsoon periods but during the transitional periods when conditions are ideal for convectional or instability rain. This convectional rain is very sensitive to local surface details. Moreover, the rainfall in most parts of Malaya fluctuates often very widely in amount and distribution from year to year, so that heavy rainstorms or dry spells are likely to occur at any time in almost any part of the peninsula.

In spite of such variations in the general pattern of rainfall, the two monsoons are important elements of the Malayan climate and help to produce differences between the west and east coasts. Protected from the violence of the north-east monsoon winds by the mountains of the peninsula and from the south-west monsoon winds by the island of Sumatra, the waters of the Malacca Straits are edged with flat, mud-covered shores. By contrast, the eastern shores of the peninsula are usually mud-free, with clean sandy beaches.

Uniformly high temperatures largely account for the impression of monotony given by the climate in Malaya; certainly the mean annual range of temperature in the country is very small—rarely over 4°F. This monotony of temperatures is far more significant than their height, which averages about 80°F. in most settled parts of the peninsula and is exceeded in many parts of the world. Yet even the monotony of temperatures in Malaya can be exaggerated. Leaving aside altogether for the moment the question of sensible or physiological temperatures, it is important to emphasise that the mean diurnal range of temperature in Malaya considerably exceeds the mean seasonal range and may be as great as 20°F. As Chapter 8 will show, this is a fact of some importance from the point of view of human comfort, especially as the mean relative humidity is almost always high: 80%–90%. The way in which books and clothing become mouldy unless frequently exposed to wind and sunshine is but one indication of the high average relative humidity experienced in Malaya. In its annual incidence, relative humidity has variations roughly parallel to the amount of rainfall: in its diurnal incidence relative humidity is commonly at its highest in the early morning and lowest at midday.

That Malayan skies are often cloudy is to be expected in view of the heavy rainfall and high relative humidity. The average duration of bright sunshine in Singapore is only about six hours a day. Clouds keep temperatures down because they absorb much of the heat before it ever reaches the earth, but this does not mean that the loss of water by evaporation is small. It has been estimated that even in Singapore the average annual evaporation from a free-water surface is of the order of sixty inches a year: that is, over half the total rainfall on the island. The conditions of cloudiness and high humidity, though they may restrict the ripening of certain crops, do at least enable crops to recover much more quickly and completely than they otherwise could from the ill effects of occasional short dry spells during the growing season.

The length of the day varies very slightly throughout the year. In equatorial Malaya there is nothing like the same importance attached to slope and insolation in human activities and settlement as occurs in more temperate latitudes. The longest and shortest days at Singapore differ by only 9 minutes, at Kuala Lumpur by 20 minutes, and even at Alor Star, in the north, by only 37 minutes. Daylight in Malaya, then, always lasts for about twelve hours. It has been demonstrated that even such small changes in light period can be significant agriculturally, for instance in their effects upon the flowering of padi varieties in Malaya. Most padis grown in Malaya flower successfully only in the shorter days from October to March. These photosensitive varieties are often termed fixed season padis because they will mature only at the one season of the year, that is during the shorter days.

. . . . .

There is little doubt that Malaya has a physical environment which is difficult for man in many ways. Here is a hilly peninsula with poor soils, an equatorial climate and three-quarters of its surface still covered with tropical rain forest and swamp jungle. On the other hand, the Malayan environment contains great possibilities. The peninsula's geographical position, the occurrence of rich tin deposits and a climate well suited to the growing of rubber have already made possible the growth of one of the most prosperous countries in Asia.

2

The Growth of Settlement up to 1900[1]

IN PREHISTORIC times the dominant geographical control in the peopling of Malaya was the peninsula's position bridging the Asiatic and Australasian worlds. Down from the Asiatic interior through the Malay Peninsula drifted the Negroids, Australoids and Proto-Malays: aboriginal groups known today in Malaya broadly as the Semang, Semai-Temiar and Jakun respectively. These were followed by Deutero-Malays, otherwise known as Neo-Malays or Coastal Malays, who moved down from Yunnan, probably between 2,500 and 1,500 B.C., displacing the aborigines from the coasts and plains into the forested interior uplands. These Deutero-Malays had an irrigated rice culture and 'at the wide plains of northern Malaya, Perlis, Kedah and Kelantan, a wave of Malay agriculturists halted. There in the north a large Malay population collected, leaving the more southerly part of the peninsula to nomad aborigines and Malay sea-gipsies.'[2]

In medieval times Malaya began to be affected by incursions of people from the south and south-east. The southern part of the peninsula was contacted by sea-tribes. Negri Sembilan, parts of Selangor, Malacca and north Johore, were colonised by Minangkabaus from south-central Sumatra, Selangor by Bugis from Celebes. Subsequently there has been a continuous immigration into Malaya of persons of Malay stock from Java, Sumatra, Celebes, and other parts of the Indonesian archipelago.

The Malays, then, are indigenous to Malaya only in the sense that they have been in the country longer than have any of the other civilised groups. Moreover, they have been influenced in numerous ways by trading and colonising contacts, the earliest of which were provided by India.

Early Indian Contacts

During the early years of the Christian era the barrier feature

[1] I am indebted to Mr. Paul Wheatley for his kind assistance on many points throughout this chapter.

[2] Sir Richard Winstedt, *Malaya and Its History*, London, 1951, p. 10.

of the peninsula's position assumed the greater importance in the settlement of Malaya. Now it was as an obstacle to sea trade between India and China that the peninsula attracted the attention of outside peoples. Particularly after the overland route between India and China was closed by continental disturbances in the seventh century, the volume of shipping passing along the coasts of Malaya and through Malaysia increased appreciably.[1] Indian traders from the Coromandel coast began to arrive in the peninsula to barter their cloths, iron goods and beads for the produce of the Malayan jungle: gums, camphor, wood and gold-dust. Many of them settled in places in the Malay Archipelago, probably including somewhere along the coast in northern Malaya which then held the bulk of the population in the peninsula. Although the Indians in their coastal colonies throughout Malaysia had territorial interests only in so far as was necessary to maintain their sea trading, these Indian traders and colonisers inevitably affected the rather primitive agricultural communities organised in small self-sufficient units. As Winstedt has shown, Malays today show evidence of having assimilated some of the diverse manifestations of Indian culture; it is evident in their religion, political system, law, astrology, medieval medicine, literature, music, sculpture in stone, metalwork and the weaving of silk.

Early Chinese Contacts

Though the history of the Chinese in Malaya reaches back at least to the middle of the fourteenth century,[2] Chinese settlement in any real sense almost certainly did not begin until the Portuguese period—that is in the sixteenth century. It was at first directed chiefly at Portuguese Malacca, for the Chinese interest was, in those days, confined to trading. Malacca's position—easily reached during both north-east and south-west monsoons, and commanding the Malacca Straits—made it a powerful settlement in Malaysia and so a vital focus of Chinese interests. Here the Chinese could control their sea trade between China and India.

The racial and cultural influence of the Chinese upon the Malays has been slight. There are two chief reasons for this. In the first place Chinese settlement for long involved only small

[1] C. A. Fisher, 'Southeast Asia,' in *The Changing Map of Asia* (ed. W. G. East and O. H. K. Spate), London, 1953, p. 187.

[2] Chinese contacts with Malaya go back at least to the 7th century A.D. and possibly to *circa* 100 B.C.

numbers of Chinese: in Malacca, their chief settlement, there were by 1760 only 1,390 Chinese out of a total population of 6,216. By 1823, Singapore contained 3,317 Chinese out of a total population of 10,683, and even as late as 1836, Newbold could write of the Chinese in Malaya as forming only small colonies in the south of the peninsula. Secondly, obstacles to intermarriage existed after the seventeenth century, by which time Malays had fully embraced Islam.

European Colonisation

European interest in Malaya began at Malacca at the beginning of the sixteenth century and remained focussed there for the next three hundred years. Malacca had become the premier settlement in Malaya during the fifteenth century and profited from its position in relation to the Malacca Straits. It had come to be the centre of a Malay Empire, extending as far north as Trengganu and including some of the coastal regions of West Sumatra; this empire declined with the capture of Malacca by d'Albuquerque in 1511.

Early European activities in Malaya had the same trading motives as those of the earlier Indians and Chinese. Their interest in trading, however, was not so much with Malaya itself, as with those areas beyond Malaya, particularly China and the Spice Islands of the East Indies. The key to this trade was Malacca: 'the city of Malacca,' it was written in 1609, 'is so commodiously situate for commerce with China and the Moluccas, whereof the Portuguese having experience, to hinder other nations from footing there, gave out, that the air was unwholesome, that it was not habitable, especially for foreigners, while they notwithstanding continued there and followed their business.'[1]

The Portuguese, though the first Europeans to settle in Malaya, had, during their 130 years of rule at Malacca, an influence which was remarkably unenduring, partly because the number of Portuguese settling in such distant parts was always small. Sea travel in those early days was difficult and dangerous, and the mother country could not spare large numbers of colonists from her small population. From the point of view of human settlement, their most important legacy is the Portuguese Eurasian community. In the 16th and 17th centuries, Portuguese soldiers in

[1] J. A. Mandelso, *Voyages and Travels into the East Indies*, London, 1609.

Malacca were encouraged to intermarry with local women because only scanty reinforcements for the Portuguese garrison could be spared from Europe, and the sons born of such unions were normally enlisted in the armed forces.

Another effect of the Portuguese period of rule was the stimulus it gave, by the very force of its opposition, to the growth of Islam in the peninsula. The Portuguese missionaries met with very little success: there was never more than a handful of native Christians. Between the 15th and 17th centuries, on the other hand, the progress of Islamisation was steady and its effects among the Malays were far-reaching: 'the Indian pantheon was replaced by the Muslim belief in one God. Buddhism and Hindu rites yielded to Islam; Indian temples and religious symbols were destroyed; Indian names of places were in some cases altered; the local rulers who used to be known by the Indian title of Maharaja or Paremeswara were thenceforth called by the Arabic title of Sultan; the Arabic alphabet was adopted in place of Indian scripts; the flow of Sanskrit words into the Malay language ceased and that source was replaced by Arabic . . . Indian aestheticism gave way to Muslim rigidity; and the convivial habits of the Malays were replaced by the strict teetotalism prescribed by Islam.'[1] Gujarati merchants from India successfully introduced Islam into the Far East and rapidly made it the dominant religion in Malaya. This, from the point of view of any study of the Malayan population, is vital, for without this Islamic influence it is probable that some considerable fusion of the races, especially along the coasts, might have taken place. By prohibiting intermarriage, Islam has perpetuated and emphasised disintegrating tendencies in the population of Malaya.[2]

In 1639 it was written that the Malay Peninsula 'was discovered [*sic*] by d'Albuquerque in 1511, since when the Portuguese have kept their ground there so firmly that none yet can supplant them.'[3] Yet two years later, Malacca fell to the Dutch. The Dutch concerned themselves, even more exclusively than had the Portuguese, with trade. Partly because of this, their influence on the settlement of Malaya was slight.

[1] Federation of Malaya, *Annual Report, 1953*, London, 1954, p. 362.

[2] Note that Malayan Islam is not quite the same as that of Southwest Asia. In some respects the womenfolk are relatively emancipated in Malaya: they work openly in the padi fields, for instance, and have never practised purdah.

[3] J. A. Mandelso, op. cit.

There were other contributory factors. As with the Portuguese, the numbers of Dutch in Malaya were insignificant; by 1666 there were in Malacca, for instance, only 145 burghers, the rest being 1,469 Portuguese Eurasians and 'blacks', 426 Chinese, 547 Moors and Hindus, 588 Malays, 102 Bugis and 1,607 slaves. Secondly, Dutch interest in Southeast Asia was focused further south than Malaya, and the Dutch approached the East Indies, not through the Straits of Malacca, but through the Sunda Straits between Sumatra and Java. This gave early prominence to Java, and by 1800 Malaya was merely at the northern fringe of Dutch colonial interests in Malaysia.

By the end of the 18th century, then, the Malay peninsula had been subjected to several streams of human contact, Asiatic and European. Yet the population was still largely confined to self-sufficient communities. Apart from the now mainly hill-dwelling aborigines, the population lived chiefly in coastal and river-mouth settlements and was largely composed of Malays descended from those Deutero-Malays who had moved down centuries before from Yunnan and of immigrant peoples of Malay stock from the islands of the East Indies. Very small numbers of Indians, Chinese and Europeans lived at Malacca and other coastal settlements. External interest in Malaya had so far been chiefly in the Malacca Straits coast. To the outside world Malacca *was* Malaya and today the peninsula is still known in many countries as the 'Malacca Peninsula'. There was little increase in the size of the population; up to 1800 the population of Malaya remained at a low level of around the quarter-million mark. But it was to rise to two millions by the end of the 19th century, largely as a result of the internal colonisation of Malaya by immigrant Chinese and Indians. This colonisation coincided with and indeed was made possible by the extension of British protection into the peninsula.

Britain, searching for new markets and new sources of raw materials at the beginning of the Industrial Revolution, and having secured India, acquired Penang in 1786 as a safeguard to the Indian Ocean. By further acquiring Singapore and Malacca, the British secured the Straits route to China and the East Indies.

The British East India Company was forced to find and acquire a base in or near the Malacca Straits and Penang was chosen as the first of the British settlements in Malaya in 1786. Britain's

need to establish a settlement in the Straits of Malacca was really dependent on the monsoons. During the south-west monsoon, 'ships could remain safely in the Bay of Bengal, and any necessary repairs could be undertaken on the sheltered Coromandel Coast. With the change to the north-east monsoon . . . it was dangerous for ships to remain off the coast of India. They were forced therefore to seek more sheltered waters, and as the Company possessed no harbour on the western coast of the Malay Peninsula—which affords ideal protection from the north-east monsoon—their vessels were compelled to sail round to Bombay, involving long voyages, protracted delays and great expense. Frequently, however, men-of-war, disabled in action in the Bay of Bengal, could not reach Bombay and had instead to limp eastwards to Acheen (Acheh) in Sumatra, or the Straits of Malacca, and, putting in at some Malay port, where no facilities existed for repairs to big ships, bide their time while their crews did what was possible to refit the vessels.'[1] Penang was ceded to the East India Company by Kedah, and a strip of the mainland (Province Wellesley), opposite Penang Island, was added to the settlement in 1800 in order that the British, in those insecure piratical times, might maintain complete control of the harbour and have a local source of food supplies on the mainland.

Although Penang flourished—by 1804 its population exceeded 12,000—it was soon to be outshone by Singapore as the premier British settlement in Malaya. A trading city had existed at Singapore until its destruction some 450 years earlier by Majapahit, the Javanese Empire. Knowledge of this fact helped Raffles, the founder of Singapore, to choose this as the best site for his proposed settlement.[2] According to an eye-witness report 'at the time when . . . Raffles came, there were under one hundred small houses and huts at the mouth of the (Singapore) River. . . . About thirty families of *Orang Luat*[3] also lived in boats a little way up the Singapore River at the wide part.'[4] But

[1] H. P. Clodd, *Malaya's First British Pioneer—The Life of Francis Light*, London, 1948.

[2] Raffles had originally favoured Carimon as a base, but the Dutch were already there. He chose Singapore only when he reached it.

[3] Literally, 'men of the sea'.

[4] Anonymous, 'Landing of Raffles in Singapore—By an Eyewitness', *J.S.B.R.A.S.*, No. 10, 1883. There is evidence, also, of a village at Kampong Glam and houses along the shores of Keppel Harbour. A number of Chinese gambier and pepper planters lived in the interior.

soon after its foundation in 1819 it was clear that Singapore was rapidly becoming the principal port in the eastern seas. By 1829 the population had risen to over 18,000.

The rise of Singapore and Penang dealt a blow to the fortunes of Malacca—already suffering from her small, rapidly silting harbour which became more and more inadequate as the size and draught of ships increased. Malacca had come under the control of the British in 1796, but the settlement was finally handed over in 1824 by the Dutch in exchange for Bencoolen in Sumatra. This cession of Malacca by Holland consolidated the principle of British supremacy in the peninsula and Dutch supremacy in the archipelago.

Until the last quarter of the nineteenth century, British activities were confined to these three Straits Settlements and the pattern of population distribution remained little changed. A rough picture of the distribution of population in Malaya in the first half of the nineteenth century can be constructed from data given by Newbold. His figures are for 1836 or thereabouts and indicate clearly the concentration of population in the Straits Settlements. Newbold describes the Malay peninsula as a country with a population of some 450,000, 'consisting in the states bordering upon Siam, of Malays, Samsans and Siamese; and in the more southerly states, of Malays interspersed with small colonies of Chinese, Chuliahs and Klings.'[1]

To understand the fact and timing of British intervention in the Malay States—an intervention which was rapidly to expand settlement in the interior of Malaya—a few features of Malayan life in the first three-quarters of the nineteenth century must be emphasised. Contemporary writers note the importance of piracy. Malays were far from considering piracy a dishonourable occupation, many of their princes openly engaging in it. Old Malayan romances and traditions refer to such cruises and gild them with all the glories of a crusade. By the middle of the century, however, piracy was unbridled and murder, incendiarism and slavery had spread to inland communities. Trade was being interrupted and agriculture neglected. There was constant warfare among the sultans, and civil wars were frequent. Among the Chinese miners who came to work in the Larut area of Perak feuds and lawlessness

[1] T. S. Newbold, *Political and Statistical Account of the British Settlements in the Straits of Malacca*, 2 Vols., London, 1839.

were rife and all contemporary accounts suggest that Perak rule was fast disintegrating.

In the interior of Malaya, then, unrest was severe and wide-spread. Chinese merchants of the Straits Settlements who were trying to carry on trade with the interior pressed the British to revise their attitude about non-intervention in the Malay States. In mid-1873 'a land and river war was being fought on the Larut coast, a permanent threat to the peace of Penang and to shipping in the Straits of Malacca. For the sake of peace in the Straits, something had to be done about Perak.'[1] In 1874 the Pangkor Treaty between Britain and Perak was signed and British protection in Malaya began. But lest the above remarks suggest rationalisation, it must be admitted that a wide variety of considerations must have helped the British decision to interfere in the Malay States. It was the period of annexation of backward territories of the world, strategically there existed the danger that the adjacent territory of Siam would fall into French hands, and finally, British capital was increasingly being invested in the tin mines of the interior.

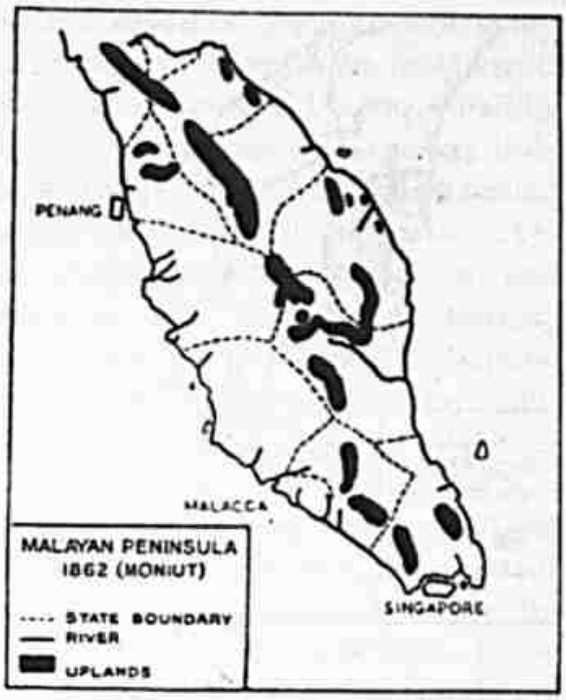


FIG. 4
The Malayan Peninsula according to Moniut.

The precursor of settlement in the interior of Malaya during the last quarter of the nineteenth century was exploration. How little was known about the interior is indicated in maps of the period. An early official map of Malaya, dated 1862, is grossly inaccurate (Fig. 4). A map dated 1876 and one of 1878 (Fig. 5) are little more than outline sketches showing a few rivers. Not until the 1880's did modern exploration of the interior begin on any scale, though Skinner described in 1879 routes from

[1] E. Sadka (ed.), 'The Journal of Sir Hugh Low, Perak', 1877, *J.M.B.R.A.S.*, Vol. XXVII, Part 4, 1954.

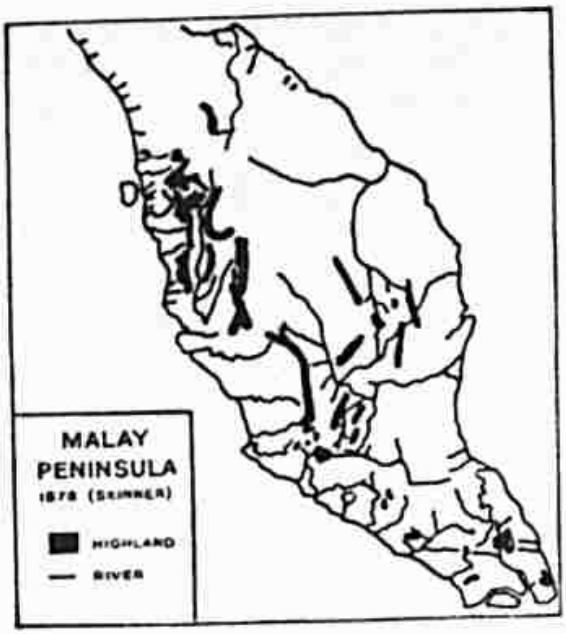


FIG. 5

The Malay Peninsula according to Skinner.

Selangor across the Main Range into Pahang, and in the 1870's Baron Miklucho-Maclay explored large parts of the peninsula. McCarthy surveyed the Perak River in 1883. As noted in the previous chapter, Swettenham crossed the peninsula from the mouth of the Bernam to the mouth of the Pahang in 1885 and this account, like most accounts of the period, emphasises the importance of rivers as lines of movement through the jungle-covered hills.

Before the end of the century, the four states of Perak, Selangor, Negri Sembilan and Pahang had accepted British protection and formed a loose federation known as the Federated Malay States. Together with Johore, the Federated Malay States formed in effect the hinterland of the three Straits Settlements of Singapore, Malacca and Penang, furnishing most of the tin reaching the world outside. It was hoped that the other states of the peninsula would later join the Federated Malay States but this they were loth to do, fearing loss of sovereignty.

The Malay States, it will be noted, never became colonies. They were never considered to be British territory. Agreements between Britain and the states of Malaya frequently contain the statement that 'the two governments will at all times cordially co-operate in the settlement of a peaceful population in their respective neighbouring territories, and in the joint defence of those territories from external hostile attack.' Where the British intervened, it was always, at least superficially, mutually desired and mutually beneficial.

It is possible to distinguish two phases in the history of settlement in British Malaya up to 1900. The three Straits Settlements of Penang, Singapore and Malacca epitomised the early trading and strategic interests of Britain in the East. There was little contact with or interest in the interior of the peninsula. The second phase began with the 'tin rushes' of the second half of the nineteenth century, resulting in increased British interest in and finally intervention in the Malay States. The peace and security so established resulted in a flood of immigrant labourers, especially from China, into the tin-mining areas. Thus the nineteenth century saw both the intensification and extension of settlement in Malaya. But the 'extension' of settlement was a movement, not of indigenous peoples extending their agricultural activities, but of alien peoples who, ignoring to a large extent the coastal Malay agricultural areas, flooded into the new tin pioneering zone in the west interior foothills of Malaya. There was little competition for land or occupations between the Malays and the incoming Chinese. Their geographical distributions and their economic functions were usually quite different.

3

The Population of Malaya

MALAYA today has a population of over seven and a half million, of which nearly one and a half million live on Singapore Island.[1] As the previous chapter indicated, a hundred years ago the population, then numbering under one million, was concentrated in the coastal padi-growing areas and in the Straits Settlements of Singapore, Penang, and Malacca. The contemporary pattern of population distribution in Malaya (Fig. 6) includes these traditional concentrations, but the emphasis has shifted into the west interior foothill zone where most of the modern developments in rubber planting and tin mining have taken place. The present concentrations of people today are in (i) the north-west padi plains of Kedah and Perlis, stretching southwards to include the Province Wellesley coastal strip and the island of Penang, (ii) the north-east padi plains, centring on the Kelantan Delta, (iii) the Malacca and West Johore coastal strip of padi and rubber smallholdings, (iv) the tin and rubber belt of the interior foothills of western Malaya, including the nuclei of urban settlement around Ipoh and Kuala Lumpur, and (v) Singapore Island.

Apart from Singapore Island, all these areas are or have been associated with the most important developments in padi, rubber and tin in the peninsula. The high density of population on Singapore Island, by contrast, simply expresses Singapore's importance as a great entrepôt and commercial centre.

Population Growth

Since about 1800, when the population numbered roughly a quarter of a million, the growth of population has been rapid. Before 1800 the population increased almost imperceptibly; after 1800 the growth curve began to steepen (Fig. 7). It is important to our argument, however, to recognise that the reasons lying behind the rapid increase of population have changed during the present century.

[1] The 1957 census figures (rounded) are: Federation of Malaya—6,300,000; Singapore Colony—1,400,000.

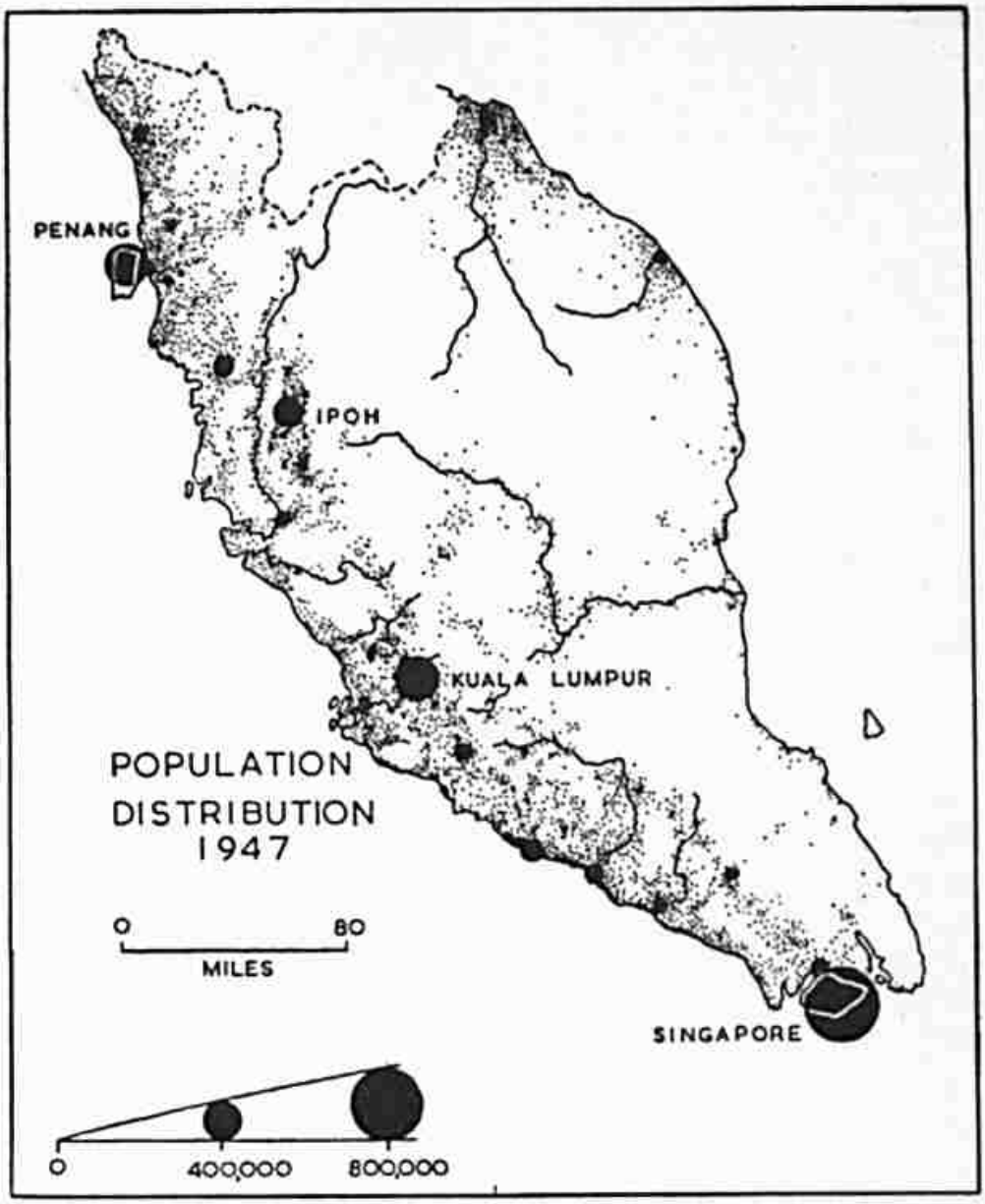


FIG. 6

The Distribution of Population. One dot represents 1,000 persons.

Before the 1920's the increase of population was due chiefly to a large-scale immigration from China, India and Indonesia. During this phase, indeed, there was frequently an excess of deaths over births—'the crude birth rate being high because of the very abnormal sex ratio and the death rate being high because tropical diseases were not under control in those early days; only the flood of fresh immigrants caused the population to rise

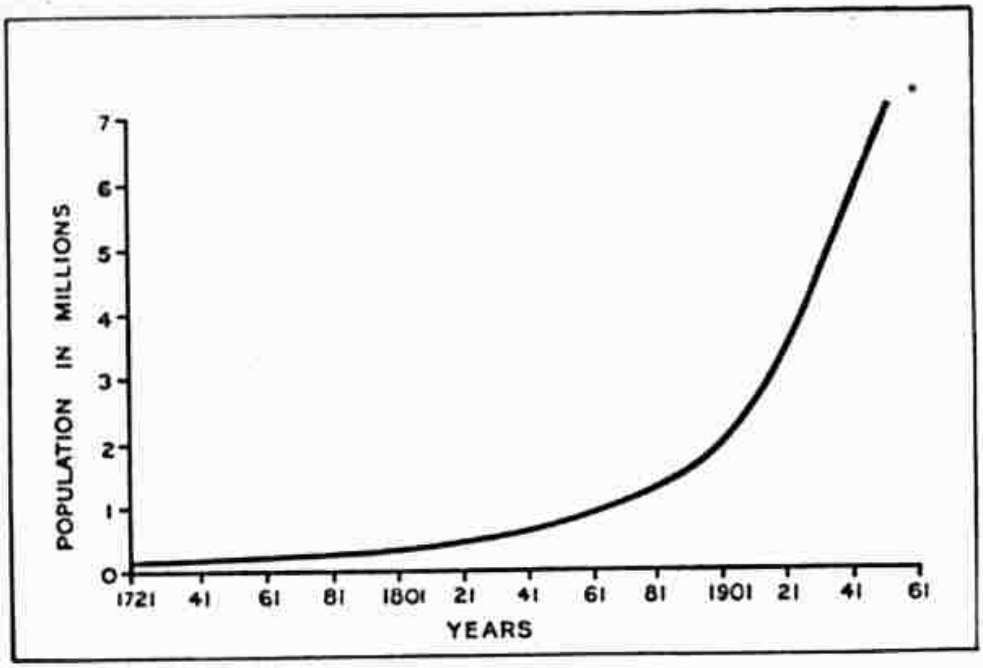


FIG. 7
Population Growth in Malaya.

rapidly.'[1] Subsequently, however, immigration fell and today migration affects the size of the population very little. Yet the rate of population growth has continued to rise. The inference is clear: natural increase has taken the place of migrational surplus as the chief factor determining the growth of population in Malaya.

How has this happened? Briefly, the general falling level of migrational surplus in Malaya since 1920 has resulted from restrictions to migration both in Malaya and in the countries of origin as well as from the less powerful operation of the attractive forces in Malaya. As for the great improvement in natural increase, this has been caused by falling death rates and rising birth rates, the latter due partly to the improving sex ratios as immigration decreased. To understand the growth of population in Malaya, then, it is essential to examine rather more closely first the question of migration, and secondly, the vital statistics of the contemporary rise in the rate of natural increase.

The study of migration in Malaya is important not only in terms of the numbers involved, which at one time must obviously have been great to produce a rapid increase in population even when there was a natural decrease of population, but also in terms of

[1] T. E. Smith, *Population Growth in Malaya*, London, 1952, p. 2.

the powerful economic position assumed by the immigrant peoples. Further, whereas the phases of large-scale immigration into Canada and Australia, for example, were chiefly concerned with permanent settlers, in Malaya immigrants were frequently temporary: there was always some emigration, not of indigenous peoples, but of the immigrant peoples themselves. Clearly, by no means all those who came to Malaya with the idea of returning eventually to their home country actually managed to do so. But as the speed of sea communications increased and passage rates fell, many more were enabled at least to visit their homelands. It also became increasingly possible, especially with the relaxation of Chinese emigration laws, for immigrants to bring their wives with them to Malaya. Thus permanent settlement has steadily been replacing the earlier, more fluid sojourning.

The majority of the immigrant peoples in Malaya are Chinese. They were faced with economic pressure at home and economic attraction—especially in tin, trading and later, rubber—in Malaya. They were drawn, probably largely because of nearness,[1] almost exclusively from the south-eastern provinces of China—from Kwangtung, Fukien and, to a lesser extent, Kwangsi. Indonesians came to Malaya in very small numbers compared with the Chinese but from the very beginning were more permanent settlers. Indians began their immigration into Malaya on any significant scale much later than the Chinese. The mass immigration of Indians, in response chiefly to the need for rubber tappers during the early years of the present century, was different from that of the Chinese in three ways: the stay of the Indian labourer in Malaya was even more temporary, it was generally of shorter duration, and his passage was usually assisted.

Turning now to the present high rate of natural increase, two main factors have operated. First there has been a decrease in the death rate, due largely to the control of tropical diseases. In the second place there has been an increase in the birth rate, due partly to a more normal sex ratio (Fig. 8). The limitations of crude rates, especially in a country which has until very recently been dependent for its growth largely upon migration, needs noting, but one important point must be clearly established: the natural increase in Malaya has risen more as a result

[1] For a discussion of this point see V. Purcell, *The Chinese in Malaya*. London, 1948.

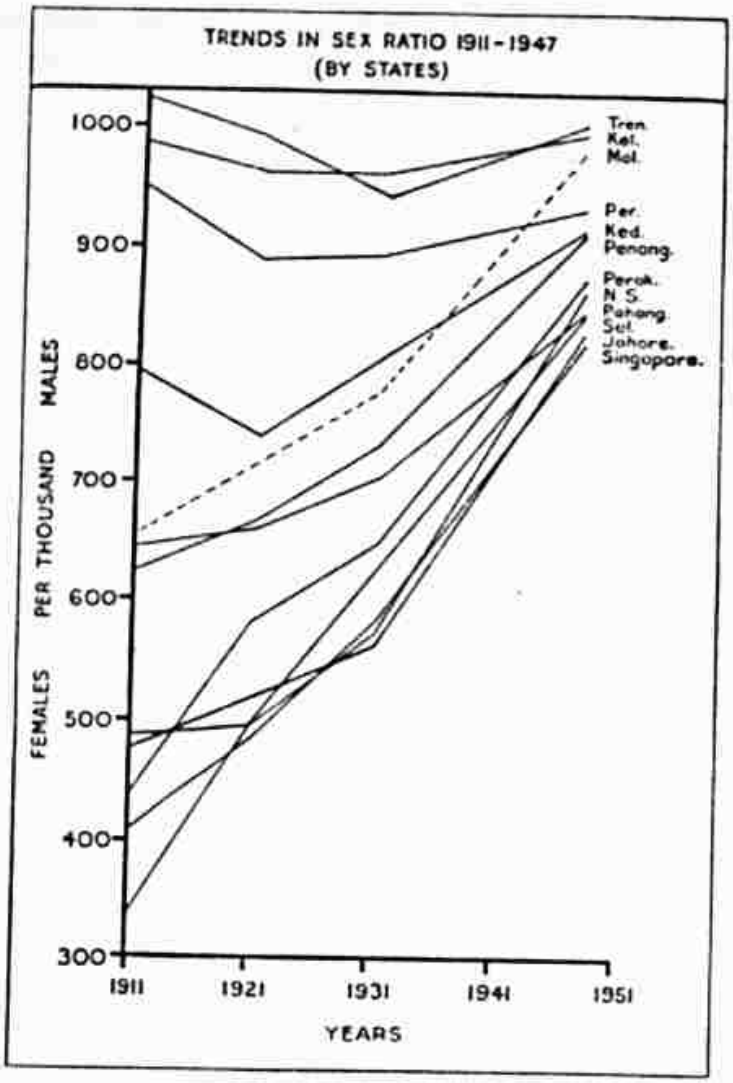


FIG. 8
Trends in Sex Ratio 1911–1947.

of a fall in the death rate than as a result of a rise in the birth rate. In this connection, certain community differences may be noted. The natural increase is rather higher among Chinese and Indians than among Malays, the death rate being noticeably lower among the immigrant peoples. Whereas the Malay death rate is about 14 per thousand, the Chinese and Indian death rates per thousand are about 9 and 9.5 respectively.[1] Chinese and Indians are perhaps less conservative than the Malays and so more readily accept Western medicine; the Malay, too, is less often in urban centres where medical attention is most easily

[1] Compare these figures with immediate post-war figures (1947) of 24.6 (Malays), 14.3 (Chinese), and 15.7 (Indians).

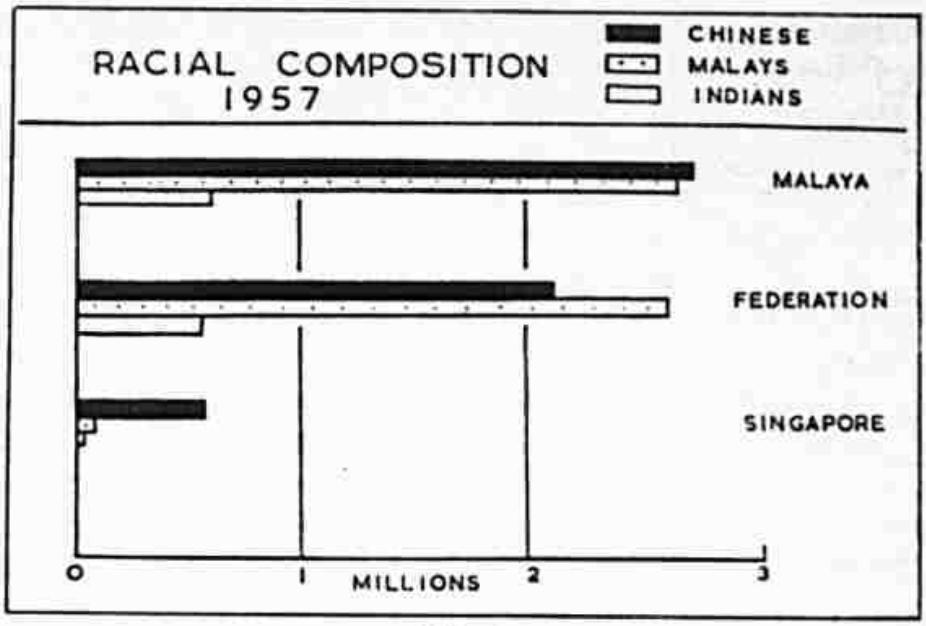


FIG. 9
The Racial Composition.

available. Moreover, the death rate among Malays is more affected by their age structure which shows a greater proportion of old people.

The rapid rate of growth of population in Malaya, due as it is almost entirely to natural increase, shows no sign at all of lessening. In Singapore the natural increase is already almost 40 per thousand a year and in most parts of Malaya it is already over 30 per thousand. Together with these facts goes a changing age structure. The population of Malaya is becoming younger in its age composition, and in Singapore, for instance, almost 50% of the population will be under 15 years of age by 1972.

The Racial Composition

The position of Malaya as a relatively rich and sparsely populated country within easy reach of the overcrowded countries of India, China and Java, probably made inevitable a mixed population. During the nineteenth and twentieth centuries Malaya has developed a racial structure which poses economic, political and social problems probably far more complicated than those of any of its neighbouring countries. Fig. 9 gives simple expression to the present racial composition of the population in Malaya, the Federation and Singapore Colony. The most significant fact about it is that while Chinese and Malays are in rough numerical

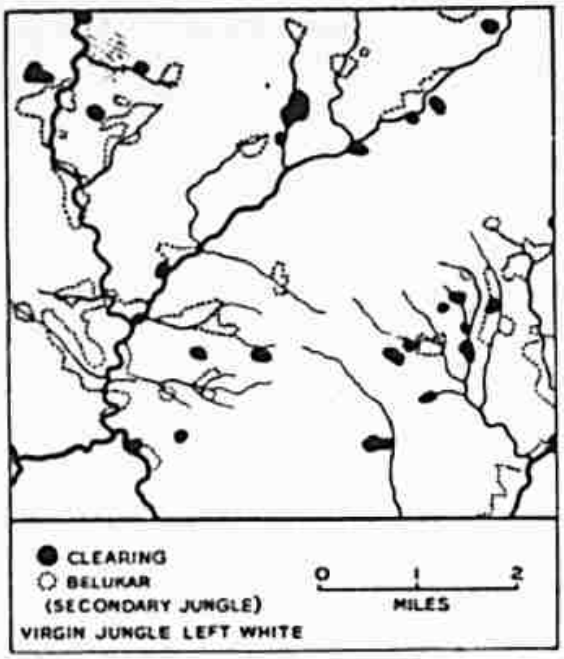


FIG. 10
Aboriginal Clearings in the Jungle.

balance in contemporary Malaya, Malays dominate slightly in the Federation and Chinese overwhelmingly in Singapore.

Though Malays, Chinese and Indians form numerically the most important groups in the peninsula, the real indigenes are the nomadic aborigines. They number some 35,000 and live chiefly in the forested interior uplands and usually have simple 'lean-to' dwellings of leaves and branches. Their nomadism is by no means indiscriminate: there are certain foci such as *durian* trees, to which they periodically return, though they are kept on the move by a number of factors, including superstition. Dread of disease and fear of spirits of the dead may cause them to change their settlement. According to one native account, a tribe was punished because it did not obey a divine decree forbidding it to remain more than four days in one place.

The nomadic aborigines may be divided into three broad divisions or ethnic groups—Semang, Jakun and Semai-Temiar—but it is impossible to establish clear-cut divisions between them. That this classification has some validity, however, is supported by the geographical groupings in Malaya: Semang in the north, Jakun in the south and Semai-Temiar more centrally placed in the peninsula and overlapping the other two groups.

The Semang (Pygmy or Negrito) are the most primitive of the three main types and show the most complete dependence upon their forest environment. Until very recently the forest alone supplied them with 'food, shelter, clothing, ornaments, implements of every description, with drugs and samples when they were sick, with materials and subjects for their dances, feasts, songs, instruments.'[1] The Semai-Temiar are rather more

[1] W. W. Skeat and C. O. Blagdon, *Pagan Races of the Malay Peninsula*, London, 1906, Vol. I, p. 3.

advanced[1] and inhabit the interior areas of Perak, Pahang and Negri Sembilan. They practise hillside agriculture and hunting and gathering. These people may be looked upon as transitional in type and stage of civilisation between the Semang and Jakun (Proto-Malays). Numbers of these Jakun, the most advanced of the aborigines, are intermarrying with the Malays proper and so losing their nomadic and pagan characteristics.

The disappearance of the aborigines[2] as a distinctive people seems inevitable. The unreliability of past census enumerations of the nomadic aborigines makes impossible any definite assertions about trends in their numbers, but they are probably decreasing.

The term *Malaysian*[3] covers a great variety of human types. The broadest division is that into *Malays*, including settled aborigines, and *Other Malaysians*, the latter being roughly synonymous with *Immigrant Indonesians*. Both these groups are complex. The Malays of Kelantan are different in many ways from the Malays of Johore, and the Javanese and Banjarese (from South Borneo) together make up about 80% of the Other Malaysians. Moreover, there is some merging of the Malaysian type, in particular the assimilation of Other Malaysians by the Malays, a process facilitated by the common religion and to a large extent common culture, though all Indonesians do not assimilate at the same rate. Whereas Sumatrans are notable for the ease and completeness of their assimilation with the Malays of Malaya, Javanese provide a more difficult problem: the frequency of the name *Kampong Java* in the west of Malaya may indicate the tendency of Javanese to isolate themselves geographically. The Banjarese have been observed to show local groupings in parts of the Krian (Perak) padi-planting district where they live in clusters, indicated on the landscape by their own peculiar house form.

[1] As long as a century ago, P. J. Begbie (*The Malayan Peninsula*, Madras, 1834) found these people 'better formed and with long black hair and fairer complexions than the Semang of Kedah. They are somewhat more civilised, and speak a different dialect.'

[2] The term *sakai* is sometimes used to refer to certain groups of the aborigines. *Sakai*, however, is a Malay word with a derogatory connotation and should be used, if at all, to cover *all* aborigines.

[3] The use of the term *Malaysian* is confined in this book to the rest of this chapter. Though demographically correct, and essential to this discussion on the population of Malaya, the term is not in everyday use. In all other chapters I have used *Malays* to refer to *Malaysians*.

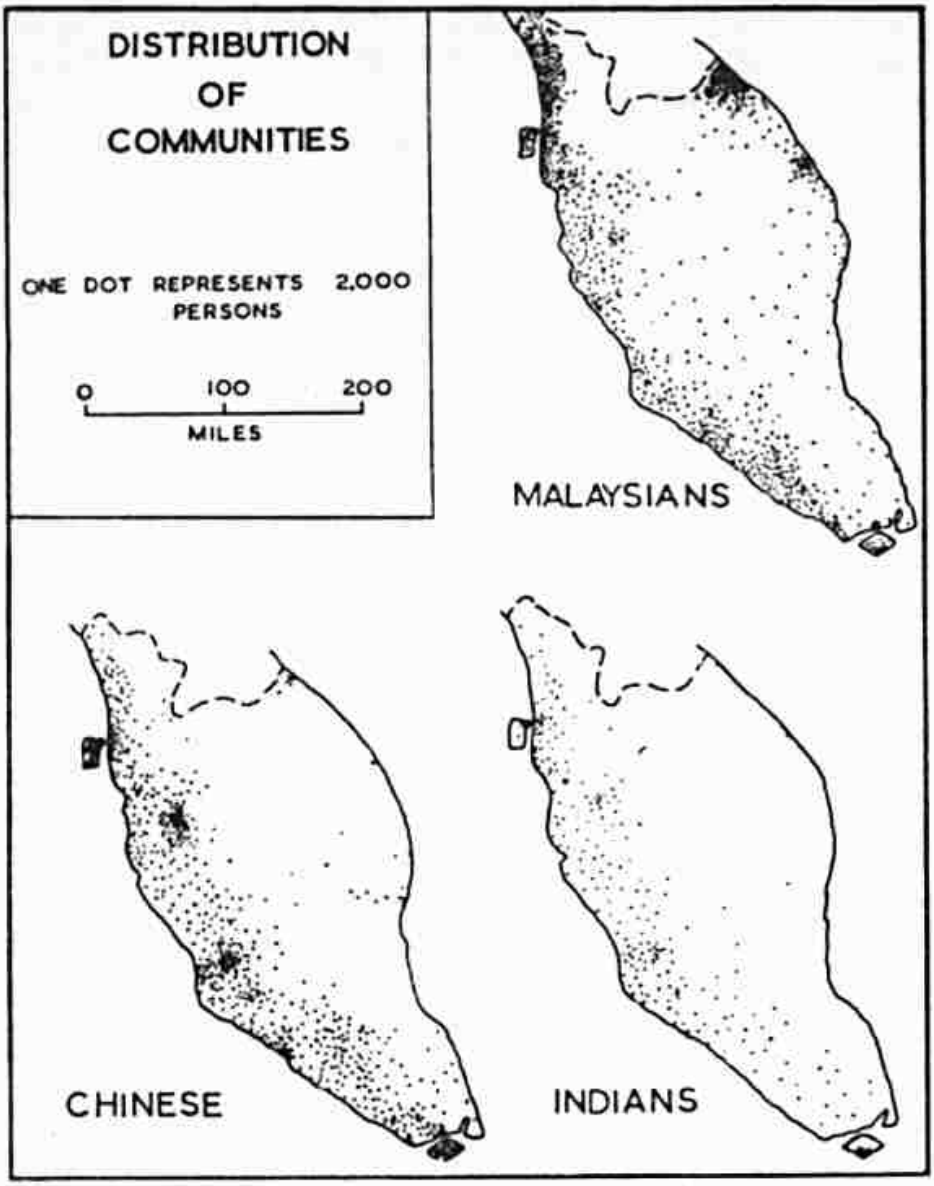


FIG. 11
Distribution of Communities, 1947.

The proportion of Malays to Other Malaysians is slowly increasing: since 1931 the Other Malaysian proportion has dropped from about 15% to under 10% of the total Malaysian population. This is due to the assimilation tendencies noted above, to decreased immigration from Indonesia and to the restricting effects of the Other Malaysian's relatively unbalanced sex ratio on their natural increase.

Fig. 11 indicates the wide distribution of Malaysians over the peninsula and their particular attraction to the coasts and deltas,

notably in the north-east (Kelantan and Trengganu) and the north-west (Perlis and Kedah): the two chief padi-growing areas of Malaya. Malaysians are overwhelmingly a rural people and the lowest proportions of Malaysians by states are associated with the islands of Penang and Singapore and with the relatively industrialised and urbanised states of Selangor and Perak.

The distribution of Chinese, on the other hand, indicates their greatest proportions in those very areas where Malaysians are least important numerically (Fig. 11). Yet the urban tendencies of the Chinese should not be exaggerated. In the Federation only 43% of the Chinese lived in towns of 1,000 or more persons in 1947, though resettlement must have raised this percentage considerably in recent years (see p. 75). In 1947, too, agriculture was still the most important occupation of the Chinese in every state in Malaya except Penang and Singapore.

The small number of women in the early Chinese immigrants encouraged a small amount of intermarriage with Malay women, but it was never very prevalent largely because of religious differences. As the Chinese sex ratio became more normal, such intermarriage became even less frequent and by the late nineteenth century had virtually ceased altogether. The few *Baba Chinese*, as they are called in Malaya, are today chiefly in and around Malacca, Penang and Singapore and provide an interesting case of culture contact. They still show their Malay blood in such obvious features as skin colour.

The most diversifying and complicating factor in the Chinese population, however, is the number of tribal groups.[1] Some 85% of all the Chinese in Southeast Asia originate from the maritime provinces of southern China: they are Hokkien, Cantonese, Tiechiu and Hakka (Kheh). The Federation has some 80% of its Chinese population composed of these four tribal groups, but in this part of Southeast Asia Hainanese (Hailam) are more numerous than Hakka and over 85% of the Chinese in the Federation are Hokkien, Cantonese, Tiechiu or Hainanese. The equivalent figure for Singapore is about 90%.

Del Tufo notes that historical accident and occupational preferences have led to a highly variable distribution of the tribal

[1] *Tribal Group* is here taken as synonymous with what is sometimes called a Chinese *Dialect Group*. The Tribe, in this sense, is based upon 'an inconsistent blend of political, geographic and linguistic, rather than ethnographic criteria.' (C. A. Vlieland, 1931 Census Report, p. 77.)

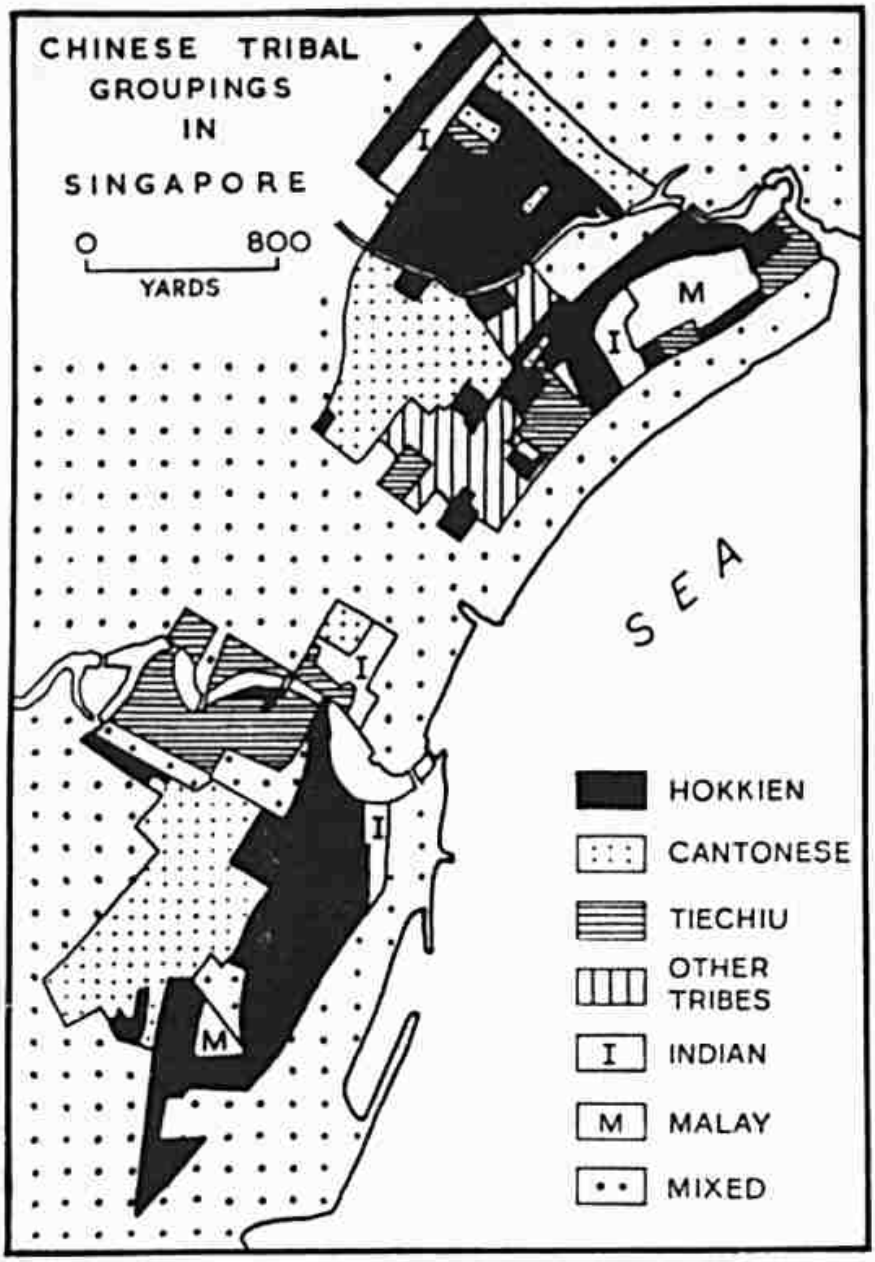


FIG. 12
Chinese Tribal Groupings in Singapore.

groups throughout the country, but an explanatory comment upon such a distribution must be very generalised. Broadly speaking, Hokkien are concentrated in Singapore, Penang, Malacca, Selangor and Johore. Hokkien were the first of the Chinese to come to Malaya in large numbers and are pre-eminently urban and commercial—rubber dealers and exporters for instance, though they also take part in agriculture, notably in Selangor, Johore and Perak. Cantonese predominate in Perak,

Negri Sembilan and Pahang, where they engage in most activities, but particularly in shopkeeping. Tiechiu are found almost everywhere, especially in towns, but only in Kedah do they form the largest single group. As in China, Hakka are the most rurally inclined of the Chinese tribal groups. Together with the Cantonese, they provide the bulk of the tin-mining population; in the Kinta Valley, for instance, Cantonese and Hakka form 80% of the tin miners. Hakka and Cantonese also predominate among Chinese rubber tappers. Hainanese, by contrast, specialise in personal service and prefer the towns and villages of the rubber-growing districts of Malacca and Negri Sembilan. They form the largest group in Trengganu, which has a very small Chinese population.

Small rural and urban districts often reveal clearer Chinese tribal groupings than the above general remarks would suggest. In Province Wellesley, for example, it has been found that the Chinese tribal groups in one *mukim* are almost completely segregated geographically and occupationally. Cantonese clusters around the hills are engaged almost exclusively in the planting of padi. Tiechius in the south-west, on the other hand, are vegetable farmers, while Hokkien are the shopkeepers along the main road. Again, in Singapore, tribal groupings occur in the older parts of the town centre and it is generally true of a Chinese in Singapore that he will gravitate towards those of his own tribe. With the high rate of illiteracy and the mutual unintelligibility of the dialects it is not surprising that a Cantonese, for example, finds many difficulties in a strictly Hokkien area. Although dialect is probably the most important single factor perpetuating the separation, there are numerous other considerations. The cooked foods sold and eaten in adjacent tribal groupings may be rather different, a fact of real importance in areas where the pressure of population demands outside communal rather than individual domestic cooking. Again, the Chinese tend to perpetuate in Singapore local family ties and village communities from China.

The various Indian[1] communities, of which Tamils (from south India) are the most numerous, do not appear to have the same tendency to separate geographically. There are far fewer Indians

[1] For convenience, the term Indian is used here to cover natives of India, Pakistan and Ceylon, and their descendants.

than Chinese in Malaya, though they are similarly distributed in the western developed zone, achieving their greatest relative importance in Perak and Selangor. Indians predominate as rubber tappers, though their urban percentage is quite high: 34% in the Federation and 74% in Singapore Colony.

Of the numerically smaller groups in Malaya, the European is largely urban, the Eurasian almost entirely so. Siamese are concentrated in the four northern states adjacent to Thailand. Arabs, by contrast, prefer the southern part of the peninsula and 80% of them live in Johore and Singapore.

In considering the geographical distribution of the main communities in Malaya, it is useful to bear in mind the historical associations of the groups. The distribution of Malaysians on the one hand and the Chinese and Indians on the other reflect broadly the former division of the peninsula into (i) the Unfederated Malay States and (ii) the Straits Settlements and the Federated Malay States. While the former remained largely Malaysian—aloof and protected from the full impact of commercial and economic exploitation—the latter attracted most of the alien peoples, especially the Chinese and Indians.

. . . . .

The remarkable racial structure of the Malayan population has obvious social, economic, and political implications. From the demographic point of view it is vital. It is not overstating the case to say that the most conspicuous demographic fact about Malaya is that it is a country in which the Malays are outnumbered by the immigrant population. 'The people of Malaya are of different racial groups, have different religious practices, different social customs and to a large degree different occupations.'[1]

[1] E. Cooper, Urbanization in Malaya, *Population Studies*, Vol. V, 1951, p. 117.

Note. In Chapters 3, 4, 5, 6, it was hoped to include the results of the 1957 Census of Population. Unfortunately these seem unlikely to be available for some time.

4

Economic Life[1]

EARLY IN THE nineteenth century the trading and commercial advantages of the peninsula's position became centred on Singapore Island; thus the rapid growth of Singapore during the nineteenth century was very much a function of its expanding entrepôt trade. On the mainland, however, new forces were at work. During the nineteenth century the chief factor affecting development there became the country's *internal* economic wealth. In particular, many of the characteristics of population and settlement in the peninsula today may be traced back to the growth of tin mining and rubber cultivation.

Tin mining formed the most powerful single incentive to the expansion of settlement in the Malayan interior during the latter half of the nineteenth century. It is true that tin and gold had been worked for centuries in Malaya, but the first 'tin rush' only began with the discovery of rich alluvial deposits in the Larut area of Perak about 1848. With the peace and security established by the British after 1874, free immigrants from China flooded to the tin mines and associated opportunities for trading. In 1891 some 90,000 Chinese are thought to have arrived in the peninsula, though the numbers are difficult to assess accurately because of the temporary nature of the Chinese settlers: their intention has until comparatively recently been to make money as quickly as possible and then return to China. The immigration of the Chinese into tin-mining areas was encouraged, partly because of their known capacity for hard work, partly because of the lack of Malay labour. Though some Malays did leave their padi fields to work in the mines, most Malays were needed to grow rice in their own villages.

Today the Chinese account for four-fifths of the total of about 39,000 tin miners (1955). On the basis of the number of workers, the mining of tin is clearly not one of the chief economic activities. However, apart from its outstanding contribution to prosperity,

[1] Dr. Lim Tay Boh kindly read through this chapter in typescript.

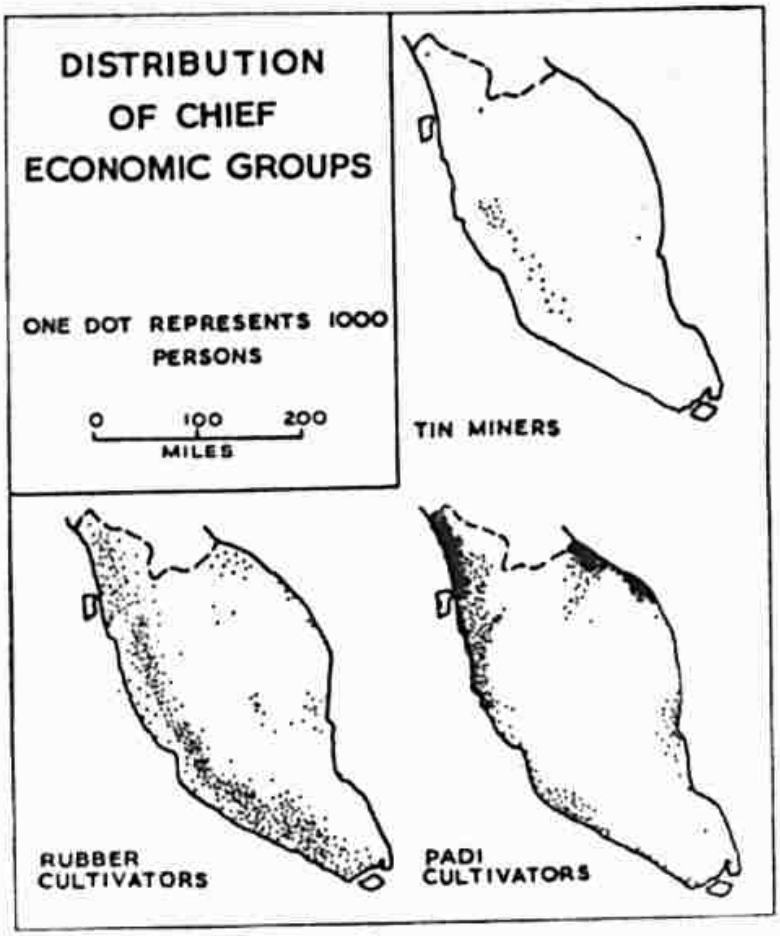


FIG. 13
Distribution of Chief Economic Groups, 1947.

tin mining is vitally important to our understanding of the geographical basis of the Malayan society for several reasons. Tin first attracted Chinese in large numbers into Malaya. Moreover, tin mining in the western foothills zone stimulated and paid for the building there of the railway—the very railway that was later to make possible the rapid development in the same zone of the plantation rubber industry. Similarly, there has been a shift in the emphasis of population distribution from the coastal trading and padi settlements to the west interior foothills where the bulk of the tin mining has taken place (Fig. 13). Furthermore, the immediate future may well see an increase in settlement based on the mining of tin in the east interior of Malaya. The main reasons for the present lack of tin mining on any scale east of the Main Range are not so much geological as historical, positional and technical. Once the Emergency is ended, the areas north of Sungei Lembung in Pahang, near Bentin in Trengganu,

and on the eastern slopes of the Main Range in Kelantan may become scenes of tin-mining activities.

Rubber occupies almost two-thirds of the total cultivated area in Malaya and constitutes about 60% of domestic export earnings. Though rubber cultivation has a shorter history than tin mining in Malaya, it has similarly affected the composition of the population, though in this case chiefly by attracting immigrant labourers from India. Even today, over 80% of the total gainfully employed Indians in Malaya are engaged in the cultivation of rubber. The distribution of population, too, was affected by the rapid growth of the rubber plantation industry, for the planting of rubber followed the railways and made use of the natural drainage of the west interior foothills. The growth of the plantation rubber industry, in fact, confirmed the new pattern of population distribution initiated by tin mining.

TABLE I

EXPANSION OF RUBBER CULTIVATION IN MALAYA

Year	*Acres*	*Tonnage*
1889	4,000	4
1905	127,000	145
1910	1,125,000	8,200
1920	2,475,000	196,000
1950	3,358,000	604,000

The Indians in Malaya are chiefly Tamils from southern India. They were indentured originally for a three-year period at the expense of individual planters. This system was replaced in 1910 by the *kangany* system in which certain people were licensed to recruit workers from their native villages in India. In 1938 this became unnecessary, owing to the increased flow of non-recruited and unassisted immigrants. Moreover, the Indian Government placed a quota on emigration to Malaya.

Such remarks, however, apply chiefly to estate rubber cultivation. Of the 3,700,000 acres in the Federation under rubber (1956), as many as 1,700,000 acres (45%) are split up into smallholdings.[1] Indians and Chinese specialise in estate work, Malays in smallholder cultivation.

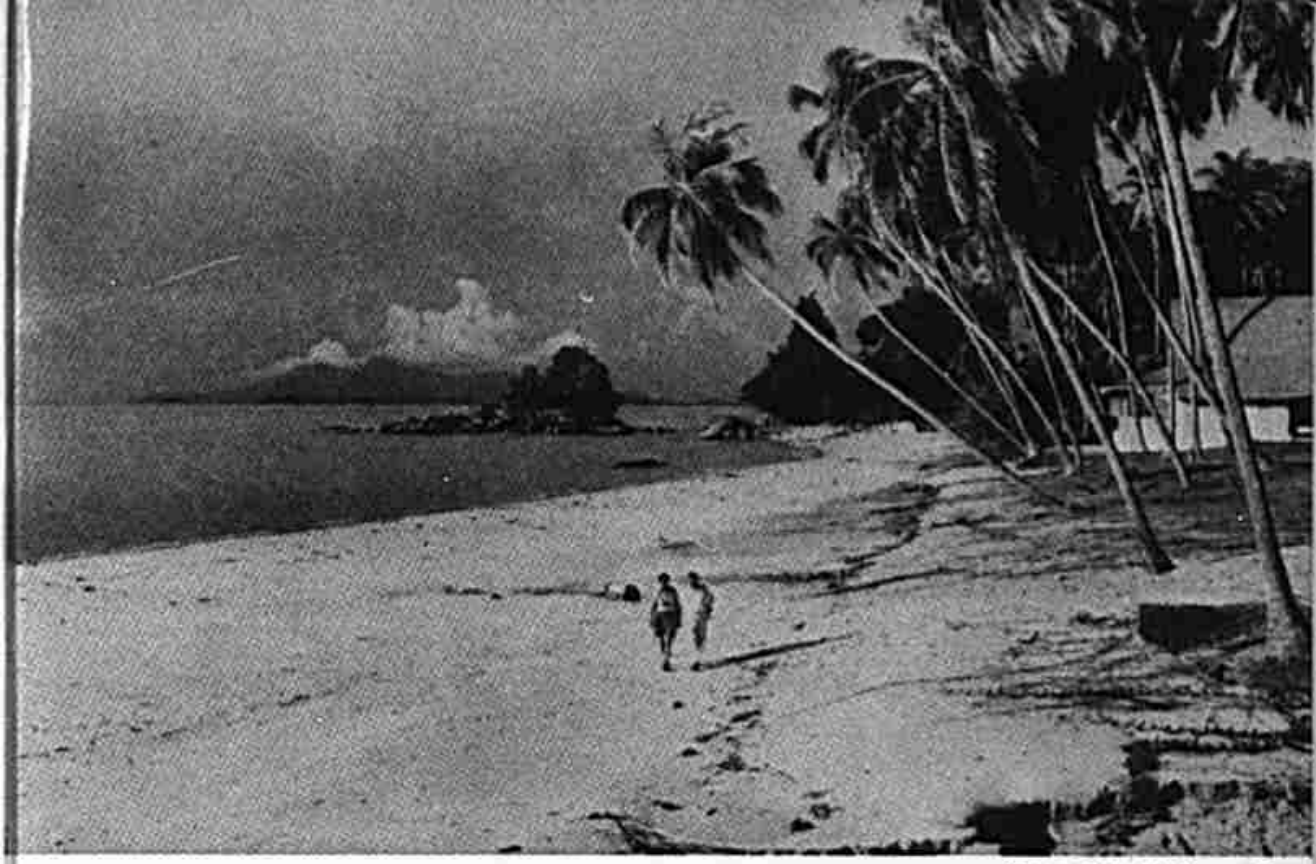
[1] The term 'rubber smallholder' in Malaya refers to one who holds 100 acres or less of planted rubber, though in fact the great majority of smallholdings are less than 10 acres in extent. (See the *Final Report of the Rubber Smallholdings Enquiry Committee*, No. 8 of 1952.)

It is easy to under-emphasise the importance of padi cultivation. It is true that the country must import about half its rice requirements and certainly no other country in Southeast Asia depends so heavily upon outside sources for the feeding of its inhabitants. Yet most of the immigrant peoples are interested not in food production but in rubber, tin and trading opportunities, and the economic development of Malaya has been based chiefly upon the wealth brought in by the sale of tin and rubber. On the other hand, rice is the staple food of Malays, Chinese and Indians alike in Malaya. Padi planters number over 150,000 more than rubber tappers and 450,000 more than tin miners. Almost a quarter of the total gainfully occupied population in the Federation is engaged in the cultivation of padi.

Padi is grown on about 15% (roughly 891,000 acres) of the total cultivated area (1954–5). 95% of this padi acreage refers to 'wet' padi and lies less than 50 feet above sea level. Padi, then, occupies chiefly the coastal plains. Padi planters are most numerous in the north-east (Kelantan) and north-west (Kedah) plains: a distribution complementary to the distribution of tin miners and rubber planters in the peninsula (Fig. 13). The three most northerly states—Perlis, Kedah and Kelantan—had more than 45% of their gainfully occupied population engaged in padi planting in 1947, Perlis recording a figure as high as 75%. These three northern states are thus the most Malay of all states in Malaya from the point of view of population composition; for while most tin miners are Chinese and rubber plantation tappers are mostly Indians and Chinese, Malays have a virtual monopoly of padi planting in Malaya.

The importance of tin mining, rubber cultivation and padi planting in the Federation is indicated in Tables II and III. Two-thirds of the Malay, two-thirds of the Indian and one-third of the Chinese gainfully employed are engaged in tin mining, rubber cultivation or padi planting. If to these three occupations are added coconut cultivation,[1] market gardening and stock-rearing, over three-fifths of the total working population in the Federation of Malaya are engaged in these five primary industries (Table III). The changes since 1931 in these five industries (Table IV) are therefore, as Smith has suggested, significant

[1] Coconuts are grown largely on smallholdings—375,000 acres out of a total of about 500,000 acres (1955).



(*Crown Copyright Reserved*)

1. Coastal scene on Penang Island

2. Padi fields in Pahang

(*Crown Copyright Reserved*)

3. Tamil woman tapping rubber

(Crown Copyright Reserved)

4. Gravel pump tin mining

(Crown Copyright Reserved)

pointers to trends in the occupational structure of the Malayan population.

TABLE II

PERCENTAGE OF TOTAL GAINFULLY EMPLOYED IN EACH RACIAL GROUP IN THE FEDERATION (1947)

	Malays	*Chinese*	*Indian*
Padi Planters	47.0	6.0	0.5
Tin Miners	0.5	4.0	1.0
Rubber Cultivators	19.0	23.5	60.5
	66.5	33.5	62.0

TABLE III

OCCUPATIONAL GROUPS: FEDERATION OF MALAYA (1947)

Occupation	*Numbers Gainfully Employed*	
Tin Mining	33,382	60% of total gainfully employed
Rubber Cultivation	493,752	
Padi Planting	470,590	
Coconuts	36,975	
Market Gardening and Stock	123,987	
Other Agriculture and Fishing	108,393	
Other Mining and Quarrying	6,455	
Manufacture	153,196	
Transport and Communications	60,351	
Commerce and Finance	173,120	
Public Administration	113,407	
Professional Service	18,767	
Entertainment, Sport and Personal Service	96,338	
Other Gainfully Employed	6,267	
	1,894,980	

TABLE IV

TRENDS IN FIVE OCCUPATIONS: FEDERATION OF MALAYA

	Numbers		*Percentage of Total Population*	
	1931	*1947*	*1931*	*1947*
Tin Miners	78,687	33,382	2.1	0.7
Rubber Growers	487,054	454,406	12.9	9.3
Padi Planters	376,120	470,590	9.2	9.6
Coconut	35,271	36,975	0.9	0.7
Market Gardeners and Stock Rearers	77,642	123,987	2.1	2.5
	1,054,774	1,119,340	27.2	22.8

Data from *Census Reports*.

Since 1931 the rubber-growing population has declined appreciably in all states except Johore, Kelantan and Trengganu where the development of the industry occurred latest. A contributory factor in this general decline is that about three-quarters of the rubber acreage in Malaya needs replanting. About 60% of trees in smallholdings are over 30 years old and many of the remainder are over 20 years old (Table V).

TABLE V

AGE OF TREES IN RUBBER SMALLHOLDINGS

Age in Years (1952)	*Acres*
40 and over	375,000
30—40	562,000
20—30	338,000
20 or less	127,000

Data from *Final Report of the Rubber Smallholdings Enquiry Committee*, No. 8 of 1952

A major hold-up to replanting is the seven-year loss of crop to the smallholders while new trees are maturing, but the alternative to replanting is the virtual extermination of the rubber smallholder, an event which would have important repercussions not only on the settlement geography of the country but also on the whole economic and social structure. Both for estates and smallholdings, the International Bank Mission Report is concerned to encourage investment in high-yielding rubber, for it feels that all efforts must be made to maintain the rubber industry in its present outstanding position in the Malayan economy.

The tin mining population has declined since 1931, partly as a result of increased mechanisation, but the chief cause of the decline both in the number of miners and in the number of rubber cultivators is that these two industries are highly sensitive to fluctuations in the world demand for natural rubber and tin. Neither industry, indeed, provides as satisfactory a basis for permanent settlement as does padi planting, which is more independent of world economic conditions. Malaya is far from being self-sufficient in rice, and modern pioneer settlement in Malaya is chiefly associated with the cultivation of padi. Since 1931 the number of padi planters has increased.

The Increase of Padi Production

It is commonly assumed that many parts of Malaya, at present virtually uninhabited, will be actively colonised in the future. But it seems that the days of carving rubber plantations out of the jungle are past and it is proving increasingly difficult to find people willing to act as colonists in pioneer areas. There are two possible reasons for this, as far as padi pioneering is concerned. First, and most fundamental, land hunger is rare. Pressure of population in Malaya is not yet sufficient to make people *want* to leave their native villages; in other words, there is little 'push' incentive. Secondly, padi cultivation has never been a profitable occupation in the past and so provides little in the way of a 'pull' incentive.

From the official point of view, however, the extension of padi land in Malaya is vital, its desirability unquestioned. There are political, as well as social and economic dangers in the dependence of Malaya upon outside sources for almost half its basic food requirements. Pioneer agricultural colonisation in Malaya, it has already been noted, has come to be thought of largely in terms of new padi lands—a development which is to some extent deplored by the International Bank Mission Report. The development of wet padi areas, moreover, is a slow process. It seems unlikely even to keep pace with the rise in population, let alone make Malaya self-sufficient in rice. Official estimates put the total area of potential wet padi in the peninsula not yet opened up at approximately 763,000 acres—that is almost the same acreage again as that already under water cultivation. At the present rate of colonisation, and with the present high rate of population growth, Malaya cannot hope to be self-supporting in rice.

In addition to the reasons already given, terrorist activities have contributed to the slowness of padi pioneering. There are, however, other difficulties inevitable in pioneering with wet rice in an equatorial rain forest environment. The conversion of virgin jungle into productive land is an arduous task for the individual settler. Even for large-scale mechanised farming, at least six distinct operations are necessary before planting can begin: felling the jungle, collecting and burning trees, removing stumps, preparing land for irrigation facilities, and finally, ploughing land ready for planting. Severe physical difficulties also have

to be faced. In the current expansion of agricultural settlement into the Perak jungle, where it is hoped that the Trans-Perak Irrigation Scheme will transform 180,000 acres of jungle into a new rice bowl, the following picture has been drawn: 'Gangs of men hew away the creeper-laced timber and excavators push steadily into the retreating wilderness, dragging out the canals behind them. Bulldozers form the peat mud bunds while . . . engineers . . . hack their way into the spreading tangles surveying the main 180,000 acres. . . . Snakes, leeches, and calf-deep peat slime make the going tough. Add to such conditions the venomous heat which pounds down from above and ricochets up from the steaming ground, and it will be understood why the labourers can endure for only 10 days at a time.'[1] Even when such land *is* prepared, roads have still to be built, essential services provided, and padi and kampong lots fixed.

One of the most successful schemes for extending the agricultural area in Malaya took place in the Tanjong Karang area of Kuala Selangor where 100,000 acres of formerly useless swamp have been converted to 50,000 acres of padi and 43,000 acres of coconut plantations, with access paths and roads. Some 80,000 people now live there. Experience there has shown that it is possible to utilise for rice-growing swamp jungle on a clay soil under a layer of peat. Ferguson has described how such land can be drained and irrigated provided the peat is not more than five feet below the surface of the ground. Over a period of five years, the cultivator can destroy the peat by burying it and mixing it with the subsoil. Assuming adequate drainage and irrigation facilities, success seems to be assured. It has also become clear that it is in these pioneer padi areas that mechanisation holds out the most promise. Experiments in mechanical cultivation in an equatorial environment are in their infancy, but most experts agree that their value in existing padi areas is very restricted, partly because of the fragmented nature of land holdings.

Fig. 14 indicates that all the so-called 'potential' padi land in Malaya is along the coasts and in the lower parts of river valleys. The implication of this for the extension of settlement in Malaya is clear. If padi is indeed to be the main basis for future pioneer settlement then settlement will not extend very much into the three-quarters of Malaya—the forested interior uplands—still

[1] *Singapore Sunday Standard*, April 11th, 1954.

virtually uninhabited.[1]

It may well be that the increase of padi production in Malaya will be effected not so much by increasing the acreage as by the intensification of production. Methods of increasing padi yields—already among the highest in Southeast Asia—include the development of new strains, improved cultural practices, improved drainage and irrigation, the use of fertilisers, and in some areas, double-cropping. From the biogeographical point of view, one of the interesting implications of intensifying production is that of dealing with the pest and weed problem. As the Rice Production Committee pointed out, wherever there is insufficient water or where the soil is poor and the land heavily infested by weeds, plants are increasingly liable to be damaged by insect pests, the most serious of which are *kutu bruang* (*Podops coarctata*), pianggang (*Leptocorisa spp.*), and the green *jassid* bug (*Nephotettia bifunctatus*). In addition, stem-boring insects may retard and break the uniformity of the ripening of the crops. Leptocoric attacks are a major cause of low padi yields in Malaya.

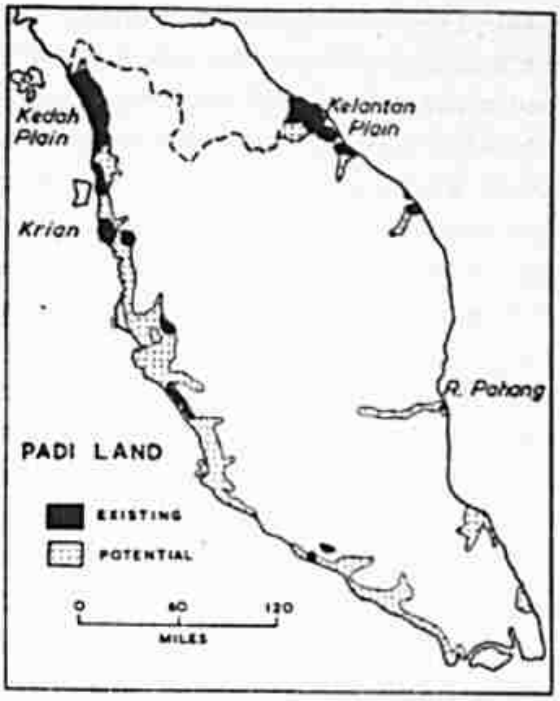


FIG. 14
Existing and Potential Padi Land.
[Rice Production Committee Report]

Carter has noted that a plot with a variety of padi which flowers or ripens a few days before the padi in surrounding plots may be singled out for attacks by rats; varieties which mature a few days later than those in adjacent fields suffer exceptionally badly from Leptocorisa. Moreover, plots where padi has been planted earlier or later than padi of the same variety in other

[1] The International Bank Mission Report, however, suggests that some pioneering in these uplands could be effected on the basis of rubber. In this, the Report follows Dobby's conclusions that rubber is the only crop which is suitable for extensive cultivation in these areas. (E. H. G. Dobby, 'The Development of Malaya's Uplands', in *The Development of Upland Areas in the Far East*, Vol. 2, Institute of Pacific Relations, 1951.)

plots may suffer similar damage. Clearly, then, two of the ways in which yields can be improved are (i) to encourage over large areas the use of padi varieties which take about the same time to mature, and (ii) to synchronise planting and harvesting times. Such uniformity, however, is difficult to achieve wherever there is a multiplicity of ownership of padi plots over quite small areas. Nor can all pest damage be so easily prevented. Much of the damage from rats, for instance, is due to climatic vagaries; damage may be severe if a showery spell occurs in the otherwise dry weather of harvest time. Again, though it may seem logical to insist on double-cropping wherever possible, such a practice often aggravates the problem of pest damage by providing plant hosts all the year round.

Industrialisation

The International Bank Mission was on the whole optimistic about Malaya's industrial future. The Mission's expectations of continuing industrial growth were based on the relatively high degree of enterprise, business experience and skills compared with most Asian countries, together with a wide domestic market benefiting from relatively high income and consumption levels.

Several difficulties face the development of manufacturing industries in Malaya, however. The country is short of power. Only 206,000 tons of coal are produced annually (1955), and future demands may have to be met chiefly[1] from hydro-electric sources. As Malaya is a mountainous country and has a heavy, well-distributed rainfall, water power can probably be developed to meet new demands for power, even if industrialisation is rapid. No adequate survey of hydro-electric power potential has yet been made, though certain promising sites have been discovered, notably on the Pahang-Perak border, just south of the Cameron Highlands.

Four other difficulties facing industrial progress in Malaya have been put forward by Smith: first, a lack of the type of enterprise required in modern industrial countries, an absence of an adequately developed money market, little intimate knowledge of modern production techniques and methods of organisation, and finally, a widespread shortage of skilled labour.

[1] Investigations are also being made about the possibility of utilising peat for fuel in Malaya.

These difficulties, however, are not peculiar to Malaya and have had to be faced by most countries undergoing the process of industrialisation. They are chiefly a function of Malaya's stage of economic development. In 1874, it will be remembered, Malaya was still, at least in the interior, a virtually unknown and sparsely populated country with a backward peasantry practising subsistence agriculture. Malaya is only now beginning to progress from the stage of processing industries, such as tin smelting, rubber milling, sawmilling, rice milling and fish curing, to the stage of developing light manufacturing industries: pine-apple canning, soap making, and the manufacture of rubber goods.

In discussing industrialisation in Malaya it is sometimes forgotten that very small-scale enterprises are the rule. According to the 1947 census, about two-fifths of the industrial labour force in the Federation comprised not wage-earners, but 'own-account' workers and unpaid family helpers. Hence the importance to Malaya of encouraging the small man in industry. To some extent this is given by the Rural and Industrial Development Authority (RIDA) which was set up in 1950, not only to build up agriculture and village amenities, but also to encourage the growth of small-scale industries. The 1956–60 Development Plan provides for an extension of RIDA's activities and for the establishment of an Industrial Development Finance Corporation.

Population Growth and Economic Development[1]

The population problem of Malaya is as yet only a potential one; it is based on the assumption that there will be very little increase in the production of tin and rubber—the twin pillars of economic life in Malaya—whereas, as the previous chapter showed, the total population of the country will continue to increase rapidly. The natural increase is already over 30 per 1,000 in most parts of the peninsula and such rates can mean the doubling of Malaya's population within the next 25 years.

One of the implications of this is a danger that economic development in Malaya will be limited by population growth. In terms of capital, certainly, such a high rate of population growth

[1] This section follows in general the argument used by the writer in 'Demographic Influences on Economic Development in Southeast Asia', in *Nationalism and Progress in Free Asia* (ed. P. W. Thayer), Baltimore, 1956, pp. 214–223.

is costly. Assuming that about 4% of the national income must be saved to cope with 1% increase in the total population at the same standard of living, Malaya requires a net domestic capital formation rate of some 12%–15% merely to deal with the increasing population. At present rates of domestic capital formation Malaya can do little in the way of economic investment without outside help. This problem is made worse by the age structure: the high proportion of children in the total population is a further limitation to capital formation.

Many issues, relating to the whole policy of social and economic planning—public utilities, education, industrial and agricultural developments—must be considered in the light of the demographic realities outlined above. Thus, many services like medicine, housing and water supply have clearly to be planned for the future rather than for the present day population. In Singapore, for instance, there must be an addition of 20,000 places a year in primary schools and it is proving difficult to provide adequate housing at a rate commensurate with the rate of population growth and at the same time improve the housing already in existence. During 1954, 5,000 houses were completed on the Island: they housed about 25,000 people, whereas the natural increase alone during that year was 44,000. Then the island colony must expand its economy to provide employment for all the extra workers at present being added to the available labour force at the rate of 16,000 a year. There is already a surplus of unskilled or semi-skilled workers in the Colony and widespread *under*employment. It is believed that the upper limit of population which the island can hold by 1972 without a lowering of the present average standard of living lies between 1,600,000 and 1,800,000. By then, however, the population is likely to be at least 2,000,000 so that there will be a surplus population of some quarter of a million. Moreover, the simple density of population on the Island is already very high. Even for a largely urban population the average density of 5,100 persons to the square mile is high when it is remembered that much of the island (about 27%) is swamp or land reserved for the armed services. In the future planning of Singapore, the fact that overrides all others is 'the rapid increase of population and its relationship to the limited area of land in the Colony.'[1]

[1] Singapore Colony, *Report of Survey: Master Plan*, Singapore, 1955.

Throughout Malaya, there seems little doubt that all efforts must be made to prevent the benefits of economic development being dissipated by the rapid growth of population. How can this be done?

One line of approach is to attack the natural increase directly by a more widespread use of birth control methods. The value of such methods is very much a matter of opinion. It is perhaps for long unlikely to be effective among the bulk of Malayans because of low educational and economic standards and because large sections of the community have cultural, particularly religious prejudices to overcome. This is not to dismiss birth control as a potentially effective measure, especially in the towns of Malaya. Indeed, it is suggested that Singapore is the one country in Southeast Asia which can and must tackle her population problem primarily by the large-scale application of birth control methods. Conditions are unusually suitable. Four-fifths of the population are Chinese, who have little prejudice against birth control. The population, moreover, is four-fifths urban and nowhere on the island so isolated from the city that the regular dissemination of information is impracticable. Then the rapid progress in education and the relatively high standard of living enjoyed by this largely urban population should itself, at least by western analogy, help to bring about the desired decline in fertility. If birth control measures are made widely available and the way to use them fully publicised, there seems to be no reason why birth control should not be successful in reducing the birth rate in Singapore. Perhaps the most difficult task is to make the population *want* to use artificial methods for birth control. There are firm and urgent grounds for widening the support given by the Government to the Family Planning Association in Singapore. To some extent, the same applies to the towns of the Federation.

The other line of approach is directed at developing production at a rate greater than the rate of population growth. The difficulties and possibilities of dealing with the two most important measures under this heading—the increase of rice production and the development of industrialisation—have already been mentioned briefly. It is hoped that industrialisation, in particular, will lead to an increase in national income, a relative increase in urban settlement and a lowered rate of natural increase of population. There is as yet little evidence, however, that urbanisation

will bring about the desired decline in fertility for some time to come. In this connection it is perhaps worth pointing out that Malaya, the most urbanised country in Southeast Asia, has the highest rate of natural increase of population.

In view of Malaya's potential population problem, and the unlikelihood of her solving her problems by emigration, it is logical to insist that immigration into Malaya should continue to be severely restricted. Moreover, it would be, as Smith puts it, 'a demographic tragedy if Malaya were made to receive large numbers of penniless illiterate immigrants, and thus lost the bright chances she now has of solving her own problem of population growth and showing the other countries of Southeast Asia how to solve theirs.'[1]

. . . . .

The distribution of population over the peninsula reflects to some extent the pattern of economic activities. Densities vary according to the crop. Thus, padi areas along the lowlands and deltas support higher densities than do the rubber plantation areas of the interior foothills of western Malaya. Moreover, the racial groups, with their several occupational specialisations, show clear instances in their distribution of correspondence with areas of specialised economic activities. Padi and rubber smallholdings are peopled chiefly by Malays: rubber plantations, tin-mining and urban areas chiefly by Chinese and Indians.

Two reservations must be made here, however. In the first place, though it has been emphasised that tin-mining, rubber cultivation and padi cultivation are still overwhelmingly the most important occupations in Malaya, the proportion of the population engaged in them has been falling and probably continues to fall. Other agricultural activities, such as oil palm cultivation,[2] are expanding; new crops, such as cocoa, are being introduced; and the relative importance of market gardening increases steadily. Industrialisation, with associated urbanisation and commercial activities, is also gaining ground. It is safe to assume that Malaya will become less and less a nation primarily of padi planters, rubber cultivators and tin miners. The simple occupational

[1] T. E. Smith, op. cit., p. 120.

[2] Oil palm, mostly an estate crop in Malaya, now occupies over 100,000 acres. (1955.)

structure is breaking down into a more diverse and complicated pattern.[1] And from the point of view of national income, it is often forgotten that activities other than rubber cultivation and tin mining are far more important (Table VI). Indeed, the whole economy of Malaya—at least western Malaya—is well advanced by most Asian standards, with well developed communications and social capital installations.

TABLE VI

GROSS NATIONAL INCOME BY INDUSTRIAL ORIGIN
(1953—Million $)

Rubber	715
Mining	325
Other Agriculture and Forestry	1,430
All Other Activities	2,925
Total	5,395

Data from International Bank Mission Report, p. 9. Figures in Straits or Malayan Dollars. One dollar = 2/4d. sterling.

In the second place, the above remarks have to some extent ignored the political separation of Singapore from the Federation. Most of the generalisations made in this chapter are quite meaningless if applied to Singapore where agriculture is of little importance, the vast majority of the gainfully occupied population there being engaged in urban activities, notably manufacturing, construction and transport. The economic structure of Singapore is quite different from that of the Federation of Malaya.

[1] It is perhaps too often and too easily assumed that such diversification of production, implying as it does an increased production for the home market, is necessarily desirable. Malaya, however, has been able to reach her relatively prosperous level of today—a *per capita* level of national income estimated at $800 in 1953 (which is the highest in the Far East)—largely by her specialisation in the production of exports for world markets. Lim Tay Boh has emphasised that diversified production for the home market *as a substitute* for specialised production for the export market would involve a lowering of Malaya's *per capita* income. Diversification, Dr. Lim concludes, should be complementary to, rather than a substitute for, specialised export production. (See Lim Tay Boh, in *Nationalism and Progress in Free Asia* [ed. P. W. Thayer], Baltimore, 1956.)

5

Rural Settlement

Rural House Types

IN MALAYA the types of peasant houses vary chiefly with the racial community inhabiting them. There is otherwise little regional variety of building material or house pattern in this peninsula of uniformly hot, wet equatorial conditions, with deeply laterised soils and rain forest vegetation.

The typical Malay house has walls and floor of some kind of wood, a steeply-pitching roof of *atap*,[1] and is commonly built on piles. Houses built on piles are found continuously from southern Tibet to the South Seas. They are now a cultural tradition among Malays in Malaya, though in places they are necessary for any kind of settlement. Along the coasts and in swamps, along the banks of rivers, or even on flat land well inland where flooding is likely, the pile is a sensible adaptation of the house form to the physical environment. But the same phenomenon is found in Malay houses even where local conditions do not demand it: Indian and Chinese houses may be found on the same site as Malay houses on piles. Piles lift the house clear from any dampness of the ground, give a cool draught under the house, provide protection against animals and snakes,[2] and allow smoke fires to be lit underneath to keep mosquitoes away. Further, they provide storage space, a work room or a rubbish dump. The piles are constructed of hard, damp-resisting and insect-resisting wood such as *nibong* (*Oncosperma tigillaria*). Where the gound is soft and yielding, 'feet' of dried laterite or large stones may be placed under the piles, thereby spreading the pressure over a larger area. More modern and prosperous houses may be supported on brick or cement piles.

[1] *Atap* is palm-leaf thatch and in poorer houses may be used for walls as well as for roofs. The use of other materials for roofing—such as locally made tiles, which are found to be more durable than atap—is increasing in parts of the peninsula.

[2] Access to the house is commonly by wooden step ladders which in jungle areas may be drawn up at night.

Variations of the Malay house type are many and cannot be explained solely in terms of community differences, though two variations at least seem to reflect such differences quite faithfully. One is the house type of the Minangkabau, found chiefly in Negri Sembilan. Constructed with carved wood, the house has an ornamental appearance which is increased by a concave roof and ridge pole. The gables are not flush with or parallel to the walls but project far out and slope back as they descend—'like the swooping flight of a hawk.'[1] A second variation in house type among Malays is found among the Banjarese in the Krian district of Perak. A Banjarese house there has rather longer stilts than other Malay houses and has an open veranda and slits in place of windows. These slits, often the width of one of the wall planks and about three to four feet long, are closed by flaps of wood hinged at the top or bottom. There may be two or more slits in each wall and they are placed at such a height that a person sitting on the floor inside can look through them.

Though the Chinese peasant house is similarly built of wood and atap, it is very rarely stilted. It is usually built on the ground without any proper foundation except an earthen platform about eighteen inches thick. There are in Malaya instances of Chinese villages built on piles, but these are invariably where settlement would be quite impossible without them. This applies more particularly to the coastal fishing communities. Thus parts of the mangrove belt along the west coast contain some large Chinese settlements, such as those on Pulau Ketam (Selangor). The Chinese villages there are all lapped by the tide, and in some cases completely surrounded by water, and are an agglomeration of semi-permanent structures raised on piles. It must also be pointed out that the pile dwelling is by no means unknown in China: it is found in scattered localities along the coast and elsewhere in South China. In general, however, the Chinese in Malaya have what amounts to a prejudice against the use of piles in constructing their houses. So strong is this prejudice that Chinese peasant houses have been noted without piles on regularly flooded land: for example, in the padi fields of Kedah. The Chinese, at least in this particular area, have stated that they do not use piles because they do not want their houses to be mistaken for Malay houses.

[1] Quoted by Sir Richard Winstedt, *Papers on Malay Subjects, Life and Customs*, Part II, Kuala Lumpur, 1909, p. 12.

Even outside padi areas, the Chinese peasant house without piles is perhaps less well adapted than the Malay house to the Malayan environment. It is true that an earthen floor maintains a fairly constant temperature somewhat below the mean air temperature, but it is likely to be damp or even wet and so to support a layer of humid air near it. It is difficult to keep clean, harbours pests, and becomes easily infected if sanitation is faulty. The chief asset of the earthen floor is that it costs practically nothing, whereas the provision of piles can easily be the most expensive item in the building of a house. Another feature common to most Chinese peasant houses is that the wall opposite the entrance is unbroken by doors or windows. This, too, is ill-suited to Malayan conditions where through draught and ventilation are all-important. This feature may be the result of the courtyard tradition in China where privacy and security from the outside were important considerations. It has also been suggested that the phenomenon may be due to the desire to be faced by the family altar on entering the house.

The rural Indian usually lives in a labour line, which is a long hut divided up into separate dwelling units but occasionally with a common veranda. Even where Indians live in smaller groups, it is common to find several Indian houses under a common roof, a characteristic rarely observed among Malay or Chinese peasant houses in Malaya. Like Chinese houses, Indian houses are very rarely stilted.

From the geographical standpoint the peasant house in Malaya is unquestionably an element of the landscape and indicates both the cultural affinities of its inhabitants and the nature of the physical environmental conditions. The cultural affinities of the inhabitants have already been shown to be particularly evident in the differences in house types between communities. Rural housing in Malaya also gives many evidences of physical controls. The structure is commonly of local wood. Wood has the advantage as a building material in Malaya in that it has a low diffusibility, a fact which has even greater importance in a hot desert country, however, where there is more seasonal temperature variation and where radiation to outer space is less curtailed by high humidity and cloud. Roofing in Malayan peasant houses is commonly of atap made from local palm leaves. The atap thatch is usually made from the sago palm (*Metroxylon*) if away from tidal waters or from the

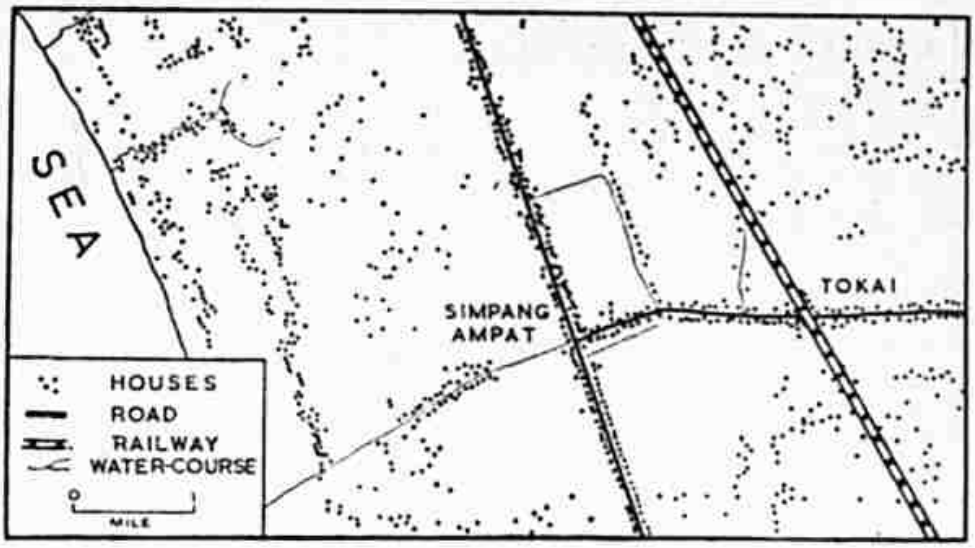


FIG. 15

Settlement in part of the Kedah Coastal Plain. Note linear pattern along permatang (near coast), roads and watercourses.

nipah palm (*Nipah fructicans*) if the area lies near brackish water. The architectural features, too, show physical correlations in certain ways: the Malay house is on piles for many reasons, including the avoidance of damp and the encouragement of greater coolness. Further, all peasant houses with atap thatches have steeply-pitched roofs in order to present as sharp an angle as possible to the sun's rays and to increase the run-off of the rain, so preventing rotting of the palm-thatch. Moreover, roofs with good air space below give more comfortable conditions than do flat roofs. The roof angle, however, is partly determined by the material used. It is usually less—about 30° from the horizontal instead of 40°—if zinc sheeting is used. Zinc sheeting does not require a steep angle to shed its water effectively and in any case zinc sheeting is more expensive than atap; a wider roof angle requires less covering. Many New Villages in Malaya have zinc roofs for their homes. Zinc sheeting has three disadvantages: it is very noisy during rainstorms, increases glare outside in the village when the sun is shining and makes for a hotter house. Sometimes a zinc roof is covered with atap.

In European countries it has been noted that the layout of the farm buildings and the plan of the house are important features geographically because they indicate the rural dwelling to be a 'functional unit which is related to the agricultural economy,

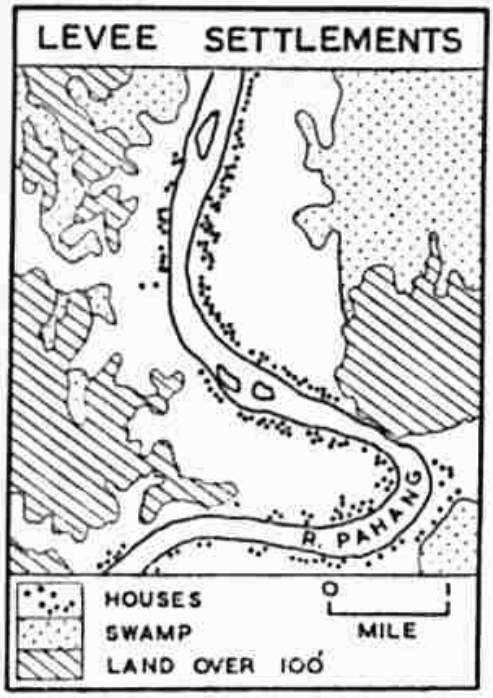


FIG. 16
Levee Settlement in Pahang. Padi land left white.

the population density and the standard of living.'[1] Rarely, however, does a Malay house have any other kind of outbuilding than a small store for padi (*jelapang*). The Chinese rural dwelling, too, is of the simplest plan, having perhaps a pigsty and a hen house nearby. It is far less true of Malaya than of Europe that 'the rural dwelling is both a shelter for man and an instrument of his agricultural activities.'[2] In most cases it is little more than the first. The tools and techniques of the peasant in Malaya are simple. His traditional subsistence, small-scale, agricultural patterns are not of a kind to stimulate any but the simplest of architectural forms.

Padi Settlements[3]

Kampongs associated with the growing of padi are largely Malay; other communities have as yet made few inroads into this traditionally Malay preserve. Padi kampongs are commonly of loose linear pattern: along the edge of a padi field, at the foot of a hill, on levées along the banks of rivers, along the tops of permatang, beside canals or parits (drains) (Figs. 15—18). This linear characteristic of padi kampongs in Malaya is a sensible adaptation of settlement pattern to a variety of conditioning factors.[4] In the first place, the linear pattern is the logical response

[1] J. M. Houston, *A Social Geography of Europe*, London, 1953, p. 109.

[2] J. M. Houston, ibid.

[3] For an invaluable descriptive study of settlement patterns in Malaya see E. H. G. Dobby, 'Settlement Patterns in Malaya', *G.R.*, Vol. 32, 1942, pp. 211–232.

[4] It must again be emphasised that the individual farmer rarely if ever considers all or indeed any of these conditioning factors. As with building his house on piles, the farmer is simply adhering to custom.

5. Kedah Malay women transplanting padi

6. Harvesting padi in a former jungle swamp

7. Trengganu fishermen

(Crown Copyright Reserved)

8. Minangkabau type house

(Zainal bin Abidin)

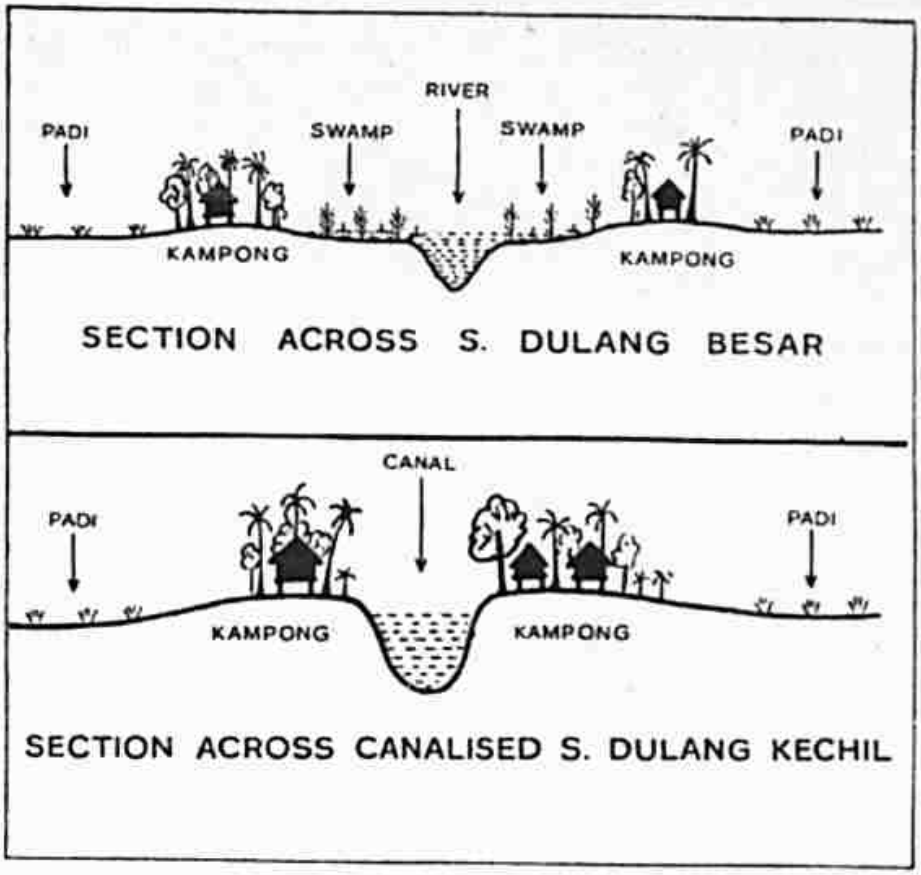


FIG. 17

Contrast in House Sites.

to the need for economy in the amount of land used for purposes other than the growing of padi: dispersed houses would entail wastage of land on connecting paths, and nucleation is impracticable since each householder desires to be as near as possible to his padi field.[1] A further reason for the linear pattern of settlement in padi areas is that both the natural and cultural features of a padi landscape—levees, permatang, roads, paths, irrigation and drainage canals—tend to be linear. Furthermore, the linear pattern of settlement in padi areas is frequently determined by the original layout of lots.

The usual practice is for a narrow elongated lot to be placed with one of its narrow ends along a stream, parit, irrigation canal, path or roadway. Such a design allows the maximum number of holdings to enjoy frontage either on to irrigation channels, which

[1] But see Figs. 19 and 20.

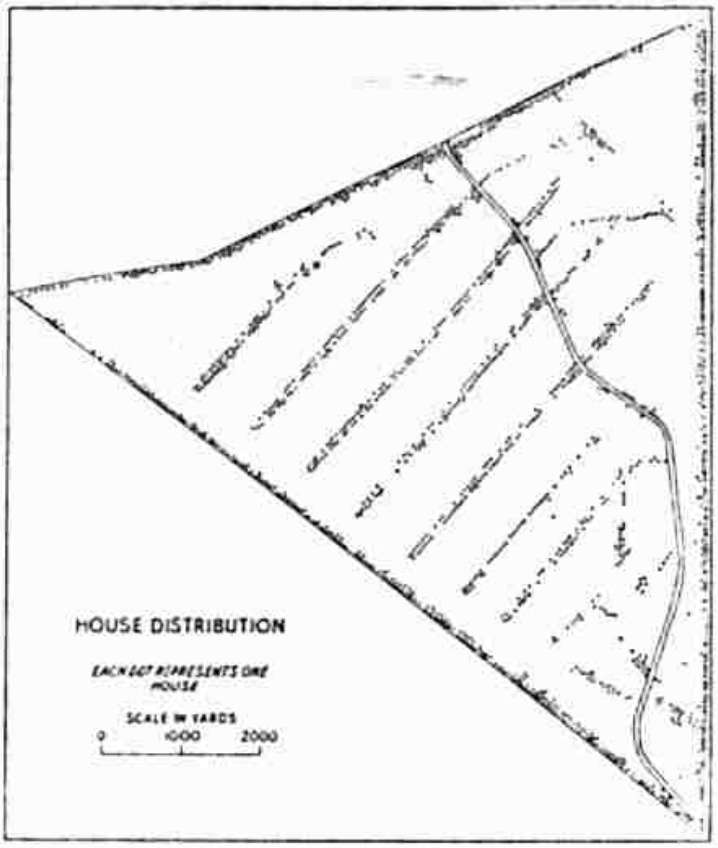


FIG. 18

Linear Pattern of settlement in padi areas.

provide access or water supply for agricultural purposes, or on to roads, which provide accesss. Kampong land may be restricted by law to a part of each lot: commonly that part nearest the water channel or road. A linear pattern of houses is the result. How important a conditioning factor this may be is indicated by the relative absence of linear pattern settlements in certain areas. In the north-east of Malaya, except where roads are good, padi settlements are often not linear in pattern, possibly the result of long-continued settlement and the fewer irrigation lines in this region of higher and more strictly seasonal rainfall.

The linear pattern is socially far from ideal. Many kinds of servicing are more expensive for loose linear settlements than for nucleated settlements, and it is often difficult to find a satisfactory location for schools, dispensaries, or other foci. Where levées line the banks of rivers, as along the Pahang River, it has been observed by Dobby that kampongs tend to split up into two

halves on opposite banks: the names of kampongs there tend to run across the river rather than along it, differentiating the two parts by the inclusion of 'right' or 'left' in the names of the kampongs. Examples are Kampongs *Layang Layang Kiri* (right bank) and *Layang Layang Kanan* (left bank).

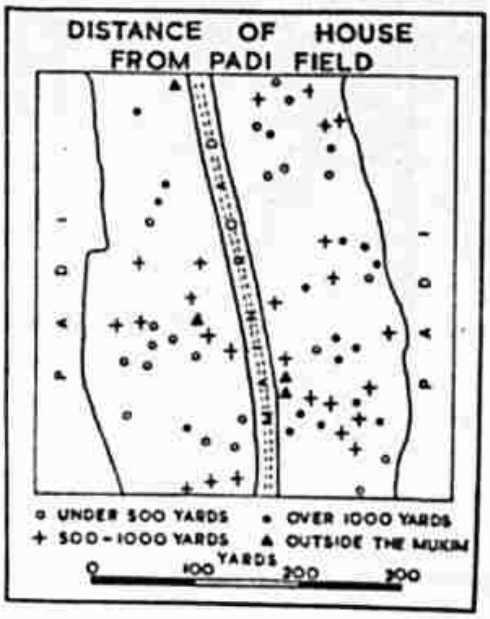


FIG. 19
Distance of House from padi field in Province Wellesley.

Rubber Estate Settlements

In contrast to padi planters, rubber estate workers are largely immigrant in origin—Indian and Chinese—and their settlements typically nucleated (Fig. 21). The houses of workers on European-owned estates are usually built before the arrival of the Indian labourers and are in the form of long buildings divided into rooms. These *lines* are placed in groups, the chief concern in

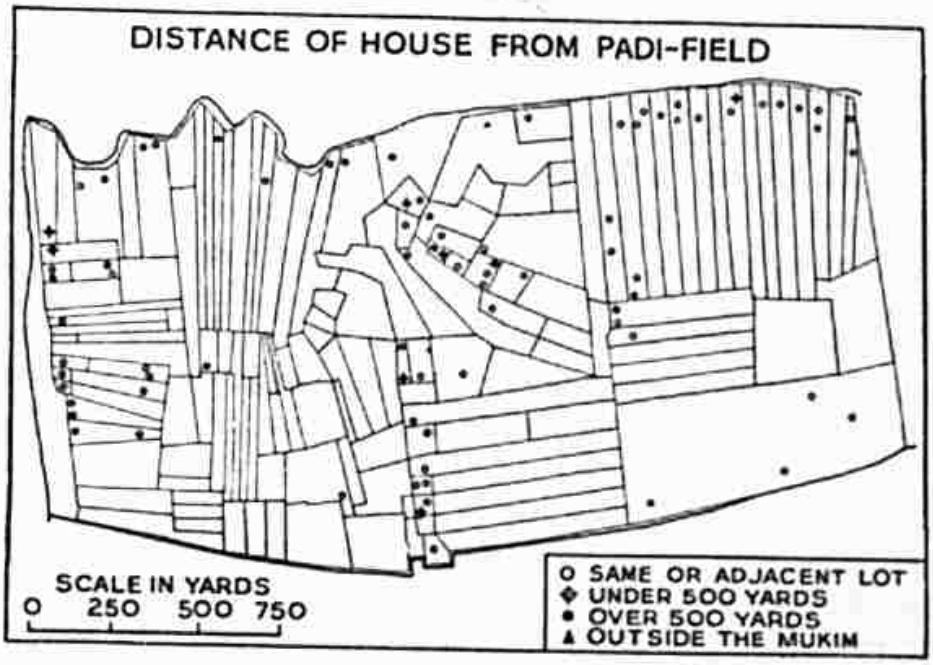


FIG. 20
Distance of House from padi field in Kedah.

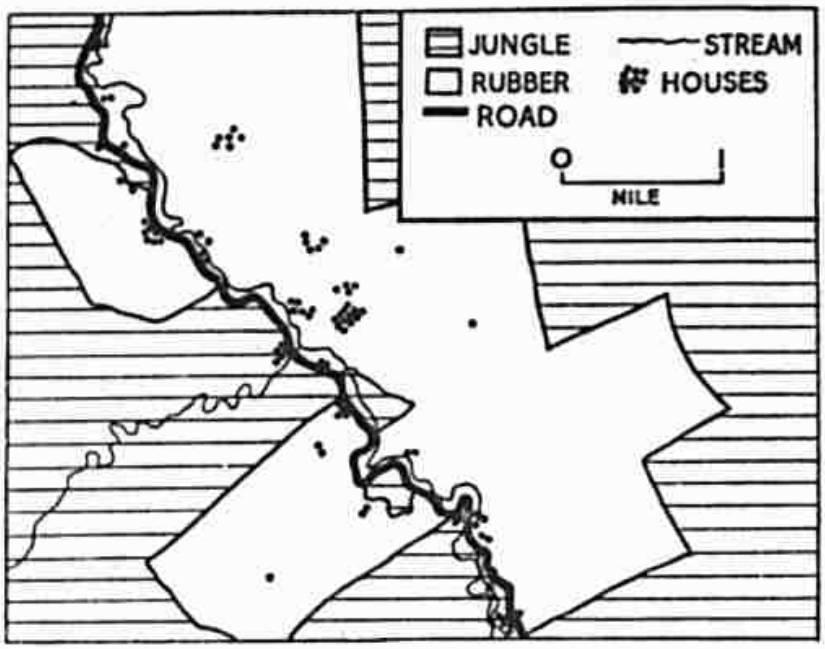


FIG. 21
Rubber Estates in Selangor.

their location being that the occupants should be able to reach all parts of the estate as quickly as possible. Such nucleations exist in spite of the fact that estates are invariably close to a road or railway which have often been the first inducement to clear jungle for the growing of rubber. Where linear settlement does exist along the road, it usually consists of Chinese or Indian shops serving the nucleated groups of coolie-lines. It is important to distinguish here between European-owned and Chinese-owned rubber estates. The former have always had the nucleated settlements just referred to, but before the Emergency Chinese tappers more usually lived around the edge of Chinese-owned estates, practising part-time subsistence or cash crop agriculture as well as rubber tapping. Only regrouping and resettlement have induced the present nucleation in their case.

Mining Settlements

Nucleation is characteristic of mining kampongs but the size and density of settlement varies not only with the *size* of the mine but also with the *type* of mine. Dredge mines are expensive, largely European-owned, and employ only a few labourers of the skilled artisan type, so that the density of settlement is

low and the buildings often temporary because the labourers must be able to move with the dredge. The other important kind of mining in Malaya—gravel pumping—results in a far greater density of settlement since more labour, largely unskilled, is required.

Dobby has noted a difference of house type and social organisation between Chinese-owned and European-owned tin-mining settlements. Chinese miners in European-owned mines live in separate family houses. In Chinese-owned mines, on the other hand, the traditional building is the *kongsi* house, which comprises mine offices and sleeping quarters for the workers and often also for the supervisory staff. While many of these kongsi houses are of poor construction and design, they suit the miner well, for he rarely brings members of his family with him on the mine, but prefers them to remain in the small house he has built on the land near at hand, growing vegetables or raising poultry and pigs. This gives the miner some kind of security should his work at the mine come to an end.

Fishing Kampongs

Padi farming and fishing are the twin pillars of the Malay way of life, but whereas few Chinese engage in the growing of padi, they have long provided competition in fishing. Consequently, fishing kampongs around the coasts of Malaya may be either Malay or Chinese—rarely Indian.

Fishing kampongs—like padi kampongs—have in general a linear pattern, though in this case it is the logical result of function and location. The focus of the fishing village is commonly the beach, which often serves as a market place. Where long stretches of firm sand occur, as along parts of the east coast, the beach may also be used as a highway. Certain favoured stretches, such as that between Kampong Cherating and Kampong Sungei Alor, can be used by motor transport at low and medium tides and so help to reduce the isolation of settlements which could otherwise only be reached by sea. Along the west coast the mangrove fringe often forces the fishing villages to the landward side of the mangrove strip, so that the effective limit to coastal settlement along the west coast of Malaya is often not the coast itself but the inner edge of the swamp. In many places the location of a fishing kampong shows clearly a response to the need for shelter from the

violence of winds and storms. This is most striking along the east coast where many fishing settlements, such as Kampong Cherating, shelter behind a ridge. Wind-breaks of coconut fronds are also to be seen in places on the windward side of settlements as the season of high winds from the north-east draws near in November.

. . . . .

The above classification of rural settlements on the basis of economic activities ignores the numerous transitional and multiple types which occur particularly where two activities—notably rice and rubber—merge. In the interior valleys—for instance in Negri Sembilan—Malay rubber and padi smallholdings produce linear settlements along the junction between two types of land use: 'the floors of the valleys and many of the branches are occupied by rice-fields, irrigated by channels taken off from the central stream and led along the hill-foot, into which the water is directed as required. Here and there these irrigation channels also intercept water from small side streams. Above the marginal irrigation channels run the main footpaths traversing the length of the valley. Lying just off these paths, usually further up the hill-foot, are the houses, each standing in its own piece of land and bowered by fruit trees and coconut palms. Behind and above the houses, the hill-sides, now grown much steeper, are usually planted with rubber, and this gives place finally to the jungle from which the people obtain timber of many kinds, gums, rattans, bamboo, and the rougher sorts of palm thatch, and from which issue forth enemies of their crops such as pigs, monkeys and deer.'[1]

Another complication arises where either rubber or coconut smallholdings dominate the land-use. The fragmented ownership of such holdings encourages dispersion rather than nucleation in settlement pattern.

As a general conclusion, it may be suggested that the racial composition of the population and the type of land use are the most critical factors governing the patterns of rural settlement in Malaya. Agricultural field patterns, however, have also occasionally been important forces in the causative process.

[1] Federation of Malaya, *Studies from the Institute for Medical Research*, No. 19, 1951, p. 13.

Resettlement

The much-publicised resettlement of squatters in Malaya has meant nothing less than the creation of villages or towns where few or no previous settlements existed. Whether these settlements will prove to be permanent once the Emergency is ended remains to be seen. At the moment, however, resettlement is having a great effect on the pattern of population distribution and has many important social and political, as well as economic, implications.

The 'squatter' problem in Malaya may be said to have begun in the 1930's when, as a result of the world economic slump, some of the immigrant labourers on the rubber estates and tin mines turned to the land for a livelihood: they squatted without title or lease on estates and Government land. But the more important cause of the squatter problem developed during the Japanese occupation. Estates and mines were closed down and there was a general exodus from towns to isolated rural areas. At the outbreak of terrorism in June, 1948, the number of squatters was about 500,000, most of whom were cultivating small plots of vegetables, fruit, and padi. They were beyond the bounds of effective administration and often completely at the mercy of the terrorists.

Such dispersion and isolation made it impossible to protect the squatters and to prevent them giving information and food to the terrorists. About 570,000 people—about 10% of the total population in the Federation of Malaya and almost all Chinese—have been taken from squatter isolation and gathered into some 550 New Villages. This has proved to be one of the most effective means of combating the Emergency.

The critical factor in the location of a resettlement unit is security, so that New Villages are normally along main roads to speed the movement of supplies and reinforcements. At first, villages were placed athwart a road, but the consequent restrictions to through traffic soon made it clear that a location along one side of the main road is more convenient. Hill sites, though providing good defence, rarely coincide with suitable farming land, and so have rarely been chosen for resettlement villages, which are composed largely of agriculturalists. Moreover, hills have often been avoided because they provide good observation points for terrorists. Flat landscapes, especially where a water

supply could be assured—such as close to a stream—provide the commonest locations for resettlement villages. Such physical requirements in some instances mean excisions from Malay reservations and the understandable reluctance of Malays to waive their rights to such land was but one of many difficulties to be overcome.

Farming, particularly market gardening, has become increasingly emphasised as the basis of the resettlement economy, partly because of the urgent need for farm produce. Over one-third of all market gardens went out of cultivation and urban markets suffered as a result of the relocation of Chinese squatters. Between 1948 and 1951 the acreage under food crops, excluding padi, in the Federation, dropped from 95,727 to 67,465 acres—that is by about one-third. During the same period imports of fresh vegetables into the Federation increased from 7,326 to 12,680 tons.

Only infrequently is sufficient farming land included within the wire perimeter of a New Village, and the resettled agricultural squatter therefore often has to face the problem of having his land located well outside the perimeter. The resettled miner or rubber plantation worker may be even more seriously placed in this respect. He often lives some way away from the mine or plantation where perhaps he is on contract. Not only is time lost in getting to and from work, but restrictions on the carrying of food result in loss of energy and reduce labour efficiency.

The substitution of nucleation for the old dispersion makes possible the provision of many social amenities and services—necessary ingredients of the resettlement policy. Many improvements are real and permanent. They include land distribution, economic security, housing, medicine, education and opportunities for worship.

New Villages are developing a strong community sense in contrast to the intense individualism associated with isolated, dispersed, rural settlements in Malaya. And indeed it is clearly desirable, for many reasons, to aim at creating balanced, self-contained communities. 'The concentration of squatters for police control, and the denial of their reluctant help to bandits in the shape of food and money, are admirable in themselves, but in these new villages, and in the new wealth and sense of responsibility which springs from them, can be found also the only answer to

Communism which the illiterate peasant will understand. It is useless to urge him to reject Communism, which promises him so much and is, moreover, controlled by people of his own blood, for this mysterious intangible called democracy. Only security of land tenure, public services, schools, and opportunity can make it a reality. This is an old argument in the west, but here in the darkness of the lawless jungle fringes, it is a promise of new life.'[1]

[1] *The Times*, January 29th, 1951.

6

Urban Settlement

AT THE 1947 census the urban percentage of the population of Malaya was 35%, having increased since 1911 as follows:

Census Year	*Urban Percentage*
1911	23
1921	28
1931	30
1947	35

Any discussion on the implications of these figures faces two difficulties. First the criterion of 'urban' remains the same throughout the period: the same definition of an urban settlement as a settlement of not less than 1,000 persons was used in 1947 as was used in 1911. Secondly, the use of municipal or other administrative limits results in a legal as distinct from a geographical concept of urban. The degree of urbanisation[1] is commonly greater than the census figures reveal partly because there has been considerable 'population-clotting' around the towns, so that, as the census puts it, 'while the figures . . . indicate that one person out of every four in the Federation lives in a town or village, the proportion would be nearer one in three if dormitory and food-supply areas were taken into account.'[2]

However, the underestimation of the urban percentage involved in the non-geographical definition of municipal and similar areas is balanced to some extent by the overestimation inherent in the use today of the 1,000 statistical criterion.[3]

The chief reason why 1,000 is probably too small a statistical criterion to define an urban settlement in Malaya today is related

[1] *Urbanisation* may be defined as the process whereby an increasing proportion of the population becomes concentrated in towns and cities. (See United Nations, *Economic Bulletin for Asia and the Far East*, Vol. IV, No. 1, 1953, p. 2.)

[2] M. V. Del Tufo, *1947 Census Report*, p. 44.

[3] This problem of criteria is illustrated as a fact of some importance by a comparison of the degree of urbanisation in Java and Malaya. Using the 1,000 population criterion, Malaya is easily the more urbanised country: using a 50,000 criterion, Java is the more urbanised.

to the processes of resettlement. Resettlement, involving some 10% of the population in the Federation, has concentrated formerly dispersed squatters into resettled units, usually exceeding 1,000 persons; this has greatly raised the official urban percentage, steepening, at least on paper, the inexorable trend of urbanisation in Malaya. These resettlement units, however, rarely have any of the functional characteristics of truly urban settlements. On the other hand, it is impossible to dismiss the statistical criterion and substitute a functional criterion. Malaya is at an early stage of social and economic development in which all but a few of the largest towns are functionally simply overgrown villages. There are also a large number of small mining settlements, too small to be considered urban, but with a distinctly industrial life.

Other objections to the use of a functional criterion in Malaya are, first, that for any sizeable area in the peninsula the necessary data are not yet available; secondly, even in a small area, the application of a functional criterion must involve subjective estimations difficult to express quantitatively. The solution to the problem is, perhaps, a higher figure than 1,000 to denote the change from a rural to an urban settlement. A figure of 10,000 gives a more realistic picture of the degree of urbanisation in Malaya.[1]

Using 10,000 as the statistical criterion, the 1911 urban percentage drops from 23% to 19% and the 1947 urban percentage from 35% to 28%. The use of the 10,000 figure avoids the effects of resettlement, for few resettlement units contain as many as 10,000 persons. However, it may be objected that 10,000 is too high a figure for 1911 and this suggests that an exact comparison of levels of urbanisation in time and space is not possible because of the changing and arbitrary nature of any urban-rural classification: there is rarely any clear-cut line at which 'rural' ends and 'urban' begins.

Adopting either the 1,000 or the 10,000 figure, the rate of increase of urbanisation between 1911 and 1947 was less than the rate of increase of the total population of Malaya. Whereas between 1911 and 1947 the population more than doubled in Malaya (Fig. 7), the urban percentage increased by little more than 50%. This is at first sight surprising, and the 1947 census report suggests that the explanation lies in the operation of a

[1] It is interesting that a figure of 2,000 was chosen for the 1957 census.

theoretical limit beyond which a country like Malaya, with its small development of secondary industries, will never reach. Some observers feel that the present urban percentage is the most that can be expected in a country with Malaya's economic structure. However, if the last inter-censal period is taken by itself it appears that during those years (1931—1947) the rate of urbanisation (50%) outstripped the total population increase of Malaya (35%). Only Kampar and Port Swettenham, both of which suffered severely from the war years, increased by less than 20% during this period. Furthermore, it is arguable whether a theoretical limit to urbanisation would ever apply in Malaya, for the social attractive forces of urbanisation are already operating very strongly. Rather does it seem likely in Malaya that 'the growth of population in urban and industrial centres appears to be inevitable if there is economic development, whether by industrialisation, by the development of mining, or by the commercialisation and improvement of agriculture.'[1]

Since the 1947 census, the increase in urbanisation is difficult to assess accurately. In the Federation there are now (1957) 36 towns with over 10,000 population as against 22 in 1947. As for the 1,000 criterion, in 1947 there were only 163 settlements with a population of over 1,000, and the addition of 550 or more New Villages as a result of resettlement must have brought the number to well over 750. An indication of how urbanisation has been stimulated in this way in Johore has been given by Dobby, who notes that in that state, whereas there were in 1947 only 19 settlements of over 1,000 persons, by 1952 there were 54 settlements of that size.

Whatever the criterion used, the urban percentage of the population is high. Even 28% (1947) is a high percentage for a country like Malaya, in which over half the working population is engaged directly in agriculture and in which there is very little industrialisation. It is, as Cooper has pointed out, a greater degree of urbanisation than is found in most Latin-American countries or in any Far Eastern country for which figures are available except highly industrialised Japan. The significance of this fact, however, is lessened by the inclusion of Singapore in the Malayan per-

[1] R. W. Steel, 'Economic Aspects: General Report' in *International Institute of Differing Civilisations*, Record of the Seventeenth Meeting held at Florence, Brussels, 1952, p. 120.

centage. The two largest towns in Malaya—Singapore and Penang—are entrepôt ports and in many ways quite untypical of Malaya. In fact, only 15% of the total population of Malaya lives in Singapore and Penang. Leaving out these two centres, the urban percentage of Malaya (using the 10,000 criterion) drops from 28% to 19% (1947).

Singapore is easily the most important urban centre in Malaya, but the most rapid rises since 1931 have been in the younger towns like Ipoh and Seremban. Of the 145 urban settlements in the Federation in 1947 for which the 1931 population was known, 39 were smaller, 40 increased by less than 25%, 23 increased by between 25% and 50%, 25 increased by between 50% and 100%, and 18 increased by over 100%. The pattern of urban growth in Malaya is clearly most uneven. Urbanisation in the peninsula, as in most parts of the world, is not simply a movement of people into the nearest towns. There has been a disproportionate concentration of population into the larger towns at the relative expense of the smaller urban centres, a phenomenon explained partly by the tendency of new industries to confine their activities to the larger towns. It is a characteristic of industries in underdeveloped countries to concentrate in a limited number of towns which often grow to a very great size.[1]

Urbanisation in Malaya does not reflect any significant change in the social and economic life of the Malay community, for Malayan towns are largely the creation of immigrant peoples. Of the total urban population in Malaya in 1947, 69% were Chinese, 12% Indians and only 18% Malays. Malays are the only community whose proportion of the urban population is less than its component of the total population. They were undisturbed by the urbanisation which accompanied the economic development of Malaya during the nineteenth and twentieth centuries. The only important towns in Malaya where Malays are the most numerous single community are in the north-east padi areas—Kota Bharu (Kelantan) and Kuala Trengganu (Trengganu)—and in the two east coast towns of Mersing (Johore) and Chukai (Trengganu). Moreover, the Malay percentage nowadays varies with the size of the town. In Singapore, Malays constitute only 11% of the population. In the Federation, Malays constitute 26% of the

[1] See on this point, 'Role of Cities in Economic Growth of Underdeveloped Countries', *Journal of Political Economy*, No. 3, 1953.

population in towns whose population is between 1,000 and 10,000, but only 19% in towns of over 10,000.

In an examination of the distribution of urban centres in Malaya, it is immediately apparent that there is no simple correlation between density of population and the distribution of towns. The two largest areas of high rural population density are in the north-east and north-west, where smallholder padi farming provides the basis for the growth of only a few smallish urban settlements like Alor Star (Kedah) and Kota Bharu (Kelantan).

The pattern of Malayan urbanisation by states shows clearly that Singapore is overwhelmingly the most urban of the political units, followed by Penang and Selangor. All other states had in 1947 an urban percentage below 30%, and Pahang, Kelantan, Perlis and Kedah were below 20% urban. The high position of Trengganu in this respect is at first sight surprising, but Trengganu has only half the population of Kelantan, and with its long coast and inhospitable interior, has a good development of fishing towns, ten of which were found along the Trengganu coast in 1947. Kelantan, with its short coast and emphasis on padi growing, has not experienced urban development to anything like the same extent.

It will further be noted that the steepest rise in urbanisation in Malaya between 1931 and 1947 was in Trengganu, chiefly as a result of the development of the fishing towns noted above. Singapore Colony, on the other hand, appears to have decreased its urban percentage since 1911, and although it has shown some increase recently, it has been at the lowest rate in Malaya. This paradox is simply explained by reference to the outward spread of the city population beyond the municipal boundaries.

Towns in Malaya are chiefly in the west. The two largest—Singapore and Penang—are on islands. On the mainland there are two groups of towns. There are those on the west coast, usually at river mouths, which derive their importance largely from local movement between their respective hinterlands and either Penang and Singapore: Port Swettenham and Malacca are examples. The second group includes those centres which have grown up mainly as the collecting and distributing foci of the tin and rubber belt in the west interior foothills: Kuala Lumpur, Ipoh, and Kampar, for instance. Along the east coast of Malaya, Kota Bharu, Kuala Trengganu and Kuantan are all small settle-

ments. Kuantan, the largest, is set well away from the silted mouth of the Pahang River and lies, like so many settlements in the east, to the lee of a protecting ridge of land. The unnavigability of the east coast during the north-east monsoon and the existence of sand-bars at river mouths are among the physical limitations to the growth of urban centres or ports along the east coast of Malaya.

Along the west coast there is a series of small ports, many of which are built on low hills, standing out like islands in swamp land and linked to the mainland by narrow bars. Telok Anson lies thirty miles up the Perak River on a peninsula formed by a meander. Port Weld is a small estuarine settlement almost surrounded by marsh and tidal water: a single road and a railway pass over the empty swamps to link it with the interior. Apart from the swampy nature of the coast, port development is further hindered by the silting of river mouths, as at Malacca.

Towns at the river mouths—whether along the west or east coasts—have one feature of some interest. Nearly all lie on one side only of the unbridged stream and in almost every case to the south—for instance Batu Pahat, Kuala Trengganu, Kota Bharu and Endau. This accords with the principle that towns tend to develop unequally on either side of the river, usually on the side least subject to flooding. But although it is true that in some cases the ground is rather higher and more suitable for settlement on the south side of the river, in many cases the south side has no apparent physical advantage at all. The fact that Singapore lies to the south of the peninsula may have some bearing on the phenomenon.

In their street patterns, Malayan towns emphasise the different historical, physical and economic factors in their growth. The irregular pattern of streets in Malacca contrasts with the regularity of the street pattern in the centre of Singapore and the severely geometrical pattern of places like Ipoh. Many of the recently developed towns in Malaya were originally placed athwart main trunk roads and built on the simple grid-iron plan, with the result that congested and dangerous traffic conditions now exist. This grid-iron pattern, however, is not confined to recent, rapidly developing towns. In some cases it must have an historical explanation. In 1909, for instance, it was observed of Kuala Trengganu that it was built with streets running at right angles;

'the squares thus left, each a separate kampong, being enclosed with high woven bamboo fences.'[1] The street patterns of some towns—for instance Kuala Lipis—indicate the hilly nature and restricted area of the site. In Seremban there is a remarkably clear correlation of street plan with the relief features of the site.

Urban Land Use In Kuala Lumpur[2]

As an example of the kind of land use found in the larger towns of Malaya, it is proposed to summarise briefly the pattern of land use in Kuala Lumpur, the Federation's capital. The urban geography of Singapore has already been described by Dobby,[3] and the land use zones of Penang by Lim.[4]

According to Fig. 22 Kuala Lumpur has seven urban land use zones, determined by the study of town plans and by work in the field.

The importance of the *Government Zone* has increased appreciably since the creation in 1947 of Kuala Lumpur as the capital of the Federation, and with the achievement of national independence in 1957. Government buildings—with strong Saracenic influences evident in their architecture—cover some 100 acres near the confluence of the Sungei Gombak and the Sungei Klang —that is at the original site of the town—and include the Sultan's mosque on the peninsula between the two rivers. The *Business Zone*, adjacent to the Government Zone but largely on the east bank of the Klang River, is a more limited area of about 20 acres but it nevertheless contains most of the large commercial and professional houses and banks of the town. Architectural features here are simpler, buildings are commonly of several stories and built close together. The great diurnal changes in population numbers, characteristic of these two zones in the centre of Kuala Lumpur, cause severe daytime traffic congestion which is aggravated by the large number of bridges.

Surrounding the Government and Business Zones, more

[1] Sir Richard Winstedt, *Papers on Malay Subjects, Life and Customs*, Part III, Kuala Lumpur, 1909.

[2] This section is a brief summary of some of the work carried out with the help of graduates from the Department of Geography, University of Malaya.

[3] E. H. G. Dobby, 'Singapore—Town and Country', *G.R.*, Vol. 30, 1940, pp. 84–109.

[4] Catherine Lim, 'Geographical Influences In Planning for Urban Penang', M.A. Thesis (Unpublished), University of Malaya, 1955.

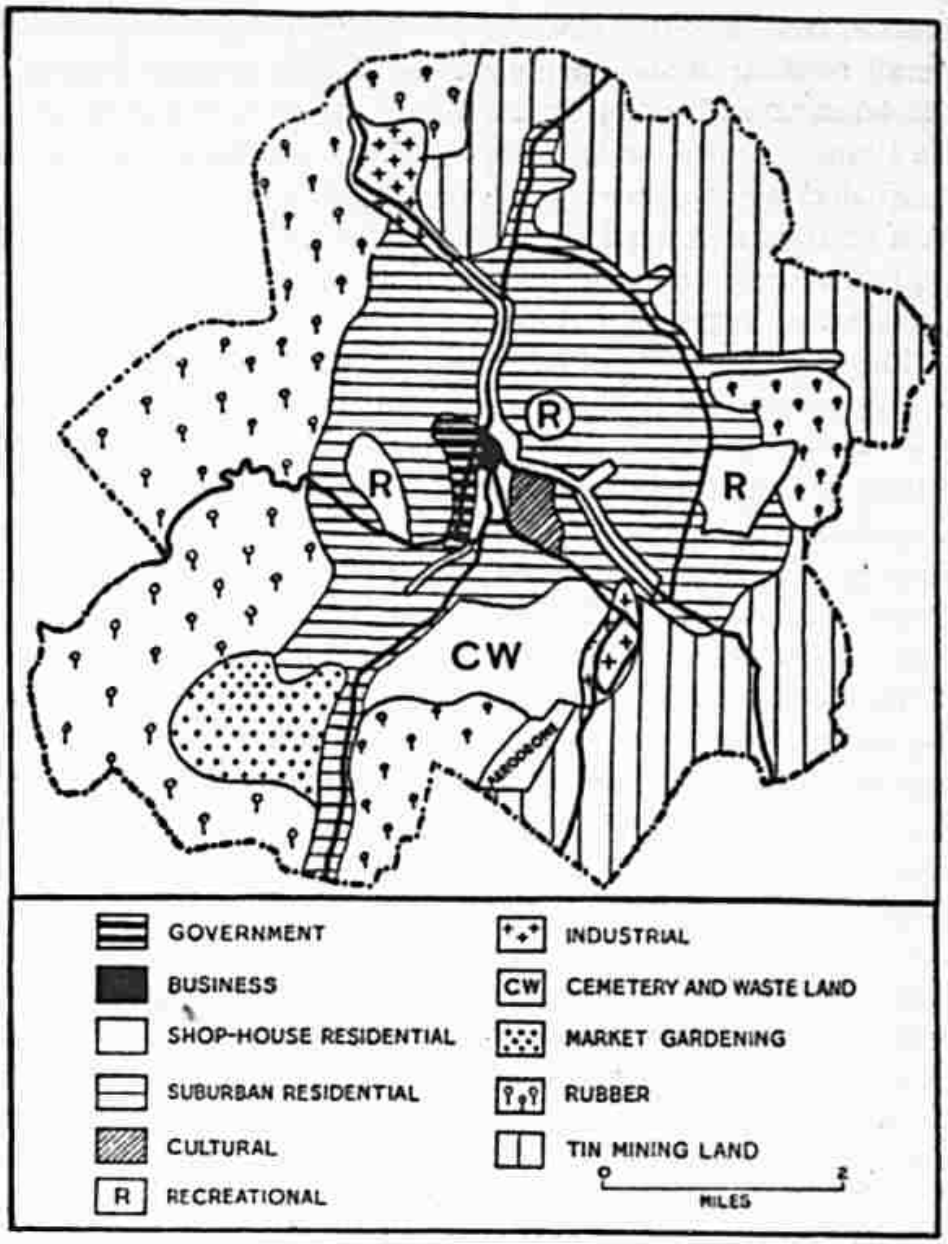


FIG. 22
Land-Use Zones in Kuala Lumpur.

especially to the west of the Klang River, the *Shophouse*[1]-*Residential Zone* radiates outwards along the main trunk roads. Regional specialisation in types of shophouses—a very characteristic feature of urban land use in Malaya—occurs frequently. For instance, the block of shophouses in Roger Street deals chiefly in wholesale general provisions—rice, dried foodstuffs,

[1] A shophouse is generally of two or more stories and consists on the ground floor of a front portion which may or may not be used as a shop.

prawns, cooking oils, beans and peas, soap, sauce and joss sticks. Retail clothing shops are numerous in Old Market Square at the junction of Petaling Street and Foch Avenue (where shops are Chinese-owned) and at Ampang Street and Batu Road (where retail clothing shops are Indian-owned). A third instance of this kind of regional specialisation occurs along the Batu Road from Ipoh Road to Pudu Road, where there is some specialisation in car servicing and repairing.

The *Suburban Residential Zone* covers a larger area than any of the other urban zones in Kuala Lumpur. It surrounds the first three zones and, like the shophouse-residential zone, stretches outwards along the main radiating roads. Europeans and wealthy Chinese live in large, modern bungalows or houses in Birch Road, Lorong Travers, Damansara Road, Circular Road, Ampang Road and in the Lake Garden-Klang Hill districts. Government quarters for Junior Asian officers and Senior Asian clerks, located in the Cheras-Peel-Circular Road area and in Kampong Pandan, are mostly two-storied, semi-detached brick houses, averaging two to three rooms each. Blocks of single-storey brick flats for municipal and railway labourers are located in Loke Yew and Shaw Roads near the railway line. The Malay Reservation in Kuala Lumpur is known as Kampong Bharu and is located on low, frequently flooded land bounded by Campbell, Batu and Princes Roads and adjacent to the Klang River. Houses here are mostly stilted in the Malay manner though there is more brick, zinc and tiling than is common in a typical rural Malay kampong.

Cultural and Recreational Zones are indistinct in Kuala Lumpur. The nearest approach to a cultural zone is the concentration of five schools, two churches, a Chinese temple and the Y.W.C.A. buildings. Three areas with recreational functions may be distinguished: the Lake Garden, the Bukit Nanas Forest Reserve and the Selangor Golf Club in the east.

Essentially a capital with administrative and commercial functions, Kuala Lumpur yet has two distinctive industrial zones. The Sungei Besi industrial area covers about 200 acres in the south-east of Kuala Lumpur. Foundries and engineering works predominate: out of a total of 48 iron foundries in Kuala Lumpur (1954), 40 are grouped together in the area bordered by the Sungei Besi and the Chan Sow Lim Road. But establishments here are mostly small, averaging fifteen workers to each estab-

lishment; the United Engineers Company is an exception in this respect. Other industries—including sawmills, aerated water factories, a biscuit factory and printing works—together employ over 1,500 workers.

The Sentul and Ipoh Road industrial area in the north-west has larger establishments than those found in the Sungei Besi area: the Central Railway Workshop, for instance, is the largest of its kind in Malaya and employs over 2,000 workers. Moreover, this industrial zone, confining its activities chiefly to engineering workshops and sawmills, has a skyline of larger industrial buildings with tall chimneys and provides perhaps the nearest approach in Malaya to an urban industrial landscape in the West European sense.

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It may be that the size and characteristics of urban centres have always been the criteria of civilisation and progress. They are the centres of intellectual as well as economic life. But apart from Singapore, Penang, Malacca, and Kuala Lumpur, most Malayan towns are alike in being simply overgrown villages: usually ugly, ramshackle, even temporary in appearance and consisting of one or two streets of Chinese and Indian shops with houses spread around. In this respect they have a pioneering outlook; a function of their rapid growth, their lack of the type of manufacturing or processing activities associated elsewhere with town life, and their dependence on the agricultural and mining activities of the surrounding countryside.

7

The Plural Society and Malayan Unity

TO ATTRIBUTE the genesis of Malaya's plural society[1] solely to the European's haste to make money out of tin and rubber is to misread the facts of history. There were important Indian and Chinese minorities around the coast before the arrival of the British (Chapter 2). Moreover, the British made no attempt to conquer the Malay States; as shown earlier, it was largely by request that they intervened in 1874 and the law and order so established turned into a flood the previously slow trickle of Chinese miners and Chinese and Indian traders into Malaya. With the development of rubber plantations in the late nineteenth and early twentieth centuries, Indian labourers were added to the stream of immigrants. Chinese and Indians together now easily outnumber the Malays.

In Malaya, the high percentage of Chinese makes unthinkable their forcible repatriation: the Chinese, as Purcell puts it, 'are here to stay.'[2] Further, they are vital to the country's economic prosperity. Why the Malay lags behind the Chinese in material civilisation is difficult to explain. Winstedt notes that the Malays are still mainly padi farmers with little need to work for hire; thus they fail to specialise or to realise the importance of capital. Lasker believes that debility and want cause their 'moral failings' [*sic*] while to Vlieland the Malay is the product of a marine-equatorial climate. Each observer will have his own opinions on this matter, but it is difficult to agree with those who imply that the Malay is lazy. Anyone who has watched the Malay at work in his padi field or fishing off the east coast feels this to be untrue. What is certain, however, is that the Malay philosophy sets greater store by spiritual than by material development. He is not greatly attracted by the sophistication and pace of urban life, so

[1] *Plural Society* is used here to mean a society in which several racial communities compete for land and occupations. Earlier chapters, however, give some support to Dobby's contention that the Malayan society is perhaps more accurately called 'cellular.'

[2] V. Purcell, *The Chinese in Malaya*, London, 1948.

that the economic incentive, so effective with the Chinese, is less successful with Malays. They are a charming, pleasure-loving and easily contented people, and their so-called indolence and improvidence are but an expression of their social and economic philosophy. A remark made in an official publication by the Indonesian Government could apply equally to Malays in Malaya: 'preference for periods of idleness among Indonesians is to some extent derived from a philosophical outlook, backed up by bitter experience, which has taught that a life of ceaseless toil is hardly human, because it allows little opportunity for development of the spirit.'[1] This is no mere rationalisation. It partly explains why, even though the Malays play such an important part in primary production, notably padi, the economic power is largely in the hands of aliens, and particularly of the Chinese. The Malay appears comparatively unwilling to undertake new functions or to learn new techniques.

While the Chinese are virtually in economic control, the Malays wield much of the political power. This division of function between the two main racial groups, though by no means clear-cut, is a serious problem in contemporary Malaya. The Chinese claim that economic power gives them at least an equal right to share the political power; the Malays find their political power weakened while the economic reins lie in the hands of another community. This functionalism along racial lines must be broken if disintegrating tendencies in the plural society are to soften. The distribution of the Malay is unlikely to change significantly. He will not be displaced into the forested interior uplands as his predecessors were. He lives close to, but is rarely part of, the main social and economic development in urban settlements. Unless he can take part more fully in urban life and shows himself willing to play his part in industrial and commercial life, the functional division will become increasingly anachronistic and the Malay, more than any other community, will suffer. There is some evidence in recent years of a growing sense among Malays of the need for economic realism. The introduction of a money economy cannot be ignored; it must rather be welcomed and encouraged. As Firth noted some years ago, 'the establishment of plantations, as those of rubber in Malaya, can show him [the Malay] useful ways of improving his cultivation. The opening up of new roads

[1] Republic of Indonesia, Ministry of Information, *Indonesia*, Djakarta, 1951.

and railways can give him a wider market among the labourers for the local sale of his fruit and vegetables. It can give him also a chance of earning money as a labourer himself during the slack season in his agriculture.'[1]

There is another facet to this problem: the proportion of Malays is decreasing, that of the Indians and Chinese is increasing. In the Federation there is still a majority of Malays, a fact which is partly responsible for the political separation of Singapore from the mainland. But this can be no more than an expedient, for the Malays are becoming relatively less important numerically (see Chapter 3). When this fact is coupled with the racial alignments in economic and political functions the seriousness of the problem arising from the plural society becomes evident. Not only internally, but externally too, 'democracy' in Malaya could involve the speedy economic and political suppression of the Malays by Chinese and Indians. Should popular elections on western lines be fully adopted, Chinese could be in effective control of this 'key' to the Pacific—a fact in which Australia and New Zealand, as well as America and Great Britain, must be interested.

The policy of Malay paramountcy still holds sway, and is still supported by most recent observers. But, as Carnell puts it, 'like the problems of French North Africa, British East and Central Africa, and Palestine, the Malayan problem is really a moral dilemma posed by those recent migrations of people which have been the very stuff and essence of modern colonisation. Each conflict has been one of right with right. In each case, the people in possession when the migration took place have been driven ultimately by nationalism to resent the presence of thrusting, economically sophisticated settlers whom they regarded as intruders who have dispossessed them of their own homeland. On the other hand, the settlers proclaim that without their industry and enterprise, the countries concerned would still be jungles, swamps or deserts. They have strenuously denied that they have any less right in these countries they have so amazingly transformed than those who claim to be their indigenous peoples. Britain in Malaya, as in all the colonial plural societies, has been faced for some time now with this dilemma.'[2] It is now the task of Malayans to face this problem themselves.

[1] R. Firth, *Malay Fishermen: Their Peasant Economy*, London, 1946.

[2] F. G. Carnell, British Policy in Malaya, *Political Quarterly*, Vol. 23, 1952, pp. 269–281.

It would be vain to hope for any kind of fusion in the sense of intermarriage between Chinese, Malays, and Indians. Winstedt is surely justified in maintaining that *no* political system can fuse races differing in colour, religion, civilisations and ideals as the Malays, Chinese and Indians differ. The Malay, perhaps, has most to lose in any failure to find a *modus vivendi* with the more recent immigrant peoples; he, as well as they, must be prepared to make adjustments if the fundamental problem of functionalism along racial lines is to be solved and the development of unity in the sense of national cohesion thereby furthered.

Malayan unity, it has been emphasised, cannot progress beyond the limits set by the plural society problem. The Chinese point of view is that a united nation in any real sense of the term can only be effected by applying the principle of *jus soli*—under which automatic citizenship is the birthright of everyone born in the Federation of Malaya—to all Malayans instead of confining this right to Malays only. Other writers express concern at the economic dependence of the Malays upon the Chinese and point to the 'evils' of the Chinese and Indian middlemen in the Malayan economy.

But the implications of the plural society on the development of unity in Malaya are often over-simplified. The demographic side of the problem, as pointed out already, includes the division of the people into three main racial and community groups, with differing functions and differing rates of growth. Moreover, each of the racial groups is by no means homogeneous. Malays and Indians are in many respects heterogeneous peoples, and the same applies perhaps to an even greater extent among the Chinese. The mutual unintelligibility of the various tribal dialects, the break-down into clans and societies, the occupational specialisation tendencies of the various tribal groups and their differences in geographical location all serve to emphasise the lack of internal cohesion even among the most numerous and vigorous element in the Malayan population.

Another aspect of the problem of unity concerns the perpetuation of ancient state rights and powers. The modern development of the tin and rubber industries has superimposed on the western foothills a strip of relatively high population density running from north to south through the various states of western Malaya. In these western states, the state capitals

began to migrate inland into the economically developing zone: in 1880, for instance, the Selangor capital was moved from Klang to Kuala Lumpur. Modern economic development in Malaya has made illogical on geographical grounds the pattern of Malayan States. Originating and developing in direct response to the simple controls of physical geography—relief, drainage and vegetation in particular—the pattern of states today is wholly anachronistic. It is doubtful, on the other hand, whether these anachronisms in state boundaries really seriously obstruct the development of Malayan unity. It is true that a re-drawing of the state boundaries of Malaya more in accordance with the contemporary social and economic geography might contribute towards more effective administration, though it would tend to ignore local political and sociological antipathies and allegiances. Such a re-drawing of boundaries, it is suggested, should not be looked upon as a means of producing unity. Malayan unity is the pre-requisite of its effective implementation. Similarly with partition. This would concentrate the Chinese and Indians into one part of Malaya, the Malays into another. The small size of the peninsula, the control by the Malays of the rice-producing areas and the control by the Chinese and Indians of the main tin and plantation rubber zones and trading activities, would make such a plan, based on the present racial groupings, difficult and pointless. Moreover, it would undoubtedly sharpen the differences between indigenous and alien peoples in the peninsula.

It is possible that some kind of federation in Southeast Asia would go far towards solving some of Malaya's problems. But there is nothing in past history to support such a hope. Although, as Fisher points out, some place in or near southern Malaya has repeatedly been the centre of gravity during both the distant and recent past, such settlements have either been extremely impermanent, or else have survived as outposts of power based elsewhere. The peripheral distribution of the richer agricultural lands in Southeast Asia has so far prevented any effective integration of the region. There certainly appears to be no possibility of uniting Malaya and Indonesia politically: the Malays of neither side appear to want it, though it would solve the demographic side of the problem in Malaya, placing the Malays there with the numerically strongest group in Malaysia. On the other hand,

Indonesians would be unlikely to accept the large, powerful and concentrated Malayan Chinese community.

A critical problem is whether Singapore should remain politically separate from the Federation of Malaya. That Singapore was overtaken by the Federation on the road to independence was due primarily to the determination of the British Government to maintain, under present conditions, some control over internal defence in the Colony. From the point of view of Britain, this reservation is only logical. The Colony, as it still remains at the time of writing, consists chiefly of one island only 225 square miles in extent, controls air and sea routes in a vital cross-roads of Asia, and is the fulcrum of the British Far Eastern Land, Sea and Air Forces. The armed services employ over one-sixth of the labour force on the island; their installations attract the largest concentrations of population and housing outside the City and have been indirectly responsible for many improvements in the road system. The armed services installations cover as much as 17% of the island's surface and include a naval base, military airfields and numerous military camps. Singapore, too, is the headquarters of the Commissioner-General for Southeast Asia and the bastion of an important dollar-earner—the Federation of Malaya.

Britain is not alone in her interests in Singapore. The island has unrivalled communications with all parts of Southeast Asia and is an international sea and air port; as such, it is the logical regional centre. Thus Australia has had her troops fighting the terrorists in Malaya, recognising that the security of Malaya and Singapore together is essential to the security of Australia.

The issues at stake in the ultimate security and prosperity of Singapore, then, are immediate and far-reaching. From almost every point of view it would undoubtedly help if there were some kind of fusion of Singapore and its hinterland—the Federation. Economically and financially they are dependent on one another. Moreover, their geographical propinquity, historical ties, racial affinities, inter-dependence in matters of internal and external defence, together with the need to act together in international affairs, all emphasise the dangers in Singapore being politically quite separate from the Federation, a separation which dates only from 1946; before then, Singapore was one of the Straits Settlements. Union with the Federation would see the emergence of a

nation with a population large enough and strategically, commercially, and in its natural resources powerful enough to have the stature as well as the status of nationality. By herself, Singapore has only 1¼ million people and no natural resources.

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It is to be deplored that geographical realities are being obscured behind a veil of racialism and communalism, and the cleavage this implies between the two chief races—Malays and Chinese—is emphasised by the political separation of Singapore from the Federation. It is true that the practical difficulties in the way of territorial unification are formidable, and there is much to be said for the view that such unification should await the establishment of more stable political conditions in both territories. On the other hand, territorial unification may itself be looked upon as the necessary pre-condition for those stable conditions. Moreover, the very great potential for population growth—certainly on the island of Singapore—is likely to intensify problems of population pressure and so to aggravate political unrest. To the writer, at least, the political separation of Singapore from the Federation of Malaya carries with it grave dangers not only for Singapore and the Federation but also for the world outside.

PART TWO

8

Climate and Man in Malaya[1]

IT HAS FOR LONG been widely accepted that the tropics, particularly the wet tropics, provide far from ideal conditions for man to live in, and that they are associated with ill-health, laziness, inefficiency and a marked physical, mental and moral degeneration. Certainly the Malayan climate is far from stimulating, but Malayans cannot afford to see the improvement of their society obstructed by an unquestioning acceptance of traditional ideas on the ill-effects of the climate on comfort and energy. Many of these ill-effects have been found to be due to disease, poverty, ignorance and poor diet. Moreover, it has been found possible, by intelligent adaptations, to avoid or at least mitigate even those ill-effects due directly to the wet tropical climate. It is important to try to understand the real nature of the climate-man relationship, to distinguish clearly between fact and fancy, and to adapt one's way of life to the peculiarities of the climate.

This chapter examines briefly the relationship between climate and mental and physical energy in Malaya. Though much remains to be learned about this branch of knowledge, and many of the conclusions can only be tentative, the subject has already been given a firm scientific basis. No attempt will be made here to discuss those relationships of a more specious nature: between climate and insanity, climate and suicide, climate and crime, and between climate and the number of men of genius. All such relationships involve climatic factors whose role may only be indirect and so strongly neutralised by other non-climatic factors that the influence of the climate becomes almost intangible. Even in skin colour, although it is true that pigmentation is usually heavier in tropical than in temperate skins, the relationship is greatly complicated by ethnic variables: the Malay with his Mongolian origin, for instance, has a much lighter skin than the African Bantu living under similar climatic conditions in Central Africa.

[1] Dr. E. M. Glaser gave me much help with this chapter in the typescript stage.

There is little agreement about the ideal climate. Huntington, basing his conclusions on the statistical analysis of the frequency of deaths in different countries, in different conditions of temperature and relative humidity, tries to express quantitatively what he believes to be the optimum climatic conditions for mental and physical work. According to this authority, the optimum temperature conditions are, for physical work, an outside mean daily temperature of 64°F. and for mental work a mean daily temperature of 38°—40°F. For both physical and mental work the ideal relative humidity is 75%—80%. Seasonal variations in temperature, he says, are desirable but should not be too great. Brunt, on the other hand, believes that for a healthy and active life the climate should be such that the mean temperature of the hottest month shall never exceed 75°F. Brunt has also specified that the ideal outdoor climate is one in which a man, lightly clothed, can (a) walk at 3 miles an hour in sunshine, without sweating, and (b) rest in bright sunshine or stand in the shade outdoors doing light work, with light air movement (17ft./min.), without body cooling. The optimum for these prescribed conditions is 67°F. for a lightly clothed man, when the relative humidity is near 50%. Another writer, Markham, believes the temperature range in which a man is at his most efficient to be between 60°F.—76°F., according to the relative humidity (ideal 40%—70%), the amount of clothing worn, and the amount of body movement. A slight air movement only is assumed. Mills puts the upper limit of comfortable conditions, assuming a low wind speed, at an average temperature of 80°F., with a relative humidity of about 58%. At higher humidities, he says, conditions are 'sultry'.

All writers on this subject, however, would agree that Malaya has too hot, too humid and too monotonous a climate for optimum physical and mental energy (Fig. 23). Most settled parts of Malaya have an average temperature which is some 16°F. above Huntington's optimum temperature for physical energy and twice that of his optimum temperature for mental energy. Even the coolest month in Malaya never has an average temperature as low as the maximum prescribed by Brunt. Little significance attaches to the isolated areas of high altitude in Malaya; there are no considerable areas of white or any other settlement dependent upon the ameliorating effects on temperature of altitude, though there are hill stations, notably at Fraser's Hill and Cameron

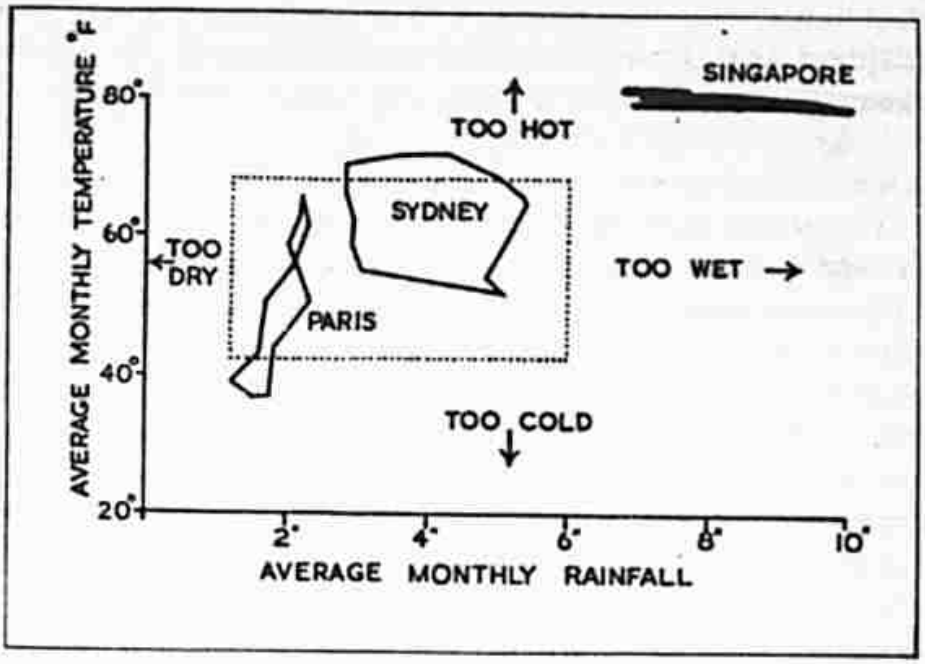


FIG. 23
Singapore's climate and the 'comfort frame'. [*Griffith Taylor*]

Highlands where temperatures are lowered by 12°—15°F. on the average.

The relative humidity in Malaya averages over 80%—higher than the optimum figure quoted by Huntington, and much higher than the optimum conditions of relative humidity quoted by most writers on the subject. As for temperature variations, they are very slight, even in the north of Malaya, but this lack of significant variation in temperature must not be exaggerated, for it applies chiefly to monthly or seasonal averages. Malaya *does* experience diurnal variations of temperature of real human significance, varying with latitude and distance from the sea. Kuala Lumpur in June has a mean diurnal range of 20°F., whereas in Singapore the equivalent figure is only 11°F. Furthermore, it must be recognised that a man in Malaya is extremely sensitive to climatic changes affecting his temperature and well-being which are so small that they would possibly go unnoticed in England. There is so little change in the climate all the year round that minor changes in the average warmth make a marked impression.

The Malayan climate is indeed far more tolerable than climatic abstractions would suggest. It is necessary to take account, among

other things, of automatic and conscious efforts to adapt human activities as completely as possible to the climate in which Malayans have to live and work.

Automatic Responses

The human body is always both producing and dissipating heat and needs to maintain a balance between heat production and heat dissipation so that the deep body temperature remains within a few degrees of 98.6°F. Heat is continuously being produced within the body as a result of the chemical processes associated with breathing, digestion and physical effort, these processes being grouped together under the name of metabolism. The heat produced within the body is conducted to the skin, partly by the normal conduction of the body tissues, but mainly by the transport of heat to the surface by the blood stream.[1] This transfer of heat is possible because the skin is generally cooler than the inside of the body. In Malaya the skin measures about 92°F., and a man may be said to operate at his best when he has a surface temperature of about 92°F. At rest, the production of heat in tissues is quite small—approximately 100 calories[2] per hour for a person sitting still—and is dissipated without too much difficulty. On the other hand, heat production can rise to 700 calories per hour during exercise and the dissipation of such heat can be a serious problem.

Heat may be dissipated from the body by convection, conduction, radiation and evaporation. But sweating, leading to evaporation, is in Malaya perhaps the most obvious automatic response a man makes to the problem of how to dissipate heat. The increased activity of sweat glands suggests that body cooling by convection and radiation alone is insufficient to maintain an even body temperature, and that evaporative cooling is also necessary.

Sweating, indeed, is one of nature's safeguards, but it will be obvious that the more moist the air, the less easily can moisture be evaporated into it from the body surface. Allowing for a person weighing about 130 pounds and for the specific heat of the human body of 0.8, about 0.22 pints of water must be evaporated from the body to reduce the average body temperature by about 2°F., a quantity of sweat which can easily be produced on the

[1] D. Brunt, *Q.J.R.M.S.*, Vol. 69, 1943, p. 77.

[2] The *calorie* (kg.cal., or kal.) used here is equivalent to 1,000 small calories.

body in Malaya by exercising for an hour.[1] The limits of evaporation, however, are passed in still air when the wet bulb temperature, which helps to measure relative humidity, exceeds 88°—90°F., even when a man is unclothed and doing no work. The surrounding air is then so saturated that no more moisture can be evaporated into it.[2] Though Malaya rarely experiences wet bulb temperatures of this order, it is true that the effectiveness of evaporative cooling is restricted by the high relative humidity experienced in the peninsula. This is an important consideration in any discussion of automatic acclimatisation, a subject of great interest and practical significance in Malaya where the true indigene is the exception rather than the rule. According to Brunt, perhaps the most important of the processes of acclimatisation is the automatic training of the sweat glands to function readily, and the onset of recognisable sweating is probably one of the best yardsticks for determining the suitability of Malaya's climate for any one person.

Man's ability to acquire any considerable degree of acclimatisation to the Malayan climate is now generally doubted. The processes of acclimatisation, certainly, include more than the increased activity of the sweat glands. Acclimatisation may also consist in a loss of weight with a corresponding increase in conductance and of the ratio of skin area to total weight of body. Glaser suggests that the development and maintenance of true acclimatisation to heat is prevented in Malaya by the lack of stimulating changes of temperature. It has been found that those who live in Singapore for many months, or even all their lives, do not show those changes in the blood usually associated with acclimatisation to heat. There is little doubt that Malayans withstand poorly not only cooling but also warming. There is evidence that frequent changes in the environmental temperatures are insufficient in Malaya to allow the processes of true acclimatisation to operate satisfactorily.

It may be objected that most of the above remarks, while possibly

[1] See E. M. Glaser, 'Health in an Equatorial Climate', *Unpublished Lectures*, Singapore, 1955.

[2] If the skin temperature was 90°F., sweating would only cease in *saturated* air at 90°F., that is, if the wet and dry bulb temperatures were both at 90°F. Usually the dry bulb temperature is higher than the wet bulb temperature (except perhaps in crowded unventilated rooms), and thus some evaporation may take place even in very humid environments, especially if the air is moving a little.

true for Europeans, are not applicable to Malays, Chinese or Indians in Malaya. It is true that most of the experimental evidence refers to Europeans, but it is unlikely that there is any significant difference in physiological response between races. The normal body temperature is the same in all latitudes and all available evidence suggests that if men of different races, but of similar age, were given a similar diet and similar work to do in similar climatic conditions for several years, the difference in physiological response to work at high temperatures which could be attributable to racial factors alone would be small. Where there may be differences between races is in psychological response and in the readiness or opportunities to make intelligent adaptations to the climatic conditions. It may well be that one of the chief keys to the whole question of comfort and energy lies in the psychological aspects of the problem. Little is yet known about these, but tropical fatigue certainly constitutes a serious obstacle to the social, economic and political development of Malaya. Monotony, boredom, and dissatisfaction undoubtedly affect man's physical and mental vigour through their effect on his nervous system. This may be because the monotonous climate requires continual loss of moisture from the body, so that the nervous system supervising this never or rarely exercises its opposite function—the conservation of heat.

Conscious Adaptations

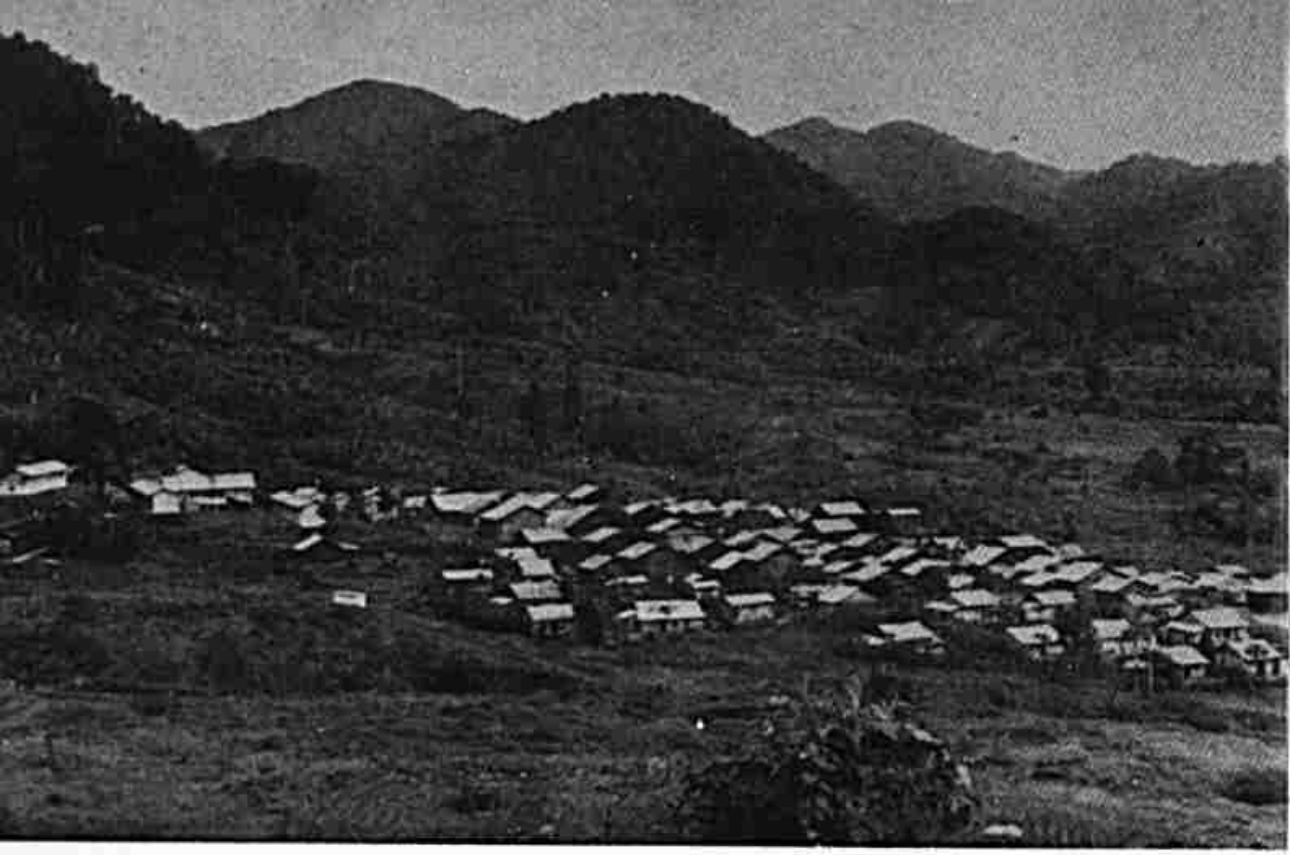
Many of the conscious adaptations to the climate in Malaya are based upon the appreciation of two facts: first that moving air carries warmth away from the body more effectively than does still air, and secondly that even the slightest air movement acting upon a body damp with sweat will accelerate the rate of body cooling by accelerating the rate of evaporation from the body. These facts, for example, lie behind the attempt to make the provision of electric fans the minimum requirement in houses built for all income groups by the Singapore Improvement Trust. The use of a ceiling fan can be illustrated as follows. If a man sits with his suit on in a room in Malaya on a sunny day, he will undoubtedly soon feel warm. If he turns the fan on he will feel cooler. If by the time he turns the fan on his body is damp with sweat then he may feel uncomfortably cool. The movement of air is the great reliever of oppression in Malaya.

(*R. Wikkramatileke*)

9. Malay kampong

10. Government buildings at Kuala Lumpur

(*Crown Copyright Reserved*)



(*R. Wikkramatileke*)

11. New Village in the Bentong Area

12. Urban shophouses

(*C. Lim*)

A breeze may have a similar cooling effect, but only if the house is properly designed and located will the maximum benefit be gained from whatever natural movement of air there is. The climate of the peninsula calls for an open type of house, located where it can be reached by local breezes: that is, on a rise in the ground. Few quantitative data can be added to a study made in Singapore in 1919 by Campbell concerning the effects on body temperature and human comfort of slight hills and breezes. These observations proved that body temperature was lower in a bungalow located on a hill exposed to breezes than in bungalows situated in a hollow and surrounded by trees. Innumerable subjective observations could be made to support the contention that small differences in siting, aspect and location of houses can produce appreciable differences in body temperature and comfort. A satisfactorily quantitative statement, however, must await integrated research in physiological climatology in the peninsula.[1]

A wholly suitable design and location for the building of houses must for long be restricted to a very small section of the population, especially in towns. Cost and sheer lack of space make it inevitable that the bulk of the population in Malayan towns must for long continue to live in badly designed, poorly located and heavily congested houses—houses which, moreover, do not even possess electric fans. Even new housing in towns is normally of inadequate design and far too congested. On the other hand, present concepts in the design and location of tropical urban housing may become outmoded if the practice of air conditioning becomes very common. In a fully air-conditioned house the ideal design is quite different from the design for a house without air conditioning: windows are fewer and smaller, rooms smaller and less airy. Air conditioning involves the creation of an artificial climate and depends for its success not upon moving the air but rather upon lowering air temperature and relative humidity. As the standard of living rises and electric power supplies improve, air conditioning is becoming more common to the extent where a small section of the population sleeps, eats, and works in its artificial climate. For the majority of Malayans, however, even in the largest towns, the only time when they may

[1] Quite a thorough quantitative study has now been published by T. P. Yap, *M.J.M.*, Vol. 10, 1956.

experience air conditioning is during a visit to the cinema. Moreover, the European must not too glibly assume that the majority of Malayans would like air conditioning, even if they could have it.

One of the important functions of the house in Malaya, both in rural and in urban areas, is to give shelter against the sun. This search for shade takes many forms in Malaya and houses are ideally orientated and their eaves and windows so designed as to produce the maximum amount of shade during the day. In towns, the covered five-foot way allows the pedestrian to walk along the streets yet under shade for most of the time. In rural areas, peasant atap houses, particularly among Malay padi planters, are frequently hidden beneath coconut trees which provide protection from the direct rays of the sun overhead and from storms. The increase in comfort when the body is in shade, it must be noted here, is due almost entirely to the absence of radiation, for the air temperature, air humidity and air movement may be exactly the same in shade as in bright sunshine. Indeed, as Yap has noted, in sunny weather the inside of a house may be hotter and show less air movement than the outside, but the house will still provide protection from heat by giving shade.

A further and obvious adaptation a man can make to climate is in his clothes. According to their colour, thickness, texture and tightness of fit, clothes can raise or lower the threshold levels of warmth at which a man begins to sweat or feel uncomfortable. Thus, 'in Singapore a lady wearing a thin dress which leaves her legs and arms bare, and light sandals on her feet may be much more comfortable than her husband in a linen shirt with collar and cuffs and in long trousers and leather shoes.'[1] In this whole question of suitable clothing, it is important to appreciate the fact that in the dissipation of heat the most important parts of the body are the hands, feet and ears: that is in those parts of the body where the total surface area is great in relation to the total volume or weight and where the supply of blood to the skin is richest. Clearly, then, the practice of wearing socks and western type leather shoes in Malaya is bad for it restricts the feet, especially the toes, as cooling agents. As for colour, it is in accordance with the principle that tropical clothes should have good reflective power and poor absorptive power that they should be

[1] E. M. Glaser, op. cit.

white or at least bright in colour. Following on what has been said above, too, they should allow good ventilation: clothes should be of loose texture and loose fitting to allow the fullest possible movement of air. Then some materials, such as cotton, help to evaporate sweat, whereas others, like nylon, tend to prevent evaporation.

In response to the fact that the highest temperatures are reached in the early afternoon—usually about 2 p.m.—it might be expected that the afternoon siesta would be a common practice in Malaya. That this is not so may be due partly to the British influence in Malaya. However this may be, some authorities are against the practice. According to Macpherson, for instance, the siesta is undesirable, partly because it wastes time, but chiefly because each day thereby begins twice, and efficiency is lower than when work has been in progress for some time. In addition the siesta sleep is rarely refreshing, and the subject tends to lie bathed in sweat. However, other experimental evidence and common experience suggest that a short nap sometimes improves efficiency.

. . . . .

It is accepted that, physiologically, the climate of Malaya is not conducive to mental and physical energy. On the other hand, it must be insisted that by increasingly intelligent adaptations it will prove possible to negative to a great extent the ill-effects of the wet tropical climate on human activities. It will be realised that the pattern of living in the peninsula has been almost slavishly transported from England. The whole concept of civilised living—in diet, housing, clothing, the distribution of work throughout the day and recreational habits—must be reassessed against the realities of the natural environment in Malaya. It is probable that with continued research in applied physiological climatology, improvements in medical knowledge and services, and an improved dietary and standard of living, there is no reason why anyone should not be as active and efficient in Malaya as elsewhere in the world. The real problem is to find exactly how to live and work at one's best in Malaya as distinct from anywhere else.

9

Water Supply

Water for Agriculture

THERE ARE SEVERAL reasons why the supply of moisture for agriculture in Malaya is generally unsatisfactory. In the first place, the rainfall in Malaya is by no means uniformly distributed throughout the year (Fig. 3). This is most true in north Malaya where, in Kedah and Perlis for instance, there is a fairly distinct, though short, 'dry' season. Yet even on Singapore Island certain parts of the year may be rather drier than others. This seasonal fluctuation of rainfall in Malaya, indeed, though slight by comparison with many other tropical countries, provides the climatic variable of greatest agricultural significance. Certain parts of the year, varying in length, intensity and period from place to place, are relatively dry and affect the supply of moisture for the growing of crops.[1]

Secondly, the rainfall is often unreliable in amount and incidence, for in no one year can it be forecast with any confidence how much rain will fall during the year or when the 'wetter' and 'drier' spells will occur. The agricultural consequences of this can be severe. In Kedah, for example, the amount and incidence of rainfall varied considerably during the four years 1946–49 (Fig. 24). As a result, 1949 was a lean year for peasants in Kedah, only 25% of the anticipated rice crop for 1948–49 being realised owing to damage by drought. In the Kota Star and Kuala Muda districts there was a mass exodus of padi planters seeking employment. In Perlis, too, the early onset in November, 1948, of the seasonal dry spell caused the complete destruction of approximately 8,380 acres out of a total planted area of 43,430 acres.[2] This kind of disaster is very com-

[1] This partly explains the different times for padi harvesting in different parts of Malaya. Recent work in Province Wellesley showed that 300 persons in one *mukim* go to Kedah each year to help in the harvest, returning in time for their own harvest. The social effects of such a movement are numerous. In this particular mukim, the ouflow does not leave enough people behind to form a quorum (40) at the village mosque.

[2] Raja Haji Ahmad bin Raja Endut, *State of Perlis Annual Report for the year 1949*, Alor Star, 1950, p. 3.

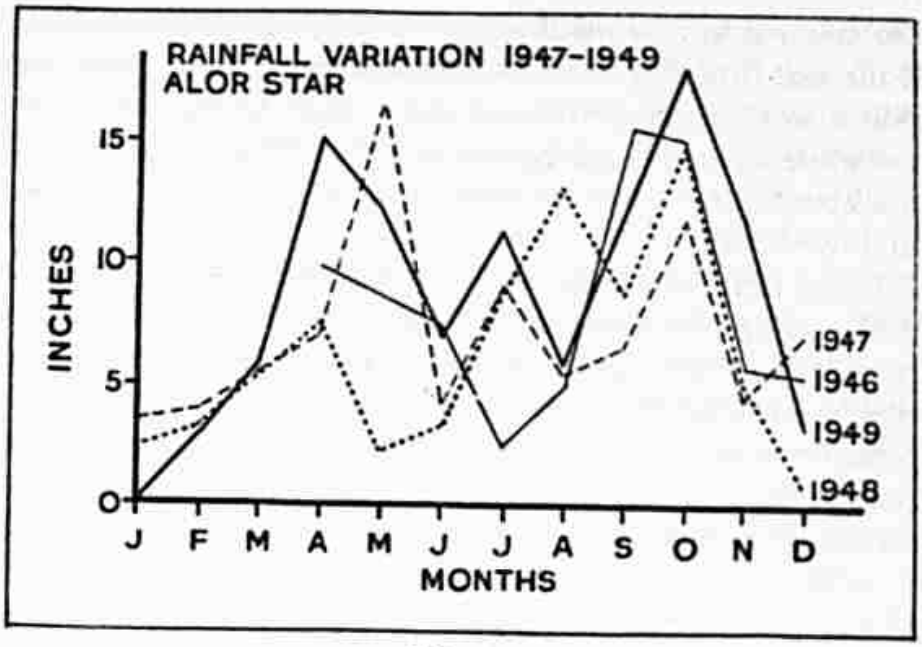


FIG. 24
Rainfall at Alor Star, Kedah.

mon since most padi lands in Malaya are unirrigated and so depend chiefly on the direct rainfall. What irrigation works there are in most cases have only a supplementary effect on water supply by conserving and distributing rain water. Should the rains come too early or too late, or fail altogether, the yield is likely to be seriously affected. It has also been noted that certain farming operations are timed to the moisture conditions. In north Malaya it has been illustrated by Lim that the reported time for starting full-scale tillage in Perlis between 1946 and 1951 varied from year to year by as much as 3½ months because tillage had to await the accumulation on the fields of a minimum of 12 inches of rainwater before being practicable. This particular phenomenon has not yet been noted in south Malaya where rainfall seasonality and unreliability are less marked.

A third reason why the supply of moisture for agriculture in Malaya is generally unsatisfactory is that much of the rain falls in torrential storms. As much as 15 inches of rain may fall in one day and during a storm the rain may fall at a rate of four inches an hour. Moreover, as much as 95% of the total rainfall during a storm lasting, say, thirty minutes, may fall during the first 15% of that period. Such intensities of rainfall have two main effects on the supply of water in Malaya. In the first place, much

of the water is lost by rapid run-off into drains, streams, swamps and the sea. Secondly, local variations in rainfall are great. Even within a small geographical area some districts may be short of water while others are adequately supplied. This has been clearly demonstrated in a recent analysis of rainfall over Singapore Island by Watts.

A fourth factor to note is that the rainfall is interspersed between periods during which insolation is high, so that rates of evaporation and transpiration are high (p. 21) and the balance of moisture available for agricultural purposes is consequently reduced. The potential supply of water must be looked upon as the precipitation deposited on land and inland water bodies, *less* evaporation and transpiration. This balance is further reduced by surface and sub-surface drainage.

Difficulties in water supply for the growing of crops, then, are due partly to the characteristics of the rainfall itself—to its intensity and to its unevenness and unreliability both in time and space—and to evaporation. But the significance of these factors depends to a large extent upon other considerations, notably the crop grown and the nature of the land on which the rain falls. Water supply, it should be emphasised, often becomes a 'problem' in Malaya only because the crop is not well suited to the particular set of climatic, edaphic, or topographical conditions under which it is grown. Shortage of water may also be due in certain areas solely to the retention of traditional but unsuitable methods of cultivation. In parts of the Krian district of Perak, for instance, there is a wasteful and inefficient use of irrigation water wherever attempts are made to simulate deep swamp conditions. The Banjarese padi farmers there regard such conditions as a normal prerequisite before the cultivation cycle can begin.

The more important crops in Malaya—padi, rubber, coconuts, bananas, pineapples, cassava, pepper and vegetables—have widely differing moisture requirements in amount, distribution and reliability. Rubber, for example, is affected adversely more by an excess than by an insufficiency of moisture in the Malayan context; it consequently demands good drainage so that any excess water falling on to the land can drain away from the roots of the trees. Rice, on the other hand, more commonly suffers from insufficient moisture, and vegetable cultivation suffers

throughout Malaya from an insufficiently regular rainfall. Vegetable cultivation requires sufficient soil moisture at all times to allow the plants an unimpaired intake. Even on Singapore Island, where the rainfall is perhaps the most regular in Malaya, vegetable cultivation suffers in this way and hand-watering is undertaken at least once a day and even four times a day on sunny days during dry spells.[1] On the other hand, root-drowning occurs after long periods of heavy rains or shorter intense rains. All crops, however, may suffer from an excess of moisture at times and from an insufficiency of moisture at others. The ideal conditions, in which the right amount of water is available in the right place at the right time, are only rarely achieved.

The characteristics of the land on which the rain falls, in particular the topography and soil, also influence the moisture balance and may be agriculturally more important than the characteristics of the rainfall itself. The choice of localities for vegetable growing in Malaya, for instance, is not influenced by climatic considerations to any extent but depends rather on soil types and available sites suitable from the point of view of relief, drainage and accessibility to markets. In general, a clay is preferred to a lighter soil, because although the clay may be more difficult to work, it retains water—a critical demand with vegetable growing. As for padi growing, a total water availability of one acre foot per month over a period of 5–6 months is considered adequate in the major rice-growing areas of the flat coastal plains, where the soil is a heavy clay. Consequently, water losses in these areas are limited almost completely to evaporation and transpiration, though wastage is also caused by the slow lateral movement over the surface of water moving towards collecting drains leading through the coastal bunds. In narrow steeply sloping valleys, as in Negri Sembilan, water losses are usually greater, partly because of the more porous nature of the soil. Wastage there is caused also by indifferent terracing and inadequate check banks.

It will be clear from the above remarks that there is in Malaya an urgent need for the control of water supplies for agriculture. It is significant that during the 1950–55 period, nearly fifty major irrigation and land drainage projects were completed, improving over 300,000 acres and making suitable for cultivation

[1] J. M. Blaut, 'The Economic Geography of a One-Acre Farm on Singapore Island', *M.J.T.G.*, Vol. 1, 1953, pp. 37–48.

74,000 acres of new land. The effective development and utilisation of land for padi cultivation in particular is very much dependent on the provision of adequate water control measures and each scheme must be individually designed to suit local topographical and soil peculiarities. The traditional peasant methods of water control in Malaya do very little to reduce the hazards of padi cultivation. In small inland riverine areas brushwood dams are built across rivers and a portion of the flow is directed to the adjoining padi fields. Elsewhere, Malayan peasants seek out habitually swampy areas where losses of water are usually made good by seepage and surface run-off from higher ground. But brushwood dams are frequently swept away by floods, and habitually swampy areas are subject to prolonged flooding which may result in partial or total loss of crops.

Drinking Water

Many of the above characteristics of the rainfall, relief and soil affect the supply of water for drinking as well as for the growing of crops in Malaya. The predominantly rural population depends largely on wells and watercourses for its drinking water.

Wells are peculiarly sensitive to variations in the amount of rainfall, and even in the south of Malaya, where rainfall is more evenly distributed throughout the year, areas dependent on well water suffer shortages at times. The main reason why wells in Malaya are unusually sensitive to vagaries in the amount of rainfall is that the subsoil water is not normally held interstitially. In other words, the colloidal soil structure does not allow percolation and the lateral movement of water in the soil. Consequently, wells are generally filled, not by percolation, but by run-off, a characteristic which not only makes them immediately sensitive to changes in the direct rainfall, but also increases the possibility of contamination. Only in a few places, for instance along the east coast where more normal groundwater features exist in the marine sands, are percolation wells at all common. Another reason why well water is so often unsatisfactory is that as the water-table is commonly near the surface of the ground, the sub-surface water is often acid. Where some slight natural drainage can take place, as on permatang (Chapter 1), well water is usually far more potable.

The problems in siting and constructing wells must be seen

against the background of the above remarks. To avoid contamination, wells should be located some distance away from, and if possible above, all sources of surface contamination such as latrines. Efforts are being made to provide as many kampongs as possible with community wells, properly sited and of satisfactory pattern—that is, with concrete lips and brick- or concrete-lined sides. Such measures reduce contamination by run-off and encourage natural filtration by percolation. The provision of community wells, however, is often a surprisingly expensive operation and may have to be paid for by money from outside the kampong—for example by RIDA.

Rivers and streams provide the other common source of drinking water in rural Malaya. Again, it has definite drawbacks. Only in the extreme upper reaches of rivers is water likely to be really fit to drink; elsewhere the many rivers of Malaya receive washings from the land, street drainage and sewage effluents, all of which carry the intestinal bacteria invariably present in human and animal excreta. Rivers are indeed a particularly important means of disposing of wastage in a country like Malaya where the bulk of the population lives along the rivers, and where tin is mined along river valleys. Nevertheless, river water is widely used for drinking and certainly it can be made reasonably safe by careful filtering and boiling. Moreover, river water often undergoes some degree of self-purification where the flow of water is slow: a natural recovery from excessive pollution can take place where dams, weirs, or breaks in gradient provide quiescent basins. All intestinal bacteria tend to lose their vitality, sink to the bottom and decrease in numbers wherever the flow of water in the river is reduced.

Malayan rivers in their lower courses are often tidal, a fact which greatly aggravates the difficulty of collecting good drinking water. This problem is to some degree met by the practice of collecting water at low tide, when the water in the river is least brackish and so at its softest and most palatable.

Other ways in which drinking water can be obtained include the use of springs, though the geological structure in Malaya is rarely conducive to their formation. Then there is the direct collection of rainwater in pans, jars or tubs, though this is surprisingly uncommon in Malaya. In this respect there is little evidence of individual initiative in dealing with difficulties in

the supply of water in rural areas such as the writer noticed among the Dayak peoples of Sarawak, who collect water from the roofs of their longhouses by means of gutters, enabling them to store sufficient water to last them over dry periods. Care must be taken to prevent the gutters and pipes becoming choked and providing mosquito breeding places, and admittedly it is difficult to prevent a certain amount of pollution, but this problem is no more serious than in well or river water.

Most of the population on Singapore Island, but only about 25% of the population in the Federation, are supplied with piped water supplies, either in the form of taps in individual houses or, more commonly, by communal standpipes. There are many difficulties in the way of a wider provision of piped water. Some are physical: the finding of enough suitable water and power for pumping. In Malaya generally, the high-level forest-covered catchments areas, on which many supplies depend, have already been utilised to capacity and major extensions must involve the installation of large and expensive pumping units to tap major streams at lower levels. The finding of suitable impounding reservoirs is an important consideration because otherwise any pipe water is left too much at the mercy of drought. This has been one of the chief problems in providing water for Kuala Lumpur. The cost of providing pipe water is further aggravated in rural Malaya by the pattern of settlements which, as Chapter 5 concluded, is commonly linear or dispersed. The cost of providing dispersed houses or loose linear settlements with piped water may well be prohibitive. The number of consumers per unit length of main in such cases is clearly very much less than it is in the case of a densely built-up district or even a simple nucleated settlement; in addition, the capital and maintenance cost of the source, reservoirs, pumps, distributing mains, and similar works, has to be shared by a relatively small number of persons. Where the population is scattered, the individual or group well is much cheaper and may indeed be the only practicable solution.

Other difficulties arise with the rapid growth of population in those areas—chiefly urban—where dependence on pipe water supplies is greatest. For example, on the basis of the present daily average rate of consumption of 40 gallons per head in Penang, the average daily needs of the town in 1981 (at the present rate of population growth) will be 11.2 million gallons—a figure

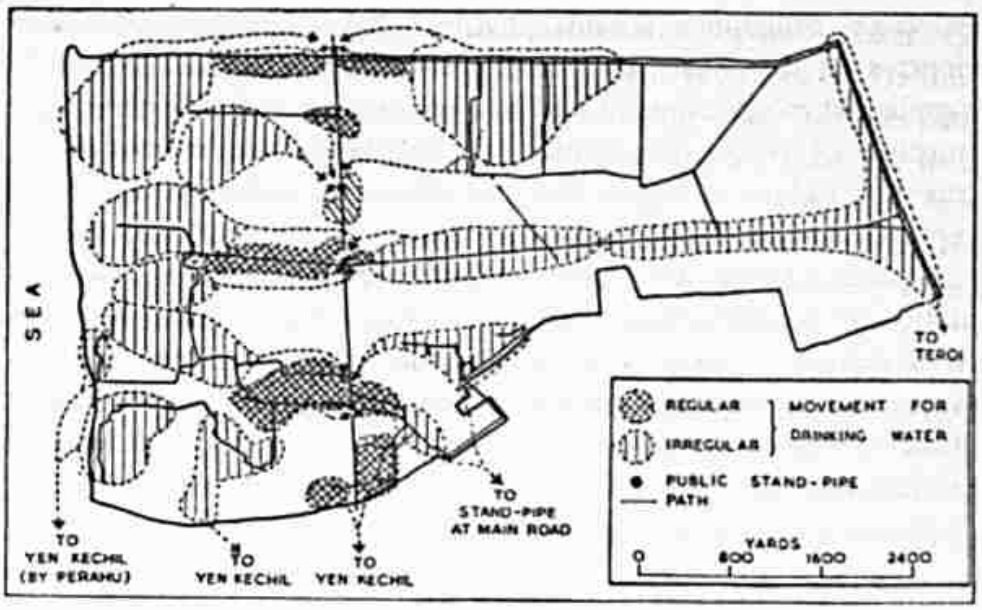


FIG. 25

Movement for drinking water in Kedah *Mukim*. The hatched and shaded areas cover all the houses in this mukim. Note that *regular* movements for water (that is by those houses which never use wells) involve moving distances up to 1,000 yards, often over padi fields without proper access paths. *Irregular* movements for water (that is by those householders who sometimes use well water—when it is potable) involve movements over distances of up to 2 miles. Note also that in two coastal areas irregular movements take place by means of *perahu* (small boat).

almost twice the present capacity. Furthermore, it has to be borne in mind that the average per capita consumption of water per day is likely to rise with any increase in standards of living and with the growth of industrial enterprises.

What are the advantages of piped water supplies? One is the saving of time and energy it means in rural areas. The seasonal movement of population for drinking water is a common phenomenon, even in this equatorial country (Fig. 25), and the time and energy consumed in fetching and carrying water for domestic use—a task normally undertaken by women—is great. It has been estimated in Trengganu that as much as one quarter of the working hours of a housewife may be used for fetching and carrying water. Another advantage of piped water is that the quality of the water can be more easily controlled. This is fundamental to the maintenance of good public health, and it is highly desirable that the standard of water purity provided throughout Malaya should be as high as that enjoyed by most of the popu-

lation on Singapore Island. (Table VII.) Moreover, any deficiencies in the water can be more easily corrected when it is supplied through pipes. Thus it is being suggested that the water supplies of Singapore should receive fluorine treatment. It is true throughout Malaya that the water is soft—a fact to be expected in this country of upland catchment areas, steep slopes, non-porous rocks, and heavy rainfall. In other words, the formation of mineral salts in water is not encouraged by the Malayan environment. Though this softness has certain practical advantages, as for washing and for industry, it has some deleterious effects from the point of view of public health. The lack of calcium and insufficient fluorine in the natural water supplies, for instance, are thought to increase the incidence of dental caries.

TABLE VII

SINGAPORE CITY COUNCIL — TAP SUPPLIES (1954)

	Average Figures in Parts per Million
Nitrites	Trace
CO_2	0.49
Total Alkalinity	12.48
Ph*	8.07
Residual Chlorine	0.02
Iron	0.26

* Ph value expresses alkalinity or acidity. Distilled water has a Ph value of 7 and is neither alkaline nor acid. Values higher than 7 indicate alkalinity, while lower values indicate acidity.

Data from *Annual Report of the Water Department*, Singapore, 1954.

. . . . .

Even a country like Malaya, with a heavy rainfall distributed throughout most of the year, may suffer severely from water shortages, both for agriculture and for drinking. The explanation of this paradox lies chiefly in the way the rain falls—its variability, unreliability and torrential nature; the high rate of evaporation; and the characteristics of the land on which the rain falls—soil, slope, texture. All these factors affect the moisture balance available for agriculture and the amount of water available for drinking.

The significance of these factors, however, depends to a large extent upon human activities. By a bad choice of crops, or by

unsuitable farming methods, the farmer may court disaster. On the other hand, by intelligently adapting his activities to the local effective moisture conditions; the farmer can make the best use of his natural resources. As for drinking water, the siting of wells is especially important in Malaya with its high water table and in the conditions of generally poor sanitation. The bulk of the Malayan population must for long continue to remain dependent upon well and stream water for their drinking water.

In the sphere of water supply, the intelligent co-operation of the individual on a small scale must go hand in hand with attempts to deal with the problem by the construction of large-scale irrigation and water-control works and the construction of reservoirs and pipe-water units. The provision of a more reliable supply of water, both for agricultural and domestic use, must be regarded as a necessary concomitant to social and economic progress.

10

Soil Erosion and the Sediment Problem

IT WAS OBSERVED in Chapter 1 that the soils of Malaya are not rich by standards of comparison in temperate climates; this in spite of the impression of fertility given by the luxuriance of the natural rain forest cover. Much of the parent rock material is very old, and of a non-volcanic and crystalline nature. Malayan soils usually have a low humus content and are almost invariably acid and poor in phosphates and lime. Moreover, they are normally heavily leached.

The removal of the natural vegetative cover may result in a deterioration in soil fertility even though actual physical erosion does not take place. In this connection, some data published by the Rubber Research Institute at Kuala Lumpur are interesting. It appears that the ground under the jungle is, in its natural climax state, so well protected as to experience incubator-like conditions: there is perpetual damp and a temperature fluctuation limited to 1°F. on either side of 75°F. After felling of the jungle, the soil temperature at night may fall a little lower, but the mean effect of exposure to the sun is to raise the soil temperature by 5°—15°F., according to the season. The enhanced soil activity associated with such a change may give a false impression of the fertility of the site, which lasts only as long as the humus reserves left by the jungle. If protection is not restored, the site conditions move inevitably to a much lower scale of balance. Exposure to the actual impact of rain can also have severe effects even though no soil is washed away. In Malaya one quarter of the rain falls at an intensity exceeding 2 inches per hour. Such intensities can compact the soil tightly into position.

Where land is *not* horizontal, physical erosion, involving the actual removal of the soil, can result from clearing vegetation and exposing the soil to the forces of destruction. Before discussing soil erosion, however, two points must be made.

In the first place, normal denudation, or geological erosion, is a beneficial, and indeed important, process in soil formation. All the

fertile alluvial plains of Malaya are the result of this kind of long-term process. Secondly, the problem in Malaya should be placed in perspective, for the peninsula experiences relatively little soil erosion compared with its neighbouring countries: India, China, Indonesia, Ceylon, and Japan. Malaya is one of those countries of the Indo-Chinese Peninsula where the density of population is comparatively low and where the largest areas are still covered by the indigenous vegetation. Though there is plenty of evidence in Malaya of the dangers of soil erosion, the more serious problem is a potential one: it is likely to develop as the population increases and more of the original vegetation is cut down.

Soil erosion and related phenomena are commonly associated in Malaya with one or other of two groups of human activities: agriculture and tin mining.

Shifting cultivation (*ladang*) was probably an early cause of forest denudation and is now illegal, though probably still practised by a few aborigines. Padi farming along the coastal plains is not normally associated with severe erosion problems, but in the early days of rubber planting erosion problems soon arose. More particularly, it was found disastrous to practise clean weeding between the trees. Here is a particularly vivid example of the dangers of taking into an alien environment like Malaya preconceived knowledge based upon experience gained in temperate countries. Local reluctance to clean weed, it was discovered, is not necessarily an indication of laziness or backwardness. A tropical garden with its untidy jungle of mixed trees and shrubs around the house is satisfactory in that it does not leave the soil exposed to torrential rain and imitates fairly successfully the natural forest ecology in which the soil is not too badly exhausted or subjected to erosion. Moreover, since the garden patch is close beside the owner's dwelling, the soil receives as fertiliser all kinds of waste materials.

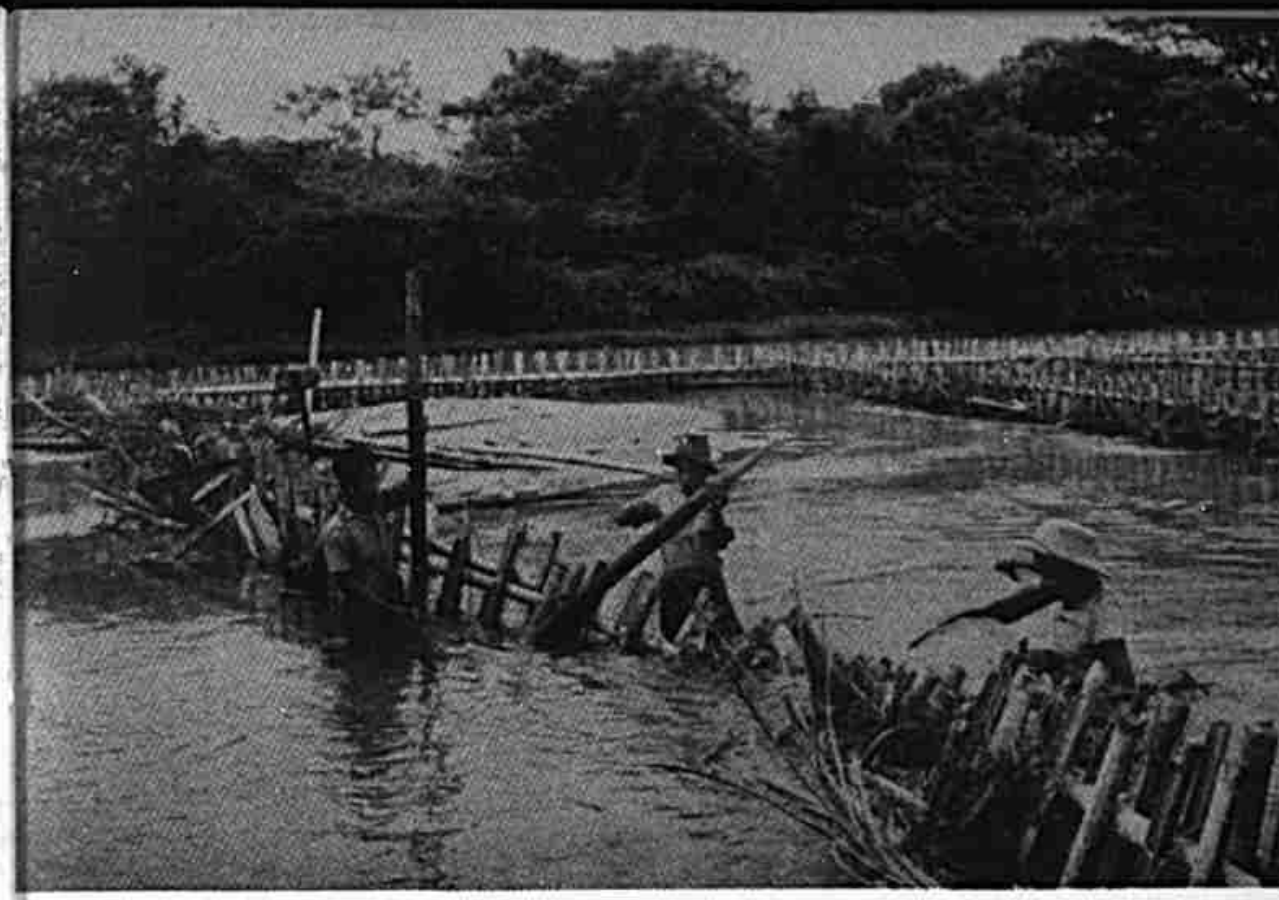
It is evident then, that the clearing of the original vegetation for agricultural activities can bring about both loss of fertility and soil erosion. Where the crop is particularly exhausting in its demands on the fertile elements of the soil, these dangers can be increased. Much of Singapore Island, outside the settled areas and mangrove swamps, illustrates this very well. The bulk of Singapore's forest was cleared a hundred years or so ago, initially for planting pepper and gambier, which are exceptionally

demanding crops. The land was then abandoned, to be succeeded by the planting of other crops, such as rubber. Many of these rubber trees have now disappeared. A 'green desert' of undulating country, covered with poor, low scrub, now exists outside the settled and cultivated areas and mangrove swamps. One characteristic type of vegetation has been described by Holttum on Singapore Island: 'this vegetation develops on undulating ground which has been cleared and abandoned, so that all or most of the humus-containing soil has been washed away, and the surface more or less compacted by heavy rain. In 1922–3, when I first remember the hill east of the Gap, it was covered with stunted rubber trees. Many of these trees had already died; others had considerable lengths of tap root exposed by erosion of the top layers of earth. All the trees have now died, and most of the area . . . is covered with scrub.'[1]

In the Federation, the cultivation of bananas on steep slopes, notably in Negri Sembilan and in parts of Johore and Pahang, has likewise resulted in soil deterioration and soil erosion, as has the cultivation of tapioca and annuals in squatter areas, and in the last century, of pepper and gambier in Johore. Tea cultivation has had similar effects in the Cameron Highlands.

Two kinds of damage caused to soil by tin mining activities have been distinguished in Malaya by Ooi. First, there is that caused by all forms of mining, though in particular by ground-sluicing or lampanning on hill sides. Secondly, there is that caused by the discharge of tailings from modern mines into the drainage system of the Kinta Valley. Tin mining in Malaya implies the drastic alteration of slopes, as well as the disturbance of the balance of nature by the destruction of forests. The effects of mining are obvious in the discoloration of the water by the suspended solids of the mine effluent. The rise of a river bed by the uncontrolled discharge of tailings from hill mining and its disastrous effects on the valley are spectacular, but the silting of a river from soil erosion may not be so obvious. The advance of the swamp as it spreads up the valley is so slow that it often takes on the appearance, as one departmental report puts it, of a natural phenomenon of which man is the innocent victim. In the Malacca River Valley, some 7,000 acres of padi have gone out of cultivation in this way.

[1] R. E. Holttum, 'Adinandra Belukar', *M.J.T.G.*, Vol. 3, 1954, p. 27.



13. Flood Works on the River Bentong

14. New road through the Main Range to Tampin

(*Crown Copyright Reserved*)

15. Laying anti-malarial drains

16. Travelling dispensary near the east coast

(*Crown Copyright Reserved*)

The problems of erosion and silting are intimately related for they are really different facets of the same problem. Some striking human effects of erosion and silting may be seen in Malaya. Kuala Kubu (Selangor), for instance, was buried by silt and had to be abandoned. The town lay at the débouchement of the Selangor River from the hills, and the streets of the town were for long protected by a bund. The sharp break in river profile just above Kuala Kubu had intensified the degree of silting. Mining in the upper courses of the river and its tributaries, however, is thought to have been the chief cause of the burying of the town. Much effort is being expended to protect other towns from suffering the same fate. In Pahang, the Bentong Silt Prevention Works are intended to retain tailings from the tin mines in the hills above the town of Bentong.

Erosion and silting are also widespread phenomena along the coasts of Malaya. The silting of river mouths is especially common. Bruas, situated on the estuary of the Dindings River and once the seat of the Malay Rulers of Perak, has for this reason declined into an inland village of little importance. Malacca has suffered similarly: 'but for the silting-up of its harbour there appears but little reason why the former queen of these shores should now sit brooding over her ancient fame.'[1] A remarkable example of coastal erosion due to the cutting down of the natural vegetation is afforded at Pontian Kechil, on the west coast of Johore, where some 200 yards of mangrove were cleared from the coast in 1951. After thirteen months the coast had been eroded to a distance of 34 yards inland. The danger to Pontian became serious and an expensive embankment scheme had to be started. In Pahang, the raising of the bed of the Pahang River has resulted in the water becoming so shallow between Temerloh and the sea that navigation, even by small motor-boats, is difficult. This seems to have occurred largely as a result of (*a*) excessive silting caused by tin mining in the upper reaches of the river around Bentong, and (*b*) silting from periodical monsoon floods. Here, too, is a particularly clear warning of the need to preserve forest belts along the banks of rivers wherever possible, especially on the large rivers where riverine forest cover is thick.

The sediment problem in Malaya is clearly an important one. Sediment raises stream beds, thereby increasing flood heights

[1] W. W. Skeat and C. E. Blagdon, op. cit.

and inundation. Sediment becomes piled up in great quantities behind dams and so reduces their capacities and functions. Sediment also causes rivers to meander, silts up irrigation and navigation channels, and finally, creates a variety of difficulties for the engineer, agriculturalist and forester.

Flooding

Flooding, like soil erosion, is not yet so serious in Malaya as in many other countries of South and East Asia. Malaya is a small, narrow country, with its rivers running to the coasts from the mountainous interior. Also, there are no very large rivers by Asian standards, so that the country is divided into relatively small catchments. This applies particularly to western Malaya. Due partly to the larger rivers and river basins on the eastern side of the peninsula, partly to the rather heavier rainfall in the east, the eastern side of Malaya is more subject to serious flooding than is the west.

Much of the developed area of Malaya is below the 100 foot contour line. Since the original development of the country took place along the easiest means of access—the rivers—many of the towns and villages are on rivers. Thus any rise in water level tends to cause floods in the most populated areas of Malaya, especially in towns. This is not to underestimate the importance of flooding in rural areas, which often has serious agricultural and human repercussions. But it is worth pointing out here that flooding in Malayan towns is due chiefly to the inability of the main streams or drains to take the water off the surface of the land at certain times of the year and under certain conditions of rainfall intensity. In Singapore, flooding is common when heavy downpours coincide with a high and rising tide; so low is the average level of the city that the state of the tide affects the working of the main drainage system. A similar state of affairs exists in Penang. In all towns the numerous concrete surfaces and the network of monsoon drains increase the rate of run-off of surface water into the main streams and drains.

Preventive and Remedial Measures

In the agricultural development of the coastal plains, particularly in the west, the construction of bunds to prevent the ingress of sea water has been found to be a necessary preliminary. The

height of these bunds need not be very great, for the tidal range is small, though it varies from place to place along the coast. The maximum ranges at the autumnal equinox are, at Penang, 8ft., at Port Swettenham, 17ft., and at Port Dickson, 10ft. However, the normal gound levels at any one place bear a relationship to the high tide levels at that place and in practice bunds seldom need to be more than 4–5 feet high. Bunds are normally sited at least 220 yards inland from an eroding coast, the land between the bund and coast being kept under natural forest and alienation prohibited so as to minimise the rate of erosion.

As for rubber land, reference has already been made to the practice of clean weeding, which has now been generally replaced by the practice of planting an undergrowth of leguminous plants. Much attention has been given to the establishment of protective cover crops in rubber, and a considerable number of creeping covers, some leguminous, and other non-leguminous, have been developed for this purpose. During replanting on slopes, efforts are commonly made to reduce the risk of soil erosion: bench-terracing is widely practised and erosion further reduced by laying the felled rubber trees along the benches.

It was suggested above that one of the chief causes of erosion and silting in Malaya has been the stripping of natural vegetation for mining purposes and the discharge of the mining effluent into the rivers. Under the Federated Malay States Mining Enactment the working of hillsides for the extraction of tin ore by washing away the soil is now prohibited. The same legislation also prohibits the discharge of effluents from mines and dredges into rivers and streams, if they contain more than 800 grains of suspended matter per gallon. Compliance with this requirement necessitates the settling out of a proportion of the suspended matter before the effluents are discharged. It may prove to be possible to restore fertility to most mined lands, after dredging has been completed; wherever drainage is good, attempts to establish leguminous plants on reslimed lands have generally been successful.

In Malayan towns, the building of good residential property on hilly areas frequently increases the risks of erosion. This can be seen around many of the towns, as in the Pasir Panjang area of Singapore where landslips and slope erosion have been causing some concern. Apart from the planting of grass tufts,

attempts have been made to halt erosion by the concrete 'painting' of the slopes.

Most attention, however, is given to maintaining the rivers of Malaya in good condition. In bank and channel stabilisation, the principle usually adopted is that the close adherence to natural conditions is always likely to be successful; consequently, the selection of the species of vegetation for growing on river banks is made after a study of the natural growth in adjacent stream banks. In river training and silt control, when rivers have become wide, shallow, meandering streams—as often happens in or below mining areas—it is possible to train the streams back into deeper and well-defined channels by the use of training fences. River rectification is perhaps the chief means of reducing floods in Malaya where no suitable sites for impounding reservoirs can be found. In all such schemes, however, it is recognised that every deviation of an alluvial river, unless carefully planned, will cause erosion in the reach above and silting in the reach below. Moreover, even the very measures used to combat soil erosion may themselves be affected by the same set of erosion forces. Earth banks are eroded and progressively lowered by weathering and by the traffic of cattle and man; and canal and drain capacities decrease as silting and the growth of weeds proceed.

. . . . .

Neither of the two chief agricultural activities in Malaya—padi farming and rubber growing—are seriously limited by the general poverty of Malayan soils. For other crops, suitable crop rotation and fallowing, together with artificial fertilisation, can to a large degree overcome the limitations of the soil. On the other hand, most agricultural activities, apart from padi farming, are likely to precipitate or accelerate soil erosion and sediment problems unless great care is taken. The mining of tin has been responsible for many instances of loss of soil fertility and soil erosion, siltation and flooding. Though the problem, seen in an Asian context, may be said to be largely potential, soil conservation and river conservancy measures are already very necessary to prevent the irreparable loss of soil and soil fertility in the peninsula.

11

Health, Disease and Diet[1]

MANY WRITERS have concluded that health is the chief problem in the settlement and development of tropical areas. Malaya was for long one of the unhealthiest countries in the tropics: today, however, it is one of the healthiest. Even so, the International Bank Mission Report notes that there are still areas of Malaya —parts of Trengganu, for instance—'where 50%—90% of the population shows signs of malaria, where worm infestations are more or less universal, where yaws is prevalent, leprosy not uncommon and smallpox a constant threat. T.B., V.D., malnutrition and a host of lesser ailments, though preventable or curable, are still widespread causes of sickness, disability and premature death more or less throughout Malaya.'[2]

Malaria

The story of the fight against malaria in Malaya is of unusual interest, for it was here that Watson developed in practice the principles worked out by Ross in India.

Malaria was always a formidable obstacle to the work of planters and other settlers in Malaya and helps to explain why large tracts of land remain underdeveloped. The disease was for long a problem in the Straits Settlements: in Penang, for instance, one-third of all deaths were attributed to malaria in 1829. But it only became prevalent during the last quarter of the nineteenth century and the beginning of the twentieth century when great strides were being made in the opening up of the country on the basis of tin and rubber. Singapore was inevitably affected, for infected subjects from nearby malarious countries passed through the port on their way to and from their homes and the mines and estates on the mainland. In the expanding rubber plantations of the interior the problem became acute. Urban centres, too, were affected; within two months of being opened in 1901, Port Swettenham was closed because of malaria.

[1] I wish to express my thanks to Dr. H. Schneiden for his assistance on several points in this chapter.

[2] International Bank Mission Report, p. 40.

As late as 1944 malaria accounted for about 40% of deaths from all causes in the Federated Malay States,[1] but in Malaya as a whole today malaria has lost its menace as the chief killing disease, though official figures of deaths from diagnosed malaria are thought to be rather lower than the true figures. Nevertheless it is fair to say that malaria in Malaya has been reduced by area control measures and personal prophylaxis to an endemic burden of sickness. In most malarious areas, the sickness rate is far higher among children than among adults, and the signs of oft-repeated malaria suggest the hazards of the slow immunising process whereby adults gain their immunity. Although the number of deaths from malaria in Malaya has been greatly reduced, the disease is still a serious consideration because of its restricting effects on energy, initiative and the development of positive good health.

Approaching the study of malaria from the geographical point of view, it is easy to find a correlation between the distribution of malaria and the distribution of population. Well-established, densely populated padi areas on the flat coastal plains, as in Kedah, Province Wellesley and Kelantan, urbanised areas like Singapore, and the west interior foothill belt of rubber and tin-mining settlements and related urban centres, are relatively free from malaria. In the sparsely populated interior, on the other hand, the incidence rises rapidly. The incidence of malaria in the peninsula is highest in narrow, isolated valleys of the interior where the population numbers are very small. But such remarks do not establish a simple causal relation; it is not true that the pattern of population distribution in Malaya is in any way determined by the distribution of malaria. The absence of malaria in populated areas is often the effect rather than the cause of settlement, anti-malarial measures being best developed in the more populated districts.

A further complication is introduced by the varying environmental preferences of individual species of malaria vectors. Thus in the hilly areas of central and southern Kedah the chief mosquito vector is *Anopheles maculatus* whereas in the coastal plain in the north *Anopheles barbirostris* is more common. The environmental preferences of the chief vectors in Malaya may be summarised as follows:

[1] This high incidence can be partly explained by the neglect of the war years.

Hilly Areas. A. maculatus. This, the most dangerous vector in Malaya, has been called the scourge of the rubber estates, and favours hilly, particularly granite areas. It is not common in the flat coastal plains. It is peculiarly a seepage breeder and demands clear, sunlit conditions.

Lowland Coastal Areas. A. umbrosus and *A. letifer.* These mosquitoes favour peaty, acid water along the coastal plains. *A. umbrosus* is characteristic of the jungle, preferring deep shade. *A. letifer*, however, prefers more light and is typically found in jungle that is being cleared.

A. barbirostris. This is similarly a coastal species, but is particularly characteristic of the inland edge of the brackish water zone.

A. sundaicus. This species prefers still, sunlit, brackish water.

A. baezai. This prefers some shade over brackish water.

The high moisture and temperature conditions essential for the breeding of these mosquitoes are found everywhere in Malaya. Attempts have been made to fit annual rainfall curves to the incidence of malaria vectors or to the actual incidence of the disease itself. So far, however, little success has been obtained in this direction though rainfall undoubtedly does influence malaria by affecting the height of the water-table. More success in establishing climatic correlations has attended attempts to relate malaria incidence and wet-bulb temperatures in Malaya. Research in this direction, however, is handicapped while climatic data are used from widely-spaced stations. The natural physical conditions *immediately* surrounding the insect—illumination, humidity, temperature and air movements—differ from regional averages. The micro-climate has more epidemiological significance than the regional climate.

The most dangerous vector in Malaya being *Anopheles maculatus*, one of the greatest difficulties in the settlement of the country has been that this vector favours the ecological conditions of cleared jungle in hilly areas. This is in contrast to Sarawak, for instance, where jungle species predominate. The clearing of the jungle in Sarawak is the most effective initial step in malaria control; in Malaya the clearing of the jungle in the foothills has often increased the danger of malaria. Yet it is exactly in these foothills that most settlement has taken place during the last one hundred years. It has been discovered during

this phase that the Malayan jungle is not necessarily a menace to be cut down if at all possible, and that uncontrolled felling on hilly land is likely to encourage the multiplication of dangerous species.

Man may unwittingly encourage malaria in three other ways, first by disturbing the soil. In Singapore, for instance, it is still feared that the rapid, mechanised disturbance of the soil on building sites will precipitate outbreaks of malaria on the island unless the strictest control measures are maintained. Secondly, interference with natural drainage carries with it the danger of malaria. Around the coastal areas, the mangrove forest, like the rain forest jungle, has very little malaria; but interference with tidal water, such as is entailed by agricultural work in the coastal belt, is one of the commonest causes of malaria outbreaks. When the mangrove is felled and the daily flushing action of the tide is obstructed, *A. sundaicus* and *A. baezai* make their appearance in stagnant pools of brackish water. In felling jungle in the interior, too, a common mistake is to allow the tree trunks to fall across ravines and streams—a practice which interferes with the natural drainage of the land, raises the water-table and produces stagnant conditions suitable for the breeding of *A. letifer*. In Singapore, again, malaria outbreaks have been traced to mosquitoes breeding near fish ponds. The ponds themselves do not breed mosquitoes while in full cultivation, but their construction has interfered with the natural drainage of the area. Such ponds, therefore, must be sited with care. Many engineering projects, too, such as road building and railway construction, have left behind a trail of malaria by obstructing the natural drainage. Thirdly, artificial means of transport and human migrations may cause malaria to spread over wide areas.

In the application of anti-malarial measures in rural Malaya, one important difficulty is the characteristic scattered distribution of houses. Anti-larval measures, used with such success to protect the population in towns, villages and estates, may be prohibitively expensive in rural areas where the population is widely scattered. Consequently, whereas in Western European countries rural life is popularly associated with healthy living and town life with unhealthy living, in Malaya the converse is true for most diseases: the healthiest spots are the towns where control measures and personal prophylaxis are more easily available and enforce-

able. The scattered distribution of rural dwellings also makes it difficult to capture the mosquitoes because there is no focal point in settlements towards which they are attracted. Another difficulty in the application of anti-malarial measures is that since the various species of vectors have different environmental requirements, malaria control measures must necessarily differ from place to place. The real key to malaria control in any one area is a knowledge of the vector species and its breeding habits in that particular area. 'The problem is first, last and always, a local one, success depending upon knowledge of the habits of the particular species of *Anopheles* concerned and the local peculiarities of topography, population and climate.'[1]

Other Diseases

The growth of *scrub typhus*, like the growth of some kinds of malaria, has resulted chiefly from human activities in which the jungle is cut down and a new set of ecological conditions produced. Scrub typhus vectors, like the chief malaria vectors in Malaya, are uncommon in the virgin jungle. But with the increase of waste land and clearings, the scrub typhus mite and its hosts have increased to the extent that almost every patch of waste land may become suspect.

The areas of proved endemicity of *filariasis* are the lower courses of the main rivers and along the coastal areas from the Sungei Merbok in Kedah to just north of Butterworth in Province Wellesley. The chief filariasis vectors in Malaya are culicine mosquitoes of the genus *Mansonia*—especially *indiana*, *uniformis* and *longipalpis*. But here again, the vectors vary in their distribution with the physical habitat. Along the coastal plains—in Perak, Province Wellesley and Kedah in particular—the vectors appear to be chiefly *Mansonia indiana* and *Mansonia uniformis* breeding in small patches of open swamp. Many different plants harbour the larvae of these two mosquitoes, but the water hyacinth (*Eichornia crassipes*), certain swamp grasses and water lettuce seem to be among the more important: all have roots hanging free in water. Control of filariasis along these coastal plains, then, involves the destruction of the water hyacinths and patches of open swamp. In contrast to this, along the lower reaches of the

[1] *Report No. 25 of the Institute of Medical Research*, Kuala Lumpur, 1951, p. 173. Control measures based upon such knowledge are known as 'species sanitation.'

main rivers—notably the Perak, Pahang and Bernam—*Mansonia longipalpis* is the principal filariasis vector. Settlement is restricted to levées along the river banks and is backed by extensive fresh-water jungle swamp where the *Mansonia longipalpis* breeds. Control here includes felling the jungle and draining the land.

Intensive investigation into this crippling disease is now in progress in Pahang, and is centred on the Institute of Medical Research's branch laboratory at Kuantan. Among the Malays in kampongs at the mouth of the Pahang river the infection rates are high: out of one 4,000 sample, 40% had filariasis infection and 6% had elephantiasis. The control of filariasis there seems likely to depend either on the destruction of the worms in the human host by drugs, or by the control of the vector mosquitoes by house spraying with residual insecticides.

Yellow fever[1] is carefully guarded against in Malaya as air transport becomes swifter and more frequent, for the peninsula lies in contact by air with countries in America and Africa highly infected with this disease; and mosquitoes capable of spreading yellow fever—*Aedes aegypti*—are present in Malaya. Strict precautions against the possible introduction into Singapore of the fever are in operation at the new Singapore airport. Air travellers can now reach Singapore from Africa and America in times well within the incubation period for the disease—usually 3–6 days. They have to be inoculated against yellow fever and before passengers may disembark the aircraft must be sprayed with insecticides. *Aedes aegypti* breed in containers, such as old tins —not in swamps—and are found in the Paya Lebar district near the airport. The Singapore Government is assisting farmers in the district to keep their farms clean and mosquito-free and will improve drainage there.[2]

Tuberculosis is of increasing importance in Malaya. Indeed, public concern may be said to have shifted from a mainly rural disease (malaria) to a mainly urban disease (tuberculosis). It is a social disease associated in its incidence with overcrowding. Overcrowding is especially common in the type of dwelling known as the shophouse and, according to Morland, the shophouse must

[1] I am grateful to Dr. C. E. Gordon Smith for help with this section.

[2] On the whole question of imported disease see 'Symposium on the Hazards of Imported Disease', *M.J.M.*, Vol. II, No. 1, 1956, pp. 21–80.

be looked upon as the most potent single factor in the production of the high rate of tuberculosis in Malaya. Over 50% of the urban population in the Federation live in shophouses, the rooms of which are commonly divided into one-family cubicles, leading to very high floor-space densities and producing units of accommodation in which there is often no direct access to light or fresh air.

Yaws (*framboesia*) is a highly contagious disease which has been eradicated from most urban and accessible rural areas but still persists in the more remote rural areas of Malaya. To get rid of it completely, every case of yaws must be found and treated, an operation which is made especially difficult when houses and villages are widely scattered. The Federation's Medical Department began in 1954 a strong campaign against yaws in the east coast states of Kelantan and Trengganu where yaws is more prevalent than elsewhere.

Skin Infections

This group of diseases is not commonly emphasised, though it is responsible for a great deal of inefficiency, loss of work, and discomfort. One authority claims that 'the high incidence of skin disease is one of the chief obstacles to successful living in the tropics.'[1] The cause of prickly heat is not yet known, though it is clear that disfunction of sweat glands occurs. Sweat glands become blocked, causing irritation and inflammation and interfering with efficient body-cooling.

It is easy to suggest that climatic factors play a primary role in producing skin infections, but in many cases this is not so. In Singapore it has been noted that of perhaps even more fundamental importance is the need to ensure that the patient, after treatment, does not return to the same hostile environment at home or work, to the same occupational hazards, or to the same pair of shoes or clogs. Many skin infections, moreover, have their origin in poor diet.

Diet and Nutrition

Rice, the staple diet of most people in Malaya—Malays, Chinese, and Indians alike—is well suited to the Malayan environment as a crop in that its methods of cultivation do not aggravate some of

[1] R. K. Macpherson, op. cit.

the problems referred to earlier: loss of soil fertility and soil erosion in particular. On the other hand, as Dobby points out, the lack of any pronounced dry season and the high proportion of cloud pose problems in the cultivation of cereals like rice. Perennial tree cultivation is really better suited to the equatorial environment than is seasonal cereal cultivation.

When considering the food value of rice, it is useful to remember that man's three main foods are (i) carbohydrates, such as rice and bananas, (ii) proteins, such as meat, and (iii) fats. The last has the highest calorific value; whereas one ounce of dry carbohydrate gives 113 calories in the body, and one ounce of dry protein gives about the same amount, fats are twice as good a fuel, one ounce of fat giving 255 calories in the body. As a carbohydrate, rice is one of the poorer foods in calorific value, weight for weight. Yet for the poorer classes of Malayans, rice, and to some extent bananas, must provide the bulk of the energy requirements of the body. To make up an adequately caloried diet, therefore, the poorer Malayans have to eat a large amount in weight of food. Partly for this very reason, the Malayan peasant or labourer is likely to fall below the minimum calorie requirements in his diet. It is believed that the minimum calorific intake per day should be about 2,500, though according to United Nations estimates, a marked increase in energy and initiative cannot be expected until a minimum level of 3,000 calories per head per day is reached.[1] In Malaya, the average is rather under 2,000 calories per head per day so that some of the poorer Malayans must exist at well under that level.

Bearing these facts in mind, it is interesting to look at the following table (Table VIII) which shows a post-war comparison in food consumption between Malaya, India and the United States. Such a table has many limitations and it is impossible to draw any definite conclusions from it, but certain ideas, at least, are suggested:

[1] See, however, J. Millis, 'Energy Requirements of the Population in Singapore', *M.J.M.*, Vol. XI, No. 2, pp. 119–125, who produces evidence to show that this picture may be somewhat exaggerated. Adjustments in calorie requirements are necessary because of climate, for instance. There appears to be a linear relationship between calorie expenditure and external temperature to the extent that in Singapore the FAO calorific standard should be decreased by 8.6%. The officially recommended allowance for Malayan peasants doing manual labour is 2,100 calories a day.

TABLE VIII

AVERAGE ANNUAL CONSUMPTION 1947–48
(Figures in metric pounds per capita per annum)

	Malaya	*India*	*United States*
Rice	252	135	—
Coarse Grain	—	61	—
Potatoes, Roots, Tubers	59	14	117
Sugar	12	27	109
Pulses and Nuts	33	40	17
Fats and Oils	7	7	45
Meat, Milk and Eggs and Cheese	20	120	594
Fish	40	3	10

Data from United Nations sources.

The importance of rice in the Malayan diet is clear. In the United States it is relatively little used, and in India the low figure reflects the fact that parts of the country are wheat-eating and millet-eating rather than rice-eating. The importance in India of coarse grains stands out in the table. The amount of rice eaten by the Malayan peasant as examined by Rosemary Firth in the north-east of Malaya is about a pound of *beras* (raw, husked rice) per head per day. She believes this figure to be highly accurate and it certainly fits in fairly well with United Nations estimates of the average per capita figure for the whole country. It should be noted, however, that the bulk of the rice eaten in Malaya is imported and 'polished' rice. The usual prejudice among the Malayan population is in favour of the relatively unnutritious white rice. In an analysis of the loss suffered by polishing Siamese rice the following figures were published:

	Percentage lost in Polishing
Protein	29
Fat	79
Calcium and Phosphorus	84
Iron	64
Other Salts	50

The loss of fat is admittedly made up to some extent by fat used during cooking, but the other losses are serious. Rice may be artificially enriched with vitamins and minerals, and the nutritive value of ordinary rice may be raised by the addition of this

enriched rice in appropriate proportions. Two potentially valuable supplements are thiamin, and iron, the former to prevent *beri beri*, the latter to prevent the very common iron-deficiency anaemias. But prejudice against a rice having a different flavour or appearance from that to which rice-eaters are accustomed is very real and difficult to overcome. In Singapore, however, enriched rice has already been supplied to government institutions and is likely to be used on rubber plantations in the Federation.

Table VIII suggests that potatoes and sugar are important sources of carbohydrates in the United States. Neither of these is much used in Malaya or India, though tubers and roots of various kinds are quite important articles of food. The figures of sugar consumption are especially significant because they are occasionally taken as the best single index of the standard of living in a country. The United States has a *direct* sugar consumption le el (per capita) nine times that of Malaya.

In view of what has already been said, the figures for fats and oils are most important. The average person in the United States takes more than six times the amount of this valuable fuel than does his counterpart in Malaya or India where, however, fat needs are not identical. Even more striking is the set of figures for meat, milk, cheese and eggs. Almost sixty times the Malayan figure is consumed by the average person in the United States. In this connection, however, it should be pointed out that animals are wasteful converters of food and so are always the first to go when food gets scarce. Furthermore, the climate and vegetation of Malaya are not conducive to livestock production: there are no natural pastures, and tree crops and padi dominate the agricultural land use. Animal fats are less common than the vegetable oils—coconut oil for instance. The diet of the Chinese is for this reason perhaps more satisfactory than that of the Malay in that the Chinese eats pork. The pig appears to be reasonably well suited to Malayan conditions, but Malays are for religious reasons debarred from keeping or eating pigs.

Fish forms the second staple of the average Malayan diet. The importance of fish, whereby the balance of protein is to some extent corrected, is indicated by a *per capita* consumption four times higher than in the United States and almost fourteen times higher than in India. Malaya is a peninsula, with many rivers, a long coastline, and many pools and ponds, so that fishing is a

very common, though often part-time, occupation. Both in the Federation and in Singapore, the value of fish to nutrition appears to be well appreciated and fresh water fish farms are being encouraged in padi fields, irrigation canals, drains and ponds, often integrated with pig-rearing, poultry-keeping, and vegetable production in Chinese squatter areas. Attempts are also being made to stimulate sea-fishing by mechanisation of fishing craft.

In any discussion on dietary, it should be remembered that traditions and prejudices affect the reaction of a people to change. This has already been noted with regard to polished rice. Furthermore, the fishermen of Kelantan, with access to additional fish, do not on that account eat less rice per head than the inland peasants. 'Rice is regarded as the staple food, and the fish is mainly the relish to it. No Malay fisherman would consider he had a "square meal" if it were chiefly of fish, and he would be astounded if he were told that his ration of rice was to be cut down for this reason.'[1] Then from the cultural point of view, it may be said that the Malay peasant regards his betel as the second most important item in his diet. In this the leaf of a species of pepper is chewed with a smearing of lime and a piece of areca nut. This is chewed after every meal, and on many occasions between meals also. The whole question of spices in the Malayan diet is of great interest. Why are they used? Is it simply a matter of taste, or has it some practical value in this particular environment? To the Malay today it is largely a matter of preference, but it seems probable that the spicing of foods among the Malays and Indians originated partly in the need to preserve foods and improve digestibility. It has also been suggested that chillies and other spices are good adaptations to the Malayan environment in that they increase bodily comfort by stimulating sweating. It has been shown in Singapore that such foods excite sweat glands, which are already on the verge of sweating, and so help to cool down people when they begin to eat. Mills believes the widespread use of spices to be due to an unwitting effort to remedy a dietary defect because most spices are ground from small seeds rich in vitamin B, and much of the weakening or enervating effect of the tropical climate is due to the deficiency of B vitamins. Mills also notes that spicing foods stimulates the free flow of hydrochloric acid in the

[1] Rosemary Firth, *Housekeeping among Malay Peasants*, Monographs on Social Anthropology, No. 8, London, 1943.

stomach secretions, again an effect particularly to be desired in ho climates. However, from the individual Malayan's point of view, he spices his food because he likes it that way, because it is the custom, and because it enables him to keep his food from going bad. The difficulty of keeping food in this hot, wet climate without refrigeration affects a whole range of activities and habits.

The dietary of a people is affected by a host of variables, but the immediate cause of deficient nutrition in Malaya is usually poverty. In general, however, there are no glaring deficiencies in dietary in the peninsula, except perhaps for proteins. Otherwise, the level of nutrition in Malaya is good by Asian standards. However, there are regional variations in dietary in Malaya—between urban and rural areas and between coastal and inland areas—as well as between the various groups in income and race. Thus, as Rosemary Firth points out, the coastal fisherman of Kelantan is at some advantage over both his fellow peasants inland cultivating rice, and a large part of the Asiatic population of towns, whose protein needs are considerably circumscribed by the high price of fish, meat and eggs, all of which he has to buy, while the Malay fisherman gets much of his fish free. The diet of the coastal fisherman, though doubtless leaving much to be desired, is not greatly deficient in any particular, with the possible exception of the vitamin B group; nor are deficiency diseases, at any rate in their more acute form, a serious factor in the society. From the point of view of nutrition, therefore, it seems probable that the fisherman's family enjoys a diet which at most times of the year is sufficient for the energy need of the people, not too unvaried, and not badly balanced.[1] There is, however, some significant variation in dietary throughout the year, especially in north Malaya where the dependence on local food (padi and fish) is greatest and seasonality is most marked. It has been noted, for instance, that there is a need for the provision of a better diet in north-eastern Malaya in the monsoon months, when few fresh vegetables and little fish are available. On the other hand, Smith suggests that the fact that Kelantan, Kedah and Perlis are food-producing areas helps to account for the better physique and

[1] See, on the other hand, evidence showing that the diet of peasant fishermen may be deficient in calories (1560 per capita per diem), proteins, calcium, vitamin A, vitamin B_1, and Riboflavin. See *Report of the I.M.R.*, Kuala Lumpur, 1949, pp. 6–7; also R. C. Burgess and Alang Musa, in *I.M.R. Report No.* 13, Kuala Lumpur, 1950.

lower infantile mortality rate of the Malays there compared with Malays in other parts of the peninsula.

Sanitation and Health

The problem of sanitation has wide repercussions on the general health situation in Malaya. The use of earth pit lavatories and the complete absence in many rural kampongs of any kind of sanitation measures affect, as noted earlier, the supply of drinking water. Unsatisfactory sanitation also makes the control of insects very difficult. Moreover, alimentary infections—hookworm, typhoid, dystentery and the diarrhoeas, for instance—are together responsible for much illness and inefficiency in Malaya today and they are all primarily due to the inadequate and unsafe disposal of night soil.

Most mosquitoes in Malaya are not disease vectors at all. But many of them bite man, who, apart from using such protective measures as the mosquito net, may site his dwelling where mosquitoes are least numerous. In doing so he considers two factors: first, the distance from natural breeding grounds. The length of flight from breeding place to source of blood meal has been placed in Malaya at a maximum of half a mile for most practical purposes. Secondly, man considers exposure to local breezes. Yet unfortunately the most common domestic mosquito in Malaya—*Culex fatigans*[1]—prefers to breed not in natural swamps but in water contaminated with organic matter: in collections of foul water or outflows from septic tanks, for instance. Other culicine mosquitoes breed in old tins or refuse thrown under and around the houses. Human settlement, then, may attract and encourage mosquitoes. Similarly, many mosquitoes result from the use of night soil and prawn dust fertilisers by Chinese market gardeners. In urban areas the erection of residential property in districts near vegetable gardens often gives rise to a clash of interests.

The common fly is nowadays perhaps an even more serious concomitant of poor sanitation than is the mosquito. Flies are among the most powerful agents in the dissemination of diseases associated with poor sanitation. It is little wonder that flies spread disease, for they flit indiscriminately from faeces to food, eating both and transporting contamination on their feet. Moreover, a

[1] The culicene group is the largest natural group of true mosquitoes. It is non-malarial.

fly is unable to suck solid particles through its probiscus, so that it vomits part of the liquid contents of its stomach on to the food before feeding.

There is a wide variety of diseases associated with poor sanitation in Malaya. The hookworm (*Anykstoma duodenale*) enters the body through the foot from land which has been infected by the faeces of someone who already has the disease. It is largely rural in its distribution. The most direct infection occurs in the case of the common roundworm (*Ascaris lumbricoides*), the eggs of which are directly infective when swallowed. The usual source of infection is food contaminated by night soil or by flies. Other diseases, especially cholera, typhoid and the amoebic and bacillary dysenteries, are usually caused by the presence of germs in water. The severe outbreak of gastro-enteritis in Pahang, Kelantan and Perlis in 1954, for instance, was almost confined to riverine villages. Cholera can break out in many ways, such as by flies contaminating milk and other foods, but the contamination of drinking water by excreta may be responsible for the prolongation of the outbreak. How far cholera germs can travel alive down waterways depends on such factors as the speed of flow and on the illumination, composition and temperature of the water. There is some proof, however, that infection has travelled at least 25 miles downstream and that cholera germs can preserve their vitality in water for several days. The epidemiology of typhoid fever is also, at its simplest, the contamination of food or water with infected faecal matter. When dry, most typhoid bacilli are killed at 60°C. in twenty minutes. They are not, however, destroyed by freezing, an important consideration in the manufacture and distribution of ice and ice-cream both in rural and in urban areas in Malaya.

The control of those diseases which are spread chiefly by drinking water are in theory much more easily preventable than insect-borne or contagious diseases. But in practice the chief problem here is one which applies to so many other aspects of life in the peninsula: to make the individual Malayan exercise the amount of care and self-discipline necessary to ensure the safety of his drinking water. Public health workers here struggle with the ignorance and thoughtlessness with which man unwittingly poisons the water on which his health and even his life depend. Water in Malayan rivers, streams, and canals is often expected to serve several purposes at once: transport, washing clothes and

bodies, drinking water, and the carrying away of human excreta and other wastes.

In England today it is the practice to regard all river and surface water as potentially polluted, and thus unfit for human consumption unless specifically purified. The discharge of sewage effluents into them is discouraged, not because of the possibility of adding further pathogenic bacteria to them, but solely on account of the possibility of polluting them in the more obvious sense by the deposition of solid matter, thereby exhausting the oxygen and destroying plants and fish. Effluents which are harmless in this last sense, though dangerous for drinking, are permitted to enter surface water. Though probably right for England, it is open to question whether such practices and assumptions are valid in Malaya where river and surface water is in fact consumed unpurified by very many people.

Similarly, it is the usual practice in England to regard the subsoil water as safe, though its pollution by pathogenic organisms is carefully guarded against. In Malaya, on the other hand, the high water-table makes the contamination of subsoil water only too easy. Much research has been undertaken to ascertain the extent to which sewage pollution may travel in the underground water. It has been shown that contamination from bored hole latrines and sewage pits seeps almost vertically downwards until it reaches the underground water-table. It then flows outwards on the surface of the groundwater. Flooding can make the problem very much worse. In 1954, for instance, severe floods in the southern half of the Federation towards the end of the year resulted not only in continuous damage to crops and homes but also created grave risks of the rapid spread of intestinal diseases.

The fundamental problem is how to dispose of sewage. The ultimate fate of all sewage is disposal on the land or in water, and the objects of sewage disposal are to secure the digestion of as much as possible of the solid matter into soluble form, to break down organic matter, and to convert the resultant offensive product into an inoffensive one, all this being done through the activities of bacteria. A further aim is to prevent harmful organisms, whether bacteria or other forms of animal life, from infecting man. From what has already been said it will be clear that in Malaya it is undesirable to concentrate on the disposal of sewage into water. On the other hand, the high water-table in the ground

makes the control of surface water contamination difficult. The consensus of opinion, however, is that the latter method is least dangerous and that composting is the best way to dispose of night soil in Malaya. Work in Singapore has revealed that the pathogenic organisms, amoebic cysts and the eggs of intestinal worms in sludge from sewage works are destroyed by being subjected to a heat of 140°F. for half an hour. Under practical field conditions the temperatures attained during disintegration of compost heaps are between 142°F. and 168°F.: that is, just sufficient to destroy the dangerous elements. Such systems of sewage disposal, however, are not always practicable and it has been said that the greatest defect in the development of tropical hygiene is the failure to produce systems of sanitation and water purification which are applicable to all rural conditions.

Nucleation, rapidly and sometimes artificially induced, as in recent resettlement schemes, certainly makes possible the better provision of sanitation and other services but makes their absence all the more serious. In Malayan towns the problem of sanitation is often chiefly a matter of engineering and finance. Large parts of most towns will for long depend on the bucket system, and the absence of back lanes in many shophouse areas means that night soil collection takes place in the streets. Another difficulty in the disposal of sewage in towns is illustrated in Singapore which, like all towns built on low-lying land by the sea, is obliged to lift and force sewage to the place of final disposal. In addition, it is burdened by climatic conditions which induce a high temperature in the sewers every day of the year and so combustion renders the essential work of oxidation unusually difficult and expensive. A further problem arises in the disposal of sewage in the sea. In Singapore and Penang, for instance, the cleanliness of sea beaches for bathing and residential purposes has to be taken into account.

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Over the last fifty years Malaya has been made one of the healthiest areas in the humid tropics. This is a remarkable achievement. On the other hand, there can be no relaxing of efforts to maintain and improve the general health of the population. How easily the situation could deteriorate was made clear during the Japanese occupation when anti-malarial measures were relaxed,

curative and preventive medicine restricted and the dietary of the bulk of the population drastically reduced. Moreover, there are still areas where the incidence of disease is high, and in towns tuberculosis is causing increasing concern. Continued research in tropical medicine, entomology, and public health is essential. To some extent, it will be realised, improvements in the general health situation and economic and social development are intimately linked. A decrease in prosperity must affect, for instance, the dietary of the people. But equally, without good physical and mental health there can be no question of making the fullest possible use of the natural resources of the country.

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Though by no means comprehensive, the following bibliography contains most of the sources from which the author has gratefully drawn. Those in the *General* section have been used throughout the book.

ABBREVIATIONS

A.A.A.G.	*Annals of the Association of American Geographers*, New York.
E.D.C.C.	*Economic Development and Cultural Change*, Chicago.
G.M.	*Geological Magazine*, London.
G.J.	*Geographical Journal*, London.
G.R.	*Geographical Review*, New York.
J.M.B.R.A.S.	*Journal of the Royal Asiatic Society* (*Malayan Branch*), Singapore.
J.S.B.R.A.S.	*Journal of the Royal Asiatic Society* (*Straits Branch*), Singapore.
J.S.S.	*The Journal of Soil Science.*
M.A.J.	*Malayan Agricultural Journal*, Kuala Lumpur.
M.J.M.	*Medical Journal of Malaya*, Singapore.
M.J.T.G.	*Malayan Journal of Tropical Geography*, Singapore.
Q.J.R.M.S.	*Quarterly Journal of the Royal Meteorological Society*, London.
T.I.B.G.	*Transactions of the Institute of British Geographers*, London.

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Glossary

alor	deep channel or river; hollow pool
api api	colonising mangrove growth (*Avicennia*)
atap	roofing thatch of palm fronds
ayer	water
batas	bund or boundary-dyke to a padi field
batu	hill; rock
belukar	secondary jungle or scrub
bendang	wet padi field
bukit	hill
durian	fruit of the durian tree (*Durio zibethinus*)
dusun	orchard
gelam	paper-bark tree (*Lelaleuca leucadendron*)
genting	pass; col
gong	permatang; sandy rise or ridge
gunong	mountain
jelapang	rice-barn raised on posts
jeram	rapids
kampong	village; cluster of buildings making up a large homestead or a small hamlet, and including the surrounding mixed gardens
kanan	right bank of a river
ketua	elder; headman
kiri	left bank of a river
kota	fort
kuala	river mouth; confluence
kubang	wallow; mud pool
ladang	cultivated clearing
lalang	coarse perennial grass (*Imperata arundinacea*)
laut	sea
lopak	impermanent swamp
mukim	land subdivision for purposes of land revenue
nibong	palm (*Oncosperma tigillaria*)
nipah	palm (*Nipah fruticans*)
padang	open field
pangkalan	wharf
parit	ditch; open drain
pasir	sand
paya	permanent swamp
penghulu	headman
permatang	sandy rise or ridge; gong
pulau	island
puteh	white; shining; bare rock
sawah	rice-field
simpang	cross-roads
surau	private mosque, as distinct from a mosque of general assembly
tanah	earth; soil
tanjong	promontory
telok	bay; re-entrant bend of a river
ulu	upper course of a river

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