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GOLD COAST DEPARTMENT OF SOIL AND LAND-USE SURVEY

TECHNICAL REPORT No. 15

REPORT ON A BRIEF INSPECTION OF THE SOILS OF BOKROM - NTAKROH - BREMANG - ANWIDA AGRICULTURAL CONCESSION: PROPERTY OF R.T. BRISCOE LIMITED, SEKONDI

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REPORT ON A BRIEF INSPECTION OF THE SOILS OF BOKROM - NTAKROM - BREMANG - AKWIDA AGRICULTURAL CONCESSION: PROPERTY OF R.T. BRISCOE LTD., SEKONDI

The area, which is 7.57 square miles, was inspected on the 15th and 16th November, 1955, with the object of assessing its suitability from the soils point of view for the production of rubber (Hevea brasiliensis).

Climate.- No accurate climatic data concerning the area are available but taking the adjacent areas into account the approximate average rainfall would probably be about 65-70 inches per annum with the dry period in December, January and February when there is little precipitation.

Geology.- The area consists of two distinct geological formations each represented by one soil association comprising several soil "types" referred to as soil series.

(a) Upper Birrimian formation which consists of basic to intermediate metamorphic lavas (greenstone) with some manganiferous phyllite.

(b) Dixcove granite formation mainly represented by medium grained horrblende granite usually with some epidote.

The Upper Birrimian rocks are dominant in the northern and middle portion of the area and the granite is confined to the south of the Cross line I and to the southeast of the Centre line. (See map).

Soils developed from Upper Birrimian rocks.- The soils developed from the Upper Birrimian rocks occupy roughly two thirds of the area. They occur on comparatively high and steep hills with summits 300 feet or more above sea level and with 20-40% slope (i.e. 20-40 feet rise per 100 feet of horizontal distance). The hills are dissected by wide flat-bottomed valleys.

The upland soils, i.e. those found on summits and slopes of hills, consist of red to brown light clay with varying amounts of ironstone concretions and hard ironpan boulders. These concretions and boulders also

occur on the surface on summits and steeper parts of hill slopes. The lowland soils, i.e. those occurring on valley slopes and bottoms, consist of yellow grey to grey uniform light clay, the colour indicating slow drainage conditions.

Except for the soils occurring on summits and upper slopes of hills, where large amounts of concretions and ironpan boulders are present, the remaining soils have good clayey texture and their moisture retention capacity is good. The valley bottom soils in particular which are fully saturated in the rainy season contain ample supply of moisture available to plants in the dry months.

Both the upland and the lowland soils, however, are extremely acid with pH below 5.0 in most cases. The following pH values for the humic topsoil have been obtained: 4.6; 4.8; 4.8; 4.6; 4.2; 5.2. These indicate a relatively low nutrient status and particularly a low degree of saturation with the exchangeable calcium, potassium and magnesium. A typical soil profile with a very similar reaction shows the following figures for the surface layer 2 inches thick.

ASIKUMA SERIES P.R.S.S.S. 235

Exchange Capacity	Exchangeable Calcium	Exchangeable Potassium	pH	Carbon %	Nitrogen %	C/N ratio	Organic Matter %	Acid soluble Phosphorus p.p.m.
25.6	6.1	0.35	4.2	7.53	0.477	15.8	13.0	10.7

The cation exchange capacity and the exchangeable calcium and potassium are calculated in milli-equivalents per 100 gms. of soil; the acid soluble phosphorus in parts per million. The series was under secondary forest which is the type of vegetation prevailing on these soils. The first layer of the humic topsoil 2-3 inches in thickness is always the most valuable nutritionally. The concentration of nutrients in the lower layers diminishes rapidly. The above data may be compared to some average figures for the surface layer of 51 upland soil profiles (1) in the forest zone of the Gold Coast given below.

Average thickness of the surface layer	2.73 ins.
Exchange Capacity (m.e. per 100 gms. of soil)	18.20
Exchangeable Calcium " " " " "	10.20
Exchangeable Potassium " " " " "	0.55
Organic Carbon %	5.09
Organic matter %	8.60
Acid soluble Phosphorus (parts per million)	14.54

The average organic matter content and the cation exchange capacity are lower than in Asikuma but this may be due to the greater thickness of the average topsoil as well as to the inclusion of a number of soils under current cultivation where losses of humus take place. The exchangeable calcium and potassium are lower in Asikuma than in the average profile quoted above.

The nutrient status of the Upper Birrimian soils is, therefore, relatively low. They are not suitable for cacao but are likely to produce rubber which is a far less exacting crop, though artificial manuring may be required in future for the permanent and economic production. Increased yields have been recorded as a result of the applications of nitrogen and phosphate in Malaya. The supply of phosphate has been found to be of major importance for the root development in the early stages of tree growth (2).

Rubber is grown on very similar soils elsewhere in the Gold Coast yielding 150-250 lbs of rubber per acre (3). Such low yields, however, may be attributed to growing of unselected and poorly producing varieties and to bad tapping, which causes serious injury to the trees. There is no doubt that by introducing the best varieties and by good management the yields can be increased considerably.

The rainfall, 65-70 inches per annum, is somewhat low for the optimum production of rubber as grown in Malaya under the rainfall of 80-100 inches or more (4). In the Benin Province of Nigeria, rubber is grown under 70 inches of rain per annum but this is well distributed with only one month in a year with less than 4 inches of rain as opposed to three practically rainless months (December, January and February) in the Gold Coast. However, the lack of rain in these months may largely be compensated by growing rubber on soils with good moisture holding capacity. In this respect the clayey

soils occurring on flat valley bottoms would be the most suitable for the crop. The upland soils though more rapidly drained contain adequate amounts of clay assuring a fairly good moisture supply, but the latter will be controlled by two factors: relief and the presence of ironstone concretions and boulders. The soils occurring on steep upper slopes and summits should be avoided. Apart from being concretionary and bouldery, which renders them easily erodible, they lose their moisture rapidly in the dry season with the consequent serious effect on the crop plants such as rubber, requiring a continous supply of moisture. For this reason a more detailed contour map would be essential for the elimination of high summits and steep slopes and for the general lay-out, before the planting of rubber takes place. By means of the contour map the total acreage suitable for rubber could also be estimated. This can be done easily by using an Abney Level and by spacing the contours at 5 or 10 feet vertical intervals on the map.

The problem of the destructive erosion of humus in the upland soils should be considered. On account of steep relief these soils are liable to lose their valuable humic topsoil at a rapid rate when left bare longer than necessary, particularly in the rainy season. Tillage and other cultivation practices should, therefore, be kept to the minimum, and further precautions involving the planting of leguminous cover crops might be useful. Of these the creeping species such as Pueraria javanica and Centrosema pubescens would be suitable for the purpose. The latter species often appears spontaneously in the regrowth after the land is cleared. Among other species which are perennial and of more or less woody growth, Tephrosia candida may be tried.

Soils developed from Dixcove granite.- The soils developed from the granitic rocks occur under relatively gentle relief on hills with summits 200-250 feet above local level and with 5-12% slope. The hills are frequently dissected by fairly extensive valleys containing clayey soils similar to those occurring in the upper Birrim area.

The upland soils consist of red or brown, fairly gritty to gravelly light clay. The content of quartz gravel and sand is not excessive but its presence accounts for a fairly rapid internal drainage. These soils are less acid with a pH of the humic topsoil often above 5.5. The following data have been obtained from the top 2 inches of a typical upland profile under current cultivation.

BEWANJA SERIES F.D.s.s. 138

Exchange Capacity	Exchangeable Calcium	Exchangeable potassium	pH	Carbon %	Nitrogen %	C/N ratio	Organic Matter %	Acid soluble Phosphorus p.p.m.
10.1	6.0	0.5%	6.1	2.21	0.162	13.6	3.8	6.1

Most of these soils are under food farming with maize and cassava as the main crops. The fallow period is relatively short and this accounts for the appearance of grasses in the fallow vegetation which is one of the signs of soil deterioration reflected in the low content of organic matter.

It will be seen, therefore, that the granitic soils in the area are less suitable for the economic production of rubber than the Upper Birrimian ones. Their chief drawback is a relatively poor moisture holding capacity which is liable to cause moisture deficiency in the dry season. Most of the valley soils, however, with their slow though not excessively impeded drainage conditions and uniform clayey texture, are better equipped for rubber growing.

Conclusion.- In concluding the foregoing it may be said that the prospects of rubber production in the area on a plantation scale are fairly promising provided the limitations stated in this report are taken into account.

In view of the marginal rainfall the most suitable soils are those occurring on lower slopes of hills and in valleys. The upland soils in the Upper Birrimian area may be utilized for rubber but those occurring on summits and on steep slopes should be avoided. Since most of the latter are already under well grown secondary forest their best economic use would be the production

of timber or firewood. On account of the hilly nature of these soils the suitable areas will have to be selected by means of a detailed contour map. This implies that they may not be adjacent to each other and thus not easily accessible. Again, the contour map will be essential in designing the lay-out and an economic road system. In the granitic area the lowland soils are better for rubber than the upland ones. The upland soils with their rapid internal drainage are liable to lose their moisture quickly in the dry season with the consequent adverse effect on the crop.

References

1. de ENDREDY, A.S. and MONTGOMERY, C.W. 1954. Some nutrient aspects of the Gold Coast forest soils. Transactions of the Fifth International Congress of Soil Science. Vol.III. Brussels, the General Secretary's Office. 1955. pp.268-73.

2. HAINES, H.B. 1948. The cultivation and manuring of rubber trees. Proceedings of the First Commonwealth Conference on Tropical and Sub-tropical Soils, 1948. Harpenden, Commonwealth Bureau of Soil Science. 1949. Technical Communication No.46. pp.217-9.

3. Unpublished reports. Gold Coast Department of Soil and Land-Use Survey.

4. IMPERIAL BUREAU OF SOIL SCIENCE. Tropical soils in relation to tropical crops. Harpenden, the Bureau. 1936. Technical Communication No.34.

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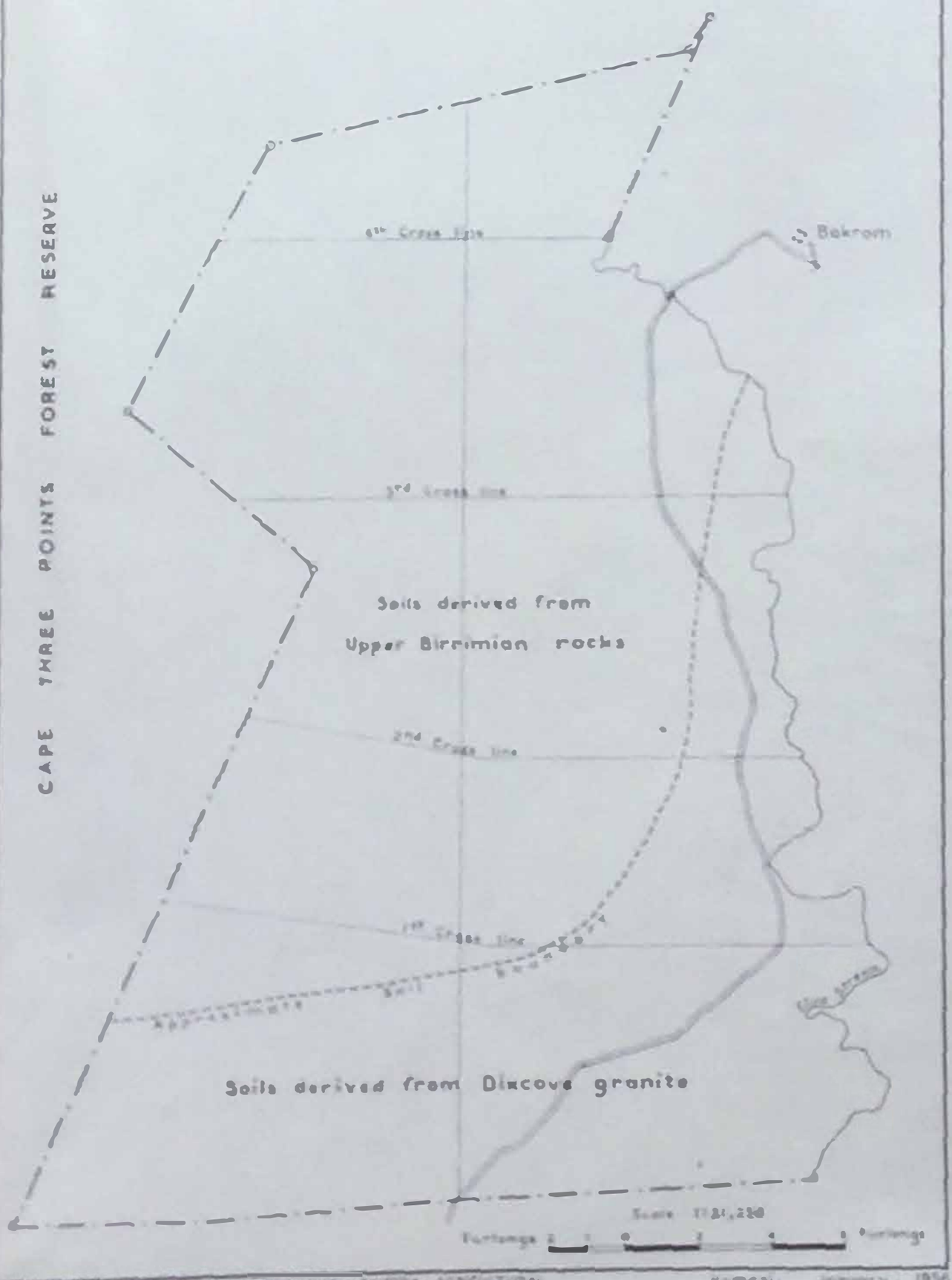
BOKROM - NTAKROM - BREMANG - AKWIDA AGRICULTURAL CONCESSION



Base map: BOKROM - NTAKROM - BREMANG - AKWIDA AGRICULTURAL CONCESSION Property of Messrs. A. T. Briscoe (Ltd.), Sekondi. 1:2,500 1955

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