THE PRESENT LAND USE of KELANTAN

I. F. T. WONG

JULY 1970

PRESENT LAND USE REPORT NO. 7

PRESENT LAND USE OF WEST MALAYSIA

LAND USE REPORT OF KELANTAN

by

I.F.T. WONG
Soil Scientist

LAND USE SECTION
SOIL SCIENCE DIVISION
RESEARCH BRANCH
DIVISION OF AGRICULTURE
MINISTRY OF AGRICULTURE AND CO-OPERATIVES
MALAYSIA
KUALA LUMPUR

CONTENTS

CONTENTS (CONTINUED)

ACKNOWLEDGEMENTS

The author is indebted to the following Units whose efforts have made this report possible.

The Interpretation Unit ..... under the direction of Mr. J.D. McEachern, Canadian Colombo Plan Land Use Specialist/ Geographer.

The Cartography Unit ..... under the direction of Mr. G.W. Millington-Hogg, Canadian Colombo Plan Cartographer.

The Area Measurement Unit ..... under the direction of Miss Chong Sew Ying.

Thanks are also due to Mr. Law Wei Min, Acting Senior Soil Scientist, for his constant encouragement.

INTRODUCTION

Before the resources of a country can be developed on a sound basis, a national resource inventory, based on scientific principles, must be carried out. With the resource inventory data at hand, sound long term development plans can be made, which, when implemented can result in the development of suitable land presently unutilized and, in settled areas, the land use can be intensified, diversified or completely changed. One form of resource inventory is a Present Land Use Survey.

A Present Land Use Survey will present, in some form or other, a picture of existing land utilization. The method of execution and the form of presentation depends on the scope of the survey, the degree of accuracy required, and the basic materials available. The usual end-products are a cartographical display and/or an area account of existing utilization.

The word "present" qualifies this type of survey and places emphasis on the current status of the information. It also indicates that the information decreases in value with time so that speed is essential in the data-gathering programme.

Up till now in West Malaysia the best cartographical display of land use has been contained in the National Topographical Mapping series and in State maps at smaller scales depicting land alienation. The land use information obtainable from these maps, however, is insufficiently detailed, often out-of-date, and in many places misleading (land alienation often bearing no relationship to actual use). Acreage statistics of major crops and some land use sub-categories are obtainable from various government departments, but the validity and accuracy of such acreages are dependent on the survey methods employed with the result that values are not always completely accurate. Also, it is often difficult to relate such results to specific geographical locations.

The Present Land Use Survey is producing a complete, quick and accurate assessment of land use both cartographically and statistically, so that an account of all significant forms of land utilization is given and displayed for every Mukim and District of each State in the Country. The Planner can thus be supplied with a complete statistical inventory of the present land use, geographically displayed and with this full understanding of the situation the formulation of development plans is facilitated. Large and small scale mapping combined with acreage figures listed for all political units ensures the comprehensive supply of "bench mark" data for both the Local and National Planner.

The tangible end-products of the Survey are:-

1. Acreage statistics of all land use sub-categories.
2. Present Land Use Mapping (1966) at a scale of 1:25,000.
3. Present Land Use Mapping (1966), by States, at a scale of 2 miles to an inch.

Malaysian Agriculturists and Planners have realised for some time the need for such information, but it was not until the drawing up of the First Malaysia Plan that the requirement was crystallised into action. Under the Colombo Plan, the Canadian Government was requested to conduct a resource type survey over West Malaysia, which from a land use point of view, would entail the supply of medium scale aerial photography and the execution of a Present Land Use Survey.

The Canadian Government contracted Lockwood Survey Corporation of Toronto to conduct this Survey and Canadian aircrew and aircraft commenced the aerial photographic phase in early 1966. Aerial photographs at the scale of 1:25,000 were taken of the entire area of West Malaysia by early 1967 and the Present Land Use Survey could then commence.

Between January and July 1967, Lockwood Survey Corporation, under the Canadian Colombo Plan Programme, supplied the services of two Land Use Specialists and one Cartographic Specialist. It was their duty to set up a Land Use Section within the Soil Science Division of the Department of Agriculture and to commence production as soon as possible.

For convenience and through the helpful auspices of the Directorate of National Mapping, an Interpretation Section was established at the Directorate while an Area Measurement Section and a Cartographic Section were established in the Soil Science Division of the Department of Agriculture. The first State acreage results were produced by October 1967 and a programme has been devised to ensure that the production of all acreage results and 1:25,000 land use mapping will be completed in the latter half of 1969.

It should be remembered that the aerial photographs were taken during the period January 1966 to February 1967 so that the mapping and crop acreages which are being published will not include changes in land use which occurred subsequent to the date of actual photography.

Within a two-year period, reports will be written for all the States of West Malaysia. This particular report is on the Land Use of Kelantan. The principal aims of this report are:-

1. To describe the methodology adopted.

2. To qualify the acreage statistics of State land use. (Contained in Appendix B).

At the conclusion of the Land Use Survey a comprehensive Land Use Report of West Malaysia covering all eleven States will be compiled. Then, with the availability of complete mapping coverage and acreage statistics it will be possible to discuss the land use of West Malaysia as an entity and, from the geographical point of view, to subdivide it into specific regions of characteristic land use.

METHODOLOGY OF SURVEY

An understanding of the methodology of the Present Land Use Survey can best be obtained from a brief description of the four distinct yet interlinked phases of the Survey.

Interpretation

Scaled 1:25,000 aerial photographs are stereoscopically inspected under power 3 magnification mirror stereoscopes and the photo image showing different types of land use is interpreted according to a land use classification legend (Appendix A). This legend is substantially the same as the one recommended by the Commission on World Land Use Survey (International Geographical Union) and only slightly modified to suit Malaysian conditions. Land Use sub-categories of two acres or larger are delineated in ink on the aerial photographs so that this annotated photography becomes a permanent record of the survey. There are approximately 18,000 aerial photographs in this 1:25,000 photographic coverage of which about 2,232 cover the State of Kelantan (Figure 6).

Interpreted photographs are then closely checked by a second interpreter before being passed on for compilation.

Manuscript Compilation

The interpreted scaled photographs are keyed to the transparent compilation bases of the 1:25,000 national mapping series and the delineated land use boundaries are traced onto a manuscript of dimensionally stable film (Durafilm). At this stage a certain amount of planimetric detail and all local political boundaries are added. This facilitates future field orientation of the final maps and enables acreage counts to be made for the smallest political unit - namely, the Mukim.

Area Measurement and Tabulation

The manuscript is the basis for the next two phases - area measurement and fairdrawing.

On each 1:25,000 land use manuscript an acreage count using a dot grid, is made for each sub-category and these counts are tabulated by Mukims. At this stage a valuable check is made by ensuring that the cumulative physical acreage of all the small sub-category units equals that of the total physical acreage of the gridded sheet. A further check is made by repeating the whole process and comparing the results for the same sub-category from the two counts. This double count ensures that each individual sub-category is correctly measured.

When a district has been interpreted and mapped in manuscript form it is possible to compile a District Abstract of land use acreage where all acreages are listed under Mukims. From this abstract a separate District Summary sheet of acreage is compiled, where the acreage of all nine land use categories and their sub-categories are presented as percentages of the district as a whole. The total agricultural acreage is given and presented as a percentage of the district while agricultural sub-categories are shown as a percentage both of agricultural land and of the district as a whole. A State Summary of land use acreage (the one for Kelantan is Appendix B of this report) follows substantially the same outline as the District Summary with the combined State Land Use acreages and percentages being listed as well as those for the component districts.

Thus, a complete picture of land use is presented. The "whole" has been obtained by inspection, delineation and classification of the entirety. Regardless of the limitations imposed by the aerial photographic method, it can confidently be stated that an accurate universal picture is obtained and that, as far as the major crops are concerned, the results can be considered as those of an accurate crop survey.

Fairdrawing

The final 1:25,000 map sheet is compiled by a fairdrawn tracing of the manuscript on dimensionally stable film. This is the final record from which printed maps or dyeline copies can be made; these may then be hand-coloured by the user according to a recognised colour system suggested by the Commission on World Land Use. The anticipated market for this scale of land use mapping is likely to be limited and therefore a coloured series at this scale is not being produced.

A printed coloured land use map series at a scale of 2 miles to an inch is, however, being published for all States. The uncoloured version, enclosed in the back cover pocket, is presented with the report.

Land Use mapping at this scale is useful as it gives an overall picture of the present conditions as well as facilitating regional and state planning. The 2 miles to one inch Land Use Map of Kelantan was compiled by condensing 100 of the 1:25,000 map sheets (Figure 7).

THE PHYSICAL ENVIRONMENT

Location and Extent

The State of Kelantan, located in the north-eastern extremity of West Malaysia (Figure 1), is bounded in the north-west by Thailand, the west by Perak, the south by Pahang, the east by Terengganu and the north and north-east by the South China Sea. It occurs within latitude 4° 30'N and 6° 17'N and longitudes 101° 20'E and 102° 41'E. The total area of the State is 3,711,537 acres or 5,799.3 square miles.

Politically the State is divided into eight districts with four (Tumpat, Kota Bahru, Bachok and Pasir Puteh) along the coast, three (Pasir Mas, Tanah Merah and Ulu Kelantan) in the hinterland and one (Machang) in the middle of the State.

Physiography and Geology

The highlands of Kelantan are dominated by two mountain ranges, the Main Range and the East Coast Range. The Main Range, composed of acid igneous intrusive rocks mainly of granitic composition, extends throughout the western border of the State and continues into Thailand. The East Coast Range, forming the eastern boundary of the state, is also composed of acid igneous intrusives of granitic composition except at Gunong Gagau in the south where the granite is overlain by arenaceous sediments of Jurassic-Cretaceous age (Geological map, 1963).

The geological formations between the two mountain ranges are predominantly of sedimentary origin. Among the fine-grained rocks calcareous deposits are common while the coarse-grained formations are predominantly arenaceous. Folding and metamorphism have occurred in these sedimentary formations the intensity of the folding and alteration increasing with increasing nearness to the granitic mountain ranges. Common rock types among the sedimentary and metamorphic formations are principally shale and quartzite. Other rock types are schist, limestone and conglomerate.

Igneous effusives in the form of tuffs and flows have also been mapped. The tuffs are mainly of acidic to intermediate composition varying from rhyolites to andesites while the flows are commonly of andesitic to basaltic composition.

The intense folding of the sedimentary formations between the two mountain ranges has produced a rugged landform pattern in the foothills region. Land at 250 or 300 feet above mean sea level often has slopes in excess of 20°, the only important exception to this rule being the large valley of the upper Sungai Lebir-Sungai Aring river system, which has steep slopes at an altitude approximating 500 feet a.s.l. (Panton, 1960).

The riverine plains of the Sungai Kelantan and Sungai Golok are generally flat when viewed on a regional basis. At larger scales, however, the general flatness is interrupted by river terraces, infilled ox-bows and other abandoned stream channels.

The almost flat coastal plain extending from the riverine plains to the South China Sea in the north continues southwards along the coast into Terengganu. Towards the coast the general flatness of the plain is broken by a series of long low sand ridges or permatangs which are aligned more or less parallel to the coastline. The depressions between the permatangs are often flooded.

Drainage

There are only two main river systems in Kelantan. That of the Sungai Kelantan is by far the larger, while that of the Sungai Golok has only one half within the boundary of Kelantan, the other half being in Thailand. Both rivers flow in a northerly direction towards the South China Sea.

The Sungai Kelantan has been described as a strike consequent river as it flows in the valley between the two mountain ranges which mark the eastern and western borders of the State. Its tributaries have their headwaters in the highlands surrounding the western, the southern and eastern margins of the State.

The Sungai Golok, by contrast, is relatively short with its headwaters originating near the northern extremity of the Main Range.

The drainage pattern in Kelantan is generally rectangular with swift-flowing tributaries issuing forth from hill and mountain ranges meeting the strike consequent main rivers at right angles, the point of confluence usually occurring at the break of slope between the highlands and the plains.

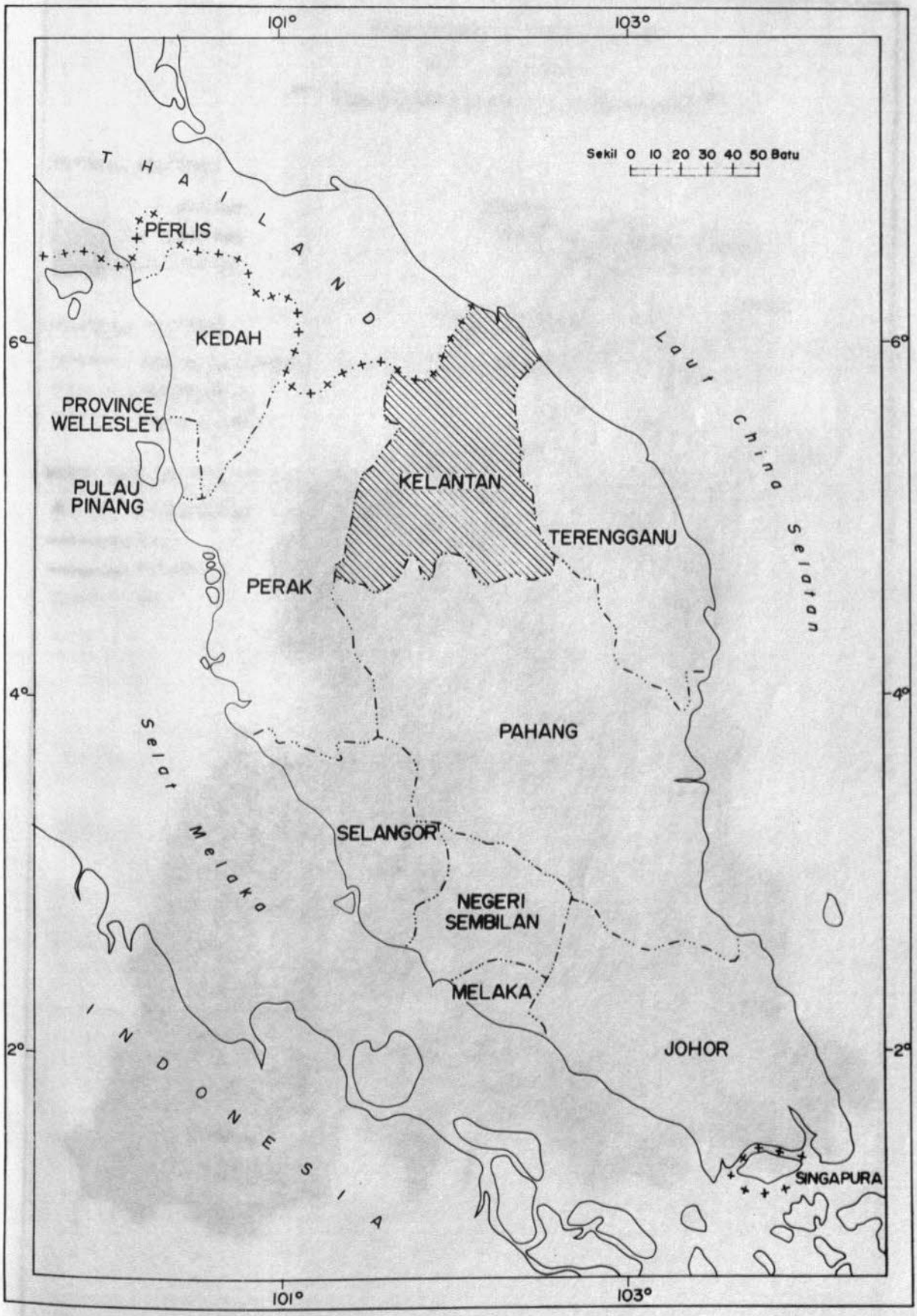


Figure 1. Location of the State of KELANTAN within West Malaysia.

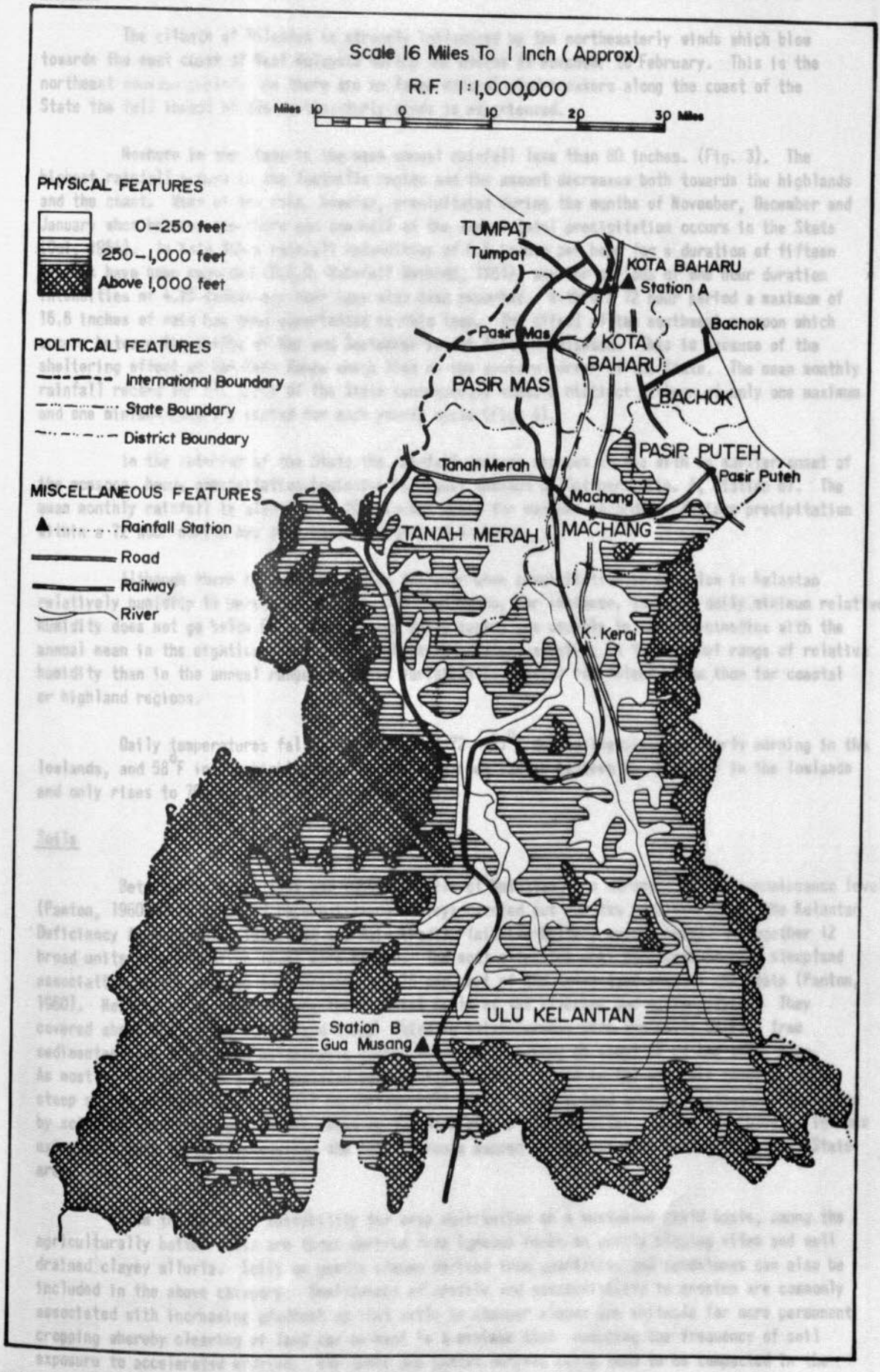


Figure 2. The main physical and political features of Kelantan and the two rainfall stations.

Climate

The climate of Kelantan is strongly influenced by the northeasterly winds which blow towards the east coast of West Malaysia during the months of November to February. This is the northeast monsoon period. As there are no large natural wind-breakers along the coast of the State the full impact of the northeasterly winds is experienced.

Nowhere in the State is the mean annual rainfall less than 80 inches. (Fig. 3). The highest rainfall occurs in the foothills region and the amount decreases both towards the highlands and the coast. Most of the rain, however, precipitates during the months of November, December and January when between one-third and one-half of the annual total precipitation occurs in the State (Ooi, 1964). In Kota Bahru rainfall intensities of 6.5 inches per hour for a duration of fifteen minutes have been recorded (D.I.D. Rainfall Records, 1961), and for periods of one hour duration intensities of 4.75 inches per hour have also been reported. Within a 72 hour period a maximum of 16.6 inches of rain has been experienced in this town. The effect of the southwest monsoon which occurs between the months of May and September is not felt in Kelantan. This is because of the sheltering effect of the Main Range which lies on the western border of the State. The mean monthly rainfall record for all parts of the State consequently shows a distinct pattern of only one maximum and one minimum rainfall period for each yearly cycle (Fig. 4).

In the interior of the State the rainfall pattern changes to one with an earlier onset of the monsoon, heavy precipitation beginning in August instead of October. (Fig. 4, Station B). The mean monthly rainfall is also lower, 16.4 inches being the maximum recorded. Maximum precipitation within a 72 hour period has only been as high is 9.5 inches.

Although there is a period during the year when precipitation is very low in Kelantan relatively humidity is persistently high. In Kota Bahru, for instance, the mean daily minimum relative humidity does not go below 60 per cent; mean daily maxima are usually in the mid-nineties with the annual mean in the eighties (Ooi, 1964). There is greater variation in the diurnal range of relative humidity than in the annual range, and this variation is greater for inland areas than for coastal or highland regions.

Daily temperatures fall to a minimum of 72 - 75°F during the night and early morning in the lowlands, and 58°F in the highlands. The daily maximum varies between 84° and 87°F in the lowlands and only rises to 70° in the highlands (Ooi, 1964).

Soils

Between the years 1955 and 1959 the soils of Kelantan were surveyed at a reconnaissance level (Panton, 1960) with detailed reconnaissance surveys carried out for two specific areas, the Kelantan Deficiency Area (Arnott, 1957) and the Main (Padi) Plain (Mc Walter, unpublished). Altogether 12 broad units at association level were mapped. The most extensive unit was, however, the steepland association which amounted to approximately 76 per cent of the total land area of the State (Panton, 1960). Next in extensiveness were the alluvial soils of the riverine and marine plains. They covered about 12% of the total land area. Third in extensiveness were the soils derived from sedimentary and associated metamorphic rocks, these soils making up about 8% of the total area. As most of the granites and associated igneous intrusives occurred in the mountain ranges, where steep slopes predominated, a small percentage (4%) of the State's land area was consequently covered by soils derived from such parent rocks on the more gently sloping sites. Soils developed on igneous extrusives were quite inextensive, the total acreage mapped being less than 0.5% of the total State area.

From the point of suitability for crop cultivation on a sustained yield basis, among the agriculturally better soils are those derived from igneous rocks on gently sloping sites and well drained clayey alluvia. Soils on gentle slopes derived from quartzites and sandstones can also be included in the above category. Shallowness of profile and susceptibility to erosion are commonly associated with increasing gradient so that soils on steeper slopes are suitable for more permanent cropping whereby clearing of land can be kept to a minimum thus reducing the frequency of soil exposure to accelerated erosion. The shale and schist-derived soils tend to be compacted in the subsoil, again limiting the suitability of such soils to more tolerant crops.

Soils developed on the sandy permatangs along the coast and the poorly drained alluvia are among the more nutrient deficient members. Drainage, either excessive or very poor, is extreme in such soils, thus making them of very limited agricultural use.

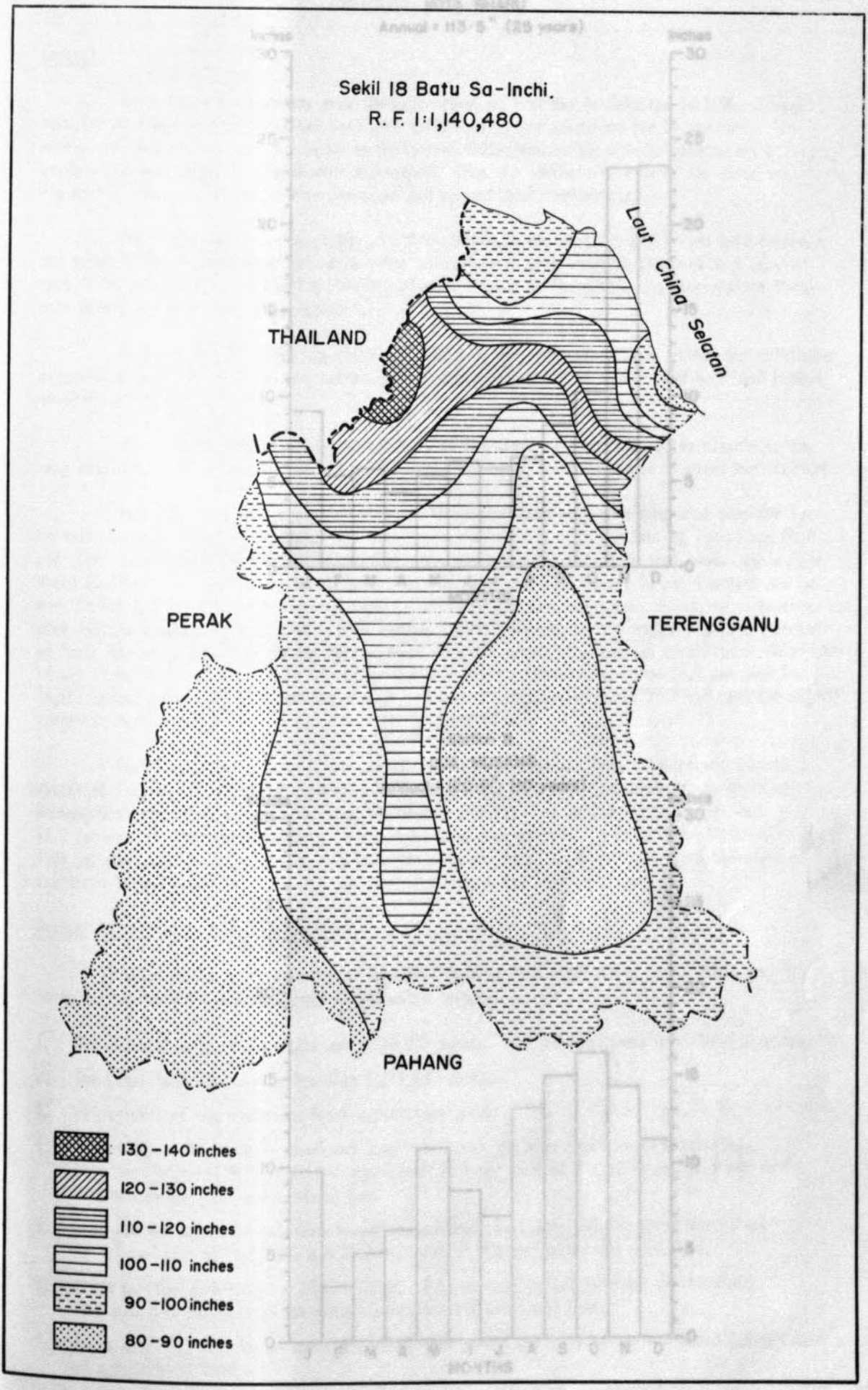
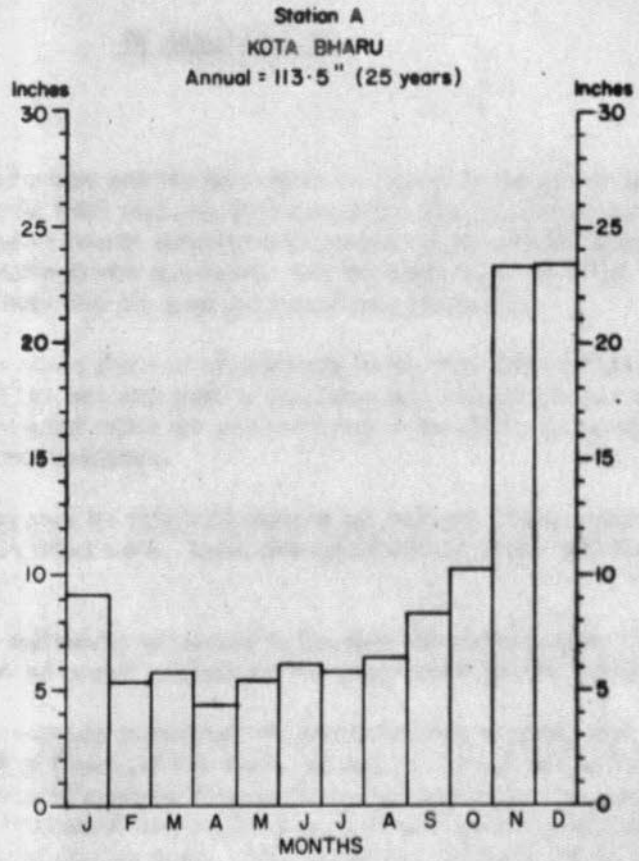


Figure 3. Mean annual rainfall distribution of Kelantan (1950 – 1965, compiled by D. I. D.)



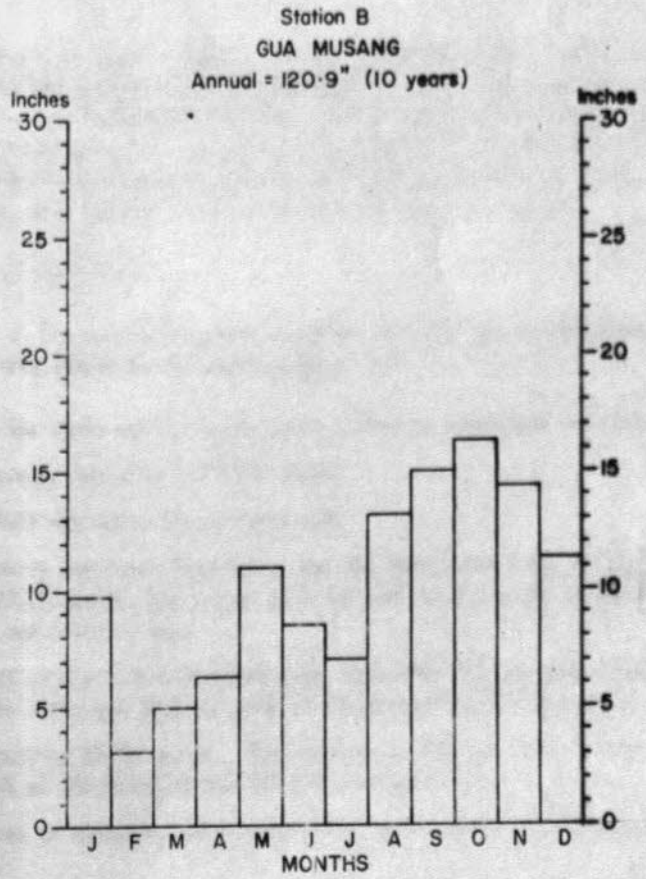


Figure 4. Average monthly precipitation for two rainfall stations.

THE PRESENT LAND USE

General

Agriculture and Forestry were the major forms of land use in Kelantan in 1966. Forest occupied 80.3 per cent of the total land area while agriculture accounted for 14 per cent. The pattern of land use was one of intense agricultural utilization on the alluvial plains and a gradual decrease as the highlands were approached. Thus the northern section of the state was the most extensively developed from the urban and agricultural standpoints.

The marine and riverine plains of all districts in the state were utilized most intensely for agriculture. Padi was the main crop grown on the plains with coconuts the next most popular crop to be grown there. Although rubber was also cultivated on the plains the rubber plots there were mainly under smallholder management.

On the hills away from the plains the emphasis was reversed. There, rubber was cultivated extensively and often on an estate basis. Large contignuous units of rubber land have been mapped on those upland areas.

The emphasis on smallholder agriculture in the state was indicated quite clearly by the many small units of rubber and coconut holdings and the large overall acreage of mixed horticulture.

Among the eight districts in the state the most extensively developed ones were the two northern coastal districts of Tumpat and Kota Bharu. As much as 82.5 per cent of Tumpat and 88.3 per cent of Kota Bharu Districts consisted of urban and agriculturally developed land. While Kota Bharu District still had 155 acres of forest and 918 acres of scrub forest Tumpat District had no more forest and only 28 acres of scrub forest. Still extensively developed, though to a lesser extent, were the two southern coastal districts of Bachok and Pasir Puteh and the northern inland district of Pasir Mas where more than 55 per cent of each district was under urban and agricultural development; in all three districts the extent of swampy land was still considerable, being 21.7 per cent (or 14,958 acres) in Bachok, 14.8 per cent (or 15,513 acres) in Pasir Puteh and 14.2 per cent (or 22,469 acres) in Pasir Mas.

The general decrease in urban and agricultural development from the northern coastal districts towards the south and southwest of the state can be traced from district to district. Machang District which is midway between the southern coastal and inland districts had only 42.8 per cent of its land under urban and agricultural development. In Tanah Merah District 19.5 per cent of the land had been developed while in Ulu Kelantan District, the southernmost of the three inland districts, only 2.9 per cent of the land had been developed.

Salient Statistics

A brief synopsis of the more outstanding facts of land utilization in Kelantan, as found by the Present Land Use Survey is indicated below:-

1. The physical area of the state was 3,711,537 acres. This is equivalent to 5,799.3 sq.miles.
2. The total land use acreage was also 3,711,537 acres.
3. 14 per cent of the state was under agricultural use.
4. Within the agriculturally developed land rubber was the most extensively cultivated. This crop occupied 223,716 acres, equivalent to 6 per cent of the state and 43.1 per cent of the acreage under agricultural use.
5. Padi was the next most extensively cultivated crop, totalling 188,390 acres equivalent to 5.1 per cent of the state and 36.3 per cent of the agriculturally used land.
6. Mixed horticulture occupied 80,561 acres. This acreage is 2.2 per cent of the state area and 15.5 per cent of the total agriculturally developed land.
7. There were 17,370 acres of coconuts, which covered 0.5 per cent of the state and 3.3 per cent of agricultural land.
8. 3,569 acres were under shifting cultivation.
9. 76 per cent or 2,819,652 acres of the state were under forest.
10. There were 64,710 acres or 1.7 per cent of the state under swamp.

Figure 5 illustrates the distribution of the major land use categories within Kelantan.

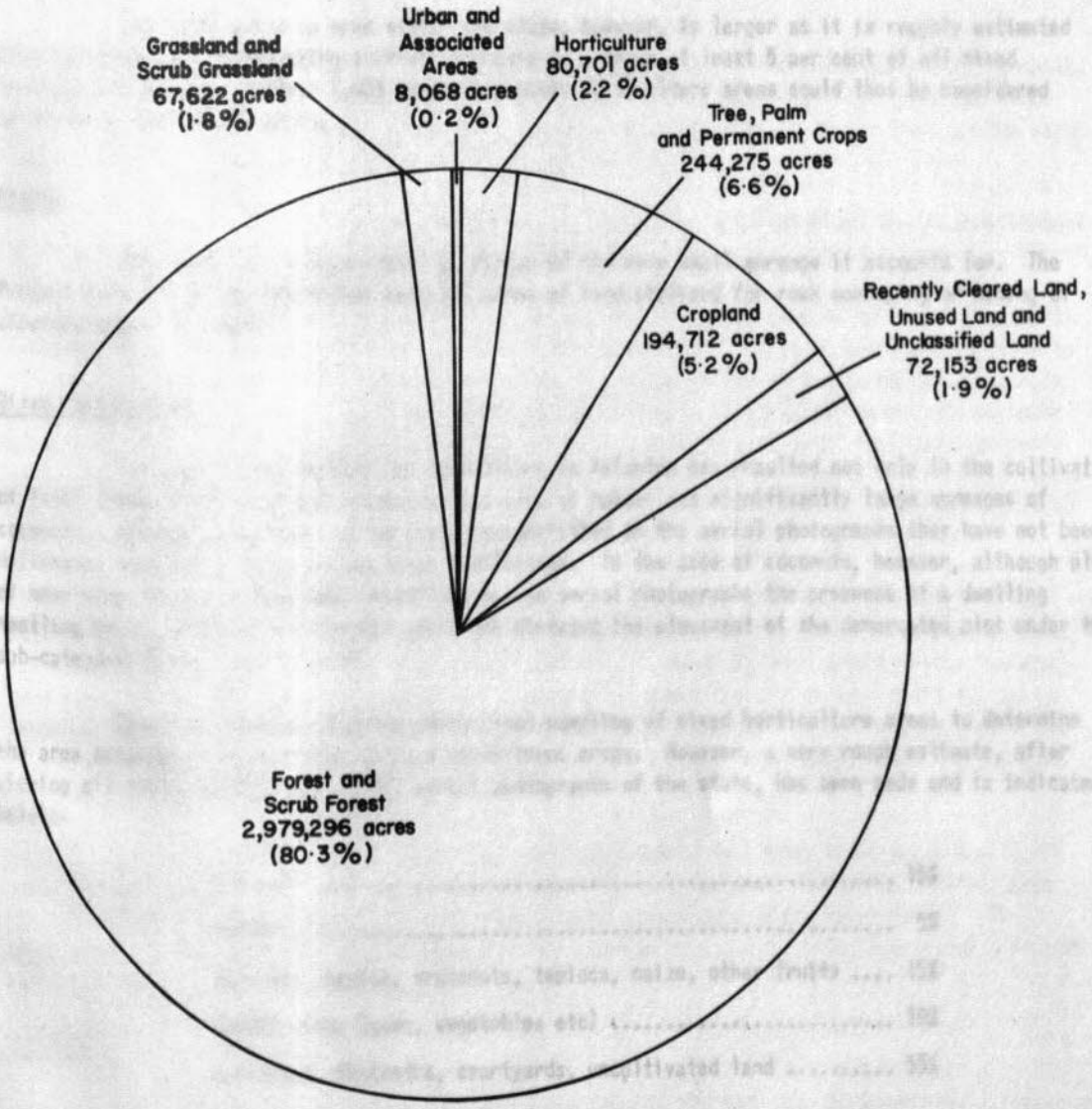


Figure 5. The proportions of land use categories within Kelantan.

Urbanization

With the exception of Kota Bharu (1,518 acres), the state capital, none of the towns in Kelantan had an area of more than 400 acres, most of them covering areas of less than 50 acres. The emphasis on agriculture in this state is even found in the urban areas where a substantial percentage of the land has often been utilized for the cultivation of annual (vegetables, cassava), semi-perennial (bananas) and perennial crops (coconuts and rubber). Considering that only 0.2 per cent (or 6,833 acres) of the state has been mapped as urban land the actual built up area within the 'urban' category cannot be very extensive as the cultivated crops also occupy some of the land within this sub-category.

The total built up area within the state, however, is larger as it is roughly estimated that buildings and accompanying courtyards occupy on average at least 5 per cent of all mixed horticulture areas; a further 4,028 acres from mixed horticulture areas could thus be considered as built up land in the state.

Mining

This activity is significant by virtue of the very small acreage it accounts for. The Present Land Use Survey identified only 352 acres of land utilized for rock quarrying or mining of minerals other than tin.

Mixed Horticulture

The emphasis on smallholder agriculture in Kelantan has resulted not only in the cultivation of fruit trees, root crops and vegetables but also of rubber and significantly large acreages of coconuts. Although the rubber plots could be identified on the aerial photographs they have not been delineated separately owing to map scale limitations. In the case of coconuts, however, although plots of more than two acres have been identified on the aerial photographs the presence of a dwelling nestling in the midst of the coconut palms has dictated the placement of the demarcated plot under the sub-category "Mixed Horticulture".

There has been no rigorous statistical sampling of mixed horticulture areas to determine the area occupied by each of the various constituent crops. However, a very rough estimate, after viewing all the 1:25,000 scale (1966) aerial photographs of the state, has been made and is indicated below:-

Coconuts	15%
Rubber	5%
Bananas, papayas, arecanuts, tapioca, maize, other fruits	15%
Garden crops (yams, vegetables etc)	10%
Buildings, footpaths, courtyards, uncultivated land	55%

As the total acreage of mixed horticulture has been measured as 80,561 the acreage of coconuts included within this catch-all sub-category would amount to 12,084 while approximately 4,028 acres would be occupied by rubber. The built up area, after examination of the aerial photographs, has been estimated to cover 5 per cent or 4,028 acres, on average.

Market Gardening

With only 67 acres mapped under this sub-category the lack of emphasis on market gardening is obvious. The above acreage figure has been obtained by measurement of plots of 2 acres or more. While it is possible to increase the total acreage still more if plots of less than two acres are also included the overall acreage would still be small as most of the smallholders of the state would have their own supply from their backgardens and so can be considered to consume a very insignificant portion of the produce from commercial market gardens.

Rubber

Covering 223,716 acres and accounting for 43.1 per cent of the total agricultural land of the state, rubber was the most extensively cultivated crop in Kelantan in 1966.

The Rubber Statistics Handbook (1966) indicates that 44,518 acres or 19.9 per cent were under estates. By subtraction from the acreage mapped by the Present Land Use Survey there were thus 179,198 acres or 80.1 per cent under smallholdings. The estate acreage was distributed among 70 estates of which 61 were Asian-owned and 9 European-owned. All the European-owned estates were more than 1,000 acres in size and only 3 of the Asian-owned ones were in this size range; of the remaining 58, only three were between 500 and 999 acres while 55 were each less than 500 acres in extent.

Total production from the estates (11,880 tons) was more than twice that from the smallholding sector (23,469 tons) considering that the latter covered more than four times the total estate acreage. The overall total production for the state amounting to 35,349 tons was the eight highest in West Malaysia taking Kedah and Perlis as one unit.

Average yield from the estate sector was 858 lbs. per acre which was the seventh highest for the peninsula, again considering Kedah and Perlis as one unit.

While on estates rubber was cultivated in large blocks the reverse held true for smallholdings, as fields of less than one acre were quite common particularly on the isolated hills in the midst of padiland; in such areas rubber fields in various stages of replanting were commonly observed. Often rubber areas which were too small to be mapped individually were included under mixed horticulture since they were often found in close proximity with rural dwellings and their associated "dusun" or "kebun" cultivations. Frequently as much as half the cultivated area under mixed horticulture consisted of rubber. A very tentative estimate of the rubber acreage included within mixed horticulture areas is 4,028 acres.

As the management of rubber smallholdings decrease the condition of the rubber trees also deteriorate so that the cultivated area takes on the appearance of scrub land. This was a common feature of land use in areas where rubber was cultivated. Where the well managed rubber holdings were large the scrub-rubber occurred on the periphery but where the former were small the latter occurred among the well managed plots. An examination of the 1966 aerial photographs showed that 25,445 acres mapped as scrub forest were in reality scrub rubber. Similarly, 9,302 acres mapped as scrub grassland contained rubber.

The district with the greatest extent of scrub-rubber was Tanah Merah which had 11,451 acres mapped under scrub forest and 1,988 acres under scrub grassland. Pasir Mas District also had extensive (8,359 acres) areas of scrub-rubber which were mapped under scrub forest. The third district with extensive scrub-rubber was Ulu Kelantan with 3,332 acres under scrub grassland and 3,443 acres under scrub forest.

Oil Palm

Occupying 1,087 acres of which 1,083 acres were in Ulu Kelantan district, the cultivation of oil palm in Kelantan appears to be just beginning to gain importance. This is indicated by the large increase in new plantings in 1966 as reported by the State Agricultural Officer (Laporan Tahunan 1966). While the acreage planted before 1966 was reported as 1,200 the new plantings for the same year occupied 2,564 acres. All the acreages planted were on an estate basis.

Coconut

The coconut palm is an ubiquitous plant on the coastal plain. Seldom is the compound of a rural dwelling without this palm which has also been grown in urban areas. The cultivation of this crop in contiguous blocks of more than two acres has also been practiced. The acreage of such areas mapped in this survey was 17,314. But if smaller acreages mapped under other subcategories such as mixed horticulture and scrub grassland were to be added to the above total figure the overall total area under this crop could be increased still more. It has been very roughly estimated that approximately 12,064 acres mapped as Mixed Horticulture consisted of this crop.

As all the coconuts grown in the state were on smallholdings there are no yield figures but considering the acreage cultivated with this crop the yield must be considerable. Not all the nuts harvested would be sold as a substantial number would be consumed by the smallholders themselves.

Pineapple

As there were no large areas where pineapples were cultivated the survey did not identify this crop. It is, however, known that pineapples have been grown in the state by smallholders as a mixed horticulture crop.

Sago

Sago palms have been found growing in narrow stream channels usually in the neighbourhood of padi-growing areas. Out of the 1,492 acres mapped, 593 acres occurred in Kota Bharu District and 408 acres in Pasir Mas District. The district with the lowest acreage (11 acres) of this crop was the hilly and remote district of Ulu Kelantan.

Bananas

This is another crop which has not been mapped on its own because of the very small plots on which it has been grown. Bananas, however, were known to have been cultivated under the following three situations:-

1. within mixed horticulture areas,
2. around dwellings within urbanised areas,
3. within areas of diversified crops.

Tobacco

This crop is usually cultivated on fallow padiland. Plots of tobacco are seldom more than 1/7 acre in extent. As it has been possible to map areas no smaller than two acres in extent toabcco plots have not been mapped in this survey. The State Agriculture Officer's annual report of 1966 (Laporan Tahunan, 1966), however, gives the following acreage for tobacco grown in Kelantan in that year:

Virginia variety	-	1,824 acres
Local variety	-	275 acres
		2,099 acres

Fish and Hyacinth Ponds

The 26 acres mapped in this survey indicates the lack of emphasis on this form of land use. Possibly this lack of emphasis on fish and hyacinth pond is due to the complete absence of tin mines, particularly open-cast mines, in the state, for in other states the abandoned excavations have been utilized for fish culture and water hyacinth growth.

Orchards

The rural make-up of Kelantan has resulted in a lack of emphasis on large scale orchard cultivation as each smallholder can have a sufficient supply of local fruits from his backgarden. Tanah Merah District had the highest acreage of orchards, which was only 242 acres, the total for the state being 452 acres. The main orchard fruits were Rambutan (Nephelium lappaceum), Durian (Dirio zibethinus), Oranges (Citrus spp.), and Mangoes (Mangifera spp.).

Padi

Cultivated on 188,390 acres which amounts to 5.1 per cent of the state, padi was an extensively cultivated crop, second only to rubber. The broad coastal plain was the main area of concentration. The districts devoted extensively to the cultivation of this crop were Tumpat, Pasir Mas, Kota Bharu, Bachok and Pasir Puteh, where 47.8, 26.6, 40.4, 35.8 and 31.8 per cent respectively of their land areas were utilized for padi growing.

Wet padi was by far the most popular variety grown. The emphasis has also been on single cropping, with off-season cropping continued on 7,660 acres only (Laporan Tahunan,1966).

The ratio of wetland to dryland padi was approximately 9 to 1 in the state in 1966. Thus, out of the total 188,390 acres mapped approximately 170,000 acres were devoted to wetland padi. As 30,274 acres were under irrigation schemes, there were an estimated 139,726 acres grown by means of simple diversion of water or seasonal flooding.

In areas bordering swamps where permanent flooding has been common, padi cultivation has not always been successful. This has led to abandonment of the unsuitable fields which in some districts have been found to be extensive. Districts with more than 1,000 acres of such land were Pasir Mas (3,853 acres), Pasir Puteh (2,689 acres), Tumpat (1,259 acres) and Machang (1,037 acres).

Production from the three main types of padi cultivation, the main season, the off-season and the "dry" or non-irrigated types has been variable as indicated in table 1 below.

TABLE 1. PADI PRODUCTION

Type / Production	Main Season	Off-season	"Dry" or Tugalan
Total yield	13,326,000 gtgs*	2,730,000 gtgs	2,417,000 gtgs
% of West Malaysian Total	5%	5.8%	31%
Average yield	116 gtgs/acre	359 gtgs/acre	196 gtgs/acre

(extracted from Statistical Digest).

The main season crop, although it is the major contributary source of padi in the state, has a low average yield as 116 gantangs per acre is only 30 per cent of the overall average yield (389 gantangs/acre). In terms of total production Kelantan's main season crop was the fifth highest among the eleven states.

The off-season average yield was higher, being 78.6 per cent of the overall average of 457 gantangs per acre. In terms of total production Kelantan also has the fifth highest production of this type of padi.

The yield of padi tugalan was the highest among the eleven states and the average yield was 94 per cent of the overall average of 209 gantangs per acre.

Diversified Crops

The main crop grown under this sub-category was tapioca (manihot utilissima). But often this was not a sole crop as bananas and maize could be grown together with the tapioca. The diversified crops areas have, nevertheless, been the main source of commercial tapioca. The cultivation of diversified crops was confined more towards the hills than in the padi-growing lowlands so that districts such as Ulu Kelantan, Tanah Merah, Pasir Mas each have more than 500 acres utilized for this purpose while the districts of Tumpat and Pasir Puteh have 73 and 72 acres respectively. Bachok District had no diversified crops at all.

Note: *gtgs = gantangs.
1 gantang = 1 gallon
1 gantang = 5.6 lbs. padi.
1 gantang rice = 8 lbs. rice (approx).
615 gantangs padi = 1 ton rice.

Shifting Cultivation

Out of the 3,569 acres mapped in this survey, 3,492 acres were found in Ulu Kelantan District where shifting cultivation has been a common practice. Individual units of shifting cultivation have not been large. The maximum size of a unit mapped was 46 acres. But more commonly units were 2 to 4 acres in extent.

Forest, Scrub Forest, Scrub Grassland and Swamp

The 2,819,652 acres of forest land in the state constitute 76 per cent of the total state area. Most of the forests occurred in the less developed districts of Ulu Kelantan and Tanah Merah where 2,510,798 and 220,360 acres respectively were mapped. Scrub forests were also extensive in these two districts being 94,820 acres in Ulu Kelantan and 32,614 acres in Tanah Merah. In the state, as a whole, if forests and scrub forests are taken together, they constituted 80.3 per cent of the state. Grasslands were also extensive, accounting for 67,622 acres or 1.8 per cent of the state area.

Swampland was extensive in the coastal plain particularly in the districts of Pasir Puteh, Bachok and Pasir Mas. As much as 14.8 per cent (or 15,513 acres) of Pasir Puteh District, 21.7 per cent (or 14,958 acres) of Bachok District and 14.2 per cent (or 22,469 acres) of Pasir Mas District consisted of swamps. Although these swamps have been mapped as such they showed, in parts, evidence of having been cultivated with padi at some time during the past as the outline of fields with the accompanying raised ridges or batas could still be seen.

While scrub grassland consisted of a wide range of local grasses, chief among which being lalang (Imperata cylindrica), in rubber-growing areas, as much as 9,302 acres of such land have been found to show distinct evidence of rubber cultivation. The rubber, however, on average did not occupy more than 10 per cent of such scrub areas. Similarly in scrub forest areas as much as 25,445 acres have been mapped as scrub rubber. In these areas as much as 30 per cent could be considered, on average, to be occupied by rubber.

The total area of scrub forest and scrub grassland containing rubber has therefore been substantial in Kelantan and this clearly indicates where land utilization could be intensified in the first instance.

Recently Cleared Land

This is land which has been cleared for new planting or replanting mainly of rubber and oil palm. Large units of such land have been found adjoining extensive areas of rubber. Some of these areas could have been cleared from old rubber while others were more likely cleared from jungle as they were found on the fringes of jungle land. Among the eight districts of the state, Ulu Kelantan had the largest acreage of recently cleared land the 17,109 acres mapped constituting 65 per cent of the total area of recently cleared land in the state.

Unused Land

This sub-category includes all land with no land use such as beaches, sand bars on rivers and limestone hills and ridges which support vegetation that is practically of little use either for forest exploitation or agriculture. Thus the 2,398 acres of unused land in Tumpat District consisted almost exclusively of beaches and sand bars while the 11,260 acres in Ulu Kelantan District were solely composed of limestone hills and ridges.

INDEX OF AERIAL PHOTOGRAPHY AND 1:25,000 LAND USE MAPPING

Photography

Aerial photographs at the scale of 1:25,000 taken in 1966 form the basic tool of this Survey. Hence it is thought dersirable that the reader be made aware of the photographic coverage of Kelantan. The original films of this coverage are lodged with the Directorate of National Mapping and prints can be made available to authorised bodies who may require them for carrying out a closer inspection of a particular area.

There are about 2,232 overlapping aerial photographs covering the State of Kelantan. This coverage is represented by an index (Figure 6) which depicts the position of every 5th photograph, the flight line position and the negative film roll number containing a particular line. For example, the photographs stereoscopically covering Kota Bharu Town in figure 6 would be referred to as, Roll C-77, Line 60, Photos 56 and 57. The State is covered by 37 north-south lines approximately 2.5 miles apart. The lateral overlap of these lines is approximately 30 per cent with the strip width of a single line being about 3.5 miles. The photographs along the flight lines overlap by about 55 to 65 per cent which means that the principal points (centres) of the photographs are approximately 1.4 miles apart.

Each aerial photograph measures 9" x 9" and covers an area of approximately 12.6 square miles. Since the lateral and forward overlap are necessary to achieve stereoscopic effect, it means that each photograph only "gains" approximately 2.8 square miles of the stereoscopic coverage.

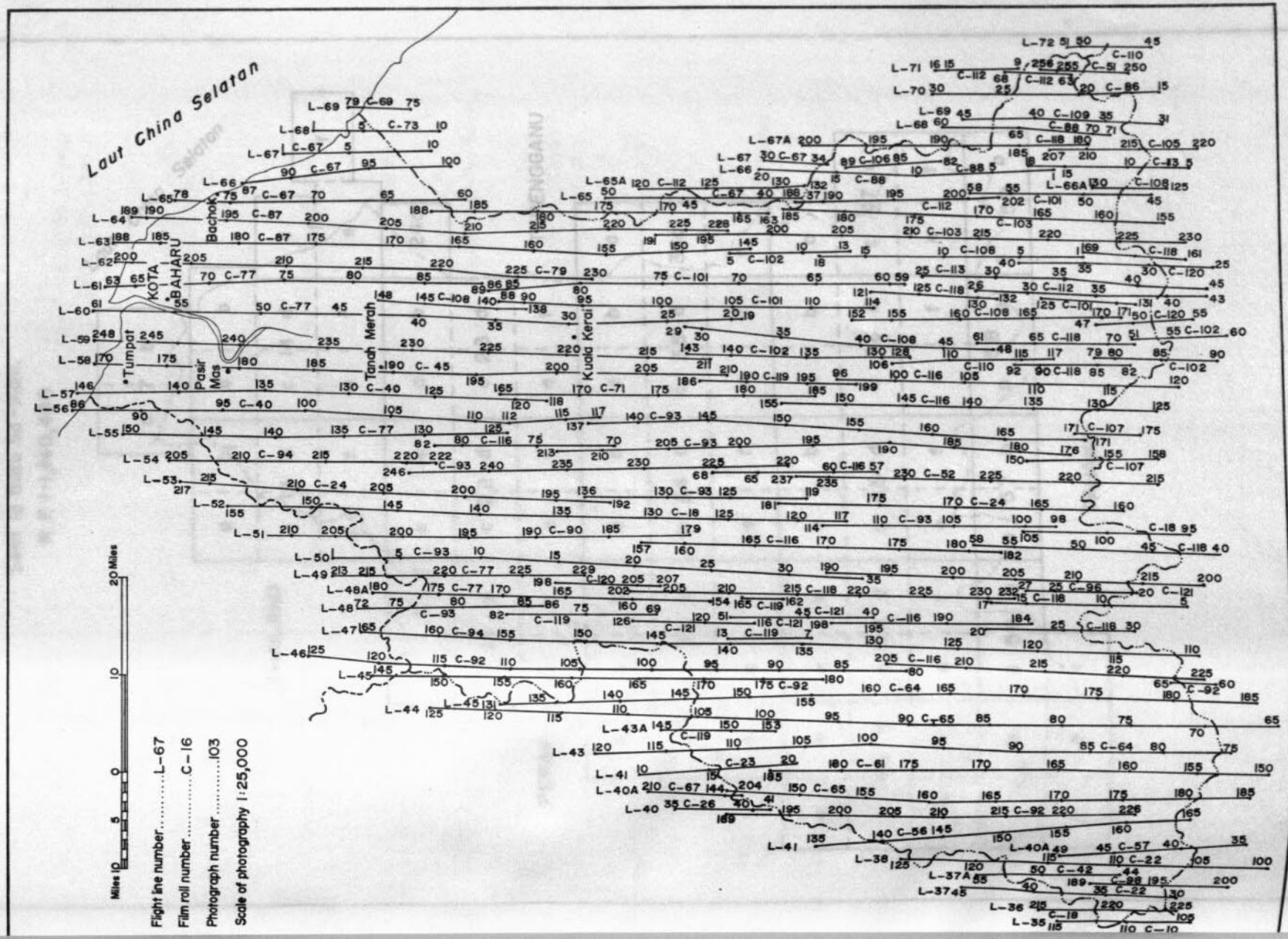
It should be noted that the aerial photographs covering Kelantan were taken at different times during the year 1966. A record of the actual dates and times of exposure for all the photographs is kept in the Land Use Section, Department of Agriculture, Kuala Lumpur.

Mapping

Figure 7 also shows the index of the 1:25,000 land use mapping of Kelantan. The State is covered by a total of 100 sheets at this scale.

A State Land Use Map at 2 miles to an inch, compiled by generalising and reducing the 1:25,000 land use mapping, is presented with this report.

Land use mapping at both scales is available as uncoloured dyeline prints from the Land Use Section, Soil Science Division, Department of Agriculture. Requests should be made in writing to the Assistant Director of Research, Department of Agriculture, Kuala Lumpur.



6. Index of 1966 aerial photography of Kelantan.

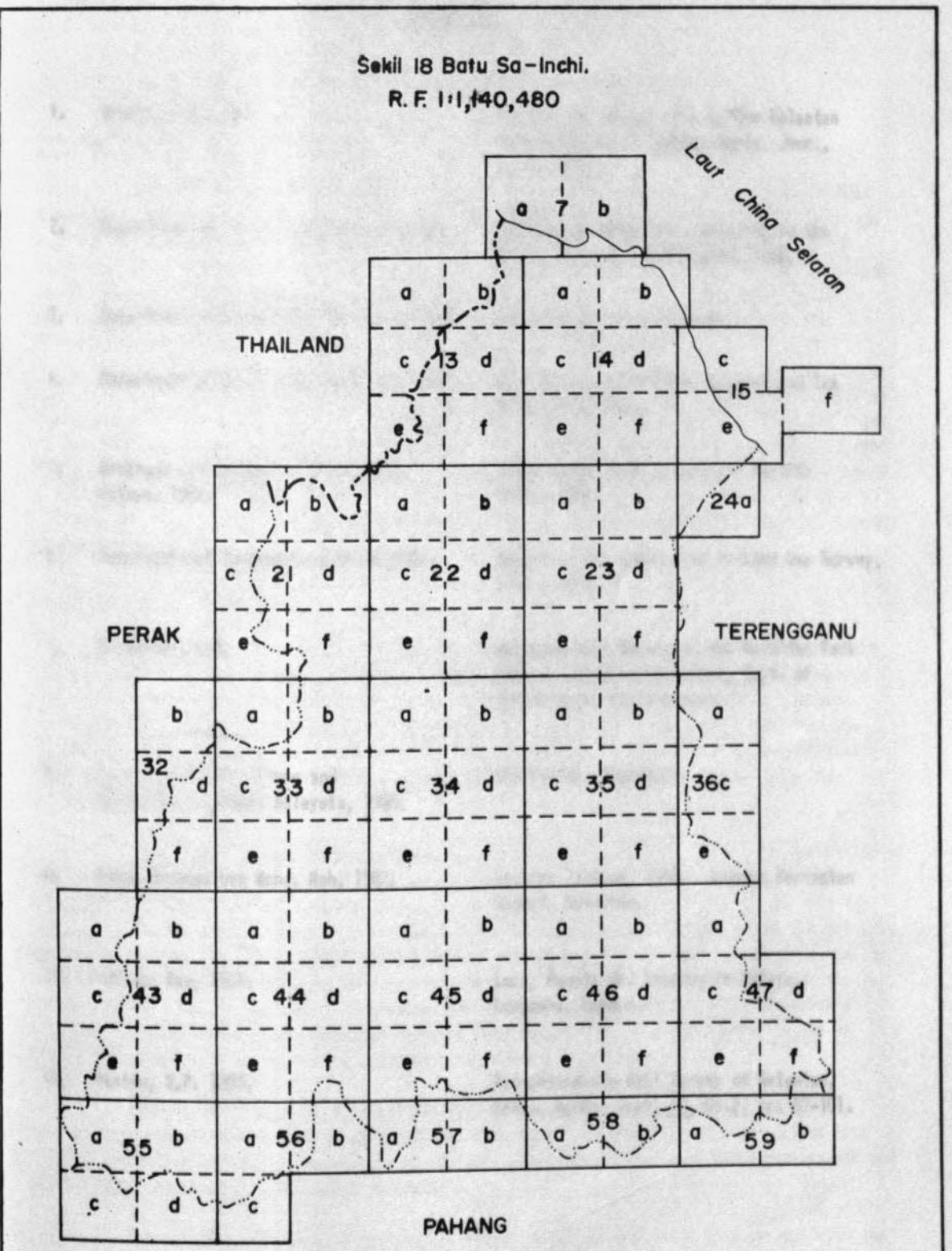


Figure 7. Index of 1:25,000 land use mapping of Kelantan.

REFERENCES

1. Arnott, G.W. 1957 — Soil Survey Report No. 6, "The Kelantan Deficiency Area" Malay. Agric. Jour., 40, pp. 60-91

2. Department of Mines, West Malaysia, 1968. — Bulletin of Statistics relating to the Mining Industry of Malaysia, 1966.

3. Department of Statistics, Malaysia, 1966. — Rubber Statistics Handbook.

4. Department of Statistics, Malaysia, 1967. — West Malaysia Oil Palm, Coconut and Tea Statistics, 1966.

5. Drainage and Irrigation Department, Malaya, 1961. — Hydrological Data - Rainfall Records 1879 - 1958.

6. International Geographical Union, 1952. — Report of the Commission on Land Use Survey, 1949 - 1952.

7. Mc Walter, A.R. — Detailed Soil Survey of the Kelantan Padi Plain. Unpublished report, Dept. of Agriculture, Kuala Lumpur.

8. Ministry of Agriculture and Co-Operatives, West Malaysia, 1968. — Statistical Digest.

9. Mohd. Ridzuan bin Mohd. Noh, 1967. — Laporan Tahunan, 1966. Jabatan Pertanian Negeri, Kelantan.

10. Ooi Jin Bee, 1964. — Land, People and Economy in Malaya. Longmans, London.

11. Panton, W.P. 1960. — Reconnaissance Soil Survey of Kelantan. Malay. Agric. Jour. 43, No.2, pp. 87-101.

APPENDIX A

THE PRESENT LAND USE SURVEY OF WEST MALAYSIA
THE LAND USE CLASSIFICATION LEGEND

For the Interpretation of 1:25,000 Aerial Photography

Introduction

The Land Use classification, developed for West Malaysia, is one based on the format presented by the Commission on World Land Use Survey for international application. It has been modified to more precisely meet the requirements of Land Use as found in West Malaysia, while still conforming to the internationally recognized and established system. The obvious advantage is that actual photographic interpretation and subsequent mapping will be immediately readable and understandable to a wide and growing group of specialists continually dealing with Land Use Classification, Land Capability and Agricultural Development Programmes.

The development of the classification legend now presented took five months to develop during which time preliminary legends were applied on a production basis to three different areas in West Malaysia, while reconnaissance trips were made to other areas possessing distinctive land use patterns. The writer believes that this legend allows photointerpretation to be accomplished with the minimum of deliberation, keeps field checking to a minimum, and yet enables the identification of all categories necessary for the subsequent compilation of meaningful Land Use Mapping and area measurement.

Classification Modifications

In developing the system of classification used for mapping land use in West Malaysia, two important requirements have been kept in mind. The first is that any classification system should conform as closely as possible to an internationally used and accepted classification. The second requirement is that any classification system must include all significant land use types found within the area for which it is to be used. It is believed that this classification embodies these qualities and only in a minor way do the local modifications differ from the internationally accepted framework.

Two slight changes in nomenclature were considered necessary. First, the Commission's category 6 "Unimproved Grazing Land", has been re-named "Grasslands" because, although it is possible to interpret and map areas of low vegetative cover that might or might not be used for grazing, it is not always possible to accurately determine whether or not these areas are actually used for this purpose. In fact most small herds of cattled graze within and on the boundaries of some of the other categories; e.g. on road right of ways, within settlement areas, inside smallholding rubber areas and on some padi areas during the "offseason". Second, the Commission's category 9, "Unproductive Land" has been re-named "Unused Land" as it is considered unwise to negate the possibility of future use under hitherto unknown practices.

Category 8 "Swamps and Marshes" has been enlarged in concept to include all poorly drained land exhibiting seasonal or permanent waterlogging. It seems illogical to include this type of vegetation in the forest category as its very existence depends on a swamp environment and without this condition it would cease to exist.

The sub-categorisation of category 7 "Forest Land" has been kept to a minimum with the knowledge that the National Forestry Department are in fact presently executing a comprehensive forestry classification interpretation on the same photography. "Shifting Cultivation", however, has been included under Category 4 (Cropland) since this is a form of land use under which food crops are produced.

Category 5 "Improved Permanent Pasture" has been maintained although the total national acreage is exceedingly small. The few areas that do exist are being grown on an experimental basis, and there is a possibility that this land use type will expand in the future.

A detailed explanation of the Classification Legend follows.

THE LEGEND

1. Settlement and Associated Non-Agricultural Lands (Shades of Red)

1U: Urban and Associated Areas

The truly built-up areas of cities, towns, kampongs, including associated and surrounding parks and open spaces, detached industrial sites, settlement areas, reservoirs, etc. Areas obviously in the process of urban development showing evidence of a road pattern and house lots but presently without buildings are also included. Fringes of urban centres, strip development and most kampongs may be included in sub-category 2H "Mixed Horticulture" if more than 50% of the land is under horticultural use.

1E: Estate Buildings and Associated Areas

All areas of estate housing, schools, hospitals, administrative buildings and recreation land. When groups of these exceed two acres they are interpreted but individual and isolated buildings occupying less than this acreage are ignored.

1T: Tin Mining Areas

All areas previously laid waste and devoid of vegetation, areas being worked at present, and cleared land obviously designated for tin mining. Within these areas all water bodies greater than two acres are identified and given the code (W).

1X: Other Mining Areas

All other areas showing mining activity other than for tin.

1P: Power Lines

Power lines or transmission lines of a width greater than one hundred feet are interpreted where they interrupt the land use of the areas they traverse. If there is no disruption of the land use activity the presence of a power line is ignored; e.g. a wide power line crossing a block of padi may not prevent the homogeneous development of the padi area. When a transmission line traverses and interrupts the continuous activity of a sub-category then the actual land use of the line is indicated in parenthesis; e.g. 1P(6) would indicate a power line swath with a ground cover of grassland.

2. Horticultural Lands (Shades of Deep Purple)

2H: Mixed Horticulture

This is a very wide and extensive sub-category including all the typical diversified "garden cultivation" found in a haphazard fashion around a family unit. It may be better visualised if it is realised that the terms, "Dusun" "Minor Cultivation", "Domestic Cultivation" and "Domestic Horticulture" were all considered as possible descriptions.

The essential basis is the family settlement unit with emphasis on the production of diversified crops for family needs with the possibility of small surpluses being sold locally. Included are mixed vegetables, yams, tapioca, chillies, pineapples, fruit trees, bananas, papayas, coconuts etc.

The complexion of this sub-category changes according to geographical location, soil condition and local traditions but the essential feature is always diversification and the activity is intense and focused around the family unit.

Often this sub-category, although existing, is completely overshadowed by the importance of the activity within which it exists. For example, if it is present in small patches within an area of intense smallholding coconuts, then the area will merely be designated as coconuts. Also, where units of more than two acres of other sub-categories appear with a background of "Mixed Horticulture", they are then, of course, separately identified. It is not uncommon to find twenty-acre lots of smallholding coconuts, rubber and orchards within and on the periphery of "Mixed Horticulture".

The most common location is along roads, waterways and on the better drained sites of padi areas. Frequently this type forms buffer strips between estate and smallholding crops.

The interpreter's decision to designate an area as 2H is taken when homogeneous units of other sub-categories are not discernible and the intense land use activity is focused around rural settlement. Mixed tree crops (often very dense) intermingled with small garden plots, footpaths and housing are the cumulative criteria necessary for designation as 2H.

2M: Market Gardening

Areas where the obvious emphasis is on the commercial production of fresh vegetables. The pattern is that of intense neatness and use with individual units being small. These areas should not be confused with the larger areas of "Diversified Cropland" (4C) where the individual units are bigger and "high" crops such as tapioca, sugar and maize are obvious.

Most market garden areas occur in or near large urban centres or in mountain areas favourable to temperate zone crops. In these latter areas, category 2M includes commercial flower gardens.

2E: Government Agricultural Stations

3. Tree, Palm and Other Permanent Crops

(The following sub-categories cover crops at all stages of growth and under various forms of management).

3G: Rubber

3O: Oil Palm

3C: Coconut

3N: Pineapple (Only commercially grown pineapple, sometimes by smallholders in conjunction with coconuts and principally for the canning industry).

3K: Coffee

3T: Tea

3A: Cocoa

3P: Pepper

3S: Sago Palm

3R: Arecanut Palm

3X: Orchards (Rambutan, Durian, Citrus, Clove, Nutmeg, etc.)

3H: Fish and Hyacinth Ponds - (Excluded are some old tin excavation ponds often stocked with fish).

When two of the crops mentioned above are found growing in a mixed fashion the area is designated by the number 3 followed by the letter of the tree or palm crop and then by the ground crop; e.g. 3CK describes an area of coconuts with intensive coffee cultivation beneath the coconuts.

4. Cropland (Shades of Brown)

4P: Padi

Double and single cropping padi areas.

4C: Diversified Crops

This sub-category covers a wide range of crops growing in reasonably large areas although the individual units (fields) may be quite small (3 to 20 acres). The size of the fields make it difficult to interpret the actual crop, especially when the same crop may be present at different stages of maturity within a mixed crop area which may also contain areas of fallow. Crops found in this sub-category are almost entirely annual with tapioca occupying the largest acreage. Other crops include maize, sugar, bananas, yams, sweet potatoes, tobacco etc.

NOTE:

Bananas appear in small units within this sub-category. It should however be realised that the bulk of the country's bananas grow within 2H "Mixed Horticulture" and in conjunction with young smallholding rubber. Within these areas they cannot be separately delineated at the present interpretation scale.

Within Malaysia bananas are not grown on a large scale commercial basis. If bananas did appear in large "plantation" areas, they would naturally be included under category 3.

4X: Shifting Cultivation

Shifting cultivation also referred to as "ladang" cultivation, describes an activity carried on by the Aborigines where primary forest areas are selected for cultivation, then cleared and planted with crops, and finally abandoned after a year or two as the soil loses its initial fertility. The most common crops planted are, upland rice (hill padi), tapioca, sweet potatoes, yams and maize. General areas of shifting cultivation are recognized by the cell-like appearance of small clearings in various stages of regenerating vegetation as well as newly cleared ladangs. Only the areas presently in use are identified and areas previously in use, but now abandoned, are identified according to the present vegetative cover. The sizes of these clearings vary between three and twenty acres.

NOTE:

It must be realised that many of the crops found in categories 3 and 4 are also found in small uninterpretable areas (less then 2 acres) within the collective sub-category 2H "Mixed Horticulture". Often the cumulative acreage of these crops within 2H "Mixed Horticulture" can be considerable.

5. Improved Permanent Pasture (Hatched Yellow)

The category at present covers an extremely small proportion of the country. But it is a category with possibilities of expansion. It includes land where selective grasses are being grown for grazing and for the production of marketable fodder.

6. Grasslands (Yellow)

Because of the difficulties created by detailed interpretation combined with the relative unimportance of this Category, it has been decided not to sub-categorize and so this Category includes areas of Lalang, Unimproved Coarse Pasture and Scrub-Grassland. The general appearance of the Category is grassland and areas are only included when shrubs and trees (generally below 15 feet) cover less than 50% of the area. When the scrub component covers more than 50% of an area it is designated as 7S "Scrub Forest".

Lalang, often occurring in "sheets" over extensive areas comprises an important part of this Category as do the grasses inhabiting the beach ridges ("permatang") of the east coast.

It is not always possible to accurately determine which areas within this Category are actually used for grazing and therefore it should be remembered that the title "grassland" does not imply an area of grazing. Only in a few local areas of the country are cattle intentionally grazed within this Category, which for the most part, is devoid of cattle.

Areas of grassland appearing in Urban (1U) and having no apparent recreational use are mapped in this Category.

Areas of grassland or scrub grassland appearing on erosion scars or on landslides are designated 6E.

7. Forest Land (Shades of Green)

7F: Forest

All dryland forests are present in this sub-category. It includes all primary forests and secondary forests or high "belukar", above about 15 feet in height. In a few areas the symbol 7F (R) denotes reforestation, afforestation and "treated" forests.

7S: Scrub Forest

This sub-category is used when more than 50% of an area is covered by shrubs, bushes, and young or dwarf trees, having a height of less than approximately 15 feet. It includes a) low "belukar", or secondary growth, which is in the first stage of regeneration of mature forest, and b) scrub vegetation whose occurrence is due to edaphic factors, such as the xerophytic scrub of the dry permatang.

Normally 7S would also include the dwarf Montane and Sub-Montane Forest growing on the thin soils of mountain summits and ridges of the interior. In these areas of primary forest this edaphically controlled dwarf scrub forest is not mapped. This is the only sub-category of land use that is mapped discontinuously, the reason being the unjustifiably high cost of mapping this relatively inconsequential type and also because a comprehensive forestry interpretation is being carried out by the Forestry Department.

NOTE:

If no agricultural land use activity is present on a complete map sheet, the entire sheet is not interpreted and therefore not mapped. These areas are mostly in the interior of the country where natural montane dwarf vegetation is found. Hence considerable areas of this vegetation type are excluded by this survey.

7C: Recently Cleared Land

These are recently cleared areas where there are no indications as to the future land use. For convenience these areas have been placed within the forest Category but it should be realised that they are not necessarily always areas cleared from forest; e.g. areas cleared from older rubber awaiting replanting into oil palm would come under this sub-category. These areas are recognized not only by a very "clean" appearance, but also by the presence of felled trees and traces of burning.

8. Swamp, Marshland and Wetland Forests (Blue-Green)

This category includes all poorly drained land exhibiting seasonal or permanent waterlogging. Wetland Grass and Forest Associations (including Mangrove, Nipah and Gelam) occur in this category, as well as Wetland Forest areas which have been recently cut-over.

9. Unused Land (Grey)

All areas, which by present practices, are unproductive; e.g. riverine and coastal beaches, mudflats, exposed rocks, cliffs, etc.

THE PRESENT LAND USE SURVEY OF WEST MALAYSIA
CONCISE FORM OF THE PRESENT LAND USE CLASSIFICATION LEGEND

For the Interpretation of 1:25,000 Aerial Photography

1. Settlements and Associated Non-Agricultural Lands (Shades of Red)

- 1U : Urban and Associated Areas
- 1E : Estate Buildings and Associated Areas
- 1T : Tin Mining Areas
- 1X : Other Mining Areas
- 1P : Power Line Right of Ways

2. Horticultural Lands (Shades of Deep Purple)

- 2H : Mixed Horticulture
- 2M : Market Gardening
- 2E : Agricultural Stations

3. Tree, Palm and Other Permanent Crops (Shades of Light Purple)

- 3G : Rubber
- 3O : Oil Palm
- 3C : Coconut
- 3N : Pineapple
- 3K : Coffee
- 3T : Tea
- 3A : Cocoa
- 3P : Pepper
- 3S : Sago Palm
- 3R : Arecanut Palm
- 3X : Orchards - (Rambutan, Durian, Citrus, Cloves, Nutmeg, etc.)
- 3H : Fish and Hyacinth Ponds

4. Cropland (Shades of Brown)

- 4P : Padi
- 4C : Diversified Crops
- 4X : Shifting Cultivation

5. Improved Permanent Pasture (Hatched Yellow)

6. Grassland (Yellow)

- 6 : Lalang, Unimproved Coarse Pasture and Scrub-Grassland.

7. Forest Land (Shades of Green)

- 7F : Forest
- 7S : Scrub Forest
- 7C : Recently Cleared Land (Black Hatching - No Colour)

8. Swamp, Marshlands and Wetland Forests (Blue-Green)

- 8 : Wetland Grass and Forest Associations, including Mangrove, Nipah and Gelam.

9. Unused Land (Grey)

APPENDIX B

LAND USE SUMMARY OF KELANTAN

Land use acreage figures for 1966 have been summarised and tabulated in table B. 1. for each of the eight districts of Kelantan. The extent of land use sub-categories and major categories in terms of acreages and percentages are also indicated. The percentage of land under agricultural use has also been incorporated in the table.

The national area has been given by the Directorate of National Mapping while the population statistics, covering the period up to June 1966, has been supplied by the Statistics Department.

The total land use acreage and the physical area of the state are based on the measurement of all land areas indicated on the 1:25,000 aerial photographs taken in 1966.

PRESENT LAND USE SURVEY - 1966

TABLE B.1. State Land Use Summary - Kelantan

AREAS TAKEN FROM 1:25,000 LAND USE MAPPING COMPILED FROM THE INTERPRETATION OF 1966 AERIAL PHOTOGRAPHY

STATE AREA:-		
LAND USE ACREAGE	3,711,537	(5,799.3 SQ. MILES)
PHYSICAL ACREAGE	3,711,537	(5,799.3 SQ. MILES)+

NATIONAL AREA	SQUARE MILES 50,806@	ACRES 32,515,840
PERCENTAGE OF NATIONAL AREA	11.4%	
POPULATION* 657,886	% OF NATIONAL POPULATION: 7.9%	
POPULATION DENSITY	PER SQUARE MILE 113.4	PER ACRE 0.18
AGRICULTURALLY USED LAND	SQUARE MILES 812.0	ACRES 519,688
POPULATION DENSITY ON AGRICULTURALLY USED LAND	PER SQUARE MILE 810.2	PER ACRE 1.26

LAND USE CATEGORY	DISTRICT																TOTAL	%	MAJOR LAND USE CATEGORIES IN ACRES	%	LAND UNDER AGRICULTURAL USE IN %		
	TUMPUT	%	PASIR MAS	%	TANAH MERAH	%	ULU KELANTAN	%	KOTA BAHARU	%	MACHANG	%	BACHOK	%	PASIR PUTEH	%					MAJOR CATEGORIES	SUB-CATEGORIES	
1U: Urban	688	1.5	582	0.4	789	0.2	939	-	3,121	3.1	228	0.2	190	0.3	296	0.3	6,833	0.2					
1E: Estate Buildings		-		-	69	-	413	-		-	34	-		-	6	-	522	-	URBAN AND ASSOCIATED AREAS				1U
1T: Tin Mining		-		-		-		-		-		-		-		-		-					1E
1X: Other Mining, Quarrying		-		-		-		-	5	-	344	0.3	3	-		-	352	-					1T
1P: Transmission Line							152	-	18	-	145	0.1		-	46	-	361	-	8,068	0.2			1X
2H: Mixed Horticulture	10,905	24.3	13,909	8.8	6,976	2.0	4,303	0.2	17,748	17.9	6,585	5.0	9,309	13.5	10,826	10.3	80,561	2.2					1P
2M: Market Gardening	6	-		-	6	-	28	-		-		-		-	27	-	67	-	HORTICULTURE			15.5	2H
2E: Agricultural Stations		-		-	27	-		-	46	-		-		-		-	73	-	80,701	2.2	15.5	-	2M
3G: Rubber	1,007	2.2	33,285	21.0	49,671	14.2	70,083	2.5	19,380	19.5	33,081	25.3	3,629	5.3	13,580	12.9	223,716	6.0				-	2E
3O: Oil Palm		-		-	4	-	1,215	-		-		-		-		-	1,219					43.1	3G
3C: Coconuts	2,836	6.3	148	0.1	302	0.1	44	-	6,332	6.4	202	0.1	5,774	8.4	1,732	1.6	17,370	0.5				0.2	3O
3N: Pineapple		-		-		-		-		-		-		-		-		-	TREE, PALM AND PERMANENT CROPS			3.3	3C
3K: Coffee		-		-		-		-		-		-		-		-		-				-	3N
3T: Tea		-		-		-		-		-		-		-		-		-				-	3K
3A: Cocoa		-		-		-		-		-		-		-		-		-				-	3T
3P: Pepper		-		-		-		-		-		-		-		-		-				-	3A
3S: Sago	84	0.2	408	0.2	78	-	11	-	593	0.6	160	0.1	51	0.1	107	0.1	1,492	-				-	3P
3R: Arecanut Palm		-		-		-		-		-		-		-		-		-				0.3	3S
3H: Fish & Hyacinth Ponds		-	8	-		-		-		-	17	-		-	1	-	26	-	244,275	6.6	47.0	-	3R
3X: Orchards	10	-	106	0.1	242	0.1	65	-	12	-	4	-		-	13	-	452	-				-	3H
4P: Padi	21,433	47.8	42,215	26.6	9,191	2.7	2,639	0.1	40,101	40.4	14,824	11.3	24,636	35.8	33,351	31.8	188,390	5.1				0.1	3X
4C: Diversified Crops	73	0.2	544	0.3	568	0.2	578	-	422	0.4	496	0.4		-	72	0.1	2,753	0.1				36.3	4P
4X: Shifting Cultivation		-		-	77	-	3,492	0.1		-		-		-		-	3,569	0.1	CROPLAND			0.5	4C
5 : Improved Permanent Pasture		-		-		-		-		-		-		-		-		-	194,712	5.2	37.5	0.7	4X
6 : Grassland	490	1.1	6,904	4.3	14,260	4.2	22,359	0.8	3,394	3.4	5,457	4.2	7,366	10.7	7,392	7.1	67,622	1.8	-	-	-	-	5
7F: Forest		-	17,731	11.1	220,360	62.9	2,510,798	91.1	155	0.2	56,445	43.2	342	0.5	13,821	13.2	2,819,652	76.0	67,622	1.8	100%	100%	6
7S: Scrub Forest	28	0.1	16,892	10.6	32,614	9.5	94,820	3.4	918	0.9	7,512	5.7	1,388	2.0	5,472	5.2	159,644	4.3	FOREST AND SCRUBLAND		Total Acreage under Agricultural Use		7F
7C: Recently Cleared Land		-	473	0.3	6,927	2.0	17,109	0.6	57	-	1,260	1.0	4	-	486	0.5	26,316	0.7	2,979,296	80.3	519,688		7S
8 : Swamp	2,724	6.1	22,469	14.2	4,105	1.2	602	-	2,685	2.7	1,654	1.3	14,958	21.7	15,513	14.8	64,710	1.7	26,316	0.7			7C
9 : Unused Land	2,398	5.3	181	0.1	233	0.1	11,260	0.4	535	0.5	192	0.1	589	0.8	276	0.3	15,664	0.4	64,710	1.7			8
UNCLASSIFIED	2,111	4.7	2,780	1.7	2,311	0.6	14,716	0.5	3,832	3.8	2,022	1.5	514	0.7	1,887	1.8	30,173	0.8	15,664	0.4	Percentage of State area under Agricultural Use		9
TOTAL	44,793	99.8	158,635	99.8	348,810	100.0	2,755,626	99.7	99,354	99.8	130,662	99.8	68,753	99.8	104,904	100	3,711,537	99.9	30,173	0.8			
																			3,711,537	99.9	14.0%		

@ As indicated by the Directorate of National Mapping.

* This is a State Population Estimate for June 1966 supplied by the Statistics Department and indicates an increase of 30% over the 1957 Census Total.

\+ This acreage total is based on measurement of all land areas indicated on the 1:25,000 aerial photographs taken in 1966.

DI-CHETAK DI-CHAWANGAN PERKEMBANGAN, JABATAN PERTANIAN, KUALA LUMPUR