Report No. 101

Report on a Reconnaissance Soil Survey
of the

KEMENA - PANDAN - LEBUS AREA

4 th. Division

By

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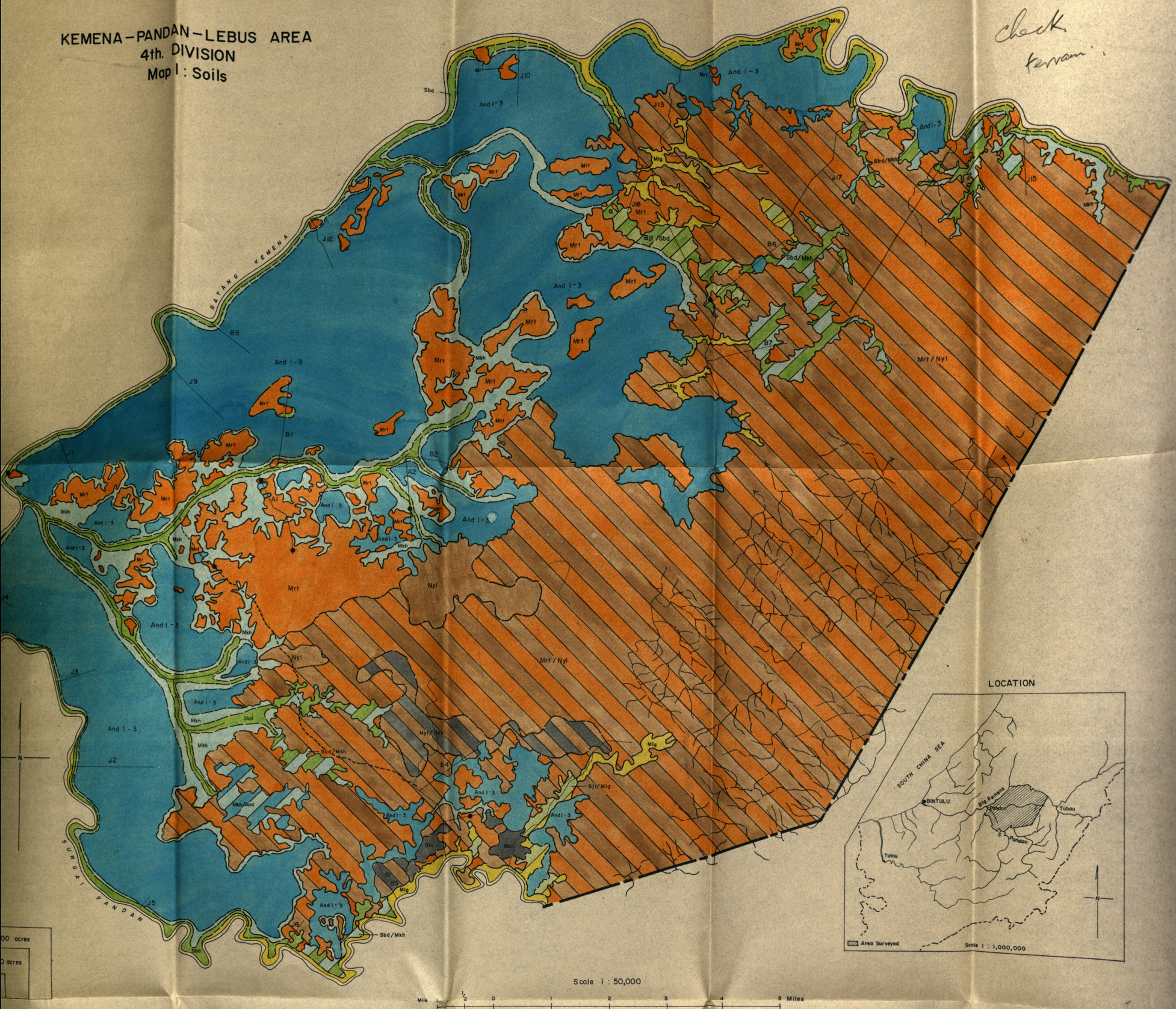
Sarawak

KEMENA – PANDAN – LEBUS AREA
4th. DIVISION
Map I : Soils

check
terrain



Scale 1 : 50,000

Mile 1 ½ 0 1 2 3 4 5 Miles

id located on the map border has
in and is divided in units of one mile

B C D E F G H I J K L M N O P Q R S T U V

KEY

ORIGIN	MAPPING SYMBOL	SOIL ASSOCIATION	TOPOGRAPHY	MAIN SOIL CHARATERISTICS	TENTATIVE SOIL SUITABILITY	MAIN LIMITATION	APPROXIMATE ACREAGE
RESIDUAL	Mrt	Merit	Rolling to strongly dissected country 10 – 35° slopes ; 50 – 200 feet + amplitude.	Merit : Yellowish brown to brownish yellow clay loams over reddish yellow clays derived probably from shale . Well drained	Rubber, pepper, oil palm, (on low hills)	Erosion hazard on steep slopes low chemical fertility	10200
	Mrt / Nyl	Merit /Nyalau		Nyalau Yellowish brown to brown yellow sandy loams over reddish yellow to strong brown sandy clay loams . Generally well drained .			62450
	Nyl	Nyalau					1200
	Nyl / Bko	Nyalau / Bako					1900
	Bko	Bako	Low to moderately high hills gentle slopes	Bako : Reddish brown humus over thick pale yellow sandy loam to loamy sand on hard but crushable dark brown humus pan.	Unsuitable	Strong erosion and very low chemical fertility.	300
ALLUVIUL	Mlg	Malang	Gently sloping levees of main rivers.	Malang : Deep yellowish brown clay loams to clays mottled light grey & reddish brown below 20 inches. Moderately well drained.	Suitable for perennial and annuals crops .	Seasonal flooding and low chemical fertility .	2150
	Mlg / Bjt	Malang / Bijat					550
	Bjt / Sbd	Bijat / Sebandi	River levees and alluvial basins.	Bijat : Pale coloured clay loams over clays mottled throughout the sub soil .	Wet rice and perennial crops with appropriate drainage .		1300
	Sbd	Sebandi					4200
	Sbd / Mkh	Sebandi / Mukah		Sebandi : As Bijat but with peat to top soils up to 10 inches thick Properly drained .			3450
	Mkh	Mukah					7000
	Mkh / And	Mukah /Anderson .		Mukah : Deep light grey clays with 10 inches – 40 inches surface peat . Very poorly drained .			450
ORGANIC	And 1-3	Anderson	Peat swamps .	Anderson : Raw peat 40 inches to more than 120 inches deep . Very poorly drained .	Unsuitable	Drainage difficulties	38950

LEGEND

- Survey Area Boundary
- Definate Soil Boundary
- Approximate Soil Boundary
- Rentis
- Main River
- Small Stream
- Footpath
- Sampling Sites

Soil Survey Drowing No. 171 Survey Area No. 101

Base map derived from Land & Survey Dept , Sarawak

Compiled by : Ahmad Haji Ebon

Drawn by : Sebli Mohamad Ap

HUNTING TECHNICAL SERVICES

CONTENTS

INTRODUCTION

This survey was requested by the Divisional Development Committee, Fourth Division, the purpose being to obtain information about the soils in the area for the planning of any future land development.

The fieldwork was started in mid-July, 1966 and was completed by mid-August. The survey team comprised the Surveyor and two Agricultural Assistants, Basmawi bin Mahli and Johdi bin Juko.

During the survey, the soils were examined along approximately 72.2 miles of rentis, footpaths and timber tracks, and 37 profile samples were collected for retention and chemical analysis where necessary.

The area is located in Bintulu District, encompassing all the land between Batang Kemana in the north and Sungei Pandan in the south. The eastern boundary is an arbitrary line from Rumah Guang (Batang Kemana) to Rumah Ringgit (Sg. Pandan). The total area covered by the survey is approximately 134,100 acres, (209.5 square miles)*.

The work was completed using methods standard for reconnaissance surveys in Sarawak. Initial air photograph interpretation in conjunction with the information from Geological Survey reports enabled the production of a map showing the tentative boundaries of soil associations. The fieldwork was designed in part to confirm or amend such boundaries. The soil data were transferred to the air photographs for the final interpretation of the soil pattern in the area. The soil map was then prepared. It is to be noted that the boundaries of the soil associations have been checked in the field only where they cross a line of investigation. Elsewhere the soil boundaries have been interpolated by means of air photograph interpretation.

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* The area is measured by a planimeter from a map of 1:50,000. Figures are therefore most accurate on flat land and least accurate on most rugged and dissected country, where errors of up to 20 per cent are probable and errors exceeding 100 per cent are theoretically possible.

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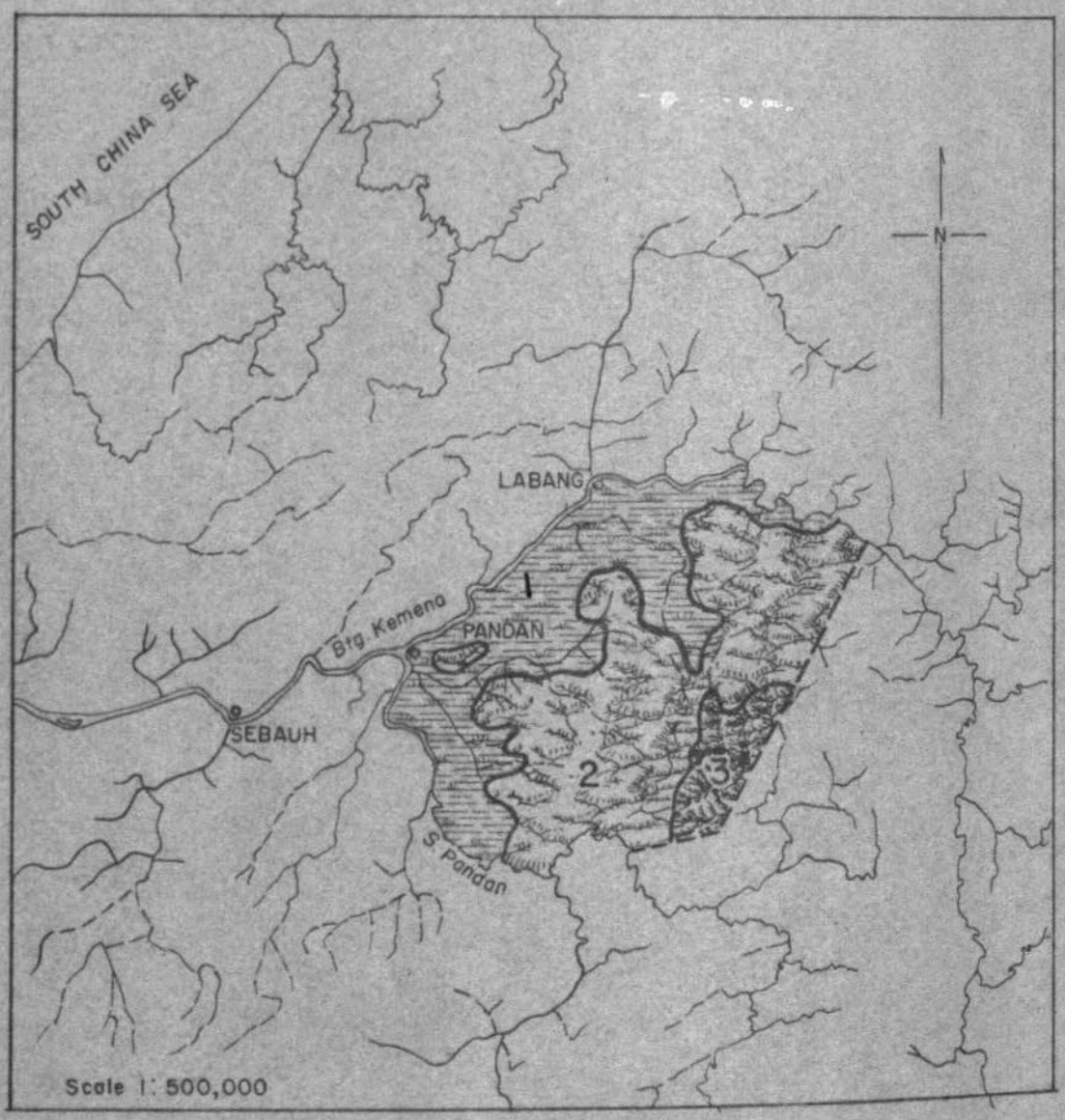
Fig.1



(1) Flat swampy land.

(2) Rolling or dissected land.

(3) Deeply dissected land.

GEOLOGY

The information on this section is based on LIECHTI (1).

Underlying almost the whole of the hill land is the Nyalau Formation, which in this area is subdivided into a Biban Sandstone member and the Nyalau Formation in general. The Biban Sandstone consists of hard, well bedded, fine- to medium-grained sandstones with subordinate argillaceous or silty intercalations at the base of the formation. A few layers have slightly calcareous nodules and sometimes hard calcareous shale. The Nyalau Formation, consists usually of the upper part of the succession but may locally comprise the whole succession as the Biban Sandstone member cannot everywhere be delimited.

The difference between the Nyalau Formation and the Biban Sandstone is slight, the former being somewhat softer sandstones with clay shales containing occasional 'limestone' lentils or beds of calcareous sandstones.

Quaternary alluvium occurs on both sides of the main river fringing the large peat swamp area.

TOPOGRAPHY

Generally the area can be divided into three topographic units as shown diagramatically on Fig. 1.

Area 1 - comprises the flat swampy land near the two main rivers, approximately 80 per cent of which is deep peat unsuitable for agriculture. The other 20 per cent comprises alluvial flats fringing the main rivers and the low hills or low old terraces.

Area 2 - comprises rolling or dissected land with 10° to 25° slopes with an amplitude ranging from 50 to 200 feet. The bulk of this land (70-80 per cent) is topographically suitable for agriculture. The other 20-30 per cent comprises land with slopes of 20° to 35° and an amplitude of more than 150 feet. Topographically such terrain is regarded as being marginal for agriculture.

Area 3 - is almost all deeply dissected land with slopes of more than 35° per cent.? This land is considered to be topographically unsuitable for agriculture.

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VEGETATION AND LAND USE

A large part of this area, both the hill land and the swamps, is still covered by primary jungle. Agricultural activity is concentrated along the alluvial flats and on the low hills in the immediate vicinity of settlements. The dominance of primary jungle areas over cleared land is illustrated on Map 2.

Timber extraction is being carried out in the area.

SOILS OF THE AREA

The soils in this area are described under the heading of soil associations. Some soil associations are more easily mapped than others, due to their correlation with easily recognised geomorphic features or specific vegetation types. Where thin, steeply dipping sandstone and shale strata are interbedded in roughly equal proportions, the residual soil associations on them are difficult to subdivide. There is also difficulty in separating alluvial flats and low hills less than 30 feet high where they are blanketed by a cover of primary or old secondary forest. For these reasons, the soils in the bulk of the area are mapped as compound associations.

Each mapping unit by definition contains at least 85 per cent of a soil family or families described in the unit. Between the lines of investigation, soil boundaries are interpolated using geological information, landforms and vegetation as shown on air photographs.

1. Merit Association (10,200 acres) and Merit/Nyalau Association (62,450 acres).

Merit Family soils are dominant in the Merit Association. Where they occur in complex association with Nyalau Family soils, a Merit/Nyalau Association has been separated.

Merit soils are generally moderately deep to deep, weakly structured, yellowish brown to brownish yellow loams to clay loams grading to clays at depth. The lower subsoils are reddish yellow to yellowish red probably due to the reddish shale parent material, the fragments of which commonly occur at depth. Strong brown, red and light grey mottles occur at the depth in several profiles. The internal drainage is generally good.

The establishment of rubber is possible on these soils. Terraces are necessary for slopes between 15° - 25° but not on slopes less than 15°.

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2. Nyalau Association (1,200 acres) and Nyalau/Bako Association (1,900 acres).

The Nyalau Association is named from the Nyalau Family which is dominant in this unit. It has also been mapped in association with Bako Family soils where the two cannot be separated.

The typical Nyalau Family profile in this area is yellowish brown to brownish yellow sandy loam overlying reddish yellow to strong brown sandy clay loam with sandstone fragments at depths of 30 inches or more. On steep slopes shallow profiles occur. Nyalau soils are generally well to moderately well drained.

Bekenu Family soils have also been recorded in the area. Bekenu Family profiles are commonly transitional in character between Merit and Nyalau profiles with which they are generally associated.

Perennial crops including rubber could be established on these soils with proper manurial and erosion prevention taken. Hills with slopes less than 20° require terraces and those hills with slopes more than 20° are best left out, because of the great erosion hazard.

3. Bako Association (300 acres)

The Bako Association comprises Bako Family soils where they can be separated on the map from the Nyalau Family soils with which they are associated. They are found mainly on gentle slopes and are strongly podsolised, having a thin dark reddish brown raw humus overlying a fairly thick horizon of pale yellow sandy loam to loamy sand. Beneath this is a hard but crushable dark brown humus pan. These soils are very infertile.

These soils are known to have low capacity of holding food material because of the sandy texture. However, annual crops such as pineapple, tapioca or vegetables may give yields during the first year after the clearing of the primary vegetation. Generally these soils are regarded as unsuitable for agriculture.

4. Malang Association (2,150 acres)

Malang Association largely comprises Malang Family soils. It belongs to the Red-Yellow Podsolic group. These soils are found mainly along Sungei Panaan and Batang Kemana, in association in some area with Sebandi soils and in other with Anderson soils.

These soils are characterised by deep yellowish brown clay loams to clays, mottled with light grey and reddish brown below 20 inches. The internal drainage is moderately good to good although external drainage is rather slow.

These soils are generally known to have better supply of plant nutrients than any other alluvial soils. Judging from the success of crops such as rubber, coffee and bananas grown on similar type of soils in other areas, similar result may be achieved here too.

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5. Malang/Bijat Association (550 acres) and Bijat/Sebandi Association (1,300 acres).

This association is confined to small interior valleys and, as the name suggests, is dominantly composed of Malang and Bijat Family soils.

Bijat Family soils comprise pale-coloured, poorly drained, clay loams to clays, generally sticky and plastic. They generally have strong brown and yellow mottles throughout the profile.

These soils are ideal for wet paddy and many off-season crops. With appropriate drainage and manurial measures, rubber and other perennial crops may show reasonable result.

6. Sebandi Association (4,200 acres) and Sebandi/Mukah Association (3,450 acres).

The Sebandi Association is comprised dominantly of Sebandi Family soils. Sebandi profiles have a peat surface layer up to 10 inches thick overlying poorly drained clays similar to those of Bijat profiles. Where the peat layer is more than 10 inches thick the soil is classified as Mukah Family. A Sebandi/Mukah Association has been mapped where these could not be separated.

These soils are reasonable for paddy cultivation. Drainage improvement on these may give better conditions for other crops.

7. Mukah Association (7,000 acres) and Mukah/Anderson Association (450 acres).

Mukah Family soils are found in low lying areas subject to flooding, and generally form a transitional belt between Sebandi and Anderson soils. Where they could not be separated from Anderson soils on the map, a Mukah/Anderson Association has been mapped.

The soils consist of light grey clay covered by peat topsoils more than 10 but less than 40 inches thick. These soils are very poorly drained.

These soils are reasonable for wet paddy. Drainage is necessary for better results.

8. Anderson Association (38,950 acres)

The soils of this association are dominantly of the Anderson Family. They occupy the large basins between the Batang Kemana and the Sungei Pandan, and extend up the river valleys.

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The soils comprise dark brown raw peat more than 40 inches in thickness, which is generally underlain by clays.

The soils are subdivided into three phases as follows:-

Anderson 1	-	peat 40-80 inches deep;
Anderson 2	-	peat 80-120 inches deep;
Anderson 3	-	peat more than 120 inches deep.

These phases have not been separated on the soil map.

These soils are not usually recommended for agriculture at the present time.

CONCLUSIONS

The whole area is divided into the following:- (see Map 2)

Area A (27,250 acres), Area B (22,050 acres), Area C (19,100 acres), Area D (20,500 acres) and Area E (45,200 acres).

Areas A & B have prospects for large agricultural development.

Area C comprises dissected low to medium height hills with slopes of more than 25° and it is considered marginal for agriculture.

Area D comprises highly dissected, medium to high hills with slopes of more than 30° and is totally unsuitable for agriculture.

Lastly Area E except for a thin strip of alluvial soils along the rivers and a few isolated hills, is at present considered unsuitable for agriculture due to the extensive area of deep peat.

REFERENCES

1. LIECHTI P. The Geology of Sarawak, Brunei and the Western Part of North Borneo. (1960)