Report No. 43

PROGRESS REPORT

COASTAL RECONNAISSANCE SURVEY
MIRI-IGAN

3rd Division

J.R.D. Wall

March 1962

HUNTING TECHNICAL SERVICES

PROGRESS REPORT ON THE COASTAL RECONNAISSANCE SURVEY FOR 1961

Contents

Land Capability Map attached (Soil Survey drawing No. 64)

derived from soil maps at 1: 50,000.

INTRODUCTION. 1. This survey was started in 1961 with the intention of -

a) producing a complete picture of the coastal soils of Sarawak, which will be of prime importance in locating areas with better soils, and therefore suitable for more intensive surveying prior to extending cultivation.

b) finding all coastal areas suitable for coconut cultivation.

2. During 1961 a strip, 5-8 miles wide, was surveyed between Miri and Igan (3rd Division), a total of 1400 sq. miles or 900,000 acres (see accompanying map).

3. Upon completion of the whole coastal survey it is intended to produce a full report, possibly in the form of a memoir, meanwhile this Progress Report gives in fair detail the results of surveying during 1961.

METHODS OF SURVEYING. 1. These were standard for reconnaissance surveys. Preliminary examination of aerial photographs gives a rough soil classification and tentative soil boundaries, both of which are subsequently field checked. Final redrawing of soil boundaries is effected by using both field data and aerial photographs.

2. The attached map, scale 1:125,000, shows in a generalized fashion those areas considered suitable, unsuitable and marginal for cultivation. It would be impracticable to draw detailed soil boundaries at this scale. It is derived from soil maps, scale 1:50,000, which show Soil Associations, Composite Associations, and sometimes Series and Phases where practicable. Necessarily in reconnaissance surveying there are many areas not visited during field work, and in these places the types of soil can only be inferred by extrapolating knowledge from known similar areas.

3. The aerial photos were good in parts, very poor or absent in parts, mainly indifferent. The accuracy of the soil maps reflects photograph standards almost directly.

MAPS. 1. The soil maps are now ready for final redrawing. They will be prepared at scale 1: 50,000 on the same sheet grid used by the D.O.S. series. So far 17 sheets are involved. For the memoir the 1: 50,000 maps will be condensed to 1: 125,000. It is suggested that the completed 1: 50,000 maps be kept by the Soils Division for the time being, and that when requests are made for information on soils within this coastal area, small soil maps can be redrawn of the area concerned and submitted with a report - as already done with reports on Mukah District, (D.A. 2345/38), and several others in 3rd and 4th Divisions; (Sg. Bayan, Sg. Bawan, Sg. Sebauh etc.).

ANALYSES. Selected samples, representative of most of the soil types present, have nearly all been completed. Confirmatory analyses are expected to be through early in 1962.

SOILS

1. No unusually good soils have been found comparable to those in parts of 1st Division but there are some promising, accessible areas containing moderate, sometimes good, soils - for Sarawak. These are to be found mainly in the region behind the coastal swamps, especially between Sg. Sibuti and Sg. Suai and to a lesser extent between Sg. Suai and Sg. Semilajau and between Btg. Kemena and Btg. Tatau. These areas will be discussed in more detail in subsequent paras.

2. For convenience the soils have been grouped under headings 'Unsuitable for cultivation', 'Suitable for cultivation', 'Marginal for cultivation'. The criteria used for putting any particular soil into these categories include natural soil fertility, soil physical properties (depth, drainage, texture, structure), slope and erodability, flooding, salinity, presence of peat. The 'suitability', is for the usual Sarawak crops such as wet padi, coconut, citrus etc. on alluvial land and rubber in particular on the hill land. It should be stressed that the soils classified as 'unsuitable' for cultivation could all be used if sufficient money, time and agricultural knowledge on their use was available. As it is, with the present systems of cultivation, they are considered unsuitable.

(i) SOILS UNSUITABLE FOR CULTIVATION. These are enumerated and described briefly below. (Approx. total 530,000 acres).

a) PEAT. This is the ever present bugbear among lowlying coastal soils and so far in Sarawak is of very limited use for cultivation above depths of approx. 3 feet.

Referring to the maps it can be seen that there are two very large peat enclaves. The largest in the south stretches almost continuously, from Btg. Kemena to Btg. Igan. The bulk of it is very deep and overlies clay. Shallower margins are rather restricted but are present in many small areas (described further in subsection (iii)(a)).

The other large enclave likewise consists of deep peat: the shallower parts are most pronounced on the coast between Kuala Niah and Kuala Nyalau where they overly beachsand. In both enclaves the peat remains very deep right to the foothills - except where streams debouch from or through the hills.

In addition quite deep peat occurs in many smaller valleys within the fringing hills especially from the Bekenu area southwards as far as Sg. Semilajau, and in swamps around Bintulu, near Tg. Kidurong, around Sg. Segan and Sg. Spadok and in the Sg. Salitut valley near Tatau.

b) PODSOLS. These very poor, almost useless soils occur mainly on the remnants of a coastal terrace or raised beach fringing the hills, especially from Miri to Tg. Bungai, from Sg. Nyalau to Tg. Kidurong and more infrequently from Bintulu to Btg. Tatau. The areas rarely exceed 1 sq. mile without being dissected by streams.

Height above sea level varies from 6' seen around Sg. Semilajau, to 270' at Miri; the general level is between 15' and 30' a.s.l.

Podsols have also been found developed on gently inclined sandstones, especially between Sg. Semilajau and Tg. Kidurong. These are generally shallower (about 4' before reaching parent sandstone) than the coastal terraces but equally poor. At Sg. Likau (N. of Tg. Kidurong) these soils are often found near present flood plain level, where it is possible that river scouring/deposition has altered the normal profile. Cultivation is impracticable since below the humus horizon the soil is completely impoverished and the excessive topsoil drainage probably induces physiological drought for the trees during the dry season.

c) SALINE SOILS. These occur under mangrove and nipah forest and are found to a limited extent at the mouths and for a short way upstream the larger rivers. Such soils only occupy a small proportion of the total area. It is interesting to note that at Sg. Kalulit, (K. Sibuti), coconuts have recently been planted on cleared mangrove and nipah swamp. If they follow the same course as those planted on similarly cleared ground at Mukah they will grow slowly and eventually die off at 15-20 years after producing a negligible number of fruit.

d) HILL SOILS - STEEP, DISSECTED. None of the hill country is exceptionally high in altitude above sea level, in fact the general level of higher hill tops does not exceed 350'. Distance from valley bottom to hill top however is often considerable (100-200') and it is such areas that are usually most badly eroded, with steep slopes exceeding 30 degrees (often 60 degrees). These areas are to be found around Bt. Lambir near Miri and in dissected country between Sg. Nyalau and Btg. Tatau.

This topography is usually developed from steeply inclined thick bedded sandstone: the soils are poor, often shallow, mainly yellow podsolics grading towards true podsol on ridge tops and red yellow podsolics on gentler slopes. Their drainage is good but the steep slopes and poorness of soil make them generally unsuitable for cultivation. There are, of course, patches of more gently sloping cultivable soil on dip slopes and in valley bottoms: these however are subordinate to the generally poor land. If terracing and plentiful manuring were to be carried out, then more of this land could be used for e.g. rubber.

(ii) SOILS SUITABLE FOR CULTIVATION (Approx. total 190,000 acres

a) ALLUVIUM. These alluvial soils, consisting of swampy basin clays and levees, are unfortunately not common. The basin clays, though generally not particularly fertile since they are derived from poor sandstones and shales, are nevertheless important

/for

for wet padi and sago cultivation. (The Setap valley contains some rich alluvium, however, probably derived from calcareous shales). The largest area of this soil is in the Sibuti-Setap basin, extending round the foothills to Tg. Bungai and to Sg. Kalulit. Here, most of this soil is already cultivated very successfully for wet padi but there are probably many small patches with shallow peat cover further inland that are as yet unused. There are other comparable areas of heavy clay soils at Mukah (see DA.2345/38), Btg. Oya (under sago), Btg. Balingian (under sago) and possibly around Niah, further inland than the limits of this survey. Levee soils are very useful for most deep-rooting perennial crops. Sg. Sibuti has narrow, low, heavy textured levees in the area surveyed. Sg. Niah has substantial, quite wide levees, mainly heavy textured, poorly-drained, and though not exceptionally fertile, quite suitable for a wide variety of orchard and kampong fruit crops. The levees of this river peter out near the mouth. Btg. Suai has low rather sandy levees in the area surveyed that are occasionally podsolized badly, especially nearer to the coast (old beach sand). Elsewhere they should be suitable for the less demanding orchard and kampong fruit crops: Btg. Tatau is very similar. The Oya, Mukah, Balingian and Bintulu rivers all have low, heavy-textured levees that are used for coconuts, sago, pinang etc.

Streams and rivers between Tg. Kidurong and Sg. Nyalau almost without exception have pronounced, high, light-textured levees that are well-drained but poor in nutrients. Since this region is all under natural vegetation no crops have been seen growing on these soils, but it is felt that they would be suitable for most fruit trees, since they are replenished fairly regularly by flooding - which must in ulu parts rise 30 feet or more if it tops the levees.

b) HILL SOILS. It is thought that with few exceptions all of the hill soils are red-yellow podsolics. No igneous rocks occur, simply the sedimentary succession from sandstone to shale. The main differences are possibly due to the different grain size of sandstones. Coarse and medium sandstones form scarps and high hills (section 5 (i)(d)) and tend to give yellow podsolic soils with good drainage and structure but which are very poor nutritionally. The fine sandstones and mixed sandstone/shale parent materials give red-yellow podsolic soils of moderate drainage and texture - but poor nutritionally. The heavy shales give red-yellow podsolic soils of poor drainage and poor nutrient value. Thus all the hill soils are equally poor, with the exception of topsoils under primary forest which have medium to good nutrient status; they differ mainly in physical properties, slope and absolute height. The latter two factors are the main basis for separating 'suitable' from 'unsuitable' hill land. The lower, less dissected hills considered suitable for cultivation without too much effort of

/terracing

terracing occur:- south of Lambir (mainly derived from sandstones; in the Sibuti/Setap basin (shale derived); between Sibuti and Suai (mixed sandstone and shale), where the hills may be steep on scarp slopes; between Suai and Nyalau (sandstone and shale), where hills are generally very low and rounded; and between Sg. Nyalau and Sg. Likau (mixed sandstone and shale); from the Sg. Likau area the soils became progressively sandier southwards. In the Bintulu region is a long narrow belt of low undulating hills drained by Sg. Sibiu: the soils are heavy and shale derived. South of Btg. Kemena are patches of low rounded hills that became more infrequent moving southwards until they are replaced by low shale hills around Sg. Kalulit, tributary of Btg. Tatau.

As mentioned above, fertility of all hill soils is low below the topsoil: they are acid, low in N,P, and soluble bases (except Na, occasionally K). Cation exchange capacity is slightly higher in the shale soils which therefore might be said to have a higher potential. The main physical difference within these low hill soils is in slope and drainage and associated factors.

(iii) SOILS MARGINAL FOR CULTIVATION. (Approx. total 180,000 acres)

a) BEACHSAND. The coastline fringing the peat swamps and the coastal hilly parts consists of a narrow belt (50'-500' wide) of beachsand with water table lower than 24", which is backed by beachsand with water table higher than 24". In the swamps, this is succeeded by gradually deeper peat overlying beachsand. During the 'landas' the water table will be considerably higher in all the beachsand soils.

The 'dry' beachsand is generally unfit for prolonged cultivation, since below a topsoil which is fertile under primary forest, is poor, leached, impoverished quartz sand. After cultivation this soil is generally left to revert to coarse pasture for cattle grazing. The 'wet' beachsand is considered marginal for cultivation: the sand is nearly always poor but if shallow peaty humus or peat exists on top it can be drained for cultivation of e.g. coconuts, orchard crops, (especially citrus), vegetables, etc. Drainage however is not always possible or practicable in which case the undrained, wet, sandy (and peaty) soil is of restricted use for cultivation. These areas are most extensive between K. Niah and K. Nyalau and from K. Kemena to K. Igan.

Beachsand at K. Nyalau contains much shelly material in definite horizons that give high Ca and Mg. m.e.% on analysis. At nearby Tg. Payong is beachsand containing many lumps of coral: the Ca figures there should give similarly high readings.

b) MIXED ALLUVIUM - HILL SOIL. This mixture of riverine and hill soils is most common between Tg. Kidurong and Sg. Telong near Btg. Suai. Included are soils both suitable and unsuitable for cultivation, as well as those that are truly

The alluvial soils include very sandy well-drained levees which may be used for fruit crops; sandy to clayey, imperfectly-drained soils behind the levees, which though not very fertile should be suitable for citrus, coconut and possibly rubber; in addition there are patches of peat of varying depth and podsolic riverine terraces.

The hills are always low and generally rounded: their soils include the red-yellow podsolics derived from sandstones and shales, a near podsol developed on flat bedded sandstone, true humus podsol on coastal terrace remnants and red-yellow podsolics that show bleaching by formerly higher sea levels. The fertility levels of the hill soils is poor: their chief merit lies in the gentle topography.

On aerial photographs the above soils occur on a landscape that is quite distinctive: the general relief is flat with frequent low undulations where hills and hillocks occur - all with very poor to poor vegetation. Included are some hillier areas where dissection is not too intense.

(iv) SOILS AND AREAS SUITABLE FOR COCONUTS

On the whole there are no exceptionally good soils in this region, and it is more a case of finding physically suitable soils for specific crops than looking for soils with a particularly good nutritional status.

As regards coconuts, its physical requirements of no permanent waterlogging in the rooting zone, moderate soil aeration and no excessive drying out of the soil can be met in the following types of soil.

a) The 'wet' beachsand. This will certainly need drainage where peat is present as topsoil; drainage of some areas however may not be practicable. The largest areas lie on the coastal fringe between K. Niah and K. Nyalau and from K. Kemena to K. Igan. The sand itself is rarely fertile, the peat may be potentially fertile after drainage. Little of this soil type has been used for cultivation.

b) The different kinds of alluvium should all be suitable for coconut cultivation after appropriate improvements. Levee soils do not need improvement on the whole except for the addition of fertilizer on the sandier levees of the hill streams and the Tatau and Suai rivers especially. The sand is dominantly quartzitic and poor, even after regular flooding by the rivers.

The basin clays are practically all used for cultivation at present: mainly for sago between Oya and Tatau, and for rice in the Niah-Sibuti region, and between Bintulu and Tatau. This soil is quite suitable for coconuts if well drained; bunds are good sites. Unfortunately the requirements of coconuts conflict with those of sago and padi.

c) Red-yellow podsolic hill soils at Tg. Kidurong are being used for coconuts but since they are not yet mature it cannot be stated how successful they will be on these soils. Growth so far is rather slow and a lot of trouble has been caused by wild pigs uprooting young palms. The soils are poor but drainage is quite good.

CLUSION

1. The soils of this coastal belt present a typical selection of soils of lowland Sarawak. Nearly all coastal, riverine and swamp soils are represented. The hills are all developed on sedimentary rocks thus their soils are confined to the coarse-textured, shallow, yellow podsolics the heavier red-yellow podsolics and occasionally true podsols.

2. With the exception of some beachsand around K. Nyalau and the alluvium of the Sibuti Setap basin, all soils are poor in nutrients below the humus layer.

3. The better areas considered suitable for cultivation are: those alluvial parts that are levees, basin clays, or drainable beachsand (both the latter two with shallow peat cover on occasions), and those hill areas that are neither too high, too steep, too eroded, nor consist purely of humus podsol. Approximately 530,000 acres are delimited as unsuitable for cultivation. Approximately 190,000 are included as suitable for cultivation on the enclosed map, and a further 180,000 acres as marginal. It should be remembered that these figures are approximations only: each of the three groups inevitably include small areas belonging to the other two.

4. Generally speaking all non swamp soils under primary forest have a medium to good topsoil, 2-6" deep, regardless of soil type beneath. The chance of losing this by 2 to 3 years cultivation is high, unless real efforts are made to maintain it. If not the soil will become as bad as many of those in 1st, 2nd and 3rd Divisions which can barely support a secondary regrowth.

5. Between Btg. Tatau and Bintulu, the bulk of the hill land surveyed is untouched by cultivation. The same is true between Kidurong almost to Sg. Sibuti and from Setap to the high Lambir hills. Scope for resettlement is therefore great but to make it successful it must be <u>permanent</u> resettlement that above all makes ample provision for maintaining, and improving, soil conditions.

6. The most promising coconut soils are the riverine alluvium and 'wet' beachsand. Depending on the success of a plantation at Tg. Kidurong on red-yellow podsolic soil it may prove worthwhile developing certain hill areas for coconuts.

7. There is the question of accessibility. The most easily accessible parts are Mukah, Bintulu and Miri - by plane. By sea, Chinese launches ply between rivers Oya, Mukah, Balingian, Tatau, Bintulu - then a long gap before the Suai, Niah, Sibuti and Miri rivers. The most inaccessible part as regards

/regular

regular traffic is between Btg. Suai and Btg. Kemena, but from the coast one can penetrate a fair way upstream via Sg. Nyalau, Sg. Semilajau, Sg. Siod and Sg. Likau. The problem of accessibility therefore is not great nor insurmountable, it is more a question of being an inconveniently long way from the nearest centres of population: (Bintulu - K. Semilajau is less than 3 hours by 40 h.p. fishing boat; the same boat can travel 3 hours up Sg. Semilajau providing the weather has not been exceptionally dry).

8. During 1962 the Coastal Reconnaissance Survey is expected to link up between Igan and Grigat. Reconnaissance surveying will also be extended behind the Coastal Survey in the promising areas between Suai and Sibuti.