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Report No. 106

**Report on a Semi-Detailed Soil Survey
of the
LONG LAMA PROPOSED
LAND DEVELOPMENT SCHEME**

4th Division

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Sept., 1967.

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HUNTING TECHNICAL SERVICES

Report on a semi-detailed soil survey of the Long Lama
proposed Land Development Scheme, Fourth Division

B. Chen and I.M. Scott

INTRODUCTION

A soil survey of the proposed Land Development Scheme at Long Lama was undertaken in April and May, 1967. The survey was at a semi-detailed level and was carried out by Assistant Agricultural Officer Benjamin Chen and Agricultural Assistants Johdi bin Juko and Basmawi Mahli. Previous work in the area had been confined to reconnaissance level survey on which a report has already been issued (Wall, 1964).

To avoid delay in planning development in the area a preliminary statement on the survey was issued in July (Scott, 1967). The present final report is based on a draft prepared by Chen on completion of the field work.

GENERAL

LOCATION

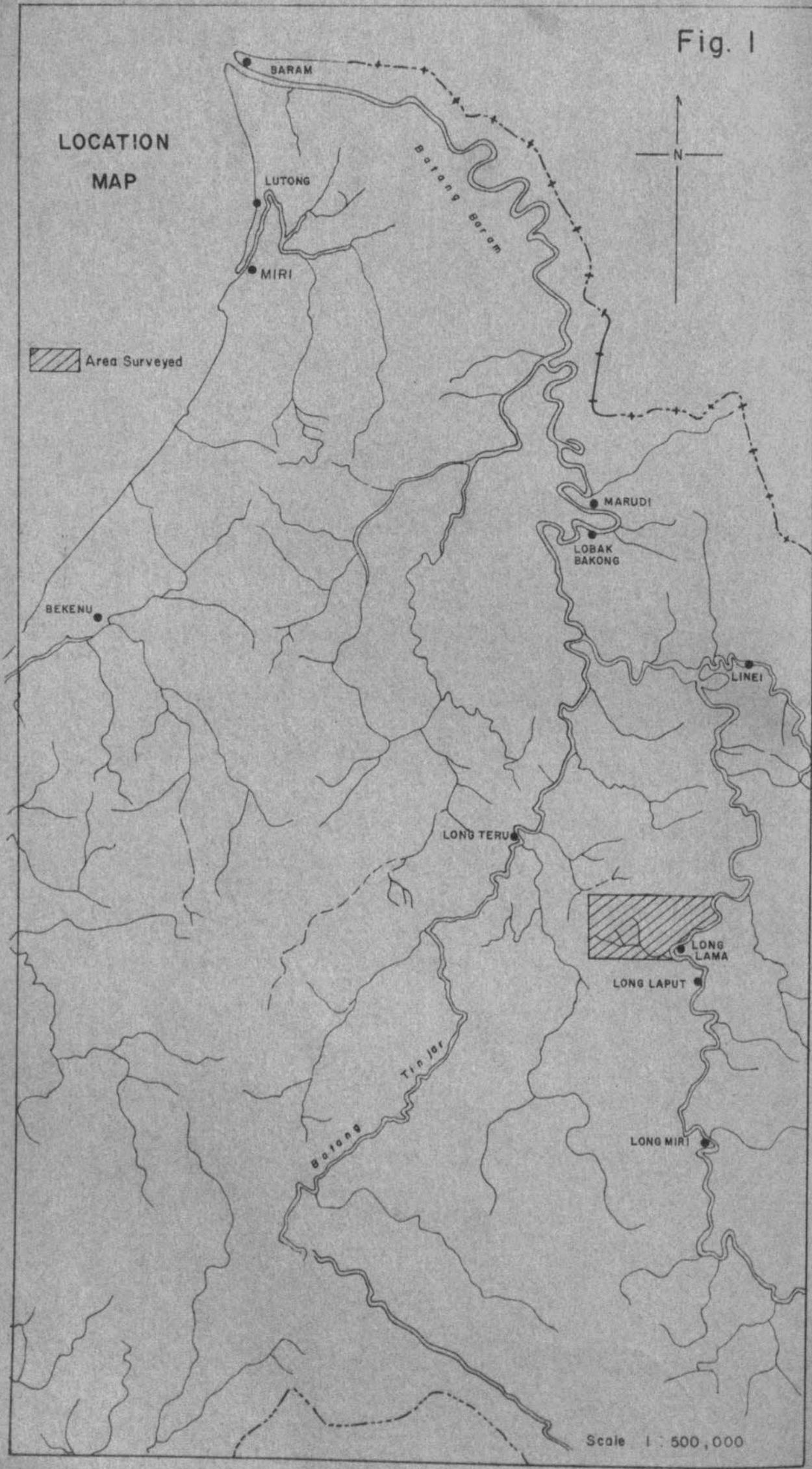
The area lies to the west of the Batang Baram at Long Lama, the river being its eastern boundary. No specific limit has been given to the area for consideration and the soil survey stopped at arbitrary boundaries on the north, south and west, extending westwards to include part of the Sg. Bain, a tributary of the Batang Tinjar. The area, which has been calculated at 17,940 acres, is located on Fig. 1.

GEOLOGY

The area is underlain by rocks of the Setap Shale Formation (Haile, 1962) which are believed to be of Miocene age and are comprised largely of shales with subordinate sandstone. These rocks mainly weather to clays with angular fragments of shale debris, which are mixed with sandy material or replaced by sands and sandy clays where sandstone is present. In the survey area sandstones are only widespread in the northern section and even there they are interbedded with shales.

Fig. 1

LOCATION
MAP



Area Surveyed

Scale 1 : 500,000

RELIEF AND DRAINAGE

Through the bulk of the area the terrain is moderately rolling, the majority of hill summits being 200-250 feet above sea level. Few summits rise to above 350 feet. Main valley bottoms are at, or a little below, 50 feet above sea level. Slopes are generally less than 25 degrees, the most steeply sloping tracts being in the headwaters of the Sg. Bain and in association with a high ridge in the east, close to the Batang Baram. A wide belt of relatively gently sloping terrain runs through the centre of the area covered. Slope data is included on Map 2.

It may be noted that all data on terrain and slopes is taken from contour maps prepared by Land and Survey Department. These are based on air photograph information and cannot be considered fully reliable as much of the area is under a high forest canopy. This will mask minor gullies on the air photographs. It may well be found on clearing the area that there is a higher percentage of steeply sloping land than the maps indicate.

With the exception of the north and northwest the area is drained by minor tributaries of the Batang Baram. Only the Sg. Lama has a floodplain of any size, there being very little flat land along the Batang Baram itself. In the north and northwest drainage is towards the Batang Tinjar. Poorly drained alluvial flats and swamp country are associated with the Tinjar tributaries but most of such land has been excluded from the survey area.

The writer does not have information on the frequency and degree of flooding in the area but it is known that the Sg. Lama floodplain area in particular is periodically subject to deep flooding and, there at least, there is a definite flooding hazard.

VEGETATION AND LAND USE

The area as a whole is sparsely developed. Both Kayan and Kenyah houses are established in this section of the Batang Baram and there are some Iban living in the ulu Bain but more than half of the hill land in the area has not been used for farming and remains under primary Dipterocarp forest. Much of the remainder has been cleared for hill rice in the past but has since been abandoned and is now under secondary forest of various ages. Old rubber is sporadically tapped in the ulu Bain and some 50 acres of rubber planted under the Rubber Planting Scheme 'A' are located south of Sg. Lama. The main alluvial flats are cultivated in part for wet rice but much remains under forest. The flooding hazard in these areas is a possible reason for wet rice being inextensively grown but a further contributing factor to the lack of agricultural activity in the area as a whole may be the employment offered by the Yu Ling Timber Company, which has been extracting timber from the area over the last two years.

SOILS

The soils of the area are mapped in seven soil associations. Many of the soil families which are present in the area occur, however, in more than one association and the individual families are therefore first described.

SOIL FAMILIES

Kapit Family

Shallow soils in which weathered rock is found close to the surface and in which no genetic horizons are expressed below the topsoil are scattered throughout the hill land. They are generally associated with steeply sloping areas where erosion is prevalent or occur in areas where relatively hard shale or sandstone is found, the latter disintegrating to hard fragments rather than weathering directly to fine material. Where weathered rock is dominant within 10 inches of the surface the soils are classed in the Kapit Family.

Kapit profiles have, below a topsoil of variable thickness, a brownish yellow to yellowish brown clay horizon. This horizon may include scattered shale fragments which become abundant with depth and are dominant below 10 inches. Even where weathered bedrock occurs within this depth it is sufficiently soft to allow some root penetration (the main distinction with the otherwise similar Meluan Family).

Kapit soils are generally of low natural fertility and are usually associated with steep slopes and dissected terrain. They also occur, however, in complex association with the superior Merit soils and can then rarely be excluded in rubber planting except where they mantle gully sides.

Merit Family

Merit Family soils are dominant in the area and comprise well-drained clayey soils more than 10 inches in depth, derived from shales. Below the surface organic layer the soil is generally a yellowish brown to brownish yellow clay. At a variable depth, but generally within 48 inches of the surface, the subsoil becomes reddish yellow in colour, this horizon overlying weathered shale. Immediately above the weathered rock there is commonly a stony layer of iron-enriched shale fragments. The profile varies considerably in depth in this area. At some sites the profile is gravel-free to depths greater than 40 inches while elsewhere shale fragments are present within 15 inches of the surface and the underlying weathered rock within 2 feet.

Merit soils are suitable for rubber. Even where the profile is shallow there is little barrier to root penetration. Natural fertility is low and all crops benefit from fertilizer applications on these soils. Steepness of slope is commonly a limiting factor to development and rubber planting is not recommended on slopes steeper than 25 degrees. Where slopes are greater than 20 degrees Merit soils are commonly found in complex association with Kapit soils.

Bijat Family

Bijat Family soils occupy the lower points of major river floodplains and in poorly-drained bottoms of minor valleys may replace Malang soils entirely. The Bijat profile is a grey or light grey clay (commonly clay loam in the surface 6 inches), mottled strong brown, red and yellow. Through most of the year the profile is wet, sticky and plastic. During the wet season watertables are always high and the soil is flooded for long periods.

Like adjacent Malang soils the natural fertility status of Bijat soils is commonly somewhat higher than that of associated hill soils. The main limitation to use is the poor drainage condition. Bijat soils are most suitable for wet padi cultivation but water control is required.

Sebandi and Mukah Families

Soils in the Sebandi and Mukah Families are found in bottomland areas where drainage is sufficiently poor for the watertable to be at or very close to the surface throughout the year. Peat or muck accumulates above the mineral soil. Sebandi soils have only a thin peat horizon - less than 10 inches in thickness - while Mukah soils have a peat mantle 10 inches to 40 inches thick. The peat in both cases is underlain by grey heavily gleyed (and usually unmottled) clays and silty clays.

Only wet padi can be recommended for these soils without drainage and unless improvements are possible it is not advisable to utilise the Mukah soils where the peat is more than some 20 inches thick as padi yields are likely to be low. Where drainage can be permanently improved a wider range of crops is possible.

Anderson Family

The Anderson Family covers all peat soils in which the peat mantle is more than 40 inches in thickness. Possibilities for agricultural development depend on the ease with which drainage can be effected and the peat mantle reduced in thickness, if not removed. Where Anderson soils are present in this area they are invariably deep. The transition is very rapid from Mukah soils (less than 40 inches peat) to Anderson soils in which the peat mantle is 150 to 200 inches thick. No agricultural development can therefore be recommended.

SOIL MAPPING UNITS

The soil mapping units given on Map 1 are described in the following sections:-

Merit - Kapit Association

Kapit soils are found scattered through the area in irregular patches in association with the dominant Merit soils. No attempt has been made to separate them as they are generally of minor importance. In some localities, however, Kapit soils are

more extensive and locally dominant. This generally occurs where high ridges are present, slopes are steep and soil development offset by erosion. The main areas where Kapit soils are of importance have been separated on the map (and are calculated to cover some 1,920 acres) but the boundary of this mapping unit is only approximate. Other smaller areas could also have been isolated.

Soils in this mapping unit can be used for rubber in large part as, where the terrain is underlain by shale, the weathered rock does not represent a great barrier to root penetration. Kapit soils over sandstone are unsuitable for planting. The main limitation to planting within the mapping unit is, however, the prevalence of steep slopes and gullies. While ample better land is available for planting in the neighbourhood, this mapping unit should therefore be ignored in any scheme.

Merit Association

The bulk of the survey area is covered by the Merit Association (approximately 11,730 acres) which largely comprises Merit Family soils. There are subordinate inclusions of Bekenu, Nyalau and Kapit soils but, as far as survey data indicates, these cover only minor areas through this mapping unit.

The Merit Association is suitable for rubber planting where slope is not a limiting factor. Provided that adequate terracing is carried out planting on these clayey soils can be recommended on slopes up to 25 degrees.

Merit - Nyalau Association

Some 940 acres have been separated from the Merit Association as Nyalau and Bekenu soils are locally important due to the prevalence of sandstone in the underlying rock. The soil mantle is a complex of Merit, Bekenu and Nyalau soils as a result. This association is found mainly in the ulu Bain in the northwest of the area. A further area has been mapped close to the Batang Baram in the northeast. Other smaller areas have not been isolated and have been included in the Merit Association.

Agricultural potential is similar to that of the Merit Association but as many of the soils in this mapping unit are rather light-textured the erosion hazard is somewhat greater. While rubber planting is possible it is recommended that it be confined to slopes of less than 20 degrees.

Malang - Bijat Association

The Malang - Bijat Association comprises well-drained to imperfectly drained alluvial soils along the Batang Baram, the Sg. Lama and other minor rivers. The dominant soils are those of the Malang Family, minor inclusions of Bijat soils being present in depression sites. These soils are generally best developed for such crops as vegetables and fruit trees. While suitable for rubber there is little purpose in using this land for that crop while ample hill land is available. The Malang - Bijat Association covers some 1,170 acres.

Bijat - Sebandi and Mukah Associations

These soils occupy the remaining valley bottoms and comprise poorly drained alluvial soils which are in general most suitable for wet padi. Vegetables and fruit crops could be grown on Bijat soils but would require mounding. The Bijat - Sebandi Association occupies some 1,860 acres and Mukah soils a further 140 acres.

Anderson Association

Roughly 180 acres, mainly in the northwest, have been mapped as dominantly Anderson Family soils. These were found to be consistently deep (sixteen feet of peat being not uncommon) and no agricultural development on them can be recommended.

LAND POTENTIAL

Any rubber planting scheme in this area will be centred on the Merit Family soils which are dominant and which, where slopes are not too steep, are suitable for this crop. It is calculated that those portions of the Merit Association and the Merit - Nyalau Association which have suitable slopes cover almost 11,000 acres in the area mapped. Assuming that a scheme of some 2,000 acres is envisaged there should thus be no difficulty in finding sufficient available land. The most appropriate locality appear to be the central part of the mapped area, north of the Sg. Lama floodplain and lying between the areas of steeply sloping land in the ulu Bain in the west and the area of steep slopes and shallow soils in the east close to the Batang Baram. It is stressed again that slope data included in Map 2 is not derived from ground information but from contours interpreted in many parts of the area from the level of the tree canopy. On clearing it may well be found that gullies exist which were masked by the tree cover and that the area is rather more dissected than the present contour data suggest.

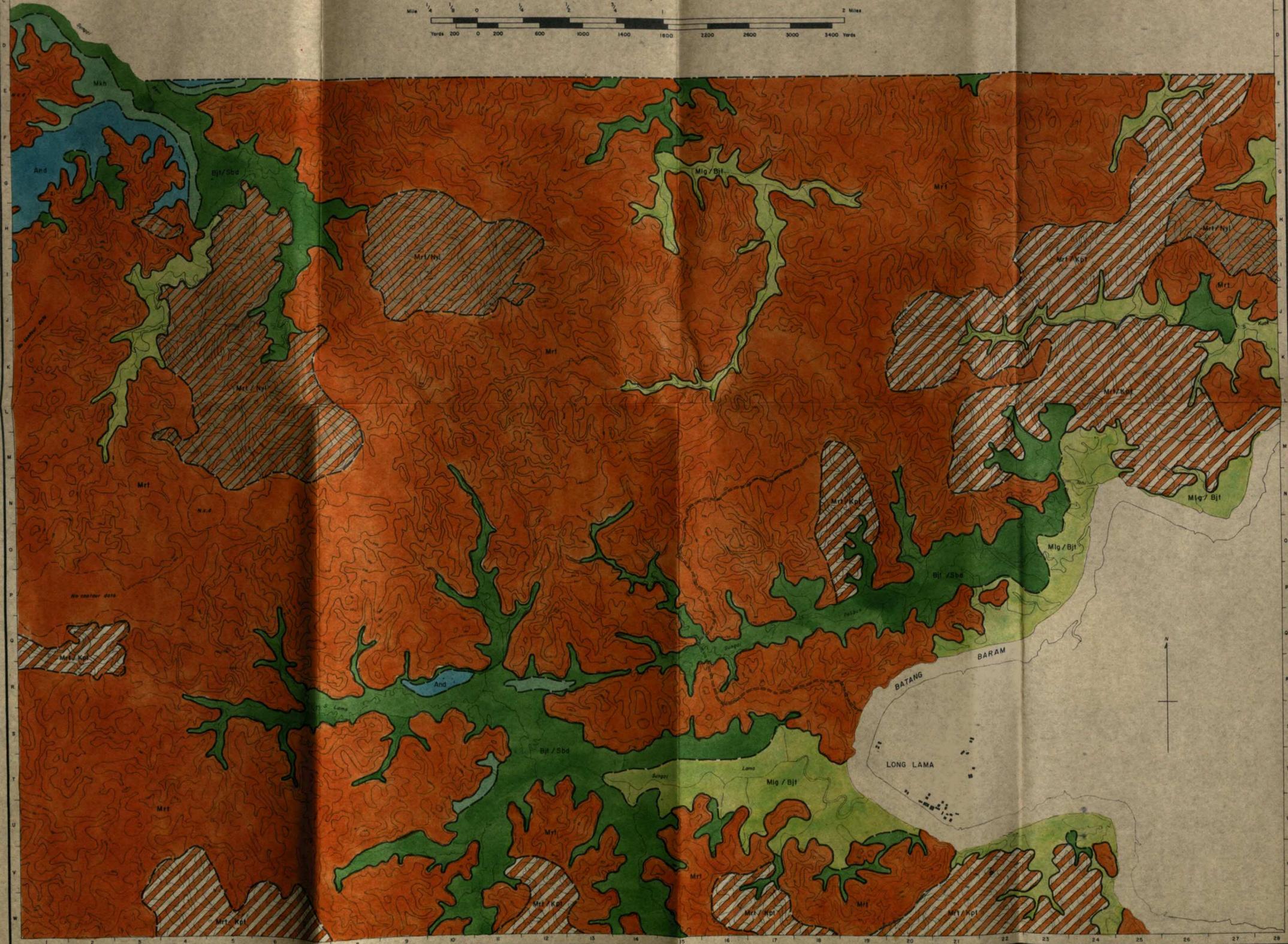
The hill soils, while suitable in general for rubber, are not inherently fertile and any mixed farming lots are best based on the alluvial soils of the Malang - Bijat Association. There are possibilities also of wet padi lots on soils of the Bijat - Sebandi Association. These soils are extensively represented in the floodplain of the Sg. Lama, adjacent to the suggested rubber area and near the site which it is believed is being considered for the village site. The main limiting factor in utilising these soils is likely to be the flooding hazard. The degree of this hazard is not known but requires investigation.

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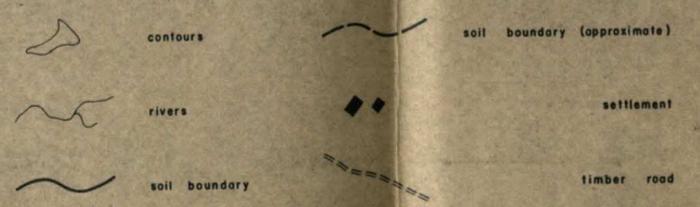
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MAP I

SOIL

ORIGIN	MAPPING SYMBOL	SOIL ASSOCIATION	MAIN SOIL CHARACTERISTICS	APPROXIMATE ACREAGE
Residual		MERIT - KAPIT	Shallow to moderately deep brownish yellow clay soils over shales and hard sandstones.	1,920
		MERIT	Moderately shallow to deep brownish yellow clay soils over shales.	11,730
		MERIT - NYALAU	Moderately shallow to deep brownish yellow clay to fine sandy loams over mixed shales and sandstones.	940
Alluvial		MALANG - BIJAT	Mainly yellowish brown well-drained clays with some gray mottled imperfectly-drained clays. Deep.	1,170
		BIJAT - SEBANDI	Mainly gray mottled imperfectly drained clays with some shallow peat soils. Peat cover rarely more than 10 inches thick.	2,000
Organic		MUKAH	As above but peat mantle continuous and mainly 10 - 40 inches thick.	140
		ANDERSON	Peat soils generally more than 10 feet thick.	180



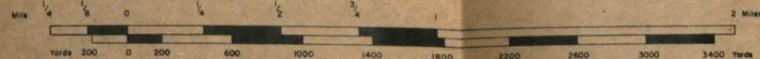
Soil Survey Drawing No. 181a
Survey Area No. 106

Base map from L. S. Dept.

Compiled by: I. M. Scott
Drawn by:

LONG LAMA PROPOSED L.D.S.

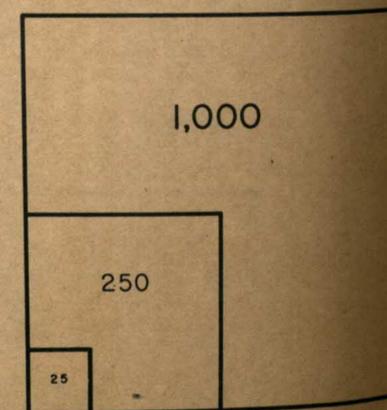
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MAP 2

LAND SUITABILITY

MAPPING UNIT	SUITABILITY FOR AGRICULTURE	APPROXIMATE ACREAGE
	Steep slopes. Unsuitable for rubber planting (>25° on Merit soils; >20 on Nyalou soils). Derived from L. & S. contour data.	2,380
	Deep peat. Unsuitable for agriculture.	180
	Suitable in part for rubber but soils shallow. Exclude from planting where better areas available.	1,400
	Suitable for rubber.	10,810
	Suitable for rubber, oil palms, vegetables, fruit crops but requires control of flooding hazard.	1,170
	Suitable for wet padi.	2,000



Acreage Scale

