GOLD COAST DEPARTMENT OF SOIL AND LAND-USE SURVEY

TECHNICAL REPORT No. 20

RESTRICTED

PRELIMINARY REPORT ON THE SEMI-DETAILED SOIL SURVEY OF THE PROPOSED COCOA ESTATE, KUKURANTUMI, BIRIM DISTRICT, EASTERN REGION

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PART I. GENERAL DESCRIPTION OF THE AREA AND RECOMMENDATIONS

Introduction

Area.- The surveyed area lies northwest of Kukurantumi and comprises about 1,300 acres. It was leased by the local farmers to the Gold Coast Agricultural Development Corporation with the object of establishing a cocoa estate.

Method of survey.-* The survey traverses were cut at 10 Gunter's chain intervals (1 chain = 66 feet) and the chisel holes dug and sampled at 5-chain intervals on the traverses. Each soil sample was identified as a soil series and as a result of this the soil map (Map 1) was produced by interpolation.

Climate.- This is fairly typical of the forest zone of the Gold Coast with a two-peak rainy season (May-June and October) lasting from March till November and a dry season with monthly averages of less than 4 inches rainfall. There is also a short dry spell in August with an average monthly rainfall well below 4 inches. It has been estimated that with less than 4 inches of rainfall per month the rate of evaporation exceeds that of precipitation and consequently soils with poor moisture holding capacity are liable to dry out rapidly causing drought conditions for many agricultural crops.

The detailed meteorological data from the West African Cocoa Research Institute which lies about 3 miles north of Kukurantumi may be referred to in the Annual Reports of this Institute. The annual rainfall figures quoted below are taken from the most recent issue (1):

1938	1939	1940	1941	1942	1943	1944	1945	16 Year
55.33	84.96	56.92	56.59	59.45	69.09	49.12	68.87	Mean
1946	1947	1948	1949	1950	1951	1952	1953	62.68
47.03	67.30	66.99	71.81	63.47	66.23	65.77	53.88	

Table 1. Annual rainfall at the West African Cocoa Research Station 1938-53, in inches.

Lithology.- The area lies within the Cape Coast granite complex which is described by Junner (2) as variable in texture and in mineralogical and chemical composition. The normal type, however, contains approximately 20-25% quartz, 30% orthoclase i.e. potash feldspar, 20-30% plagioclase i.e. soda and lime feldspar, 20% biotite, muscovite and some chlorite.

*The survey was carried out between 8th December, 1955, and the 9th January, 1956.

The principal soil-forming rock in the area is represented by medium-grained quartzose granite containing varying proportions of feldspar, biotite and muscovite. Quartz veins and small bodies of mica schist are not uncommon. The granite is generally deeply weathered and, with the exception of the river beds, few solid outcrops on uplands have been found.

There are also small patches (each comprising a few acres) of coarse-grained diorite but they are not sufficiently extensive to merit special attention for agriculture.

Relief and drainage.- The area consists of undulating hills 600-650 feet above sea level with slope gradients commonly between 3-6% and not exceeding 8%. The slopes merge gradually into fairly wide and seasonally swampy valleys.

With the exception of the two streams, Beyera and Bompon, which constitute the northern and the western boundaries of the area, most of the stream beds and swampy depressions dry up in the dry season, though the water table remains at 2-3 feet below the surface.

Vegetation and land-use.- (See Map 2 and its expanded legend in Part II, pp. 14-15). Except for a few scattered mature forest trees, the area is mostly covered either by cacao farms devastated by swollen shoot disease or by semi-natural woody regrowth referred to as thicket, with relics of cacao. The thicket is fairly dense and tangled, 20-30 feet high and 5-10 years old. There is a scattered canopy of trees above the thicket layer. These were originally shade trees for cacao which had died out and became overgrown by fast growing species of the thicket.

Judging by the widespread presence of relic cacao trees, practically the whole area must have supported cacao at one time. This original cacao has been completely destroyed by swollen shoot and capsids. Small expanses of younger cacao, subsequently planted, are also considerably infected.

There is very little food farming and only very occasional attempts to replant cacao are being made at present. This is not surprising in view of mass infection of the existing cacao farms and nutrient exhaustion of soils which have supported cacao for a number of years with no manurial treatment.

The cacao farms in the area are being treated for swollen shoot disease by the Cocoa Division of the Department of Agriculture but only trees which show symptoms of the disease are cut out. The neighbouring trees, which may be infected but do not show symptoms at the time of cutting, are left untouched. These represent a continuous source of infection and require frequent and costly re-inspections in order to spot and destroy trees which begin to show disease symptoms.

Other important sources of infection not controlled at present are alternative host plants, i.e. some members of the Bombaceae, Tiliaceae and Sterculiaceae families which are well represented in the area, and undetected diseased cacao trees scattered in and overgrown by thicket.

It will be seen from the foregoing that in order to establish a disease-free cacao crop on plantation scale, all the existing cacao trees and all the tree and shrub species will have to be destroyed.

The most common virus in the area has been identified as the virulent New Juaben strain which is reported to produce leaf mosaic as well as swellings on stems and branches.

Soils

Most of the soils are derived from weathering products of granite described on pp. 1-2. They consist of red to yellow-brown coarse sandy light clays or loams confined to uplands (Koforidua, Nankasi and Akroso series), and yellow-grey to grey gravelly sands (Nta and Ofin series) which occur on extensive middle and lower slopes of hills and in valley bottoms. Among these lowland soils small expanses of grey and waterlogged clays occur. These are represented by Oda series.

Along the streams Bompon and Beyera and scattered along some of the larger tributaries, alluvial soils are found. These mainly consist of greyish yellow and loose sand deposits, with varying proportions of quartz gravel classified as Chichiwere series, among which small expanses of silty clays occur. The latter give rise to Kakum series.

There are also two small patches of soils derived from coarse-grained diorite. These are Tano and Ati series.

Koforidua series.- This is a sedentary soil derived from weathering products of biotite granite. It consists of red, sandy light clay with some quartz stones and gravel and with traces of mica, gradually merging into the weathered, friable parent rock. It occurs on summits and upper slopes of hills.

Nankasi series.- This is similar to Koforidua series in respect of the profile form and the parent rock but on account of its lower topographic site, i.e. middle slopes of hills, the internal drainage is relatively slow. This condition is responsible for the brown colour of the subsoil.

Akroso series.- This is a yellow-brown associate of Koforidua and Nankasi series derived from similar but transported parent material. It consists of yellow-brown, sandy light clay or loam overlying weathered granitic bedrock at a depth of 2-3 feet. This series occurs on middle to lower slopes of hills.

The three soil series described above are suitable, if manured, for permanent production of cacao on a plantation scale. Their base-exchange capacity, i.e. the capacity to hold plant nutrients in an easily available form, is relatively high, though the quantities of nutrient elements such as potassium, calcium, magnesium and phosphorus are low for the optimum production of cacao. The application of artificial fertilizers supplying these elements together with a green manure

crop will bring economic responses because the physical conditions of these soils are satisfactory.

Nta series.- This soil is developed over transported material of granitic origin. It consists of yellow-grey, coarse gravelly sand or light loam several feet in thickness, overlying weathered granitic bedrock. It occurs on middle and lower slopes of hills.

Ofin series.- This is similar to Nta series in respect of the profile morphology and parent material but owing to its occurrence on valley slopes and bottoms the colour of the subsoil is quite grey and the texture even coarser than that of Nta.

Both Nta and Ofin series are quite unsuitable for the economic production of cacao. The dominant constituent of their parent materials is quartzose sand and gravel which represents the residual products of weathering and leaching of the granitic rock. Such products are of little or no nutritional value to crops.

The organic matter content and base-exchange capacity of these series are extremely low. On account of their poor texture the application of artificial fertilizers is not likely to improve their nutrient status, since most of these will be leached out of the topsoil before the plant roots can absorb them.

The coarse sandy texture of Nta and Ofin series is also responsible for their rapid internal drainage conditions which make them droughty and generally unreliable in respect of moisture status.

These two series frequently occur in the granitic areas of the forest zone of the Gold Coast and all the field observations of this Department confirm that they have repeatedly failed to support economically productive cacao.

Oda series.- This soil is developed from transported parent material. It consists of grey, uniform clay and is found on valley bottoms where it typically occurs in small disconnected and scattered expanses. The soil is waterlogged throughout the rainy season and even in the dry period the water table persists 1 or 2 feet below the surface.

Though its nutrient status is much superior to that of either Nta or Ofin series owing to imperfect drainage, this soil is not suitable for the production of cacao.

Chichiwere series.- This soil is developed from alluvial material consisting of greyish yellow, loose, fine sand or sandy loam. It is similar to Nta and Ofin series in respect of its nutrient status and the capacity to support economically productive cacao.

Kakum series.- This is an associate of Chichiwere series consisting of greyish yellow, fine, silty clay. It is superior to Chichiwere series in both nutrient status and physical conditions but it is frequently flooded in the rainy season. It occurs in small expanses and as such it is of little importance in the area.

Tafo and Ati series.- These soils are even less extensive than Kakum series and, therefore, of no importance in the area.

Recommendations

The distribution and extent of the soil series described in this report are indicated in Map 1. Out of the total 1,300 acres of the proposed estate only about 500 acres could safely be recommended for the growing of cacao. The remaining soils are not suitable for this crop and can best be utilized for the production of fast growing annuals.

In view of the above findings it is doubtful if an economically successful cacao estate can be established in this area.

PART II. EXPANDED MAP LEGENDS

MAP 1. SOILS. DETAILED DESCRIPTIONS OF THE SOIL SERIES

Koforidua series

Profile No.:	KCE 1/1-7.
Locality:	Traverse 3, peg 15.
Site:	Upper slope of gentle undulations.
Parent rock:	Biotite granodiorite.
Vegetation:	Cultivation: plantains with cacao seedlings.
Rainfall:	63 inches per annum.
Altitude:	650 feet.

0- 2 inches	Dark brown (10 YR 4/3), humic, sandy light clay. Crumbly, loose and porous. pH 5.8.
2- 9 "	Brown (7.5 YR 4/4), less humic sandy clay. Rare quartz gravel. Weakly crumbly and porous. pH 5.6.
9-18 "	Reddish brown (5 YR 4/3), sandy clay. Occasional fine quartz gravel. Rare small subangular quartz stones. Rare polished ironstone concretions. Slightly cloddy and slightly compact. pH 5.4.
18-28 "	Reddish brown (5 YR 4/4), heavy loam. Angular and subangular quartz stones. Frequent quartz gravel. Occasional ironstone concretions. Rare traces of weathered rock. Slightly cloddy and compact. pH 5.4.
28-42 "	Yellowish red (5 YR 4/6), mottled yellow and brown, light loam. Frequent angular quartz stones. Frequent quartz gravel. Occasional traces of weathered rock. Slightly cloddy and compact. pH 5.2.
42-60 "	Yellowish red (5 YR 4/8), mottled, light loam. Occasional quartz gravel. Frequent traces of weathered rock. Slightly cloddy and compact. pH 5.2.
60-70 "	Yellowish red (5 YR 5/6), mottled, light loam. Very frequent traces of weathered rock. Structureless to slightly cloddy and slightly compact. pH 5.2.

Nankasi series

Profile No.:	KCE 2/1-7.
Locality:	Traverse 8A, peg 25.
Site:	Upper slope of gentle undulations.
Parent rock:	Biotite granite or granodiorite.
Vegetation:	Cacao affected by swollen shoot disease.
Rainfall:	63 inches per annum.
Altitude:	600 feet.

0- 2 inches	Dark brown (10 YR 4/3), humic, sandy light clay. Crumbly, loose and porous. pH 6.0.
2- 7 "	Dark brown (7.5 YR 4/4), less humic, sandy light clay. Weakly crumbly and less porous. pH 5.4.
7-15 "	Strong brown (7.5 YR 5/6), sandy light clay. Occasional quartz gravel. Occasional subangular quartz stones. Occasional ironstone concretions. Cloddy and compact. pH 5.0.
15-25 "	Strong brown (7.5 YR 5/6), sandy light loam. Rare quartz gravel. Rare ironstone concretions. Occasional traces of weathered granite. Cloddy and compact. pH 5.0.
25-41 "	Reddish yellow (7.5 YR 6/6), mottled red, light loam. Occasional fine quartz gravel. Rich in mica. Frequent traces of weathered rock. Cloddy and compact. pH 5.2.
41-66 "	Yellowish red (5 YR 5/8), mottled red, light loam. Very frequent traces of weathered rock. Very rich in mica. pH 5.0.
66-80 "	Yellowish red (5 YR 5/8), mottled red and yellow loamy sand. Very frequent traces of weathered rock. Very rich in mica. pH 5.0.

Akroso series

Profile No.:	KCE 13/1-7.
Locality:	Traverse 2, peg 10.
Site:	Upper slope of gentle undulations.
Parent rock:	Biotite granite or granodiorite.
Vegetation:	Cacao.
Rainfall:	63 inches per annum.
Altitude:	575 feet.

0- 2 inches	Brown (10 YR 5/3), humic, sandy light loam. Crumbly, loose and porous. pH 5.8.
2- 8 "	Yellowish brown (10 YR 5/4) less humic, sandy light loam. Occasional quartz gravel. Weakly crumbly and porous. pH 5.0.

8-19 inches	Yellowish brown (10 YR 5/6), sandy light loam. Occasional quartz gravel. Cloddy and compact. pH 5.2.
19-33 "	Brownish yellow (10 YR 6/8), mottled yellow and red, sandy loam. Occasional subangular quartz stones. Rare ironstone concretions. Cloddy and compact. pH 5.2.
33-54 "	Brownish yellow (10 YR 6/8), mottled pale yellow, sandy loam. Rare fine quartz gravel. Occasional traces of weathered rock. Cloddy and compact. pH 5.2.
54-74 "	Pale yellow (2.5 Y 7/4), mottled white yellow and brown, light loam. Abundant traces of weathered rock. Cloddy and compact. pH 5.0.
74-89 "	Pale yellow light loam. Weathered rock. pH 5.6.

Nta series

Profile No.:	KCE 20/1-7.
Locality:	Traverse 9A, peg 25.
Site:	Lower slope of gentle undulations.
Parent rock:	Granite.
Vegetation:	Cacao affected by swollen shoot disease.
Rainfall:	63 inches per annum.
Altitude:	550 feet.
0- 3 inches	Greyish brown (10 YR 5/2), humic sand. Crumbly and loose. pH 6.8.
3- 9 "	Pale brown (10 YR 6/3), less humic sand. Weakly crumbly and loose. pH 6.6.
9-19 "	Pale brown (10 YR 6/3), sand. Structureless and loose. pH 6.2.
19-37 "	Pale brown (10 YR 6/3), sand. Structureless and loose. pH 5.4.
37-52 "	Very pale brown (10 YR 7/4), loamy sand. Structureless and loose. pH 6.4.
52-60 "	Very pale brown (10 YR 7/4), mottled brown, yellow and grey, gritty light loam. Abundant subangular quartz stones. Stone-line. Structureless. pH 5.4.
60-66 "	Yellow (10 YR 7/6), mottled brown and grey, sandy clay. Occasional fine quartz gravel. Structureless and slightly compact. pH 5.2.

Oda series

Profile No.:	KCE 25/1-7.
Locality:	Traverse 11B, peg 15.
Site:	Bottom/Flat.
Parent rock:	Alluvium.
Vegetation:	Cacao affected by swollen shoot disease.
Rainfall:	63 inches per annum.
Altitude:	550 feet.
0- 2 inches	Dark greyish brown (10 YR 4/2), humic, silty light clay. Crumbly and loose. pH 6.4.
2- 7 "	Light brownish grey (10 YR 6/2), fine, sandy clay. Rusty root channels. Weakly crumbly and compact. pH 5.2.
7-16 "	Light brownish grey (10 YR 6/2), mottled yellow, red and brown, fine sandy clay. Slightly cloddy and compact. pH 5.4.
16-36 "	Light yellowish grey (2.5 Y 6/4), mottled olive and grey, fine sandy clay. Slightly cloddy and slightly plastic. pH 6.2.
36-49 "	Pale olive (5 Y 6/3), loamy, fine sand. Structureless and loose. pH 7.0.
49-60 "	Pale olive grey (5 Y 6/2), mottled clay. Frequent subangular quartz stones. Stone-line. Traces of weathered rock. pH 7.2.
60-70 "	Olive grey (5 Y 4/2), mottled, sandy light loam. Abundant fragments of weathered granite. pH 6.4.

Tafo series

Profile No.:	KCE 24/1-6.
Locality:	Traverse 3, peg 39.
Site:	Lower slope of gentle undulations.
Parent rock:	Diorite.
Vegetation:	Cacao.
Rainfall:	63 inches per annum.
Altitude:	575 feet.
0- 3 inches	Dark greyish brown (10 YR 4/2), humic; fine, sandy light loam. Crumbly and loose. pH 6.6.
3- 8 "	Dark greyish brown (10 YR 4/2), less humic sandy light loam. Frequent quartz gravel and rare subangular quartz stones. Weakly crumbly and loose. pH 6.6.

8-21 inches	Yellowish brown (10 YR 5/4), mottled white and yellow, light loam. Slightly compact. Rare fragments of weathered diorite. pH 5.6.
21-37 "	Yellowish brown (10 YR 5/6), mottled white and yellow light loam. Frequent fragments of weathered diorite. pH 5.6.
37-53 "	Yellowish brown (10 YR 5/6), mottled white and grey, light loam. Abundant fragments of weathered diorite. pH 6.6.
53-70 "	Greyish brown (2.5 Y 5/2), mottled loamy sand. Weathered diorite. pH 7.2.

Ati series

Profile No.:	KCE 9/1-6.
Locality:	Traverse 12A, peg 45.
Site:	Upper slope of gentle undulations.
Parent rock:	Diorite.
Vegetation:	Cacao affected by swollen shoot disease.
Rainfall:	63 inches per annum.
Altitude:	600 feet.
0- 2½ inches	Dark greyish brown (10 YR 4/2), humic, fine, sandy light clay. Crumbly and loose. pH 6.8.
2½-9 "	Brown (10 YR 4/3), less humic, fine, sandy light clay. Weakly crumbly and loose. pH 6.4.
9-22 "	Reddish brown (5 YR 4/4), sandy clay. Slightly cloddy and compact. pH 5.4.
22-35 "	Yellowish red (5 YR 4/8), mottled grey and black, sandy clay. Rare patches of weathered diorite. MnO_2 present. Slightly cloddy and compact. pH 5.4.
35-46 "	Strong brown (7.5 YR 5/6), mottled black, light clay. Frequent patches of weathered diorite. MnO_2 present. Slightly cloddy and compact. pH 5.2.
46-60 "	Yellowish brown (10 YR 5/6), mottled white, light loam. Abundant fragments of weathered diorite. Structureless and friable. pH 5.2.

Kakum series

Profile No.:	KCE 22/1-6.
Locality:	Traverse 13A, peg 40.
Site:	Bottom/Flat.
Parent rock:	Alluvium.
Vegetation:	Cacao.
Rainfall:	63 inches per annum.
Altitude:	550 feet.

0- 2 inches	Dark grey (10 YR 4/1), humic, sandy light clay. Crumbly, loose and porous. pH 5.4.
2- 6 "	Greyish brown (10 YR 5/2), less humic. sandy light loam. Weakly crumbly and less porous. pH 5.0.
6-15 "	Pale brown (10 YR 6/3), loamy sand with rusty root channels. Structureless. pH 5.4.
15-32 "	Yellowish brown (10 YR 5/4), mottled grey, silty clay. Very rare, soft ironstone concretions. Structureless. pH 6.8.
32-50 "	Yellowish brown (10 YR 5/4), mottled brown, olive and grey, silty clay. Rare scattered, subangular quartz stones. Occasional fragments of weathered biotite granodiorite. Structureless. pH 7.2.
50-57 "	Very dark greyish brown (10 YR 3/2), mottled brown, olive and white, clay. Frequent fragments of weathered biotite granodiorite. Highly manganiferous. pH 7.2.

Chichiwere series

Profile No.:	KCE 23/1-7.
Locality:	Traverse 17, peg 10.
Site:	Levee/Flat.
Parent rock:	Alluvium.
Vegetation:	Thicket with relics of cacao.
Rainfall:	63 inches per annum.
Altitude:	550 feet.

0- 2 inches	Dark greyish brown (10 YR 4/2), humic, fine, sandy light loam. Crumbly and loose. pH 5.6.
2- 7 "	Brown (10 YR 5/3), less humic, fine, sandy light loam. Weakly crumbly and loose. pH 5.8.
7-15 "	Light yellowish brown (10 YR 6/4), fine sand. Structureless and loose. pH 6.8.

15-28	inches	Pale brown (10 YR 6/3), loamy, fine sand. Structureless and loose. pH 6.8.
28-43	"	Yellowish brown (10 YR 5/4), mottled brown and grey, fine, sandy light loam. Structureless and loose. pH 7.2.
43-60	"	Dark yellowish brown (10 YR 4/4), mottled brown and grey, fine, sandy clay. Structureless. Patches of weathered biotite granodiorite, MnO_2 present. pH 7.2.
60+	"	Solid biotite granodiorite.

Note. No profile pits were dug in occurrences of Ofin series; accordingly no detailed description of this series is included in this report.

Code No.	Series name	Vegetation	pH	Cation exchange capacity	Exch. Ca	Exch. Mg	Exch. K	Carbon	Nitrogen	C/N ratio	Organic matter	Total bases	% Base saturation
KCE 1	Koforidua	Cultivation & cacao seedlings	6.01	7.84	3.96	1.05	0.16	0.96	.096	10.00	1.66	5.17	65.94
" 2	Nankasi	Cacao with swollen shoot	5.45	6.59	2.67	0.74	0.08	1.05	.101	10.40	1.81	3.49	52.96
" 3	"	Thicket with relics of cacao	6.00	6.05	3.36	1.29	0.13	0.98	.078	12.56	1.69	4.78	79.01
" 4	"	Thicket with relics of cacao	7.81	7.69	6.57	1.35	0.11	0.82	.083	9.88	1.41	8.03	104.42
" 6	"	Cultivation & cacao seedlings	5.25	9.41	3.28	0.81	NIL	1.37	.131	10.46	2.36	4.09	43.46
" 7	"	Cacao with swollen shoot	6.20	9.18	5.36	1.37	0.13	1.43	.137	10.51	2.47	6.86	74.73
" 8	"	Thicket with relics of cacao	6.30	8.29	6.34	1.06	0.15	1.25	.116	10.77	2.16	7.55	91.07
" 11	Akroso	Secondary forest with relics of cacao	6.00	8.40	5.37	1.00	0.15	1.19	.106	11.23	2.05	6.52	77.62
" 12	"	Thicket with relics of cacao	6.90	6.58	6.44	0.94	0.05	1.15	.103	11.17	1.98	7.43	112.92
" 13	"	Cacao	5.05	6.93	3.53	0.44	0.20	1.00	.056	17.86	1.72	4.17	60.17
" 15	"	Cacao with swollen shoot	6.10	7.96	5.47	0.43	0.15	1.05	.099	10.61	1.81	6.05	76.01
" 16	Nta	Cacao with swollen shoot	7.00	5.64	4.54	0.57	0.10	0.80	.090	8.89	1.38	5.21	92.38
" 17	"	Cacao with swollen shoot	6.05	4.05	2.53	0.57	0.08	0.77	.071	10.85	1.33	3.18	78.52
" 18	"	Thicket with relics of cacao	6.80	6.06	5.62	0.27	0.05	1.10	.098	11.22	1.90	5.94	98.02
" 19	"	Thicket with relics of cacao	6.35	6.61	4.08	1.45	0.13	1.04	.101	10.30	1.79	5.66	85.63

Table 2. Analytical data of 9-inch topsoil samples.

MAP 2. VEGETATION AND LAND-USE

Expanded legend

1. Swamp thicket 6-10 years old with occasional patches of secondary swamp forest

The swamp thicket which frequently occurs in valley bottoms and swampy depressions is dense and tangled, forming a difficultly-penetrable woody growth 20-30 feet high, from which scattered trees emerge.

The most common TREE species are represented by Carapa procera, Lannea wetwitschii, Mitragyna stipulosa, Anthocleista nobilis, Cleistopholis patens, Alstonia boonei and Pseudospondias microcarpa.

SHRUBS: Alchornea cordifolia, Calamus deerratus, Glyphaea lateriflora, Acacia pennata.

HERBS: Scarchophrynium brachystachyum, Phrynium confertum, Haemanthus multiflorus, Costus afer, Palisota hirsuta, Marantochloa flexuosa.

FERNS: Dryopteris quadrangularis, Nephrolepis biserrata.

2. Thicket regrowth 4-10 years old with relics of cacao

This thicket occurs on well drained uplands. It is not as dense and tangled as the swamp thicket and consists of a scattered canopy of trees (originally shade trees for cacao) and a shrub layer 20-30 feet high among which relic cacao trees are frequently found.

TREES: Erythrina senegalensis, Artocarpus incisa, Cola nitida, Discoglyoremna caloneura, Ficus asperifolia, Ceiba pentandra, Ricinodendron heudelotii, Cola gigantea var. glabrescens, Terminalia superba, Triplochiton scleroxylon, Treculia africana, Musanga cecropioides, Pycnanthus angolensis, Chlorophora excelsa.

SHRUBS: Macaranga barteri, M. rowlandii, Mallotus oppositifolius, Clerodendron capitatum, Combretum mucronatum, Hybophrynium braunianum, Vernonia amygdalina, Baphia nitida, Sterculia tragacantha, Griffonia simplicifolia.

3. Cacao in moderate condition, typically 10-15 years old, shaded by scattered forest trees

Although the cacao trees are well grown and not badly affected by swollen shoot disease, the yields in number of pods per tree are small.

4. Cacao affected by swollen shoot disease, under current treatment by the Department of Agriculture

This unit represents cacao farms which are almost completely devastated by the virus. Large number of these farms have ceased to exist and the space formerly occupied by cacao trees is being rapidly overgrown by thicket species.

5. Young replanted cacao 2-4 years old, shaded by plantains and forest trees

Cacao seeds or seedlings are planted under the shade of food crops. So far very little success has been achieved in replanting.

6. Land under current cultivation with subsistence crops of plantains, cocoyam and cassava ± cacao seedlings. Occasional patches of forb regrowth

HERBS: Aspilia latifolia, Pupalia lappacea, Ageratum conyzoides, Costus afer, Justicia flava. Thicket species in the herbaceous stage also occur.

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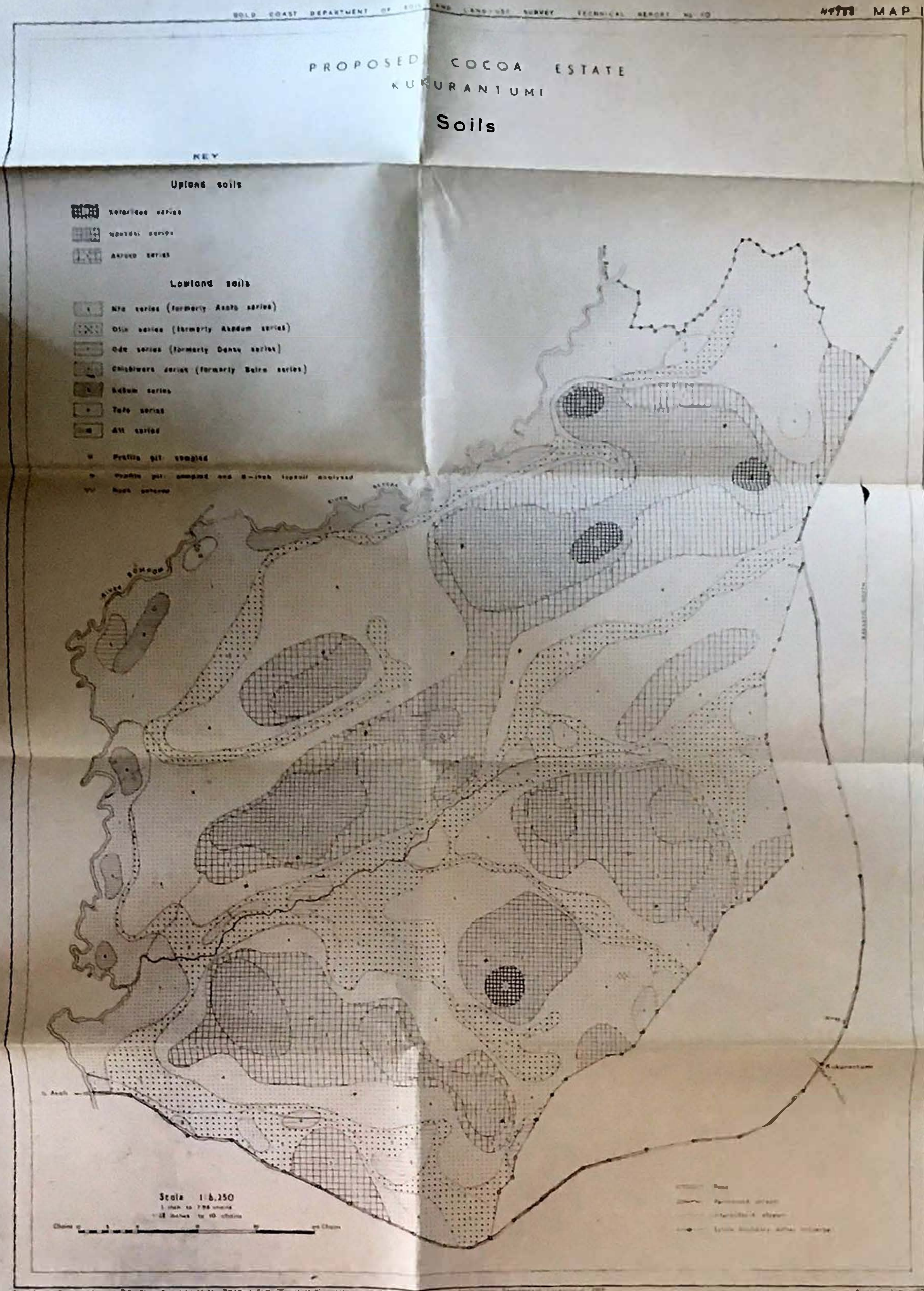
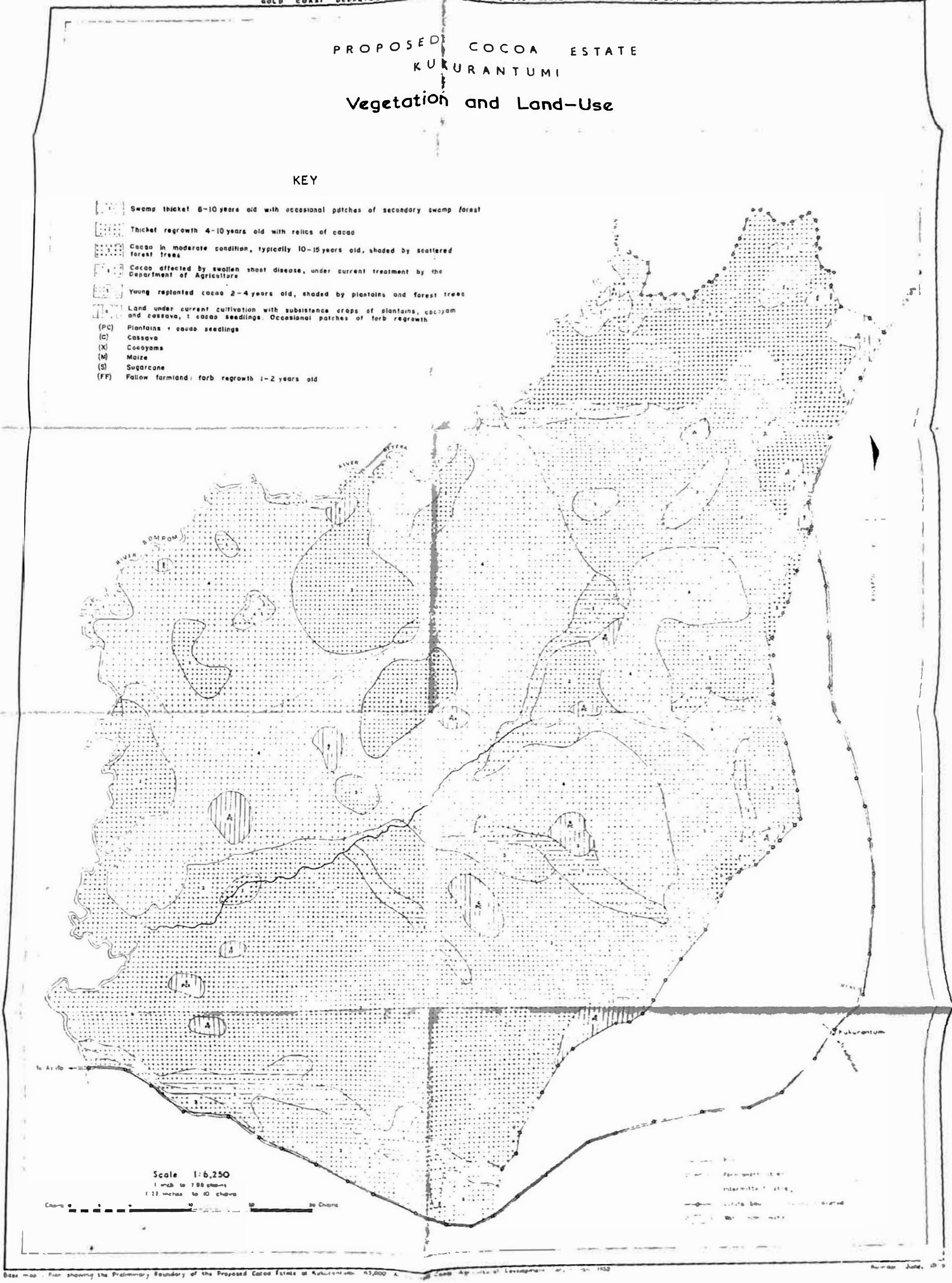


GOLD COAST DEPARTMENT OF SOIL AND LAND-USE SURVEY TECHNICAL REPORT
MAP I
PROPOSED COCOA ESTATE
KUKURANTUMI
Soils
KEY
Upland soils
Akroso series
Lowland soils
Oda series (formerly Densu series)
Tafo series
Profile pit sampled
Scale 1:6,250
Chains
Kukurantumi
Road

GOLD COAST DEPARTMENT OF SOIL AND LAND-USE SURVEY TECHNICAL REPORT No. [illegible] 44988 MAP 2



Base map: Plan showing the Preliminary Boundary of the Proposed Cocoa Estate at Kukurantumi 93,000 A [illegible] Coast Agricultural Development [illegible] 1953

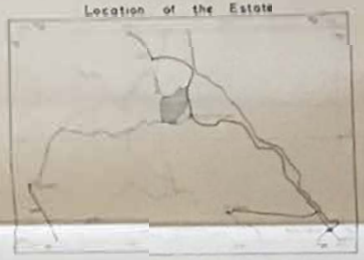
PROPOSED COCOA ESTATE
KUKURANTUMI

Traverses and Miscellaneous Information

KEY

- Traverse line
- Permanent stream
- Small intermittent stream running in the wet season only
- Wet season swamp
- Footpath
- Permanent village site
- Abandoned village site

Location of the Estate



Scale 1:6,250