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Report No. 40

**Notes on Broad Reconnaissance Soil Survey
of the
KAPIT - MERIT AREA**

(KAPIT DISTRICT)

3rd. Division

by
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HUNTING TECHNICAL SERVICES

NOTES ON SOIL INVESTIGATIONS IN THE KAPIT AND MERIT AREAS

(Third Division - Kapit District)

by

J. P. Andriesse.

I. Introduction

In the middle of 1960 a broad reconnaissance survey was carried out in the Kapit - Sut area with the aim of finding suitable land for agricultural settlement. Because of the disappointing results Third Divisional authorities have since been looking around for other prospective areas in the Kapit District.

2. As a result a request was made by the Agricultural Officer, Third Division, to investigate possibilities of settlement immediately west of Kapit (ref. AS/116/(67) dated 13.1.61).

3. The terms of reference were laid down in communication AS/116A(2) dated 3.6.61 and they read as follows:-

1. To survey the area roughly delineated by Sungei Kapit in the east, Bukit Goram in the south, Sungei Yong in the west and Batang Rejang in the north.
2. To investigate the soils and lands with respect to their suitability for agriculture in general and for rubber specifically.
3. To give, if possible, indications on the alignment of a feeder road which should be constructed to improve communications between Kapit bazaar and the area concerned.

4. The soil surveyor in charge of the survey team suggested that he should extend his tour to the Merit area to investigate possibilities of intensifying agriculture in that area. This with a view to recent enquiries made by H.E. the Governor (ref. CSO. 5486 dated 11.5.61).

The survey team once in the area paid visits to Sungei Pila and Sungei Ba areas as well with the purpose of collecting preliminary data on the soils found there. Attempts to penetrate deep into the area between Batang Rejang and Bukit Mersing had to be given up because of the total lack of communications in that area and the short time available.

(The only communications are by river but the water was extremely low because of an unusual long spell of drought). An alternative method, namely the cutting of rentises proved to be unsatisfactory because of the very slow progress. Our conclusion is that it is impossible to do any soil survey work in this area outside the landas season. The local population believes that the best time will be October/November.

5. The soil investigations, being of a very general nature, do not give enough detailed information for compiling soil maps of a large scale. The areas themselves being all of relatively small acreages cannot be shown satisfactorily on a small scale map and we have therefore abstained from an attempt of preparing such a map. Instead we are using in this report a generalised map on which we have given indications concerning soils and other relevant features connected with this report.

6. However, our investigations have given us enough information to satisfy the immediate objects of our visit.

7. The areas investigated are discussed in the following order:-

- (a) Kapit area
- (b) Merit area
- (c) Sungei Pila area
- (d) Sungei Ba area.

II. Kapit Area

8. The area as delineated in paragraph 3.1 is for the majority deeply dissected terrain. A number of ridges running in east-west direction (parallel to the Batang Rejang) make the area quite inaccessible from northern and southern approaches. These ridges, although not very high, have moderate to steep northern slopes (varying from 25 to 40 degrees) while the southern slopes are steep without exception (more than 30 degrees and up to 60). Between the ridges narrow valleys can be found with small strips of land on both sides of the small streams flowing in the middle of these valleys. The eastern part of the area drains towards Sungei Kapit while the western part is drained by Sungei Yong. Both streams are of moderate size but too difficult to navigate outside the landas season because of the numerous small rapids and low water level. Communications which are maintained by these streams are, therefore, very bad in the drier periods of the year.

9. According to the aerial photographs taken in 1951 and 1954 a large part of the area was still under Primary Forest and for this reason the area was obviously chosen as a prospective place for settlement. Our investigations have revealed that in the last ten years a considerable area has been cleared and there is now almost no Primary Forest left. The areas still covered with Primary Forest are in general too steep for cultivation and/or the soil cover is too thin to give satisfactory rice yields. There is, however, a considerable area covered with old secondary forest (10-20 years old) which is maintained by the local population as their own small 'forest reserves'. These areas occur mainly at the furthest boundaries of kampong areas and they are used for hunting purposes (wild boar) and for collecting forest products for personal use.

10. Shifting cultivation is the main agricultural activity in the area while as a cash crop rubber is extensively planted. Rubber planted by the natives is mainly located on alluvial soils, these being easy to reach by sampan. Along the main streams and Batang Rejang rubber is found on the hill slopes. The Chinese have acquired a considerable acreage of land along the Batang Rejang and are not afraid of planting rubber on slopes as steep as 40 degrees; their gardens, mainly planted with R.P.S. rubber, are well maintained and the growing is satisfactory. Native rubber is planted without system and there is a tendency to plant seedlings on all sorts of slopes and soils as long as it is near the longhouse. Some biliks have planted up more than 10 acres. This is the reason why young rubber is found everywhere near streams. In the interior where communications are bad no rubber is found.

11. I have the impression that since 1951 many more people have moved into the area; the number of longhouses is much higher than the aerial photographs indicate and it is therefore no wonder that the population along Sungei Yong complains about the low rice yields of the last three years; apparently a result of shortage of virgin land and consequently too short a rotation. Our soil survey work was hampered by this fact because we were not allowed to dig pits or use the auger for fear of disturbing the rice spirits which have recently received generous offerings in the form of pigs and chickens slaughtered at every branch of Sungei Yong.

12. The soils of the area can roughly be divided into two groups, namely:-

- (a) the hill soils, which belong for the majority to the skeletal soils while the deeper phase of this group can be classified as Yellow Latosols
- (b) Alluvial soils; mainly dry levee soils.

There is very little alluvium used for wet paddy cultivation and although some scattered small areas of wet alluvium were found, these hydromorphic soils are of no importance when considering the whole area.

The Hill Soils

13. The hill soils (approximately 75% of the area) are in general shallow, which could be expected with such steep slopes and they are of a skeletal nature. The natural vegetation roots virtually in the rotten shale (the dominant rock type in the area). The following description of a moderately deep profile found on top of a ridge can be given:-

- 0 - 1" dark grey crumbly clay loam
- 0 - 12" brownish yellow clay loam, angular blocky, friable
- 12 - 20" brownish yellow clay loam - clay with red mottles (red mottles are in fact rotten shale pieces)
- Deeper than 20" soft weathering shale of multi-colour (grey, red and yellow)

(Samples: 5129/5130, 5140/5142)

On slopes exceeding 35 degrees the soil is often less deep than in the described profile and rotten shale is found at the surface. On moderately steep slopes the soil is deeper but weathering rock was always met within the first three feet of depth. This soil type is well-drained and although we expect that the nutrient status will be low, rubber is doing well on these soils.

15. Towards Sungei Yong the soils are in general more sandy and I have the impression that the soils in Ulu Kapit are of somewhat better quality than those in Ulu Yong. It is possible that in the latter area sandstone beds occur near the surface so that the soils are derived from a mixture of shale and sandstone.

16. Most of the hill soils can be used for rubber cultivation were the slope not such a serious limitation. It will be difficult to find large acreages of land suitable for rubber planting in large blocks. Parcels of land up to 4 acres in size occur scattered over the area and there is scope for the individual farmer to develop such places. On the other hand it will be difficult to bring out the rubber as a wide network of tracks has to join up all those scattered rubber gardens. Often the only way out is along the numerous east-west valleys as frequent crossings of the ridges is very difficult.

The levee soils - recent alluvium

17. Along the main streams a small band of alluvium has developed. The soils are well-drained and texture ranges from sandy loam in the top to clay loam in the subsoil. The total acreage of the alluvium which is of reasonable quality is small and most of it is already planted up with old rubber or young seedlings.

18. Small areas of this alluvium can be found in the narrow valleys between the ridges. There it is sometimes used for wet paddy cultivation if topography permits.

Conclusions

19. The soils in the Kapit area are for the majority suitable for rubber planting. The main limitations are steepness of slope and in connection with this, shallowness of soil. However, it has been proved that rubber can grow well on steep slopes and if properly terraced there is nothing to say against it.

We generally consider a slope of 35 degrees as the maximum allowable slope to cultivate but it is realised that in parts of the country one has to go beyond that maximum if agricultural development is to proceed and no other land is available. Erosion is an obvious feature on these steep slopes, especially when the natural vegetation is removed.

The most dangerous situation arises when after cutting the original forest bare soil is exposed to rainstorms. It is in such periods that landslides occur and slopes are deprived of most of their soil cover. As soon as the soil is covered again erosion is not so serious. It is therefore essential that if steep slopes have to be used for rubber planting terraces should be built and the soil cover restored as quickly as possible. The best time for preparing such gardens is therefore immediately after the wet season.

20. Apart from rubber, I do not recommend other commercial crops for the area. Pepper cannot be grown satisfactorily on such steep slopes. The local population could grow coconut palm on the alluvium along the main streams together with fruit trees for home consumption.

21. In general I do not find the area suitable for a large scale settlement project, and this for a number of reasons:-

- (a) areas of suitable land and soil are scattered
- (b) communications are bad and it will be costly to improve them because of the nature of the landscape
- (c) the greatest difficulty will undoubtedly be to persuade the natives to relinquish customary rights, as it appears that suitable agricultural land is indeed not so abundant as was originally thought.

Recommendations

22. I do not recommend a large scale government-sponsored settlement project. Even if local population is willing to hand over part of their land, it is possible that a great part of that land will be useless. Instead, it would be best to encourage the local population to develop the best parts of their land. Chinese will undoubtedly continue to buy land, 4 acres here and 10 acres there and if they have the necessary capital they will indeed be the only people who can afford to terrace such steep slopes and to grow rubber on them.

23. The building of a road from Kapit bazaar into the area would not open a large area of land for agriculture. Communications away from the road will still be difficult. If this road has to be built as part of a larger project, e.g. to improve communications between Kapit and areas south-west of Kapit towards the Second Division, this road has to follow a course along Sungei Kapit. This is not an easy route as a number of ridges stop dead at Sungei Kapit leaving no place for building a road along the riverbank. It will therefore be impossible to construct such a road without crossing these ridges, which involves the frequent building of hairpin bends. Although this is technically quite possible with the help of modern equipment, the cost will be high.

III. Merit Area

General

24. The area is a one day long-boat distance from Kapit. The only communication is by boat using the Batang Rejang which involves crossing of the Pelagus Rapids. The population is rather dense for Upper Rejang standards; longhouses are mainly located along the wide bends of the Batang Rejang in that area. The interior is, with the exception of Sungei Merit, uninhabited.

Most of the 'tandjungs' of the Batang Rejang consist of alluvium of good quality and they are at present in extensive use for the growing of hill paddy. Only in low lying places where water stands above the surface for most of the year swamp paddy is grown.

Rubber is extensively grown on slightly higher places and on river banks, but there is no sign of any large scale plantings with R.P.S. rubber. The rubber seems to be attacked by root fungus in the early growing stages, a feature which is undoubtedly connected with bad drainage.

25. The great disadvantage in this area is the annual flooding. Floods occur over most of the flat lying land but they are not of the same magnitude every year. Only in 1961 abnormal high flood levels were recorded. On average 4 to 5 feet of water above the land surface can normally be expected in the low lying lands. Somewhat higher lying ground is covered with 1 to 2 feet of water or not at all. The period of flooding is, however, never more than one week at the time and most crops seem to survive the floods. Rubber can stand the flooding quite well as long as they are not serious in the first year of growth. Hill paddy seems to survive when the floods occur in the late growing stages. Also coconut and bananas are not harmfully affected by the floods.

26. At present we can say that most of the area is not at all developed and that natural resources, which are undoubtedly richer than in most parts of the Third Division have not yet been used to full advantage.

Soils and Agriculture

27. The soils are mainly of an alluvial nature. Along the Rejang brown sandy loam to silty loam of good quality can be found. Although analyses have still to be carried out, the experience with this type of soil is that by Sarawak standards they will be of high quality. I was told that if no floods occur and neither pest or disease attack the rice, yields can be as high as 400 gantangs/acre. I arrived at this figure after converting the locally used measurements (information from Rumah Sandai). The rotation on the alluvial soils is normally 4 years (3 years fallow and 1 year hill rice).

Wet paddy land is planted almost every year, but failures are frequent because of flooding. Although the risk of flooding is high, yields in a good year often make good for the failures. Besides that the annual floods enrich the soil so that continuously good yields can be expected.

28. On somewhat higher places and away from the river the soils are in general more clayey and of a yellow colour. Mottles occur in the subsoil showing that drainage in the deeper horizons is imperfect. Watertable was frequently encountered at 5 feet depth. The soils on the higher places which are more aerated than the soils on low lying ground can be compared with the alluvium along the Limbang river. They have been noted, too, along S. Serin (24th mile 1st Division). In these places the soils are of very good quality and suitable for a variety of crops.

29. A profile description of a soil on low lying ground follows:-

Pit 5114/5116

Flat empran land with 3 years old Temuda. Dominant Melastoma vegetation.

0 - 5" crumbly silty loam (10YR 4/3) dark brown, rich in org. matter, well rooted, merging into

- 5 - 15" angular blocky, friable, silty clay (10YR 6/8) brownish yellow with grey mottles along structural planes and root channels. Clayskins present along structural planes.
 - At 13" weak, reddish mottling
 - 15 - 26" as 5 - 15", but olive grey mottles more prominent, sticky and plastic clay
 - 26" watertable.
- | | |
|--------------------|-------|
| (Sampled: 0 - 4" - | 5114 |
| 7 - 13" - | 5115 |
| 20 - 26" - | 5116. |

30. On land which was almost above flood level the same alluvial soil is found but with intensive red mottling in the lower horizons. The following auger description might suffice:-

- 0 - 12" Yellow brown crumbly silty loam, hard and dry
- 12 - 24" Yellow silty loam, angular blocky, hard and dry (channels filled in with greyish coloured topsoil ant activity)
- 24 - 36" Reddish brown silty clay loam with weak yellow mottles at 42" moist.

31. Outside the bends of the Rejang river low flat-topped hilly land occurs. The tops of these hills look like old terraces made by the river in former times, but it is more likely that they are formed by horizontal beds of sandstone. On these hills two types of soil can be found.

32. Type 1 is a typical red-yellow podsollic soil (in fact the most typical one found so far by reporter in Sarawak):-

Pit 5117/5121

Gently undulating terrain, flat overall topography.

Vegetation: Primary forest - Keladang and Kresak dominant. Undergrowth nil.

Parent material: Mainly sandstone with an admixture of shale.

- 0 - 1" root math, not much leaf litter, overlying,
- 1 - 2" 10YR 5/3, brown sandy loam with intensive grey mottling, crumbly and well rooted. (Note: there is a very small band of half an inch wide in which the grey mottles become almost the matrix colour of the soil and it resembles then the A2 horizon of a podsol).
- 2 - 15" 10YR 7/6, yellow sandy loam with intensive grey mottles. After 10" also some weak brown mottling, friable, sticky, gradually merging into
- 24 - 42" 7.5YR 6/8, reddish yellow silty clay with intensive 2.5Y 7/6 yellow mottles, sticky and plastic, compact, moist.

Note: In corner of pit from 24 - 42" light grey, brownish mottled sandy clay loam is found (might be weathered sandstone boulder). Roots almost confined to top 10" only, a few big roots occur at 24".

| | | | |
|-------------|----------|---|------|
| Sampled at: | 0 - 2" | - | 5117 |
| | 3 - 5" | - | 5118 |
| | 10 - 15" | - | 5119 |
| | 26 - 32" | - | 5120 |
| | 40 - 44" | - | 5121 |

33. This soil type is well suited to rubber but not much rubber was actually found growing on it because the soils occur generally too far from the longhouse. The soils are all above flood level.

34. Type 2 a typical example of an intergrade between red-yellow podsollic soil and true podsol.

Pit: 5131/5135

On flat topped hilly land.

Vegetation: Better type of Kerangas Primary forest

- 0 - 1" organic litter, slightly decomposed leaves and roots.
- 1 - 3" brown friable sand mixed with highly decomposed org. matter. Charcoal present (old shifting cultivation?), moist and loose.
- 3 - 17" yellow fine sand with distinct light grey and reddish yellow mottles, crumbly, moist.
- 17 - 37" pale yellow brown sand with faint grey mottles and organic staining.
- 37 - 67" light grey fine sand with faint yellow and dark brown mottles. Faint rusty mottles along root channels, loose and moist.

Note: last horizon is decomposed sandstone.

35. The latter soil type, although carrying a vegetation almost similar to that of soil type 1, is definitely of inferior quality for agriculture. Still, if occurring near longhouses, rubber is found on it and it grows well. As only young rubber was found (1 - 2 years old) it is impossible to say whether satisfactory growth will persist in later years.

36. We have to conclude from our investigations that at least 5,000 acres of good alluvial soil can be found in the Merit area. In addition good soils can be found on hilly land which topographically is very suited to rubber planting. In all, soil conditions appear to be favourable for a diversified system of agriculture. The great disadvantage in this area is the annual floodings. My impression is that floods only occur once in so many years (5?) and that if floods were really bad people would never stick to such a place. In actual fact people have moved in from other areas. If the soils are good and yields are high, the risk of losing a crop say, once in the five years, is balanced out by the surplus of rice made in good years.

37. Before any action on agricultural development is taken an immediate start should be made with recording the flood levels of the Batang Rejang, preferably at Merit bazaar. At present nobody is able to tell with certainty how often these floods occur and what their effect is on planted crops. Development of the Merit area should be a carefully planned long term project and basic data should be collected before any expensive project is started.

I would advise that a more detailed soil survey is undertaken in the future to locate the exact areas and acreages of suitable soils but it is best to wait for a topo-survey first so that we are able to find out which areas are above and which are below normal flood level. Such a map will be a necessity for crop planning and detailed soil surveying. A joint exercise would be the best solution in order to avoid repeating expensive and laborious rentice cutting. The Merit area is undoubtedly an area with prospects for intensive agriculture and settlement but great care should be taken not to rush things and to first investigate this project from many angles.

IV. Sungei Pila Area

38. The Sungei Pila area was investigated because of favourable reports given by the population in the Merit area. Only two days were spent in investigating soil conditions there, but this was enough to enable us to give brief comments on the area.

39. Along Sungei Pila a considerable area of good alluvial soil is found. At present most of this soil is not used for agriculture and is still under Primary Forest. As illustrated on the map a large area of this soil could be used for agriculture if the annual floods did not prevent people from doing so. This year up to 15 feet of water above the ground surface was reported, and evidence of this can still be seen high up in the trees growing on the riverbanks.

40. The Iban people in the area speak highly of the quality of the alluvial soil in Sungei Pila area and therefore samples have been collected to investigate this properly. The following description is typical for the alluvium:-

Pit: 5136/5139

Location approximately 100 yards from the river.

Flat lying empran land. Vegetation: Temuda.

- 0 - 3" Brown, 10YR 5/3 loam with many slightly decayed roots, charcoal pieces, crumbly and friable, well rooted, moist.
- 3 - 12" 10YR 6/3, pale brown loam with many light grey mottles, angular blocky structure.
- 12 - 28" Pale brown loam to clay loam with dark grey and rusty coloured mottles along root channels.
- 12 - 48" Light grey clay loam to clay with many rust coloured mottles.
(Imperfectly drained profile)

| | | | | | |
|----------|----|---|-----|---|------|
| Sampled: | 0 | - | 3" | - | 5136 |
| | 3 | - | 12" | - | 5137 |
| | 12 | - | 28" | - | 5138 |
| | 28 | - | 48" | - | 5139 |

41. The hilly land bordering the flat alluvial land along the lower part of the river course is of the same nature as the hills around Merit and the soils found in that hilly land are mainly of type 2 (see paragraph 34). Further upstream the alluvial land becomes more narrow, the hills along the river steeper and the soil on those hills is more like type 1 (see para. 32).

Conclusions

42. Although a large stretch of good alluvial soil is found along Sungei Pila, the annual flooding will make it impossible to develop this area intensively. The great fluctuations in water levels in the river is caused by high water levels in the Batang Rejang. If the Rejang is in flood, the water from Sungei Pila cannot flow out and is forced up. This is the case with most of the small rivers draining into the Rejang in that area. It is impossible to remedy this natural feature without large and expensive control measures. The hill soils in the Ulu Pila are suitable for rubber planting, although again the limitation is steepness of slope.

V. Sungei Ba Area

43. Regarding existing plans to explore soil conditions between Batang Rejang and Bukit Mersing, attempts were made to penetrate into this country by making use of the only means of communication, namely the rivers. Sungei Merit proves to be full of wood and it is impossible to go up-river at this time of year (June/July) because of the low water level. Sungei Metah was tried and the same difficulty was experienced. Finally, Sungei Ba allowed us to penetrate about 6 miles in one day and from that point some soil investigations were carried out.

44. The aerial photographs of the area give us the impression of a very homogeneous country, deeply dissected, with ridges running in approximately east-west direction and with small narrow valleys in between. In general, a country quite similar to the Kapit-S. Yong area with one big difference, namely the hills in the Sungei Ba area are higher. Our investigations along Sungei Ba have given us the key to interpreting these features more accurately.

45. Along the numerous streams, small stretches of alluvium are found. This alluvium is of the same nature as found in the Kapit area and could be used for rubber. Steep hills rise up from these comparatively small valleys, the slopes ranging from 30 - 60 degrees. Little or no soil cover is found on these slopes and only on the top of the ridges and at the foot some deeper soil was encountered. The soils are of a sandy nature, sandy loam in the top and sandy clay in the subsoil. They will be of low fertility as they are predominantly derived from sandstone.

One profile was sampled: 5122/5124.

Conclusions

46. If the country is really as homogeneous as the aerial photographs indicate, then I do not expect to find much of value as far as soils are concerned. Again the country is very dissected and although rubber could be grown on the steep slopes, the area does not seem to possess a great potential for a large scale settlement. A reconnaissance soil survey of the area between Batang Rejang and Bukit Mersing will be of doubtful value as we can predict with some

certainty that agricultural development in that area will never materialise because of the unsuitability of the majority of the land for cultivation.

Note: The following samples were collected in the course of our investigations. Awaiting analytical results an account on the fertility of the encountered soil types will follow up this report in due course.

Reference to soil samples

Kapit area

| | | |
|-----------|---|-----------|
| Alluvium | - | 5125/5128 |
| Hill Soil | - | 5129/5130 |

Merit area

| | | |
|------------------|---|-----------|
| Rejang Alluvium | - | 5114/5116 |
| Hill Soil type 1 | - | 5117/5121 |
| Hill Soil type 2 | - | 5131/5135 |

Sungei Pila area

| | | |
|----------|---|-----------|
| Alluvium | - | 5136/5139 |
|----------|---|-----------|

Sungei Ba area

| | | |
|-----------|---|-----------|
| Hill Soil | - | 5122/5124 |
|-----------|---|-----------|

GENERALISED
BROAD RECONNAISSANCE SOIL MAP
KAPIT - MERIT AREA

Scale 1: 125,000.



KEY

- Dominantly poor sandy soils with Kerangas vegetation.
- Mixed sandy soils and clay soils (sandstone and shale derived) deeply dissected country with steep slopes and skeletal soils.
- Dominantly red-yellow podsollic soils, deep, suitable for rubber. Gently undulating country.
- Mixture of red-yellow podsollic soils and shallow latosols. Dissected country, steep slopes. Partly suitable for rubber.
- Dissected country with steep rising ridges covered with shallow yellow latosol (Clay soils derived from shale) and small valleys filled up with alluvium.
- Good quality alluvium, (mainly loams). Partly flooded in period of high water in Batang Rejang.
- Auger sample hole.
- Profile pit (sampled).
- Area qualifying for more detailed investigations.
- Approximate soil boundary.
- Contour.
- Followed course (Footpath, cuttings)

