F.A.O.

Second Meeting of the Soil Correlation Sub-Committee for West Africa

Notes for Field Tour of the Bauchi and Gombe Areas

Nigeria.

1973.

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PART I. PROGRAMME FOR FIELD TOUR.

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DAY 1.

Depart Jos.

Stop at Naraguta

Profile Examinations near Toro. Profiles 1, 2, 3.

Stop at Panshanu

Lunch at Bauchi

Profile Examination Bauchi - Zalanga road. Profiles 4, 5.

Night halt at Bauchi.

DAY 2.

Depart Bauchi

Profile Examination Bauchi - Kafin Madaki road. Profiles 6, 7, 8, 9, 10, 11, 12.

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Night halt at Bauchi

DAY 3.

Depart Bauchi

Profile Examination near Alkalere. Profiles 15, 16.

Stop at gorge section.

Lunch at Gombe

Profile Examination near Gombe. Profiles 17, 18.

Night halt at Gombe.

DAY 4.

Depart Gombe

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Packed lunch en route.

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Night halt at Gombe.

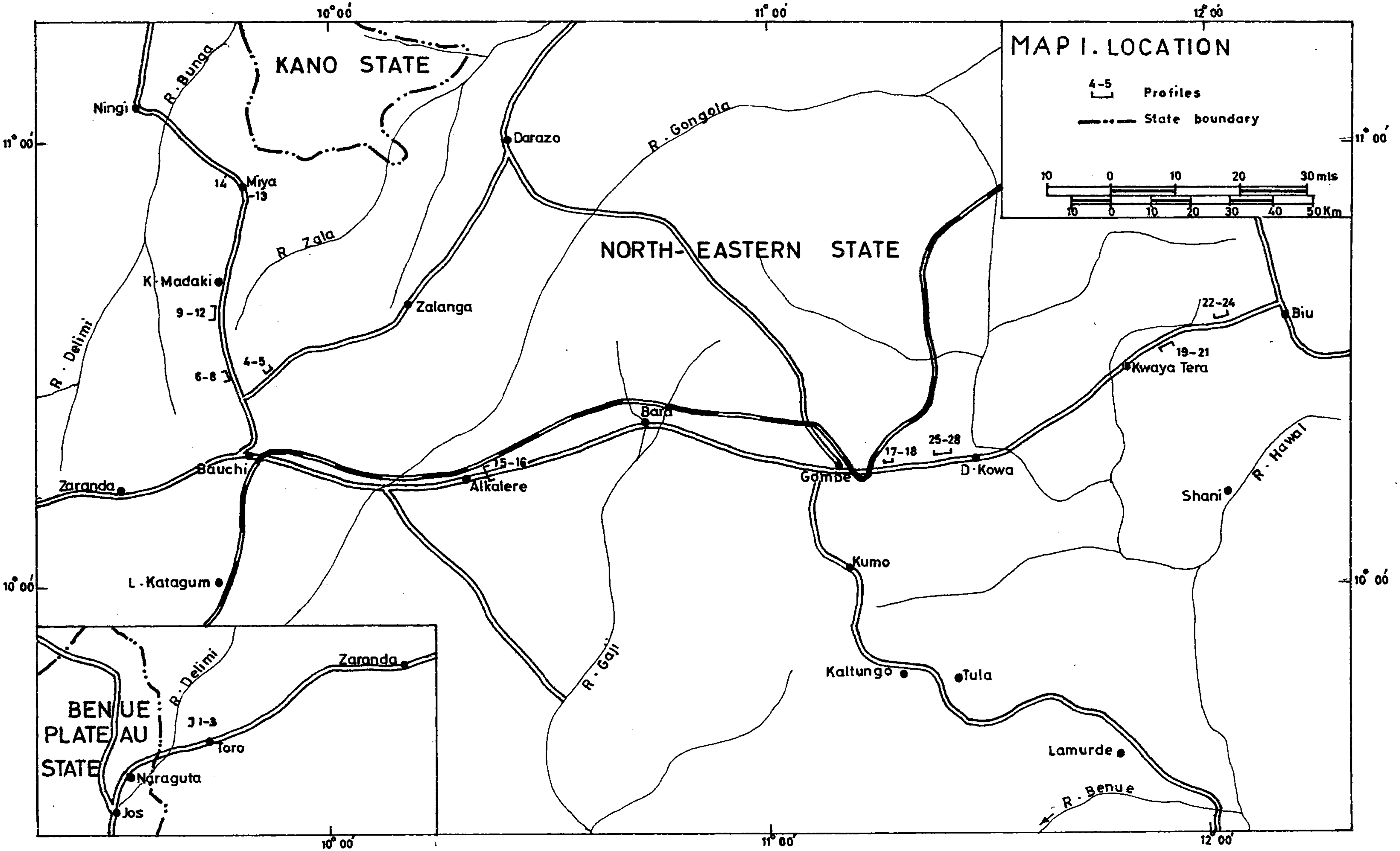
DAY 5.

Depart Gombe

Profile Examination near Dadin Kowa. Profiles 25, 26, 27, 28.

Lunch at Bauchi

Return Jos.



MAP I. LOCATION
4-5
Profiles
State boundary
10
0
10
20
30 mls
10
0
10
20
30
40
50 Km
10°00'
11°00'
12°00'
KANO STATE
NORTH-EASTERN STATE
BENUE PLATEAU STATE
R. Bunga
R. Zala
R. Gongola
R. Delimi
R. Gaji
R. Hawal
R. Benue
Ningi
Miya
14
13
Darazo
K-Madaki
9-12
Zalanga
4-5
6-8
Bara
Bauchi
Zaranda
15-16
Alkalere
Gombe
17-18
25-28
D-Kowa
22-24
19-21
Biu
Kwaya Tera
Shani
Kumo
L-Katagum
Kaltungo
Tula
Lamurde
1-3
Toro
Naraguta
Jos

PART II. THE ENVIRONMENT.

The area to be visited during the field tour is described in the introductory chapters, and shown on Map 1.

The area was chosen because it contains a relatively wide and varied range of soils. This variety is caused by important differences in geological and geomorphological conditions. The locations of the profiles to be studied are shown on Map 1.

Previous work

Reconnaissance soil surveys (1:100,000) have been carried out in the eastern part of the area by the Institute for Agricultural Research (Klinkenberg et. al. 1963, Klinkenberg, 1967) later assisted by staff of the Land Resources Division (Carroll and Hope 1970). This eastern section was also part of the area for a comprehensive study by the Land Resources Division (Aitchison et. al. 1972; Bawden, Carroll and Tuley, 1972); de Leeuw, Lesslie and Tuley (1972)).

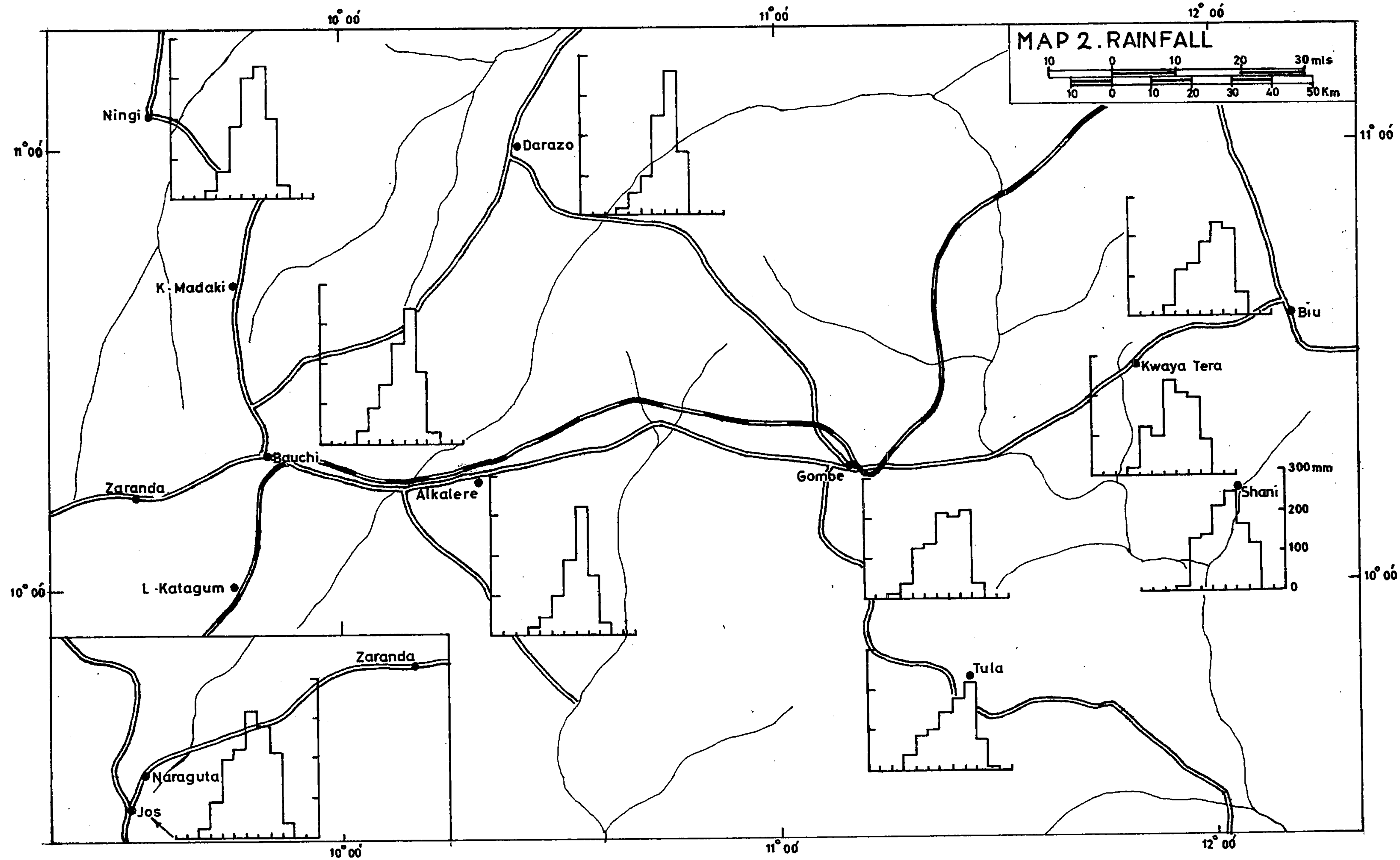
The land forms and soils of the western part of the area have been described by Hill et. al. (1972). Their report is accompanied by 1:250 000 soil maps.

Climate.

Climatic data are published by the Nigerian Meteorological Service. Unfortunately only records up to 1962 are available.

Bauchi and Jos are the only stations for which full climatological data are available. Rainfall records are available for some 13 stations.

Monthly means for maximum and minimum temperatures as well as relative humidities are given in Table 1 for Bauchi and Jos for the year 1962. The table shows that the highest temperatures occur just before and after the rainy season, while the lowest minimum temperatures are recorded during the dry season.


MAP 2. RAINFALL
10 0 10 20 30 mls
10 0 10 20 30 40 50 Km
10° 00'
11° 00'
12° 00'
Ningi
Darazo
K-Madaki
Biu
Kwaya Tera
Bauchi
Zaranda
Alkalere
Gombe
300 mm
Shani
200
100
0
L-Katagum
Tula
Naraguta
Jos

Rainfall data are produced in Tables 2 and 3. The location of the various stations is shown on Map 2, which also gives the monthly distribution depicted in histograms for some stations.

Total rainfall over most of the area is in the order of 870 to 1,150 mm (34 to 45 in.). There are considerable local variations due to topographic factors. The Jos Plateau has a higher rainfall than the rest of the area: 1 300 to 1 400 mm (52 to 55 in.).

The rainy season starts in the first half of May (April for Jos Plateau) and finishes at the end of September. In the west, around Bauchi, the distribution shows a definite peak in August, while in the east the rainfall is more evenly distributed over the months of July, August and September. The rainy season tends to be slightly longer in the east than in the west.

The dry season is very severe as hardly any rain falls between November and March. Relative humidity is very low during this period. During the dry season the winds come mostly from the north-east and often carry dust (harmattan). During the rains the dominant direction of the winds is from the south-west.

Table 1: Temperature and relative humidity for Bauchi and Jos (1962).

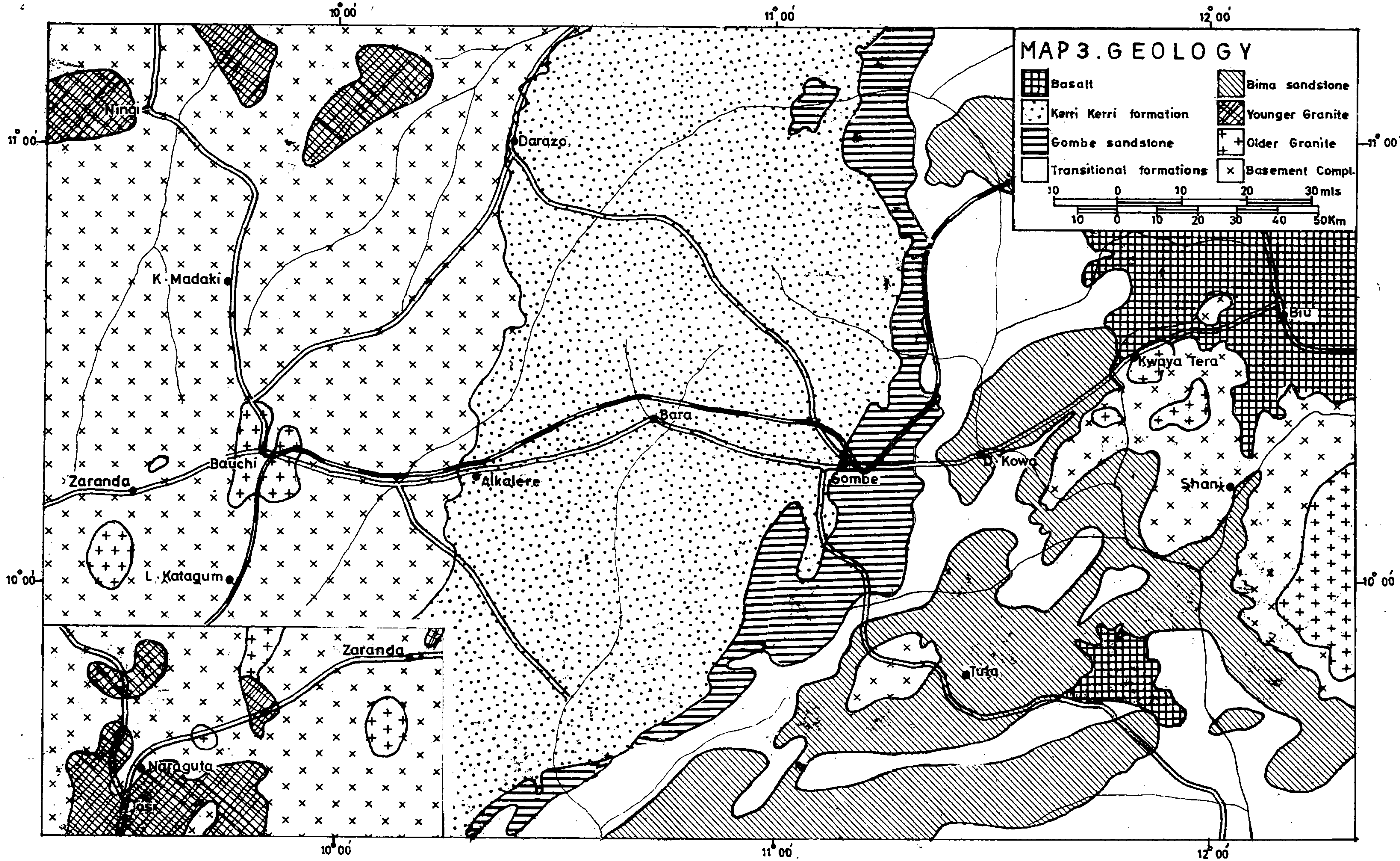
Month	Mean Maximum °C	Mean Minimum °C	Mean Maximum °F	Mean Minimum °F	RH 09.00	RH 15.00
Bauchi						
Jan.	29.2	11.3	84.5	52.4	17	11
Feb.	33.0	14.8	91.3	58.7	12	8
Mar.	36.7	21.5	98.0	70.6	26	16
Apr.	36.1	23.4	96.9	74.1	38	26
May	35.0	23.0	94.9	73.4	50	33
June	31.2	21.2	88.1	70.1	64	53
July	29.6	20.6	85.2	69.1	74	65
Aug.	28.4	20.0	83.1	67.9	76	66
Sept.	29.7	20.1	85.5	68.2	72	62
Oct.	31.7	19.7	90.0	67.4	55	43
Nov.	34.1	18.5	93.3	65.3	43	29
Dec.	32.4	14.3	90.3	57.8	18	15
Jos						
Jan.	26.1	12.3	78.9	54.2	14	9
Feb.	28.7	14.9	83.7	58.8	10	5
Mar.	30.3	18.2	86.5	64.8	39	28
Apr.	29.0	18.9	84.1	66.0	53	44
May	28.4	18.0	83.0	64.3	63	46
June	25.5	16.8	77.9	62.3	74	66
July	24.2	16.8	75.6	62.2	77	72
Aug.	23.4	16.2	74.1	61.2	81	76
Sept.	25.5	16.7	77.8	62.0	74	69
Oct.	27.9	16.8	82.1	62.3	56	44
Nov.	28.8	16.8	83.8	62.3	39	29
Dec.	28.1	15.3	82.6	59.6	18	15

Table 2: Monthly rainfall data (mm) .

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Number of years.
Jos	3	3	25	88	199	225	321	278	214	42	4	2	1,402	40
Naraguta	2	1	15	76	180	194	306	273	234	49	4	2	1,335	19
L. Katagum	-	-	2	40	87	132	192	304	173	38	-	-	967	5
Bauchi	-	-	5	35	93	147	255	340	181	34	1	-	1,091	52
K. Madaki	-	-	4	18	86	147	295	298	178	27	-	-	1,054	10
Ningi	-	-	4	22	69	186	303	335	200	36	-	-	1,156	7
Daraze	-	-	4	18	89	119	253	366	157	33	-	-	1,039	9
Alkalere	-	-	3	24	53	101	188	322	148	32	-	-	871	5
Gombe	-	-	8	38	126	143	215	205	218	43	1	-	997	9
Tula	-	1	5	36	93	105	148	180	216	76	13	-	873	11
Kwaya Tera	-	-	6	19	125	97	246	210	199	91	-	-	994	7
Shani	-	-	2	12	129	143	212	248	169	122	4	-	1,041	7
Biu	-	-	4	33	124	142	192	240	217	58	2	-	1,012	20

Table 3: Monthly rainfall data (in).

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Number of years
Jos	0.10	0.11	1.00	3.45	7.84	8.87	12.63	10.93	8.42	1.65	0.14	0.07	55.21	40
Naraguta	0.06	0.04	0.61	2.98	7.10	7.64	12.04	10.73	9.23	1.92	0.11	0.09	52.55	19
L. Katagum	-	-	0.08	1.58	3.41	5.18	7.54	11.97	6.83	1.50	-	-	38.09	5
Bauchi	-	0.02	0.21	1.38	3.67	5.79	10.02	13.38	7.11	1.35	0.03	0.01	42.97	52
K. Madaki	-	0.02	0.15	0.71	3.38	5.79	11.61	11.74	7.02	1.07	-	-	41.49	10
Ningi	-	-	0.17	0.87	2.73	7.34	11.94	13.20	7.86	1.41	-	-	45.52	7
Darazo	-	-	0.17	0.72	3.52	4.68	9.95	14.39	6.18	1.31	-	-	40.92	9
Alkalere	-	-	0.13	0.95	2.09	3.99	7.40	12.66	5.82	1.25	-	-	34.29	5
Gombe	-	-	0.31	1.51	4.98	5.64	8.47	8.08	8.57	1.68	0.05	-	39.29	9
Tula	-	0.03	0.20	1.41	3.67	4.15	5.83	7.08	8.50	2.99	0.50	0.02	34.38	11
Kwaya Tera	-	-	0.22	0.76	4.94	3.83	9.69	8.27	7.84	3.59	-	-	39.14	7
Shani	-	-	0.07	0.46	5.07	5.63	8.34	9.78	6.65	4.82	0.15	-	40.97	7
Biu	-	-	0.16	1.30	4.88	5.59	7.55	9.44	8.54	2.30	0.07	-	39.83	20



MAP 3. GEOLOGY
Basalt
Kerri Kerri formation
Gombe sandstone
Transitional formations
Bima sandstone
Younger Granite
Older Granite
Basement Compl.
10 0 10 20 30 mls
10 0 10 20 30 40 50Km
10°00'
11°00'
12°00'
Ningi
Darazo
K. Madaki
Bauchi
Zaranda
L. Katagum
Alkalere
Bara
Gombe
D. Kowa
Biu
Kwaya Tera
Shani
Tula
Naraguta
Jos

Geology.

Map 3 is a simplified geological map of the area.

Basement Complex. The geology of the western part was first described by Falconer (1911). Falconer and Raeburn (1923) investigated part of the area in more detail and Bain (1926) described the geology of the area around Bauchi town. The Geological Map of Nigeria (1964) shows the area mainly as undifferentiated Basement Complex, with areas of Cambrian or Pre-Cambrian Older Granites and Jurassic Younger Granites. Oyawoye (1962) has discussed the petrology of the area around Bauchi town.

Fargher, in an undated report on the Basement Complex of the Toro Sheet 148, has distinguished four main groups of rocks in the Basement Complex:

1. Garnetiferous schists and gneisses.
2. Migmatites
3. Granite gneisses
4. Coarse porphyritic granites.

These four groups can probably be included with the gneisses and migmatites described by Oyawoye (1964). The migmatites and gneisses are heterogeneous and all grade into each other. The gneisses are typically strongly foliated with bands, streaks, veins and pegmatites; scattered felspar phenocrysts occur frequently. Where veining is more abundant the gneisses grade into migmatites; where the gneisses are strongly porphyritic they grade into porphyritic granite, that is the Older Granites. Fargher suggests that the gneisses always occur between migmatites and porphyritic granites, but Oyawoye (1964) points out that many different types of granite contact have been observed.

A series of non-orogenic intrusives and associated acid volcanics of Jurassic age have been intruded into the Basement Complex and are referred to as the Younger Granites. These have been discussed in considerable detail by Jacobson, MacLeod and Black (1958) and by MacLeod, Turner and Wright (1971). For the most part the Younger Granites outcrop on the margins of the area, but the Kwandonkaya Hills and Zaranda Hill form major massifs within the area.

The geology of the eastern part of the area has been described by Carter <u>et. al.</u> (1963).

Cretaceous sediments. These have been described by Carter et al. (1963). Cretaceous sediments were deposited in what is now the middle and lower parts of the Gongola Valley. The strata have been tilted so that in general younger formations are exposed in the west and older ones in the east.

The oldest Cretaceous sediments are the Bima Sandstones. They consist of massive, coarse, false-bedded sandstones resting unconformably on rocks of the Basement Complex. The sandstones are largely derived from the erosion of the Basement rocks and particularly in the lower parts, frequently contain felspar.

The Bima sandstones are succeeded by a group of sedimentary rocks, which are here referred to as "transitional formations". The conditions under which these rocks were laid down varied from time to time and from place to place, although marine environments were most common. The rocks consist of shales, limestones, mudstones and sandstones. Often several rock types occur within short horizontal or vertical distances.

The sequence of Cretaceous sediments is concluded with another group of continental deposits, the Gombe Sandstone Formation. This formation consists of flaggy sandstones and siltstones. In places the rocks are strongly haematised. The distribution of the various formations is to some extent governed by gentle folding and faulting. The main axes of folding run approximately west-~~south-west~~ to east-north-east. In the core of some of the structural units, e.g. near Gombe and Kaltungo, rocks of the Basement Complex are exposed. These are also found in the east of the excursion area.

Tertiary sediments. Paleocene sediments, occurring in the centre of the area, consist of a sequence of flat-lying continental grits, sandstones and occasional clays known as the Kerri Kerri Formation.

The Kerri Kerri Formation unconformably overlies Cretaceous sediments in the east and rocks of the Basement Complex in the west. On the boundary between the Basement Complex and the Kerri Kerri Formation a basal conglomerate is commonly found.

The Kerri Kerri Formation is covered by a layer of reworked material and outcrops of the actual rock are relatively infrequent.

Basalt and other volcanic rocks. The main area of volcanic activity has been in the Biu Plateau in the east. This plateau consists of a number of extensive flows of olivine basalt. There are several volcanic cones on the plateau, which are associated with a variety of pyroclastic rocks, including agglomeratic tuffs.

Throughout the Cretaceous area in the south are numerous volcanic cones and plugs, which consist of basaltic material or of trachyte. They vary in height from a few meters to about 700 m.

Recent deposits. The importance of colluvial, alluvial and to some extent aeolian superficial deposits is discussed in the section on soil genesis later in this booklet.

Geomorphology.

The area can be divided into three major physiographic regions, corresponding to major geological differences:

The Basement Complex region in the west.
The Kerri Kerri Sandstone region.
The Cretaceous region in the east. This region also includes Basement Complex and basalt areas.

The Basement Complex region in the west. Hills mountains and isolated inselbergs occur scattered throughout the region and escarpments are found on the margins. Dissected plains, that is areas of low relative relief and fine drainage texture occur mainly on and around major watersheds. To the south of the Chad Gongola watershed dissected plains occur due to erosion by the headwaters of the Gongola River system. To the north the terrain becomes flatter and drainage texture coarser. In general terms the Basement Complex region has had a relatively stable development. Old land surfaces are well established and there are extensive cappings of ironpan. The area has been subject to considerable reworking of surface material, but the broad land form pattern has been maintained for long periods.

The Kerri Kerri Sandstone region consists of an undulating plain with a very widely spaced drainage system. A few, small hills, capped with ferruginised sandstone rise above the level of the plain. Erosion of the whole area has taken place during the late Tertiary to the present.

The Cretaceous region in the east has a very varied relief. The sandstones and granites form several steep hill ranges which alternate with gently undulating plains. The transitional formations generally give rise to gently undulating terrain. The basalt forms plateaux often bounded by steep escarpments.

This landscape has been effectively rejuvenated by tectonic movements and the downcutting of the Benue-Gongola River system. The associated erosion in combination with the varied lithology, has produced the diverse terrain.

The development of the landscape is summarised below. The dating is tentative.

1. The formation of the post-Gondwana surface in the Cretaceous. This is now represented on parts of the Jos Plateau and some remnant hill masses.

2. (a) The post-Gondwana surface was cut into by the African cycle of erosion (King 1962), which by the Miocene resulted in an extensive planation surface at about 760 - 670 m (2 500 - 2 200 ft). This is now represented by the Toro Plains and the summits of many hills and inselbergs to the east.
(b) The Kerri-Kerri sandstone was deposited in the early Tertiary and Carter et. al. (1962) suggest a Palaeocene date. Burke and Durotoye (1970) suggest a Pliocene age. The relationship between the Kerri Kerri and the African surface is thus not clear: if the Kerri Kerri is Palaeocene, the African surface must be older than Miocene; if the African surface is Miocene, then the Kerri Kerri must be more recent.

3. The African surface was eroded and by the Pliocene the post-African planation surface was well developed (King 1962). It is seen throughout much of the Bauchi area and as mesa remnants on the Kerri Kerri formation at about 600 - 450 m (2 000 - 1 400 ft). It is not known how far this surface extended to the east as it is possible that tectonic disturbance may have prevented their formation.

4. Extensive ironpan formation took place on the existing surface, probably during the Pliocene. It was formed before the Villafranchian as ironpan underlies Chad deposits further north.

5. Volcanic activity took place during the late Tertiary or early Pleistocene. Extensive basalt lava flows were extruded to form the Biu and Longuda Plateaux. They overlie ironpan and Burke and Durotoye (1970) quote a K/Ar date of 2.8×10^6 years.

6. Continued uplift along south west to north east axes in the eastern part of the area was accompanied by downcutting of the Gongola and other rivers which have cut gorges in some places.

7. Erosion of the ironpan surfaces may have been associated with this period of downcutting, but as erosion of most present day surfaces is continuing it is not possible to date the start of the erosion.

8. In the Pleistocene during one or more arid periods there has been extensive reworking of surface materials throughout the area, resulting in stony gravelly or concretionary layers. The concretionary material has sometimes been recemented to form a secondary ironpan, which has in its turn been eroded.

9. Wind blown sands were deposited during an arid period, particularly in the north of the area. These may have been associated with a period of reworking.

10. Terrace deposits were laid down along some rivers.

11. Streams and rivers were incised.

Vegetation. The vegetation of the area has been described by Ramsay and de Leeuw (1965). It is a reflection of climate, site, soil and the activities of man.

In relatively undisturbed areas a mature woodland has developed. The species composition is related to rainfall. In drier areas (generally less than 1 000 mm per annum), Anogeissus leiocarpus, Combretum spp. and Prosopis africana are dominant, while in areas of higher rainfall Afrormosia laxiflora, Detarium microcarpum, Isoberlinia doka and Burkea africana are more common. The woodland is best developed on the plains of the Kerri-Kerri Sandstone where it is 10 to 15 m tall and quite dense. In the Basement Complex in the west it is more open.

Rocky and hilly areas also often carry a woodland of varying density. Boswellia dalzielii is a characteristic species in the drier areas and Detarium microcarpum and Isoberlinia doka are common in the west where rainfall is higher. Riparian woodland is found along a number of streams. The Vertisol areas over shale, where not cultivated, carry a dense Acacia (A. seyal and A. polyacantha) woodland while poorer drained areas on the basalt have an open tree or shrub savanna with Acacia hookii.

In areas of dense, permanent cultivation a parkland is found of useful trees such as Parkia clappertoniana, Tamarindus indica, Butyrospermum paradoxum, Adansonia digitata which are preserved for their fruit. A combretaceous shrub savanna develops after cultivation with as most common species: Combretum glutinosum, C. ghasalense, Piliostigma reticulata and locally Guiera senegalensis.

Land Use.

Arable farming. Cultivation on the Basement Complex in the west is mainly concentrated to the south-west of Bauchi. The area to the west of the Bauchi-Ningi road is very sparsely inhabited and is only locally cultivated.

The cultivation pattern in the Kerri Kerri Sandstone area is variable. Near villages with good water supply there are relatively extensive areas of large, square cultivated fields. Elsewhere, especially in the south the population density is extremely low and cultivation is very sparse.

The most important farming areas are on the sedimentary rocks and the basalts in the east. The area under cultivation here has increased dramatically over the last 20 years and a considerable number of people have migrated into the area, from as far away as Sokoto in the North-Western State of Nigeria. Near main roads there are several areas of permanent cultivation.

The main food crops grown are sorghum, millet and cowpeas, while rice and cassava are of less importance. Some of these crops are also sold for cash, but cotton and groundnuts are the main cash crops grown. The eastern part of the area, between Gombe, Biu and Numan is one of the most important cotton areas in Nigeria producing in the order of 36 000 tons seed cotton per year, that is nearly 25 per cent of the Nigerian production. There are ginneries at Gombe, Lamurde and near Kumo and Biu. Groundnuts are of secondary importance as a cash crop. They are mainly grown near Bauchi and on the sandier soils near Gombe.

Virtually all farming is done by small-holders. In the east there are a considerable number of mixed farmers who use bullock-ploughs for cultivating their land. Elsewhere farmers use mainly hand-tools.

Fertilisers and insecticides are mainly used on more remunerative crops like rice and vegetables.

There are a few commercial farms, the most important of which is the 4 000 ha project of the Nigerian Agricultural Development Industry at Dadin Kowa. Tomatoes, sorghum, cotton, onions and other vegetables are some of the crops grown on this scheme, which is partly irrigated. The project also includes a tomato paste factory.

The possibility of constructing a dam across the Gongola River at Dadin Kowa is being studied. This could be used for generating electricity and for irrigating some 50 000 ha of land. This is mainly along the lower course of the Gongola, near the confluence with the Benue. In this area a large (18 000 to 10 000 ha) sugar plantation is being established.

Livestock. Most of the cattle in Nigeria belong to nomadic or semi-nomadic Fulani. These people move their cattle during the dry season to areas to the south and along rivers where grazing and water are then available. During the wet season these areas are unsuitable because of flooding and the presence of tse-tse fly.

Accurate data on the number of cattle are difficult to obtain but it is estimated that the cattle population in the Bauchi-Gombe-Biu area is in the order of 250 000 to 350 000. About half of these spend the wet season in the Kerri Kerri Sandstone area. The others are found around Bauchi (mainly to the north), Gombe and Biu. Some of the latter are owned by mixed farmers.

During the dry season the cattle from the Kerri Kerri, Gombe and Biu areas move to the Gongola and Benue Valleys. The cattle from the Bauchi area move mainly to the south-west. Crop residues form an important part of the animal's diet during the early part of the dry season.

There are or have been important foci of tse-tse fly to the west and northwest of Bauchi, in the southern part of the Kerri Kerri Sandstone area in the Gongola Valley and around Biu. These are mostly *Glossina morsitans*, but *G. palpalis* and *G. tachinoides* are also important, particularly near streams. A large eradication scheme is in progress in the Gombe-Biu area, while a smaller tse-tse clearing project was carried out near Kafin Madaki.

There is a meat processing and canning factory at Bauchi. Data are not available for other livestock, as goats, sheep, donkeys, horses and poultry.

Forestry. (2 500 sq. mi) Some 6 500 km^2 (i.e. about 11 per cent of the area) have been declared Forest (or Game) Reserves. In the past the Government Forestry Department concentrated mainly on demarcating unfarmed areas as reserves. At present establishment of new reserves has come to a virtual stand-still and efforts are concentrated on developing the resources of the existing reserves. This is mainly done by establishing plantations on the better suited sites in the reserves. Most common species are Eucalyptus, Gmelina and Neem (Azadirichta indica).

Some reserves, particularly near Biu have been converted to grazing reserves. The 1850 km^2 (720 sq. miles) large Yankari Game Reserve is well established. There are also plans to develop the Lame Reserve (2 300 km^2) (900 sq. miles) northwest of Bauchi for game.

PART III. SOILS.

Classification conventions.

The soils have been recognised as units of the Soil Map of the World (FAO 1970). In the use of the Key to the Soil Units, certain conventions have been adopted and these are outlined here.

1. Layered or polyphase soils, that is soils that have one or more discontinuities in the profile are classified on their characteristics to a depth of 1 m. Thus if the discontinuity is below 1 m, the soil is classified solely on the characteristics of the upper layer: if the discontinuity occurs at less than 1 m the characteristics of the lower layer are also taken into account.

2. The Gleyic Horizon. The definition given by FAO is not very specific. A more specific definition is suggested below.

(i) The gleyic horizon is indicative of pronounced wetness occurring within 50 cm of the surface, and is reflected by:

a Colours on the Munsell gley colour page.

and/or b For hues of 10YR or redder moist chromas of 2 or less and values of 5 or more.

For hues yellower than ~~2.5Y~~ 10YR moist chromas of 3 or less and values of 5 or more.

(ii) Pronounced red mottling is not considered diagnostic for the gleyic horizon.

(iii) If values are 4 or less mottles along root channels indicate the presence of a gleyic horizon.

Although not specific to the classification certain other conventions for defining drainage classes can be conveniently listed here. These are extremely tentative and should be regarded as a basis for discussion only.

Drainage classes given here are based entirely on profile morphology. The presence or absence of a water table is not taken into account in assessing the drainage class but should be recorded.

Very poorly drained. Gleyic Horizon colours within 10 cm of surface.

Poorly drained. Gleyic Horizon colours within 50 cm of surface.

Imperfectly drained. a. Gleyic Horizon colours within 150 cm of surface.

b. (i) For hues of 10YR or redder moist chromas of 3 or less and values of 5 or more.

(ii) For hues yellower than ~~2.5Y~~ 10YR moist chromas of 4 or less and values of 5 or more.
Both (i) and (ii) occur within 50 cm of surface.

c. (i) 10% or more of streaks of Gleyic Horizon colours within 50 cm of the surface.

(ii) 20% or more of streaks of Gleyic Horizon colours within 150 cm of surface.

Well drained. Well drained soils do not have the colours listed above.

Exceptions to the colour criteria.

(i) Vertisols

(ii) Sands and loamy sands.

3. Fluvisols. An estimate of whether or not a soil is receiving fresh sediment often determines whether the soil is classed as a fluvisol or not. This estimate must often be made from site characteristics and not from soil criteria. This is most unsatisfactory, but the following sites are thought to receive fresh sediment and hence carry fluvisols. (a) present day floodplains, (b) low terrace and levees which flood at some time, (c) concave slopes close to a stream line.

4. Gleyic Cambisols that is Cambisols with a gleyic horizon must by definition be gleysols.

5. The Cambic Horizon. Many soils developed over ironpan or ironpan rubble in the Bauchi Area have been classed as Cambisols, although (i) they lack the weatherable minerals diagnostic of a cambic horizon, (ii) have a high proportion of concretions. For these soils the parent material itself, the ironpan or ironpan rubble has few weatherable minerals and the concretions are fragments of ironpan and due to previous climatic conditions. Since there is little evidence of the formation of

any other diagnostic horizons the B horizons are regarded as cambic. Many of these soils would probably be regarded as Entisols in the USDA classification. There would seem to be the need for an equivalent grouping in the F A O Key.

6. The argillic horizon is defined by F A O (1970) as a B horizon that contains illuvial layer lattice clays, that is clay that has been moved downward into the horizon by water. This illuvial clay is reflected by clay cutans on ped faces and in pores. However not all cutans are due to clay illuviation, many are stress cutans due to in situ reorganisation of clay due to alternate wetting and drying. As it is often very difficult to distinguish illuvial and stress cutans in the field, a B horizon which contains recognisable cutans and meets the other requirements of the definition is considered argillic.

The other requirements of the definition are of thickness and texture. If the soil shows a discontinuity above the argillic horizon, then the textural requirements are waived. Most soils in the area have a sandy surface which is probably due to a surface wash or to termite action. It could therefore be considered to be separated from the argillic horizon by a discontinuity; textural criteria can therefore be virtually disregarded in many of the soils.

7. Percentage base saturation is an important factor in the definitions of the World Soil Map Units (F A O 1970). The Eutric sub-group has percentage base saturation greater than 50, whilst the Dystric sub-group has percentage base saturation less than 50. Because the cation exchange capacities of most of the soils of the Bauchi Area are very low, usually less than 10 and often less than 5, small differences in the levels of exchangeable cations can make a big difference to the percentage base saturation. Even small differences, within the limits of accuracy of methods of determining exchangeable cations, may appreciably affect percentage base saturation. Thus several soils that are morphologically similar may have widely differing percentage base saturation. If the majority of profiles in a morphologically defined series have more than 50% base saturation all the soils have been classes as Eutric: Thus within a series classed as Eutric there may be profiles with percentage base saturation less than 50.

8. Many (i.e. 20% F A O Handbook) mottles and concretions are considered diagnostic of the Ferric sub-group of Acrisols and Luvisols. The concept of concretions"being enriched" and having redder hues in the interior than on the margins implies active i.e. present day concentration of iron. It has been found that with the exception of transported

concretions which have no relation to the surrounding matrix, it is extremely difficult to distinguish between active and inactive or inherited mottles or concretions. Consequently the following definition is suggested.

The Ferric Acrisols or Luvisols have

a) 20% or more Fe concentrations with hues redder than 7.5YR or chromas > 5 or both. Concentrations that are transported are not diagnostic.

(i) Fe **concentrations** include both mottles and concretions. An Fe concentration is identified by a redder hue than the matrix or the same hue as the matrix with equal or lower value and equal or greater chroma.

b) An exchange capacity (from NH_4 Cl) < 24 meq % clay in at least some part of the B horizon.

Soil genesis.

In the description of each of the soils notes are made on the genesis of the soils. Certain processes are common to more than one series and they are discussed below in more detail.

Stone lines. Many of the soils have a gravelly horizon or stone line overlying Basement Complex rocks or ironpan. Their thickness varies from 8 cm to about 70 cm (3 - 30 in); there is no consistent correlation between thickness and position on the slope. The stone lines are either composed of rock fragments or concretionary material. The rocky stone lines are mainly fragments less than 10 cm (4 in) in diameter. The rock fragments are a variety of rocks and usually weathered. The concretionary stone lines contain many sesquioxidic concretions, which are usually well rounded, 1 - 2 cm ($\frac{1}{2}$ - 1 in) in diameter and with a shiny patina. They have an abrupt boundary with the soil matrix and there is no surrounding mottle or halo. Fragments of ironpan and angular quartz stones are included in these stone lines, which overlie ironpan or Basement Complex rocks. The gravel horizon rests with an abrupt and clear boundary on the underlying material. This abrupt boundary amounts to an unconformity and can be more clearly seen in road cuttings.

It is thought that lateral movement of the eroded material is responsible for the stone lines. Bruckner (1955), Ruhe (1959) and Burke and Durotoye (1970) envisaged the accumulation of coarse material on a developing pediment in an arid climate.

Arid climates alternating with more humid periods have affected this part of Nigeria. (Grove and Warren 1968 and Burke, Durotoye and Whiteman 1971). Consequently lateral movement of coarse material could have taken place during a recent arid period which would account for the abrupt boundary between stone line and weathered rock. Erosion of ironpan and the deposition further down slope would also explain the occurrence of the concretionary horizon overlying weathered rock in the soils with concretionary stone lines. If the stone lines are due to the lateral movement of coarse particles, the fine material occurring above must post-date the stone lines. No conclusions as to the origins of the fine layer can be drawn from the present studies but as it is always less than 50 cm thick, faunal activity could have brought it up from below the stone line. Burke and Durotoye (1970) postulate that the faunal activity takes place during a humid period following the arid conditions in which the stone line was formed.

Wind blown sands. Sandy deposits occur to the north of the Bauchi Area and fixed dunes can be recognised. South of the dunes there is an area where wind blown sand is an influence in the landscape and this includes the northern parts of the Bauchi Area. Fine wind blown material has been recorded on the Jos Plateau (Macleod Turner and Wright 1971) so similar material was probably spread throughout the Bauchi Area. In the more dissected areas no evidence of this remains. On the flatter plains in the north the sand is spread unevenly, with localised accumulation, particularly around some inselbergs. Thus some soils are sandy throughout, whilst others have only a sandy surface horizon.

Mechanical analyses of the deeper sandy soils in the north of the area have a percentage of fine sand (50 - 200 μ) plus silt (2 - 50 μ) in excess of 60 and up to 80. These are the size fractions commonly found in wind blown material. Shallower soils occurring over ironpan are also thought to be mainly windblown sand as the percentage of fine sand and silt are again very high.

Further south, the sandy surface horizons of some soils also have a high percentage of fine sand and silt. If this is wind blown sand, then a discontinuity is to be expected in the profile. Field descriptions and mechanical analyses of some profiles show a textural change. If this textural change corresponds to the discontinuity, it may be reflected by a change in the fine sand/coarse sand ratio, or the fine sand plus silt/coarse sand ratio. These ratios have been plotted against depth but there is no obvious discontinuity.

Miscropic examination of the sand fraction of these soils shows that most of the fine sand grains are rounded or subrounded, with a frosted surface appearance. These are characteristics often associated with wind blown sands. However, soils derived from Basement Complex rocks, contain similar rounded sand particles. Thus, the characteristics of the soils do not provide conclusive evidence that they are developed on wind blown sand, but they do not show that they are not. As fixed dunes occur to the north of the area it is probable that the sands are aeolian.

Terminology.

The terminology used in the description of the soils is based on the F A O Guidelines for Soil Description though some additions have been made. The profiles are presented on cards designed for computer storage of the information. They are provisional working copies. A blank card and a list of the abbreviations used are given at the end of this booklet.

Soil analyses.

Profile pits for the excursion were dug in January 1973 and soil samples were analysed in the laboratory of the Soil Survey Section at the Institute for Agricultural Research under supervision of Mr. E.R. Drzymalski.

The following analytical methods were used:

1. Mechanical analysis. 50 g soil, 50 ml "Calgon" and 200 ml water, stirred by high-speed mechanical stirrer for 5 minutes, transferred to sedimentation jar and made up to 1 litre with water. Clay and silt (20 µ) determined by Bouyoucos hydrometer, after 4 minutes.

Clay (2 µ) in the same way after 90 minutes. Fine (50 - 200 µ) and coarse sand (200 - 2 000 µ) dry by sieving and weighing. The fraction 20 - 50 µ was calculated by difference.

2. pH. Determined on an EIL 23A pH meter in a 1:5 soil:water suspension.

3. Organic Carbon. Standard Walkley Black method. Using 10 ml N potassium dichromate and 20 ml concretions H_2SO_4. After dilution, titrated with ferrous ammonium sulphate using ortho-phenanthroline as an indicator.

4. Cation exchange capacity. 6 g soil shaken for 10 minutes with 25 ml N ammonium acetate at pH 7. After centrifuging this is repeated with another 25 ml and after centrifuging and washing made up to 200 ml with water and heated. Ammonia distillate collected in boric acid and titrated with HCl.

5. Exchangeable bases. 10 g soil shaken for 120 minutes with 200 ml. N ammonium acetate at pH 7. Ca + Mg determined by EDTA method. Na and K on the flame photometer.

No allowance is made for the possible presence of carbonates or other salts, so in fact extractable bases are determined. This explains why some soils appear to have a base saturation of more than 100 per cent.

PART IV. THE SOIL PROFILES.

The dominant soils from a number of soil associations have been selected, though not every soil in the association will be seen. General information is given for each soil association followed by site data, profile descriptions and analytical results for individual soil profiles. Problems of genesis, drainage and classification of each soil are suggested for discussion. The classification of each soil in terms of the F A O World Soil Map Units has been given: space has been left for the appropriate French, Ghana and U S D A classifications to be written in, after delegates have seen the soils in the field.

The Toro Association. Profiles 1, 2, 3.

Location	The Toro Association occurs in the western part of the Basement Complex region between 8° 55' E - 9° 03' E and 10° 00' N - 10° 20' N.
Altitude	880 m (2 900 ft).
Geology	Basement complex - predominantly granitic gneiss.
Land form	The unit is a gently undulating plain with small mesas on interfluve crests, broad planar to concave valley side slopes and well marked slightly incised valley bottoms with flat floors. Relative relief is 15 m (50 ft) and inselbergs stand up to some 100 m (300 ft) above the level of the interfluves. The drainage pattern is dendritic with a medium texture.
Rock outcrops	There are a few small rock outcrops predominantly on the upper slopes, occurring as low whalebacks and inselbergs.
Ironpan	There are a few small and medium outcrops of ironpan on the upper slopes often forming small mesas or small scarps.
Dominant soils	Kasuan Series - Ferric Luvisol - concretionary phase. Ganyi Series - Ferric Luvisol.

SITE DATA.

Location.	Two miles north of Jos-Bauchi road on track to Kasuan Ganyi.
Position	Mid to Upper slope.
Slope	Convex slope 1°.
Parent material	Unconsolidated material derived from ironpan and granite gneiss.
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Imperfect.
Vegetation	Tree savanna.

FOR DISCUSSION.

1. Soil genesis. The presence of inherited concretions mainly fragments of ironpan and quartz stones in the lower part of the profile suggest that the soil is developed on material that has moved laterally.

2. The sandy surface horizons may be due to termite activity or to surface wash, or may represent an eluvial horizon.

Drainage 1, Horizon 5 has gleyic horizon colours within 150 cm of the surface and has common mottles, so the soil is considered to be imperfectly drained (see Part III).

Classification. 1. Horizons 3, 4 and 5 have cutans and meet the textural requirements for an argillic horizon; if there is a discontinuity between the sandy surface and the lower part of the profile, it should be noted that the textural criteria need not be considered. The percentage base saturation is greater than 50, so the soil is classed as a Luvisol.

SITE DATA.

Classification. 2. There are more than 20% of red concentrations so the soil is classed as Ferric. Transported concentrations are not considered diagnostic for the Ferric sub unit.

F A O	Ferric Luvisol
French	
Ghana	
U S D A.	

ANALYSES.

Characteristic	Horizon (depth in cm)					
	1 0-16	2 16-33	3 33-60	4 60-109	5 109-162	6 162-200
pH 1:2.5 H_2O	6.2	5.8	5.6	5.8	6.1	6.0
Exch. Na meq %	Nil	Nil	Nil	Nil	Nil	Nil
Exch. K meq %	0.1	0.1	0.2	0.4	0.3	0.2
Exch. Mg meq %	0.4	0.5	1.0	1.5	1.3	1.0
Exch. Ca meq %	1.0	1.0	1.5	3.0	2.9	2.2
TEB. meq/100 g	1.5	1.6	2.7	4.9	4.5	3.4
CEC. meq/100 g	2.5	2.5	5.0	7.0	5.8	4.4
Base saturation %	60	64	54	70	78	77
% org. C o.d.s.	63	31	20	03	05	05
Mechanical analysis						
2 000 μ - 200 μ	50	50	36	28	32	40
200 μ - 50 μ	24	18	14	10	10	11
50 μ - 20 μ	10	10	18	18	20	13
20 μ - 2 μ	8	8	8	10	10	10
2 μ	8	14	24	34	28	26

COUNTRY		PROJECT		LAND UNIT		PROFILE	1
GEOG COORDS E		N					

HORIZON	THICKNESS & DEPTH	BDY CLAR	BDY SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	ABUND %	SIZE mm	CONT.	COLOUR	ABUND %	SIZE mm	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE GRADE	SIZE	TYPE	GRADE	SIZE	TYPE		MOISTURE	CONSISTENCE D SM	M VM	W	W	CEMN	ROOTS No.	SIZE mm	TYPE
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	fr	25Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	10-10³	3-10	wdy
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
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7 7 7				75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Bst H CL	>60			pl			pl				lomy						
8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oth																	
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0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	fr	25Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
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3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
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1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	fr	25Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
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3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
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0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	fr	25Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	10-10³	3-10	wdy
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
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1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	fr	25Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	10-10³	3-10	wdy
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60			col			col			xh	xfm						
7 7 7	162			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Bst H CL	>60			pl			pl				lomy						
8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oth																	
9 9 9	183	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	fr	25Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	10-10³	3-10	wdy
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60			col			col			xh	xfm						
7 7 7				75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Bst H CL	>60			pl			pl				lomy						
8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oth																	
9 9 9	221	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No./dm²	SIZE mm	TYPE	No/dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE					
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-600					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			600-2000			600-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

Profile 2.

SITE DATA.

Location	$2\frac{1}{4}$ miles north of Jos - Bauchi road on track to Kasuan Ganyi.
Position	lower slope
Slope	1°
Parent material	Unconsolidated material derived from ironpan and granite gneiss.
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Poorly drained.
Vegetation	Tree savanna.

FOR DISCUSSION.

Soil genesis.	The presence of inherited concretions, mainly fragments of ironpan and quartz stones at the base of the profile suggests that the soil is developed on material that has moved laterally.
Drainage	A Colour of 10YR 5/2 occurs within 50 cm of the surface so the soil is regarded as poorly drained.
Classification	1. Horizons 3 and 4 have cutans and can be considered as an argillic horizon. The percentage base saturation is greater than 50 so the soil is classed as a Luvisol. 2. As a colour of 10YR occurs within 50 cm of the surface the soil is a Gleyic Luvisol.
F A O	Gleyic Luvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1 0-18	2 18-43	3 43-70	4 70-98	5 98-147	5 147-190
pH 1:2.5 H_2O	5.4	5.2	5.6	5.8	5.8	6.0
Exch. Na meq %	Nil	T	T	T	0.1	0.1
Exch. K meq %	0.1	0.2	0.4	0.3	0.3	0.2
Exch. Mg meq %	0.6	1.2	2.0	2.0	2.6	2.2
Exch. Ca meq %	1.2	2.9	4.7	4.2	5.3	4.5
TEB. meq/100 g	1.9	4.3	7.1	6.5	8.3	7.0
CEC meq/100 g	3.6	7.3	10.8	9.9	10.6	10.0
Base saturation %	53	59	66	66	78	70
% org. C o.d.s.	63	48	23	12	13	05
Mechanical analysis						
2 000 μ - 200 μ	40	28	22	24	19	24
200 μ - 50 μ	22	12	9	9	11	11
50 μ - 20 μ	16	18	19	21	18	15
20 μ - 2 μ	10	8	8	10	12	12
2 μ	12	34	42	36	40	38

COUNTRY		PROJECT		LAND UNIT		PROFILE	2
GEOG COORDS E		N					

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	ABUND %	SIZE MM	CONT.	COLOUR	ABUND %	SIZE MM	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE (DEV SIZE TYPE DEV SIZE TYPE)	MOISTURE	CONSISTENCE (D/SM M/VM W W CEMN)	ROOTS (No. SIZE mm TYPE)
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	B+H H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oth					
9 9 9	18	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	ABUND %	SIZE MM	CONT.	COLOUR	ABUND %	SIZE MM	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	B+H H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oth					
9 9 9	43	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	ABUND %	SIZE MM	CONT.	COLOUR	ABUND %	SIZE MM	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	B+H H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oth					
9 9 9	70	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	ABUND %	SIZE MM	CONT.	COLOUR	ABUND %	SIZE MM	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	B+H H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oth					
9 9 9	98	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	ABUND %	SIZE MM	CONT.	COLOUR	ABUND %	SIZE MM	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	B+H H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oth					
9 9 9	147	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	ABUND %	SIZE MM	CONT.	COLOUR	ABUND %	SIZE MM	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	B+H H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oth					
9 9 9	200	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARDNESS	SHAP	TYPE	ABUN %	SIZE mm	HARDNESS	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

SITE DATA.

Location.	2½ miles north of Jos - Bauchi road on track to Kasuan Ganyi.
Position	Terrace.
Slope	Planar 1^{o}
Parent material	Terrace material
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Well drained.
Vegetation	Shrub savanna

FOR DISCUSSION.

Soil genesis. The soil is developed on an old terrace. This material was probably laid down on the existing Basement Complex soils: remnants of these are in evidence in Horizon 6.

Classification. 1. Weakly developed cutans occur in Horizon 2 and 3 and the percentage base saturation in the B horizon is mainly less than 30. The soil can thus be classed as an Acrisol. C E C % clay in the lower part of the profile is close to or less than 24 meq. so the soil can be considered as a Ferric Acrisol.

2. To maintain the similarities with Luvisols a Chromic Acrisol sub-unit may be necessary.

F A O Ferric Acrisol

French

Ghana

U S D A

ANALYSES

Characteristic	Horizon (depth in cm)						
	1 0-9	2 9-30	3 30-72	4 72-102	5 102-135	6 135-173	7 173-232
pH 1:2.5 H_2O	5.8	5.2	5.2	5.3	5.4	5.5	5.8
Exch. Na meq %	Nil	Nil	Nil	Nil	Nil	T	T
Exch. K meq %	0.1	0.4	0.4	0.5	0.4	0.4	0.4
Exch Mg meq %	0.6	0.9	1.2	1.4	1.2	1.2	1.5
Exch. Ca meq %	0.6	0.3	0.4	0.5	0.6	1.3	2.3
TEB. meq/100 g	1.3	1.6	2.0	2.4	2.2	2.9	4.2
CEC meq/100 g	2.3	6.5	8.9	8.9	7.9	7.6	6.6
Base saturation %	57	25	22	27	28	38	64
% org. C o.d.s.	48	26	14	12	09	06	05
Mechanical analysis							
2 000 μ - 200 μ	50	33	26	22	24	26	40
200 μ - 50 μ	21	14	8	10	12	12	10
50 μ - 20 μ	13	11	14	20	16	16	10
20 μ - 2 μ	6	8	8	8	8	10	8
2 μ	10	34	44	40	40	36	32

COUNTRY	PROJECT	LAND UNIT	PROFILE 3
GEOG COORDS E	N		

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS ABUND % / SIZE mm / CONT. / COLOUR / ABUND % / SIZE mm / CONT. / COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE DEV SIZE TYPE DEV SIZE TYPE	MOISTURE	CONSISTENCE D M W W CEM	ROOTS No. SIZE mm TYPE
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1 1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3 3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5 *		*	25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5 5 5 25YR 5 5	Py CS CS *	25-40	* vs vc pr vs vc pr	* w	vh v.fm	*
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7 7 7 75R 7 7	BA H CL	>60	pl pl		[illegible]	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9 9	9	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1 1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3 3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5 *		*	25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5 5 5 25YR 5 5	Py CS CS *	25-40	* vs vc pr vs vc pr	* w	vh v.fm	*
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7 7 7 75R 7 7	BA H CL	>60	pl pl		[illegible]	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9 9	30	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1 1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3 3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5 *		*	25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5 5 5 25YR 5 5	Py CS CS *	25-40	* vs vc pr vs vc pr	* w	vh v.fm	*
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7 7 7 75R 7 7	BA H CL	>60	pl pl		[illegible]	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9 9	72	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1 1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3 3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5 *		*	25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5 5 5 25YR 5 5	Py CS CS *	25-40	* vs vc pr vs vc pr	* w	vh v.fm	*
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7 7 7 75R 7 7	BA H CL	>60	pl pl		[illegible]	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9 9	102	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1 1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3 3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5 *		*	25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5 5 5 25YR 5 5	Py CS CS *	25-40	* vs vc pr vs vc pr	* w	vh v.fm	*
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7 7 7 75R 7 7	BA H CL	>60	pl pl		[illegible]	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9 9	173	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1 1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3 3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5 *		*	25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5 5 5 25YR 5 5	Py CS CS *	25-40	* vs vc pr vs vc pr	* w	vh v.fm	*
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7 7 7 75R 7 7	BA H CL	>60	pl pl		[illegible]	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9 9	232	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

3.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THX NESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE					
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			600-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			600-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000						1	1	4					2	1	1	2					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

The Geji Association. Profiles 4 & 5.

Location	The Geji Association occurs in the central part of the Basement Complex region between 9° 25' E - 10° 00' E and 10° 10' N - 10° 25' N.
Altitude	730 - 670 m (2 400 - 2 200 ft).
Geology	Basement Complex - predominantly granitic gneiss.
Land form	The unit is a gently undulating plain with moderately broad convex interfluves and concave lower valley side slopes. Second and third order valley bottoms with flat floors are slightly incised. Relative relief is about 20 m (70 ft) and inselbergs stand up to 75 m (250 ft) above the level of the plain. The drainage pattern is dendritic with a medium texture.
Rock outcrops	There are common, medium and large outcrops, occurring on the mid and upper slopes as rocky whalebacks and inselbergs.
Ironpan	Ironpan occurs on the upper slopes with common medium outcrops mainly in sheet form.
Dominant soils	Baram Series - Gleyic Luvisol Gubi Series - Eutric Cambisol - stony phase.

Profile 4.

SITE DATA.

Location	Bauchi - Maiduguri road. 200 yards east of culvert 94/1.
Position	Upper slope.
Slope	Convex slope 1^{o}
Parent material	Unconsolidated mixed gravel derived from granite gneiss.
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Imperfectly drained.
Vegetation	Shrub savanna

FOR DISCUSSION

Soil genesis	The soil is developed in gravel derived from Basement Complex rocks. The clear boundary between the gravel and the underlying rock suggests lateral movement of the gravel.
Drainage	Colours of 2.5Y 5/3 and mottles within 50 cm of the surface make this an imperfectly drained soil (see Part III). Horizon 3 is gravelly and probably very permeable but may be waterlogged for some time due to laterally moving water.
Classification	1. As discontinuity in this profile occurs at 69 cm the material below it is considered in the classification of the soil (see Part III).

F A O	Eutric Cambisol - stony phase.
French	
Ghana	
U S D A.	

ANALYSES

Characteristic	Horizon (depth in cm)			
	1 0-17	2 17-42	3 42-69	4 69-116
pH 1:2.5 H_2O	6.4	5.9	5.9	6.5
Exch. Na meq %	0.1	0.1	0.1	0.6
Exch. K meq %	0.1	0.1	0.2	0.3
Exch. Mg meq %	0.5	0.7	0.7	1.4
Exch. Ca meq %	3.2	2.7	4.7	10.9
TEB. meq/100 g	3.9	3.6	5.7	13.2
CEC meq/100 g	4.7	4.4	6.5	13.4
Base saturation %	83	82	88	99
% org. C o.d.s.	60	23	18	08
Mechanical analysis				
2 000 µ - 200 µ	60	47	68	49
200 µ - 50 µ	20	18	6	13
50 µ - 20 µ	12	21	8	10
20 µ - 2 µ	4	4	4	6
2 µ	4	10	14	22

COUNTRY	PROJECT	LAND UNIT	PROFILE 4
GEOG COORDS E	N		

HORIZON	THICKNESS & DEPTH	BDY (CLAR / SHAP)	PREDOMINANT COLOUR (PED INTERIOR (DRY) / PED INTERIOR (WET) / PED SURFACE (DRY) / PED SURFACE (WET))	OTHER COLOURS (ABUND % / SIZE MM / CONT. / COLOUR / ABUND % / SIZE MM / CONT. / COLOUR)	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE (D/SM / M/VM / W / W / CEMN)	ROOTS (No. / SIZE mm / TYPE)
	17									
	42									
	69									
	69 / 116									
			Weathered granite gneiss							

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE					
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10^2	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10^2	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v. hd	ang	SiO_2	15-25	>75	v. hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10^2	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10^2	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-16	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v. hd	ang	SiO_2	15-25	>75	v. hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10^2	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10^2	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v. hd	ang	SiO_2	15-25	>75	v. hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000						1	1	4					2	1	2	2					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10^2	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10^2	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v. hd	ang	SiO_2	15-25	>75	v. hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000						1	2	4													8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

SITE DATA.

Location	Bauchi - Maiduguri Road. Culvert 94/1.
Position	Valley head.
Slope	Concave slope 1^{o}
Parent material	Unconsolidated surface material.
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Poorly drained.
Vegetation	Shrub Savanna.

FOR DISCUSSION

Soil genesis.

1. The soil is probably developed in material washed down from the surrounding slopes. This is suggested by the presence of quartz stones throughout the profile and by the fact that the soils on the nearby slopes show strong evidence of lateral movement.

2. The carbonates may be derived from calc-alkaline felspars in the rock.

Classification

1. Horizon 3 with a moist colour of 10YR 5/2 is a gleyic horizon (see Part III).

2. Cutans occur in Horizon 4 but the soil is not a Luvisol for there is a gleyic horizon within 50 cm and the cutans occur at more than 50 cm of the surface.

F A O Eutric Gleysol

French

Ghana

U S D A

ANALYSES.

Characteristic	Horizon (depth in cm)			
	1 0 - 13	2 13 - 38	3 38 - 95	4 95 - 140
pH 1:5 H_2O	6.7	7.8	9.1	9.0
Exch. Na meq %	.10	.65	.70	.65
Exch. K meq %	.06	.14	.15	.15
Exch. Mg meq % / Exch. Ca meq %	1.68	5.56	5.52	6.88
TEB. M meq/100 g	1.8	6.4	6.4	7.7
CEC meq/100 g	3.4	9.6	12	13
Base saturation %	53	67	53	59
% org. C o.d.s.	.40	.25	.14	.05
Mechanical analysis				
2000 /u - 200 /u	41	33	30	28
200 /u - 50 /u	21	12	9	10
50 /u - 20 /u	20	15	17	16
20 /u - 2 /u	10	8	12	10
2 /u	8	32	32	36

COUNTRY	PROJECT	LAND UNIT	PROFILE
			5

GEOG COORDS E N

HORIZON	THICKNESS & DEPTH	BDY (CLAR / SHAP)	PREDOMINANT COLOUR (PED INTERIOR DRY / PED INTERIOR WET / PED SURFACE DRY / PED SURFACE WET)	OTHER COLOURS (ABUND % / SIZE mm / CONT. / COLOUR)	TEXTURE	Coarse Material ABUND. %	STRUCTURE (DEV / SIZE / TYPE)	MOISTURE	CONSISTENCE (D SM / M VM / W / W / CEMN)	ROOTS (No. / SIZE mm / TYPE)
1 I	13	cl wa	10YR 6/2 / 10YR 4/2 / nr / nr	2 <5 pr 7.5YR 5/8; 0	L S	1-5	w c ab; simp	dry	vh	10-10² <3 fib
2 II	38	cl sm	10YR 6/2 / 10YR 3/5 / nr / nr	0; 2 5-15 di 10YR 6/6	S CL	1-5	w c ab; m c ab comp	dry	vh	0-10 <3 fib
3 III	95	gr sm	10YR 6/2 / 10YR 2/5 / nr / nr	1 5-15 di 10YR 6/8	L CL	10-15	m m ab; simp	dry	vh	0-10 <3 fib
4 IV	125/160	cl ir	10YR 2/2; 2.5Y / 10YR 2/5 / nr nr / nr	1 5-15 di 10YR 5/8	L CL	1-5	m c ab; simp	m	vh fm	0 0 0
5 V		nr nr								

Weathered granite gneiss

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000						1	1	4													8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000						1	2	4													8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

The Kula Association. Profiles 6, 7, 8.

Location	The Kula Association occurs in the central part of the Basement Complex region, between 9^{o} 42' E - 10^{o} 15' E and 10^{o} 15' N - 10^{o} 45' N.
Altitude	580 m (1 900 ft) dropping northwards to 550 m (1 800 ft).
Geology	Basement Complex - predominantly granitic gneiss.
Land form	The unit forms a gently undulating plain with broad convex interfluves and concave valleys. Second and third order valley bottoms with flat floors are slightly incised. Relative relief is about 15 m (50 ft) and the inselbergs stand up to 60 m (300 ft) above the level of the plain. The drainage pattern is dendritic with a medium texture.
Rock outcrops	There are a few small and medium rock outcrops mainly on the interfluves occurring as whalebacks and inselbergs.
Ironpan	There are many large ironpan outcrops occurring on the interfluves particularly around the inselbergs. The ironpan occurs as extensive sheets and may underlie upper and mid slopes even where it does not outcrop.
Dominant soils	Boi Series - Eutric Cambisol - concretionary phase Dull Series - Chromic Cambisol - concretionary phase Madaki Series - Eutric Cambisol - petroferric phase. Zol Series - Chromic Cambisol - petroferric phase.

Profile 6.

SITE DATA.

Location	Bauchi - Ningi road. Culvert 7/5.
Position	Crest of interfluve.
Slope	Convex slope 1^{o}
Parent material	Ironpan rubble
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Well drained.
Vegetation	Tree savanna.

FOR DISCUSSION.

Soil genesis

1. The soil is developed in gravel composed of fragments of ironpan. The presence of micas and felspars indicate that some gneissic material is present. It is probable that the rubble is derived from the erosion of a massive ironpan. The sharp discontinuity between the rubble and the underlying rock suggests that the rubble has been moved laterally.

Classification

1. Little profile development can be distinguished within the ironpan rubble, so it is considered to be a cambic horizon.

F A O	Chromic Cambisol - concretionary phase.
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)		
	1 0-18	2 18-50	3 50-74
pH 1:2.5 H_2O	6.2	5.7	5.8
Exch. Na meq %	Nil	T	T
Exch. K neq %	0.1	0.2	0.2
Exch. Mg meq %	0.8	1.5	0.9
Exch. Ca meq %	4.1	4.1	3.2
TEB. meq/100 g	5.0	5.8	4.3
CEC meq/100 g	5.9	8.0	5.6
Base saturation %	85	73	77
% org. C o.d.s.	96	36	33
Mechanical analysis			
2 000 μ - 200 μ	45	55	53
200 μ - 50 μ	23	6	11
50 μ - 20 μ	14	7	10
20 μ - 2 μ	8	8	6
2 μ	10	24	20

COUNTRY		PROJECT		LAND UNIT		PROFILE	6
GEOG COORDS E		N					

Horizon					Thickness & Depth	BDY Clar	BDY Shap	Ped Interior (Dry)			Ped Interior (Wet)			Ped Surface (Dry)			Ped Surface (Wet)			Other Colours Abund %		Size mm	Cont.	Colour			Abund %		Size mm	Cont.	Colour			Texture			Coarse Material Abund. %	Structure Dev	Size	Type	Dev	Size	Type		Moisture	Consistence D/SM	M/VM	W	W	Cemn	Roots No. 3^3dm^3	Size mm	Type
0	0	0	0	0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1		ab	sm	25Y	1	1	25Y	1	1	25Y	1	1	25Y	1	1	1	1	<5	ft	25Y	1	1	1	1	<5	ft.	25Y	1	1	By	C	C	1-5	w	vf	cr	vw	vf	cr	simp	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	10-10^3	3-10	wdy.
3	III	3	3	3		gr	ir	75YR	3	3	75YR	3	3	75YR	3	3	75YR	3	3	3	3	>15	pr.	75YR	3	3	3	3	>15	pr.	75YR	3	3	Gra	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10^3	>10	
4	IV	4	4	4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5*		*		25YR	5	5	25YR	5	5	25YR	5	5	25YR	5	5	5	5			25YR	5	5	5	5			25YR	5	5	Py	CS	CS*	25-40	vs	vc	pr	vs	vc	pr		*w	vh	v.fm				*		
6		6	6	6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	My	S	S	40-60			col			col			xh	x.fm						
7		7	7	7				75R	7	7	75R	7	7	75R	7	7	75R	7	7	7	7			75R	7	7	7	7			75R	7	7	BA	H	CL	>60			pl			pl				comp						
8		8	8	8					8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9	18	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1		ab	sm	25Y	1	1	25Y	1	1	25Y	1	1	25Y	1	1	1	1	<5	ft	25Y	1	1	1	1	<5	ft.	25Y	1	1	By	C	C	1-5	w	vf	cr	vw	vf	cr	simp	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	10-10^3	3-10	wdy.
3	III	3	3	3		gr	ir	75YR	3	3	75YR	3	3	75YR	3	3	75YR	3	3	3	3	>15	pr.	75YR	3	3	3	3	>15	pr.	75YR	3	3	Gra	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10^3	>10	
4	IV	4	4	4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5*		*		25YR	5	5	25YR	5	5	25YR	5	5	25YR	5	5	5	5			25YR	5	5	5	5			25YR	5	5	Py	CS	CS*	25-40	vs	vc	pr	vs	vc	pr		*w	vh	v.fm				*		
6		6	6	6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	My	S	S	40-60			col			col			xh	x.fm						
7		7	7	7				75R	7	7	75R	7	7	75R	7	7	75R	7	7	7	7			75R	7	7	7	7			75R	7	7	BA	H	CL	>60			pl			pl				comp						
8		8	8	8					8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9	50	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1		ab	sm	25Y	1	1	25Y	1	1	25Y	1	1	25Y	1	1	1	1	<5	ft	25Y	1	1	1	1	<5	ft.	25Y	1	1	By	C	C	1-5	w	vf	cr	vw	vf	cr	simp	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	10-10^3	3-10	wdy.
3	III	3	3	3		gr	ir	75YR	3	3	75YR	3	3	75YR	3	3	75YR	3	3	3	3	>15	pr.	75YR	3	3	3	3	>15	pr.	75YR	3	3	Gra	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10^3	>10	
4	IV	4	4	4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5*		*		25YR	5	5	25YR	5	5	25YR	5	5	25YR	5	5	5	5			25YR	5	5	5	5			25YR	5	5	Py	CS	CS*	25-40	vs	vc	pr	vs	vc	pr		*w	vh	v.fm				*		
6		6	6	6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	My	S	S	40-60			col			col			xh	x.fm						
7		7	7	7				75R	7	7	75R	7	7	75R	7	7	75R	7	7	7	7			75R	7	7	7	7			75R	7	7	BA	H	CL	>60			pl			pl				comp						
8		8	8	8					8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9	74	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0		0	0
1	I	1	1	1		ab	sm
2	II	2	2	2		cl	wa
3	III	3	3	3		gr	ir
4	IV	4	4	4		di	br
5	V	5	5	5*		*	
6		6	6	6			
7		7	7	7			
8		8	8	8			
9		9	9	9	80	nr	nr

Weathered granite gneiss

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No. /dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THXNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARDNESS	SHAP	TYPE	ABUN %	SIZE mm	HARDNESS	SHAP	TYPE					
0 0-10 10-10² >10² nr	0 <3 3-10 >10 nr	0 fib wdy nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 <5 nr	0 pl tub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl tub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl tub nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz Fm Mi Fel Ca Mg nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz. Fm Mi Fel Ca Mg nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc. Qz ind nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc Qz ind nr	0 wk md stg nr	0 thin thick nr	0 v.face h.face pores 1+2 1+3 2+3 1+2+3 nr	5Y 2.5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	0 1 2 3 4 5 6 7 8 nr	0 1 2 3 4 5 6 7 8 nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 Soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
0 0-10 10-10² >10² nr	0 <3 3-10 >10 nr	0 fib wdy nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 <5 nr	0 pl tub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl tub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl tub nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz Fm Mi Fel Ca Mg nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz. Fm Mi Fel Ca Mg nr	0 1-5 5-10 10-16 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc Qz ind nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc Qz ind nr	0 wk md stg nr	0 thin thick nr	0 v.face h.face pores 1+2 1+3 2+3 1+2+3 nr	5Y 2.5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	0 1 2 3 4 5 6 7 8 nr	0 1 2 3 4 5 6 7 8 nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 Soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
0 0-10 10-10² >10² nr	0 <3 3-10 >10 nr	0 fib wdy nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 <5 nr	0 pl tub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl tub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl tub nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz Fm Mi Fel Ca Mg nr	0 0-15 15-50 >50 1 nr	0 <.25 .25-.5 >.5 1 nr	0 Ind. Qz Fm Mi Fel Ca Mg 4 nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc Qz ind nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc Qz ind nr	0 wk md stg nr	0 thin thick nr	0 v.face h.face pores 1+2 1+3 2+3 1+2+3 nr	5Y 2.5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	0 1 2 3 4 5 6 7 8 nr	0 1 2 3 4 5 6 7 8 nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 Soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

Profile 7.

SITE DATA.

Location	Bauchi - Ningi road. Mile Post 8.
Position	Mid slope
Slope	Convex slope 1^{o}.
Parent material	Ironpan
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Well drained.
Vegetation	Shrub savanna.

FOR DISCUSSION.

Soil genesis

1. The soil is developed on secondary recemented ironpan.

Classification

1. There are no weatherable minerals in this soil, but weatherable minerals are diagnostic for a Cambic horizon. However a Cambic horizon could develop in a parent material with few weatherable minerals, as in this profile, and the soil is regarded as a Cambisol.

2. The percentage base saturation of this profile is less than 50 above the ironpan and it is classed as Dystric. However, most morphologically similar soils in this area have a percentage base saturation greater than 50 and the series is considered to be Eutric (See Part III).

3. No limits are given for the depth at which ironpan occurs in the definition of the petroferric phase. The concretionary phase is defined as having concretions within 1 m and a similar depth has been adopted for the petroferric phase.

SITE DATA.

Classification	4. Apart from the colour there is little difference between Eutric and Chromic Cambisols petroferric phase. The significance of this distinction is doubtful.
F. A O	Dystric Cambisol - petroferric phase.
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)	
	1 0-23	2 23-37
pH 1:2.5 H_2O	6.2	5.5
Exch. Na meq %	Nil	Nil
Exch. K meq %	0.1	0.1
Exch. Mg meq %	0.5	0.4
Exch. Ca meq %	2.0	1.1
TEB. meq/100 g	2.6	1.6
CEC meq/100 g	3.2	3.3
Base saturation %	81	48
% org. C o.d.s.	65	31
Mechanical analysis		
2 000 μ - 200 μ	50	54
200 μ - 50 μ	18	14
50 μ - 20 μ	18	12
20 μ - 2 μ	6	8
2 μ	8	12

COUNTRY		PROJECT		LAND UNIT		PROFILE	7
GEOG COORDS E		N					

HORIZON			THICKNESS & DEPTH	BDY CLAR	BDY SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	ABUND %	SIZE mm	CONT.	COLOUR	ABUND %	SIZE mm	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE GRADE	SIZE	TYPE	GRADE	SIZE	TYPE		MOISTURE	D/SM	M/VH	W	W	CEMN	ROOTS No. 3^2dm^3	SIZE mm	TYPE
0	0	0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft.	25Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	Fib
2	II	2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10³	3-10	wdy.
3	III	3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr.	75YR 3 3	3 3	>15	pr.	75YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4	IV	4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gr FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6		6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60			col			col			xh	x.fm						
7		7 7 7				75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Ba H CL	>60			pl			pl				comp						
8		8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Ot																	
9		9 9 9	23	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft.	25Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	Fib
2	II	2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10³	3-10	wdy.
3	III	3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr.	75YR 3 3	3 3	>15	pr.	75YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m	sh	f	v	v	ind	>10³	>10	
4	IV	4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gr FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6		6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60			col			col			xh	x.fm						
7		7 7 7	23			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Ba H CL	>60			pl			pl				comp						
8		8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Ot																	
9		9 9 9	37	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0 0 0		0	0																														
1	I	1 1 1		ab	sm																														
2	II	2 2 2		cl	wa																														
3	III	3 3 3		gr	ir																														
4	IV	4 4 4		di	br																														
5	V	5 5 5																																	
6		6 6 6																																	
7		7 7 7																																	
8		8 8 8																																	
9		9 9 9		nr	nr																														

Massive secondary ironpan

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No. 10^2/dm²	SIZE mm	TYPE	No/ dm²	SIZE mm	SHAP	No./ dm²	SIZE mm	SHAP	No./ dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THK NESS	POSI TION	COLOUR			TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	< 5	<1	pl	< 5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	Soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	Ang	Ind	15-25	>250	Ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	< 5	<1	pl	< 5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	Soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	Ang	Ind	15-25	>250	Ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

SITE DATA

Location	Bauchi - Ningi road. Culvert 8/5.
Position	Lower slope
Slope	Concave slope >1°
Parent material	Alluvium.
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Imperfectly drained.
Vegetation	Tree savanna.

FOR DISCUSSION.

Soil genesis	The soil is developed on alluvium.
Drainage	Although colours of 10YR 5/2 occur in this profile, the soil is not considered as poorly drained for they occur below 50 cm (See Part III).
Classification	1. Fluvisols are developed from alluvial deposits. Some fluvisols are defined simply as receiving fresh sediments which is often difficult to determine; it must be inferred from the site, and not from soil characteristics. This is very unsatisfactory, but on this basis the soil is considered to be receiving fresh sediment and therefore to be a fluvisol as it occurs on a concave slope close to a stream line. (See Part III).
F A O	Dystric Fluvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1 0-35	2 35-51	3 51-96	4 96-120	5 120-132	6 132-190
pH 1:2.5 H_2O	5.8	5.4	6.1	6.1	6.1	5.9
Exch. Na meq %	0.1	0.2	0.5	0.8	0.4	0.1
Exch. K meq %	0.1	0.1	0.1	0.1	0.1	T
Exch. Mg meq %	1.1	0.9	0.6	0.6	0.2	0.1
Exch. Ca meq %	6.4	5.5	3.2	3.4	1.5	0.6
TEB. meq/100 g	7.7	6.7	4.4	4.9	2.2	0.8
CEC meq/100 g	10.7	11.0	7.9	10.7	3.8	1.7
Base saturation %	72	61	56	46	58	47
% org. C o.d.s.	76	42	41	31	30	16
Mechanical analysis						
2 000 μ - 200 μ	20	7	10	10	36	47
200 μ - 50 μ	22	17	20	20	30	31
50 μ - 20 μ	24	30	28	22	14	12
20 μ - 2 μ	12	14	16	16	8	4
2 μ	22	32	26	32	12	6

COUNTRY	PROJECT	LAND UNIT	PROFILE 8
GEOG COORDS E	N		

HORIZON	THICKNESS & DEPTH	BDY	PREDOMINANT COLOUR	OTHER COLOURS	TEXTURE	Coarse Material	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
		CLAR / SHAP	PED INTERIOR (DRY) / PED INTERIOR (WET) / PED SURFACE (DRY) / PED SURFACE (WET)	ABUND % / SIZE MM / CONT. / COLOUR / ABUND % / SIZE MM / CONT. / COLOUR		ABUND. %	DEV / SIZE / TYPE / DEV / SIZE / TYPE		D/SM / M/VM / W / W / CEMN	No. / SIZE mm / TYPE
1	35									
2	51									
3	96									
4	120									
5	132									
6	200									

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
1	3	2	500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
1	3	2	500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			600-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000						1	2	5													8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

The Batu Association. Profiles 9, 10, 11, 12.

Location	The Batu Association occurs in the north and central parts of the Basement Complex region between 9^{o} 10' E - 10^{o} 20' E and 10^{o} 25' N - 11^{o} 00' N.
Altitude	550 - 490 m (1 800 - 1 600 ft).
Geology	Basement Complex - predominantly granitic gneiss.
Land form	The unit forms a gently undulating plain with narrow interfluve crests and broad planar to concave valley side slopes. Second and third order streams are often incised with flat valley floors. Relative relief is usually about 15 m (50 ft) and the inselbergs stand up to 120 m (400 ft) above the surface of the plain. The drainage pattern is dendritic and the texture is coarse.
Rock outcrops	There are few small and medium rock outcrops mainly occurring on interfluves.
Ironpan	There are few small ironpan outcrops mainly around the inselbergs though some outcrop on lower slopes. The ironpan forms sheets and occasionally small scarps.
Dominant soils.	Baram Series - Gleyic Luvisol Ringim Series - Orthic Solonetz Rowta Series - Solodic Planosol.

SITE DATA.

Location	Bauchi - Ningi road. 400 yards north of Mile Post 15.
Position	Upper slope
Slope	Convex slope 1^{o}
Parent material	Granite gneiss
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Imperfectly drained.
Vegetation	Tree savanna

FOR DISCUSSION.

Soil genesis	The soil is probably developed almost in situ, but the presence of some fragments of ironpan in the upper part of the profile points to some lateral movement.
Drainage	The soil is considered as imperfectly drained because of the presence of colours of 2.5Y 5/2 within 150 cm of the surface.
Classification	The classification depends on whether Horizon 5 is considered to be an argillic horizon or part of the C horizon. Cutans are found in Horizon 5, so it could be argillic. Cutans are also found in Horizon 6 but the structure is predominantly that of the rock so it is considered to be a C horizon.
F A O	Eutric Cambisol (Orthic Luvisol if Horizon 5 is considered to form an argillic horizon).
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1 0-13	2 13-28	3 28-50	4 50-79	5 79-102	6 102-150
pH 1:2.5 H_2O	6.5	6.4	6.2	6.4	-	-
Exch. Na meq %	T	T	T	0.1	0.3	0.5
Exch. K meq %	0.3	0.1	0.2	0.3	0.3	0.2
Exch. Mg meq %	1.1	1.1	1.2	1.4	1.6	1.2
Exch. Ca meq %	7.2	6.0	5.8	7.2	12.5	11.9
TEB. meq/100 g	8.6	7.2	7.2	9.0	14.7	13.8
CEC meq/100 g	9.4	7.9	8.0	10.1	16.6	19.7
Base saturation %	91	91	90	89	89	70
% org. C o.d.s.	94	63	47	23	-	-
Mechanical analysis						
2 000 μ - 200 μ	41	40	41	50	-	
200 μ - 50 μ	25	25	20	9		
50 μ - 20 μ	14	13	13	9		
20 μ - 2 μ	8	6	4	4		
2 μ	12	16	22	28		

COUNTRY	PROJECT	LAND UNIT	PROFILE 9
GEOG COORDS E	N		

HORIZON	THICKNESS & DEPTH	BDY CLAR	BDY SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS ABUND %	SIZE mm	CONT.	COLOUR	ABUND %	SIZE mm	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE DEV	SIZE	TYPE	DEV	SIZE	TYPE		MOISTURE	CONSISTENCE D. SM	M. VM	W	W	CEMN	ROOTS No.	SIZE mm	TYPE
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0	0	0	5Y 0 0	0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1	<5	ft	25Y 1 1	1	<5	ft.	25Y 1 1	By C C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2	5-15	di	10YR 2 2	2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10³	3-10	wdy.
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3	>15	pr.	75YR 3 3	3	>15	pr.	75YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4			5YR 4 4	4			5YR 4 4	Gri FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5			25YR 5 5	5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6 6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6			10R 6 6	6			10R 6 6	My S S	40-60			col			col			xh	x.fm						
7 7 7 7				75R 7 7	75R 7 7	75R 7 7	75R 7 7	7			75R 7 7	7			75R 7 7	BrH H CL	>60			pl			pl				[illegible]						
8 8 8 8				8 8	8 8	8 8	8 8	8			8 8	8			8 8	OH																	
9 9 9 9	13	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9	nr	nr	nr nr nr	9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr

Thickness & depth of subsequent horizons: 28; 50; 79; 102; 200

9

ROOTS	VOIDS			MINERAL GRAINS		STONES (inert or decaying)		CUTANS	OTHER CONCENTRATIONS		
No./dm², Size mm, Type	No./dm², Size mm, Shap	No./dm², Size mm, Shap	No./dm², Size mm, Shap	Abun %, Size mm, Type	Abun %, Size mm, Type	Abun %, Size mm, Shap, Type	Abun %, Size mm, Shap, Type	Dev., Thickness, Position, Colour, Type	Abun %, Size mm, Hard's, Shap, Type	Abun %, Size mm, Hard's, Shap, Type	
0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 5Y 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
0-10 <3 fib	<5 <1 pl	<5 <1 pl	<5 <1 pl	0-15 <.25 Ind.	0-15 <.25 Ind.	1-5 2-20 rnd p.m.	1-5 2-20 rnd p.m.	wk thin v.face 25Y 1 1 clay	1-5 <2 soft rnd clay	1-5 <2 soft rnd clay	1 1 1 1 1
10-10² 3-10 wdy	5-10 1-2 tub	5-10 1-2 tub	5-10 1-2 tub	15-50 .25-.5 Qz	15-50 .25-.5 Qz	5-10 20-75 s.rnd inh conc	5-10 20-75 s.rnd inh conc	md thick h.face 10YR 2 2 R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	2 2 2 2 2
>10² >10	10-20 2-5	10-20 2-5	10-20 2-5	>50 >.5 Fm	>50 >.5 Fm	10-15 75-250 irreg Qz	10-15 75-250 irreg Qz	stg pores 7.5YR 3 3 MnO_2	10-15 20-75 hd irreg MnO_2	10-15 20-75 hd irreg MnO_2	3 3 3 3 3
	20-50 <5	20-50 >5	20-50 7.5	Mi	Mi	15-25 >250 ang Ind	15-25 >250 ang Ind	1+2 5YR 4 4 SiO_2	15-25 >75 v.hd ang SiO_2	15-25 >75 v.hd ang SiO_2	4 4 4 4 4
	50-200	50-200	50-200	Fel	Fel	25-40 tab	25-40 tab	1+3 2.5YR 5 5 Carb	25-40 tab Carb	25-40 tab Carb	5 5 5 5 5
	200-500	200-500	200-500	Ca Mg	Ca Mg	40-60 comb	40-60 comb	2+3 10R 6 6 Gyp	40-60 pl Gyp	40-60 pl Gyp	6 6 6 6 6
	500-2000	500-2000	500-2000			>60	>60	1+2+3 7.5R 7 7 Sol. Salt	>60 Sol. Salt	>60 Sol. Salt	7 7 7 7 7
	>2000	>2000	>2000					8 8			8 8 8 8 8
nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr nr	nr nr nr nr	nr nr nr nr nr nr nr	nr nr nr nr nr	nr nr nr nr nr	9 9 9 9 9
0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 5Y 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
0-10 <3 fib	<5 <1 pl	<5 <1 pl	<5 <1 pl	0-15 <.25 Ind.	0-15 <.25 Ind.	1-5 2-20 rnd p.m.	1-5 2-20 rnd p.m.	wk thin v.face 25Y 1 1 clay	1-5 <2 soft rnd clay	1-5 <2 soft rnd clay	1 1 1 1 1
10-10² 3-10 wdy	5-10 1-2 tub	5-10 1-2 tub	5-10 1-2 tub	15-50 .25-.5 Qz	15-50 .25-.5 Qz	5-10 20-75 s.rnd inh conc	5-10 20-75 s.rnd inh conc	md thick h.face 10YR 2 2 R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	2 2 2 2 2
>10² >10	10-20 2-5	10-20 2-5	10-20 2-5	>50 >.5 Fm	>50 >.5 Fm	10-15 75-250 irreg Qz	10-15 75-250 irreg Qz	stg pores 7.5YR 3 3 MnO_2	10-15 20-75 hd irreg MnO_2	10-15 20-75 hd irreg MnO_2	3 3 3 3 3
	20-50 <5	20-50 >5	20-50 7.5	Mi	Mi	15-25 >250 ang Ind	15-25 >250 ang Ind	1+2 5YR 4 4 SiO_2	15-25 >75 v.hd ang SiO_2	15-25 >75 v.hd ang SiO_2	4 4 4 4 4
	50-200	50-200	50-200	Fel	Fel	25-40 tab	25-40 tab	1+3 2.5YR 5 5 Carb	25-40 tab Carb	25-40 tab Carb	5 5 5 5 5
	200-500	200-500	200-500	Ca Mg	Ca Mg	40-60 comb	40-60 comb	2+3 10R 6 6 Gyp	40-60 pl Gyp	40-60 pl Gyp	6 6 6 6 6
	500-2000	500-2000	500-2000			>60	>60	1+2+3 7.5R 7 7 Sol. Salt	>60 Sol. Salt	>60 Sol. Salt	7 7 7 7 7
	>2000	>2000	>2000					8 8			8 8 8 8 8
nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr nr	nr nr nr nr	nr nr nr nr nr nr nr	nr nr nr nr nr	nr nr nr nr nr	9 9 9 9 9
0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 5Y 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
0-10 <3 fib	<5 <1 pl	<5 <1 pl	<5 <1 pl	0-15 <.25 Ind.	0-15 <.25 Ind.	1-5 2-20 rnd p.m.	1-5 2-20 rnd p.m.	wk thin v.face 25Y 1 1 clay	1-5 <2 soft rnd clay	1-5 <2 soft rnd clay	1 1 1 1 1
10-10² 3-10 wdy	5-10 1-2 tub	5-10 1-2 tub	5-10 1-2 tub	15-50 .25-.5 Qz	15-50 .25-.5 Qz	5-10 20-75 s.rnd inh conc	5-10 20-75 s.rnd inh conc	md thick h.face 10YR 2 2 R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	2 2 2 2 2
>10² >10	10-20 2-5	10-20 2-5	10-20 2-5	>50 >.5 Fm	>50 >.5 Fm	10-15 75-250 irreg Qz	10-15 75-250 irreg Qz	stg pores 7.5YR 3 3 MnO_2	10-15 20-75 hd irreg MnO_2	10-15 20-75 hd irreg MnO_2	3 3 3 3 3
	20-50 <5	20-50 >5	20-50 7.5	Mi	Mi	15-25 >250 ang Ind	15-25 >250 ang Ind	1+2 5YR 4 4 SiO_2	15-25 >75 v.hd ang SiO_2	15-25 >75 v.hd ang SiO_2	4 4 4 4 4
	50-200	50-200	50-200	Fel	Fel	25-40 tab	25-40 tab	1+3 2.5YR 5 5 Carb	25-40 tab Carb	25-40 tab Carb	5 5 5 5 5
	200-500	200-500	200-500	Ca Mg	Ca Mg	40-60 comb	40-60 comb	2+3 10R 6 6 Gyp	40-60 pl Gyp	40-60 pl Gyp	6 6 6 6 6
	500-2000	500-2000	500-2000			>60	>60	1+2+3 7.5R 7 7 Sol. Salt	>60 Sol. Salt	>60 Sol. Salt	7 7 7 7 7
	>2000	>2000	>2000		1 1 4			8 8			8 8 8 8 8
nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr nr	nr nr nr nr	nr nr nr nr nr nr nr	nr nr nr nr nr	nr nr nr nr nr	9 9 9 9 9
0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 5Y 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
0-10 <3 fib	<5 <1 pl	<5 <1 pl	<5 <1 pl	0-15 <.25 Ind.	0-15 <.25 Ind.	1-5 2-20 rnd p.m.	1-5 2-20 rnd p.m.	wk thin v.face 25Y 1 1 clay	1-5 <2 soft rnd clay	1-5 <2 soft rnd clay	1 1 1 1 1
10-10² 3-10 wdy	5-10 1-2 tub	5-10 1-2 tub	5-10 1-2 tub	15-50 .25-.5 Qz	15-50 .25-.5 Qz	5-10 20-75 s.rnd inh conc	5-10 20-75 s.rnd inh conc	md thick h.face 10YR 2 2 R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	2 2 2 2 2
>10² >10	10-20 2-5	10-20 2-5	10-20 2-5	>50 >.5 Fm	>50 >.5 Fm	10-15 75-250 irreg Qz	10-15 75-250 irreg Qz	stg pores 7.5YR 3 3 MnO_2	10-15 20-75 hd irreg MnO_2	10-15 20-75 hd irreg MnO_2	3 3 3 3 3
	20-50 <5	20-50 >5	20-50 7.5	Mi	Mi	15-25 >250 ang Ind	15-25 >250 ang Ind	1+2 5YR 4 4 SiO_2	15-25 >75 v.hd ang SiO_2	15-25 >75 v.hd ang SiO_2	4 4 4 4 4
	50-200	50-200	50-200	Fel	Fel	25-40 tab	25-40 tab	1+3 2.5YR 5 5 Carb	25-40 tab Carb	25-40 tab Carb	5 5 5 5 5
	200-500	200-500	200-500	Ca Mg	Ca Mg	40-60 comb	40-60 comb	2+3 10R 6 6 Gyp	40-60 pl Gyp	40-60 pl Gyp	6 6 6 6 6
	500-2000	500-2000	600-2000			>60	>60	1+2+3 7.5R 7 7 Sol. Salt	>60 Sol. Salt	>60 Sol. Salt	7 7 7 7 7
	>2000	>2000	>2000					8 8			8 8 8 8 8
nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr nr	nr nr nr nr	nr nr nr nr nr nr nr	nr nr nr nr nr	nr nr nr nr nr	9 9 9 9 9
0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 5Y 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
0-10 <3 fib	<5 <1 pl	<5 <1 pl	<5 <1 pl	0-15 <.25 Ind.	0-15 <.25 Ind.	1-5 2-20 rnd p.m.	1-5 2-20 rnd p.m.	wk thin v.face 25Y 1 1 clay	1-5 <2 soft rnd clay	1-5 <2 soft rnd clay	1 1 1 1 1
10-10² 3-10 wdy	5-10 1-2 tub	5-10 1-2 tub	5-10 1-2 tub	15-50 .25-.5 Qz	15-50 .25-.5 Qz	5-10 20-75 s.rnd inh conc	5-10 20-75 s.rnd inh conc	md thick h.face 10YR 2 2 R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	2 2 2 2 2
>10² >10	10-20 2-5	10-20 2-5	10-20 2-5	>50 >.5 Fm	>50 >.5 Fm	10-15 75-250 irreg Qz	10-15 75-250 irreg Qz	stg pores 7.5YR 3 3 MnO_2	10-15 20-75 hd irreg MnO_2	10-15 20-75 hd irreg MnO_2	3 3 3 3 3
	20-50 <5	20-50 >5	20-50 7.5	Mi	Mi	15-25 >250 ang Ind	15-25 >250 ang Ind	1+2 5YR 4 4 SiO_2	15-25 >75 v.hd ang SiO_2	15-25 >75 v.hd ang SiO_2	4 4 4 4 4
	50-200	50-200	50-200	Fel	Fel	25-40 tab	25-40 tab	1+3 2.5YR 5 5 Carb	25-40 tab Carb	25-40 tab Carb	5 5 5 5 5
	200-500	200-500	200-500	Ca Mg	Ca Mg	40-60 comb	40-60 comb	2+3 10R 6 6 Gyp	40-60 pl Gyp	40-60 pl Gyp	6 6 6 6 6
	500-2000	600-2000	500-2000			>60	>60	1+2+3 7.5R 7 7 Sol. Salt	>60 Sol. Salt	>60 Sol. Salt	7 7 7 7 7
	>2000	>2000	>2000		1 1 4			8 8			8 8 8 8 8
nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr nr	nr nr nr nr	nr nr nr nr nr nr nr	nr nr nr nr nr	nr nr nr nr nr	9 9 9 9 9
0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 5Y 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
0-10 <3 fib	<5 <1 pl	<5 <1 pl	<5 <1 pl	0-15 <.25 Ind.	0-15 <.25 Ind.	1-5 2-20 rnd p.m.	1-5 2-20 rnd p.m.	wk thin v.face 25Y 1 1 clay	1-5 <2 soft rnd clay	1-5 <2 soft rnd clay	1 1 1 1 1
10-10² 3-10 wdy	5-10 1-2 tub	5-10 1-2 tub	5-10 1-2 tub	15-50 .25-.5 Qz	15-50 .25-.5 Qz	5-10 20-75 s.rnd inh conc	5-10 20-75 s.rnd inh conc	md thick h.face 10YR 2 2 R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	5-10 2-20 m.hd s.rnd R_2O_3	2 2 2 2 2
>10² >10	10-20 2-5	10-20 2-5	10-20 2-5	>50 >.5 Fm	>50 >.5 Fm	10-15 75-250 irreg Qz	10-15 75-250 irreg Qz	stg pores 7.5YR 3 3 MnO_2	10-15 20-75 hd irreg MnO_2	10-15 20-75 hd irreg MnO_2	3 3 3 3 3
	20-50 <5	20-50 >5	20-50 7.5	Mi	Mi	15-25 >250 ang Ind	15-25 >250 ang Ind	1+2 5YR 4 4 SiO_2	15-25 >75 v.hd ang SiO_2	15-25 >75 v.hd ang SiO_2	4 4 4 4 4
	50-200	50-200	50-200	Fel	Fel	25-40 tab	25-40 tab	1+3 2.5YR 5 5 Carb	25-40 tab Carb	25-40 tab Carb	5 5 5 5 5
	200-500	200-500	200-500	Ca Mg	Ca Mg	40-60 comb	40-60 comb	2+3 10R 6 6 Gyp	40-60 pl Gyp	40-60 pl Gyp	6 6 6 6 6
	500-2000	500-2000	500-2000			>60	>60	1+2+3 7.5R 7 7 Sol. Salt	>60 Sol. Salt	>60 Sol. Salt	7 7 7 7 7
	>2000	>2000	>2000					8 8			8 8 8 8 8
nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr nr	nr nr nr nr	nr nr nr nr nr nr nr	nr nr nr nr nr	nr nr nr nr nr	9 9 9 9 9

SITE DATA.

Location	Bauchi - Ningi road. 450 yards north of Mile Post 15.
Position	Crest of interfluve
Slope	Convex slope 1°
Parent material	Unconsolidated surface material, mainly ironpan rubble.
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Imperfectly drained.
Vegetation	Tree savanna.

FOR DISCUSSION.

Soil genesis

1. The soil is developed on gravel composed of fragments of ironpan. The presence of micas indicates that some gneissic material is present. The abrupt discontinuity between Horizon 3 and 4 suggests that the gravel has moved laterally.

2. The sandy surface horizon may be partly wind blown material.

Drainage

Colours of 10YR 6 /2 together with mottles within 150 cm of the surface so the soil is considered to be imperfectly drained. (See Part III). There is considerable difficulty in distinguishing present day and inherited mottling in this profile. It is also possible that the gleyed colours are inherited.

Classification

1. Cutans are present in Horizon 4 and it can be considered an argillic horizon. The discontinuity between Horizons 3 and 4 is at less than 1 m so the soil is a Luvisol (See Part III).

2. There are more than 20% of iron concentrations in the lower part of the profile so the soil is a Ferric Luvisol.

F A O	Ferric Luvisol - concretionary phase
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)				
	1 0-18	2 18-60	3 60-86	4 86-100	5 100-150
pH 1:2.5 H_2O	6.6	5.6	6.3	6.0	5.8
Exch. Na meq %	0.1	0.1	0.1	0.2	0.5
Exch. K meq %	0.2	0.3	0.2	0.3	0.3
Exch. Mg meq %	0.9	0.9	0.5	1.3	2.2
Exch. Ca meq %	5.6	5.5	3.5	8.1	14.3
TEB. meq/100 g	6.8	6.8	4.3	9.9	17.3
CEC meq/100 g	6.6	9.1	5.1	12.2	20.5
Base saturation %	100	75	84	81	84
% org. C o.d.s.	94	37	33	10	07
Mechanical analysis					
2 000 μ - 200 μ	37	26	58	32	226
200 μ - 50 μ	24	13	9	10	10
50 μ - 20 μ	19	13	7	8	12
20 μ - 2 μ	8	8	6	8	12
2 μ	12	40	20	42	40

COUNTRY		PROJECT		LAND UNIT		PROFILE	10
GEOG COORDS E		N					

HORIZON	THICKNESS & DEPTH	BDY	PREDOMINANT COLOUR	OTHER COLOURS	TEXTURE	Coarse Material	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
		CLAR SHAP	PED INTERIOR (DRY) · PED INTERIOR (WET) · PED SURFACE (DRY) · PED SURFACE (WET)	ABUND % · SIZE mm · CONT. · COLOUR · ABUND % · SIZE mm · CONT. · COLOUR		ABUND. %	DEV SIZE TYPE · DEV SIZE TYPE		D/SM · M/VM · W · W · CEMN	No. · SIZE mm · TYPE
1	18									
2	60									
3	86									
4	100 / 146									
5	100 / 180									
6										

Weathered granite gneiss

10

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No. 10²dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THK NESS	POSI TION	COLOUR			TYPE	ABUN %	SIZE mm	HARDNESS	SHAP	TYPE	ABUN %	SIZE mm	HARDNESS	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	5-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	5-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	5-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000													1	1	4	1					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<6	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	5-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<6	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	5-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000						1	1	4													8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

SITE DATA

Location	Bauchi - Ningi road. Culvert 15/3
Position	Valley head
Slope	**Concave slope** 1^{o}
Parent material	Granite gneiss.
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	Poor
Vegetation	Open woodland.

FOR DISCUSSION

Soil genesis

1. The soil is probably developed almost in situ from the underlying granite gneiss.

2. The carbonates may be derived from calc-alkaline felspars in the rock.

3. The sandy surface horizon may be partly wind blown material.

Drainage

Horizon 3 is probably waterlogged at times due to impeded drainage above the compact lower horizons. This is reflected by the pale colours.

Classification

1. There are cutans within 50 cm of the surface, and although these may be pressure faces they must be considered diagnostic of an argillic horizon, and the soil classed as a Luvisol.

2. Colours of 2.5Y 5/2 within 50 cm of the surface indicate the presence of a gleyic horizon, so the soil is a Gleyic Luvisol.

3. The exchangeable sodium percentage in this profile is less than 6 but some rather similar soils in the area have an ESP greater than 15 and are classed as Gleyic Solonetz. In others the albic horizon is well developed and they might be considered as Planosols.

F A O	Gleyic Luvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)						
	1 0-13	2 13-24	3 24-38	4 38-71	5 71-105	6 105-142	7 142-185
pH 1:2.5 H_2O	6.0	6.2	6.5	8.4	8.9	8.8	8.8
Exch. Na meq %	0.3	0.4	1.0	1.7	1.7	2.1	2.1
Exch. K meq %	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Exch. Mg meq %	1.2	0.6	1.3	2.4	2.0	2.3	2.1
Exch. Ca meq %	6.4	4.4	8.6	15.7	16.5	17.9	17.9
TEB. meq/100 g	8.0	5.5	11.1	20.1	20.5	22.6	22.4
CEC meq/100 g	9.8	7.7	13.4	20.1	21.2	22.3	22.6
Base saturation %	82	71	83	100	97	100	99
Exchangeable Sodium percentage	1.1	2.4	3.5	3.5	4.1	4.4	5.4
% org. C o.d.s.	38	38	27	20	12	09	06
Mechanical analysis							
2 000 μ - 200 μ	28	31	23	18	18	16	18
200 μ - 50 μ	18	16	12	10	8	9	10
50 μ - 20 μ	28	31	23	20	26	23	24
20 μ - 2 μ	8	4	10	12	10	12	8
2 μ	18	18	32	40	38	40	40

COUNTRY		PROJECT		LAND UNIT		PROFILE	11

GEOG COORDS E | N

HORIZON	THICKNESS & DEPTH	BDY CLAR	BDY SHAP	PED INTERIOR (DRY)			PED INTERIOR (WET)			PED SURFACE (DRY)			PED SURFACE (WET)			OTHER COLOURS ABUND %	SIZE mm	CONT.	COLOUR			ABUND %	SIZE mm	CONT.	COLOUR			TEXTURE			Coarse Material ABUND. %	STRUCTURE GRADE	SIZE	TYPE	GRADE	SIZE	TYPE		MOISTURE	CONSISTENCE D SM	M VM	W	W	CEM	ROOTS No. 3^2dm^2	SIZE mm	TYPE
0 0 0 0 0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	5Y	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y	1	1	25Y	1	1	25Y	1	1	25Y	1	1	1	<5	ft	25Y	1	1	1	<5	ft.	25Y	1	1	By	C	C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	5-15	di	10YR	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10²	3-10	wdy.
3 III 3 3 3		gr	ir	75YR	3	3	75YR	3	3	75YR	3	3	75YR	3	3	3	>15	pr.	75YR	3	3	3	>15	pr.	75YR	3	3	Gra	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10²	>10	
4 IV 4 4 4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4			5YR	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR	5	5	25YR	5	5	25YR	5	5	25YR	5	5	5			25YR	5	5	5			25YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6 6 6 6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6			10R	6	6	6			10R	6	6	My	S	S	40-60			col			col			xh	x.fm						
7 7 7 7				75R	7	7	75R	7	7	75R	7	7	75R	7	7	7			75R	7	7	7			75R	7	7	BA	H	CL	>60			pl			pl				comp						
8 8 8 8					8	8		8	8		8	8		8	8	8				8	8	8				8	8	Oth																			
9 9 9 9		nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	nr	nr	nr	nr	nr	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.

Depths of horizons 1 to 7: 13, 24, 38, 71, 142, 185, 21?

Weathered granite gneiss

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE					
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

Profile 12.

SITE DATA.

Location	Bauchi - Ningi road. Culvert 16/1.
Position	Lower slope
Slope	Concave slope 1^{o}
Parent material	Alluvium
Underlying rock	Granite gneiss of the Basement Complex.
Drainage	**Poor.**
Vegetation	Open woodland.

FOR DISCUSSION

Soil genesis. The soil is developed on alluvium. The nearby gulley shows stratification and some horizons may be correlated with those in the profile.

Classification Similar problems arise at this site as with Profile 8. The soil is classified as a Fluvisol because it occurs on a concave slope close to a stream line, and is therefore thought to be receiving fresh sediment. (See Part III).

F A O	Eutric Fluvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)				
	1 0-15	2 15-43	3 43-65	4 65-89	5 89-120
pH 1:2.5 H_2O	6.1	6.6	7.5	8.5	8.9
Exch. Na meq %	0.5	1.2	1.6	1.4	4.2
Exch. K meq %	0.2	0.2	0.3	0.2	0.4
Exch. Mg meq %	1.8	1.2	1.4	0.8	2.2
Exch. Ca meq %	10.5	8.2	8.3	5.2	13.3
TEB. meq/100 g	13.0	10.8	11.6	7.6	20.1
CEC meq/100 g	16.4	14.5	12.3	8.0	16.2
Base saturation %	79	74	94	95	100
% org. C o.d.s.	1.52	60	35	20	10
Mechanical analysis					
2 000 μ - 200 μ	18	17	19	36	29
200 μ - 50 μ	16	12	18	20	12
50 μ - 20 μ	22	29	27	22	19
20 μ - 2 μ	12	18	16	8	8
2 μ	32	24	20	14	22

COUNTRY	PROJECT	LAND UNIT	PROFILE
			1 2

GEOG COORDS E | N

HORIZON	THICKNESS & DEPTH	BDY	PREDOMINANT COLOUR	OTHER COLOURS	TEXTURE	Coarse Material	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
1	15									
2	43									
3	65									
4	89									
5	120/150									
6										

Weathered granite gneiss

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No. dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					CaMg			CaMg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					CaMg			CaMg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					CaMg			CaMg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab	Feb			1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					CaMg			CaMg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			600-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000													1	1	4	2					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab	Feb	25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					CaMg			CaMg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			600-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

The Biri Association.   Profiles 13, 14.

Location	The Biri Association occurs in the northern part of the Basement Complex region between 9° 45' E - 9° 55' E and 10° 45' N - 11° 00' N.
Altitude	520 - 490 m (1 700 - 1 600 ft)
Geology	Basement Complex - predominantly granite gneiss.
Land form	The unit is a gently undulating plain with broad slightly convex to planar interfluves and shallow but well marked narrow concave valleys. The relative relief is 15 m (50 ft) and inselbergs stand at 90 m (300 ft) above the level of the plain. The drainage pattern is dendritic with a very coarse texture.
Rock outcrops	There are few small and medium rock outcrops occurring mainly on the interfluves as whalebacks and small inselbergs.
Ironpan	Ironpan occurs on the interfluves as extensive sheets.
Dominant soil	Miya Series - Eutric Cambisol - concretionary phase.

Profile 13.

SITE DATA

Location	Bauchi-Ningi road. Village of Miya.
Position	Upper slope close to inselberg.
Slope	Convex slope 1^{o}.
Parent material	Wind blown material
Underlying rock	Granite gneiss of the Basement Complex
Drainage	Well drained.
Vegetation	Cultivated.

FOR DISCUSSION

Soil genesis

1. The soil is developed on material that is though to be largely of aeolian origin.

2. The coarse quartz and felspar fragments have probably been incorporated by surface wash of material derived from the nearby inselberg.

3. The mottling in the lower part of the profile is probably due to lateral movement of run off water from the inselberg.

Classification

1. The cutans in Horizon 3 are diagnostic for an argillic horizon and are associated with a maximum in the percentage clay. Percentage base saturation is greater than 50 so the soil is a Luvisol.

2. There are more than 20% of mottles with hues redder than 7.5YR so the soil can be classed as Ferric.

F A O	Ferric Luvisol
French	
Ghana	
USDA	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1	2	3	4	5	6
pH 1:2.5 H_2O	5.8	5.6	5.9	6.1	6.2	6.4
Exch. Na meq %	Nil	Nil	Nil	Nil	Nil	Nil
Exch. K meq %	0.1	0.1	0.1	0.1	0.1	T
Exch. Mg meq %	0.3	0.2	0.5	0.5	0.3	0.2
Exch. Ca meq %	1.4	1.4	3.7	3.4	2.2	1.7
TEB. meq/100 g	1.8	1.7	4.3	4.0	2.6	1.9
CEC meq/100 g	2.1	2.1	5.2	4.4	2.9	2.6
Base Saturation %	86	81	83	91	90	73
Mechanical analysis						
2 000 /u - 200 /u	32	32	26	21	27	24
200 /u - 50 /u	56	53	43	50	53	57
50 /u - 20 /u	6	7	9	7	8	9
20 /u - 2 /u	2	2	0	4	2	2
2 /u	4	6	22	13	10	8

COUNTRY		PROJECT		LAND UNIT		PROFILE	13
GEOG COORDS E		N					

HORIZON	THICKNESS & DEPTH	BDY (CLAR, SHAP)	PREDOMINANT COLOUR (PED INTERIOR (DRY), PED INTERIOR (WET), PED SURFACE (DRY), PED SURFACE (WET))	OTHER COLOURS (ABUND %, SIZE mm, CONT., COLOUR, ABUND %, SIZE mm, CONT., COLOUR)	TEXTURE	Coarse Material ABUND. %	STRUCTURE (DEV, SIZE, TYPE, DEV, SIZE, TYPE)	MOISTURE	CONSISTENCE (D. SM, M. VM, W, W, CEMN)	ROOTS (No., SIZE mm, TYPE)
1	32									
2	48									
3	105									
4	148									
5	185									
6	220									

ROOTS No./dm²	Size	Type	VOIDS No./dm²	Size mm	Shap	No./dm²	Size	Shap	No./dm²	Size	Shap	MINERAL GRAINS Abun%	Size mm	Type	Abun%	Size mm	Type	STONES (inert or decaying) Abun%	Size mm	Shap	Type	Abun%	Size mm	Shap	Type	CUTANS Dev.	Thickness	Position	Colour			Type	OTHER CONCENTRATIONS Abun%	Size mm	Hard	Shap	Type	Abun%	Size mm	Hard	Shap	Type					
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000			1	1	2				>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

SITE DATA.

Location	Bauchi - Ningi road. Culvert 36/1.
Position	Mid slope
Slope	Planar slope >1^{o}
Parent material	Wind blown material overlying ironpan.
Underlying rock	Granite gneiss of the Basement Complex
Drainage	Well drained
Vegetation	Shurb savanna

FOR DISCUSSION

Soil genesis

The soil is developed on material that is partly aeolian in origin and that overlies secondary recemented ironpan. The coarse quartz grains within the profile indicate that material derived from the Basement Complex rocks is maixed with the wind blown deposits.

Drainage

Colours of high chroma and value occur throughout the profile so the soil is considered well drained. (see Part (ii). If the mottling in Horizons 3 and 4 are thought to be due to present day hydromorphism, they may indicate impeded drainage above the ironpan.

Classification

1. There is little profile development and the percentage base saturation is greater than 50 so it is classed as a Eutric Cambisol.

2. Because hard ironpan occurs within one metre the soil is classed as petroferric phase. (See Part III).

F A O — Eutric Cambisol-petroferric phase.

French

Ghana

U S D A

ANALYSES

Characteristic	Horizon (depth in cm)			
	1 0-18	2 18-38	3 38-57	4 57-76
pH 1:2.5 H_2O	6.3	5.4	5.9	6.3
Exch. Na meq %	Nil	T	T	T
Exch. K meq %	0.2	0.1	0.2	0.2
Exch. Mg meq %	0.7	1.1	1.1	0.9
Exch. Ca meq %	3.5	3.4	4.8	4.8
TEB. meq/100 g	4.4	4.6	6.1	5.9
CEC meq/100 g	4.7	7.2	7.6	6.8
Base saturation %	94	64	80	87
% org. C o.d.s.	71	36	21	21
Mechanical analysis				
2 000 /u - 200 /u	30	26	23	30
200 /u - 50 /u	40	23	25	25
50 /u - 20 /u	14	21	20	15
20 /u - 2 /u	2	4	4	4
2 /u	14	26	28	26

COUNTRY		PROJECT		LAND UNIT		PROFILE	1 4

GEOG COORDS E		N	

HORIZON	THICKNESS & DEPTH	BDY	PREDOMINANT COLOUR	OTHER COLOURS	TEXTURE	Coarse Material	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
		CLAR SHAP	PED INTERIOR (DRY) / PED INTERIOR (WET) / PED SURFACE (DRY) / PED SURFACE (WET)	ABUND % / SIZE mm / CONT. / COLOUR / ABUND % / SIZE mm / CONT. / COLOUR		ABUND. %	PDEV / SIZE / TYPE / PDEV / SIZE / TYPE		D SM / M VM / W / W / CEMN	No. / SIZE mm / TYPE
0 I 1 1 1 … 9 9 9 9	18	ab, cl, gr, di / sm, wa, ir, br	5Y, 25Y, 10YR, 75YR, 5YR, 25YR, 10R, 75R, nr	0, 1, <5, 5-15, >15, ft, di, pr, 5Y, 25Y, 10YR, 75YR, 5YR, 25YR, 10R, 75R, nr	By, St, Gra, Gri, Py, My, Ba, C, Si, L, FS, CS, S, H, CL	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	vw, w, m, s, vs / vf, f, m, c, vc / cr, gr, sab, ab, pr, col, pl / simple, comp, trans, trans down	dry, s.m., m., vm, w	lo, so, sh, h, vh, xh / lo, vf, f, fm, v.fm, x.fm, comp / s, st, v / s, pl, v / wk, stg, ind	0-10, 10-10³, >10³ / <3, 3-10, >10 / fib, wdy
0 I 1 1 1 … 9 9 9 9	38									
0 I 1 1 1 … 9 9 9 9	57									
0 I 1 1 1 … 9 9 9 9	76									
0 I 1 1 1 … 9 9 9 9	90	ab, cl, gr, di / sm, wa, ir, br	Massive secondary ironpan							

ROOTS			VOIDS									MINERAL GRAINS					
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi
			* 50-200			* 50-200			50-200			*		Fel			Fel
			200-500			200-500			200-500					Ca Mg			Ca Mg
			500-2000			500-2000			500-2000								
			>2000			>2000			>2000								
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi
			* 50-200			* 50-200			50-200			*		Fel			Fel
			200-500			200-500			200-500					Ca Mg			Ca Mg
			500-2000			500-2000			500-2000								
			>2000			>2000			>2000								
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi
			* 50-200			* 50-200			50-200			*		Fel			Fel
			200-500			200-500			200-500					Ca Mg			Ca Mg
			500-2000			500-2000			500-2000								
			>2000			>2000			>2000								
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz
10^2	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi
			* 50-200			* 50-200			50-200			*		Fel			Fel
			200-500			200-500			200-500					Ca Mg			Ca Mg
			500-2000			500-2000			500-2000								
			>2000			>2000			>2000								
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr

STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	TH'K NESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE					
O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
10-16	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
												8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
10-16	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
												8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
1-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
												8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	O	O	O	O	O	O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
* 25-40		tab		25-40		tab		*		1+3	25YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
												8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

The Wawa Association. Profiles 15, 16.

Location	The Wawa Association covers most of the Kerri Kerri Sandstone area. It stretches from 10° 20' to 11° 10' E and from 9° 45' to 11° 10' N.
Altitude	300 - 600 m (1 000 - 2 000 ft).
Geology	Kerri Kerri Sandstone.
Land form	The unit forms an undulating plain with long planar to convex slopes. Locally dune patterns can be recognised on the aerial photographs. The drainage pattern is dendritic with a very coarse texture.
Rock outcrops	There are hardly any rock outcrops.
Ironpan	There is ironpan on some small hills rising above the plain.
Dominant soil	Wawa Series - Dystric Nitosol.

Profile 15.

SITE DATA.

Location	Bauchi - Gombe road. Culvert 59/1.
Position	Upper slope
Slope	Convex slope 1°
Parent material	Unconsolidated surface material derived from Kerri Kerri Sandstone.
Underlying rock	Kerri Kerri Sandstone.
Drainage	Well drained.
Vegetation	Tree savanna

FOR DISCUSSION.

Soil genesis

As reworking of the surface layers of the Kerri Kerri Sandstone is widespread in this area, the soil is probably developed on reworked Kerri Kerri material. However the only evidence of this reworking in this profile is the presence of occasional rounded pebbles.

Classification

1. The percentage clay is less than 15 throughout the profile so the soil is classed as an Arenosol.

2. The B horizon does not have the characteristics of an oxic B horizon, nor is it albic or luvic so the soil is a Cambic Arenosol.

F A O	Cambic Arenosol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)				
	1 0-22	2 22-52	3 52-107	4 107-175	5 175-243
pH 1:2.5 H_2O	6.2	5.4	5.4	5.2	5.2
Exch. Na meq %	Nil	Nil	Nil	Nil	Nil
Exch. K meq %	T	0.1	0.1	0.1	0.1
Exch. Mg meq %	0.3	0.2	0.2	0.3	0.3
Exch. Ca meq %	0.9	0.6	0.6	0.5	0.4
TEB. meq/100 g	1.2	0.9	0.9	0.9	0.8
CEC meq/100 g	1.0	1.2	1.3	1.7	1.8
Base saturation %	>100	75	69	53	44
% org. C o.d.s.	19	13	07	05	05
Mechanical analysis					
2 000 μ - 200 μ	52	54	50	61	51
200 μ - 50 μ	37	32	32	20	27
50 μ - 20 μ	5	2	8	3	6
20 μ - 2 μ	2	4	4	2	2
2 μ	4	8	6	14	14

COUNTRY		PROJECT		LAND UNIT		PROFILE	15
GEOG COORDS E		N					

HORIZON	THICKNESS & DEPTH	BDY CLAR	BDY SHAP	PREDOMINANT COLOUR PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS ABUND %	SIZE mm	CONT.	COLOUR	ABUND %	SIZE mm	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE DEV	SIZE	TYPE	DEV	SIZE	TYPE		MOISTURE	CONSISTENCE D/SM	M/VM	W	W	CEMN	ROOTS No.	SIZE mm	TYPE
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10^2	3-10	wdy
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gr L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10^3	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gr FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6 6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60			col			col			xh	x.fm						
7 7 7 7				75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Bk H CL	>60			pl			pl				comp						
8 8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oh																	
9 9 9 9	22	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10^2	3-10	wdy
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gr L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10^3	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gr FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6 6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60			col			col			xh	x.fm						
7 7 7 7				75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Bk H CL	>60			pl			pl				comp						
8 8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oh																	
9 9 9 9	52	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10^2	3-10	wdy
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gr L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10^3	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gr FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6 6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60			col			col			xh	x.fm						
7 7 7 7				75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Bk H CL	>60			pl			pl				comp						
8 8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oh																	
9 9 9 9	107	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10^2	3-10	wdy
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gr L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10^3	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gr FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6 6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60			col			col			xh	x.fm						
7 7 7 7				75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Bk H CL	>60			pl			pl				comp						
8 8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oh																	
9 9 9 9	175	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft	25Y 1 1	By C C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10^2	3-10	wdy
3 III 3 3 3		gr	ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3	>15	pr	75YR 3 3	3 3	>15	pr	75YR 3 3	Gr L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10^3	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gr FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5			25YR 5 5	5 5			25YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6 6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	My S S	40-60			col			col			xh	x.fm						
7 7 7 7				75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7			75R 7 7	7 7			75R 7 7	Bk H CL	>60			pl			pl				comp						
8 8 8 8				8 8	8 8	8 8	8 8	8 8			8 8	8 8			8 8	Oh																	
9 9 9 9	243	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No. dm^2	Size mm	Type	No./dm^2	Size mm	Shap	No./dm^2	Size mm	Shap	No./dm^2	Size mm	Shap	Abun %	Size mm	Type	Abun %	Size mm	Type	Abun %	Size mm	Shap	Type	Abun %	Size mm	Shap	Type	Dev.	Thkness	Position	Colour			Type	Abun %	Size mm	Hard Ds	Shap	Type	Abun %	Size mm	Hard Ds	Shap	Type					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-16	75-250	irreg	Qz	10-16	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<6	<1	pl	<6	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
1	3	2	500-2000			500-2000			600-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<6	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

Profile 16.

SITE DATA.

Location	Bauchi - Gombe road. Culvert 59/1.
Position	Lower slope
Slope	Concave slope $<1^{o}$
Parent material	Unconsolidated surface material, possibly alluvium.
Underlying rock	Kerri Kerri Standstone
Drainage	Imperfectly drained.
Vegetation	Tree savanna.

FOR DISCUSSION.

Soil genesis	The soil is developed on material that has accumulated by alluvial or colluvial processes in this valley.
Drainage	The soil has a colour of 10 YR 6/3 in Horizon 3 and is thus considered imperfectly drained. Although arenosols may form an exception to the colour criteria for assessing drainage (See Part III) the presence of mottling in Horizon 3 indicates impedance of the drainage.
Classification	1. The percentage clay is less than 15 throughout the profile so it can be considered an Arenosol.
F A O	Cambic Arenosol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1 0-13	2 13-58	3 58-101	4 101-135	5 135-158	6 158-180
pH 1:2.5 H_2O	6.0	5.3	5.8	5.8	5.6	5.8
Exch. Na meq %	Nil	Nil	Nil	Nil	Nil	Nil
Exch. K meq %	0.1	T	T	T	T	T
Exch. Mg meq %	0.3	0.3	0.1	0.1	0.1	0.3
Exch. Ca meq %	1.2	1.3	0.5	0.5	0.7	1.1
TEB. meq/100 g	1.6	1.6	0.6	0.6	0.8	1.4
CEC meq/100 g	2.1	2.2	0.7	0.6	1.2	2.0
Base saturation %	76	73	86	100	67	70
% org. C o.d.s.	36	32	05	10	12	3
Mechanical analysis						
2 000 μ - 200 μ	26	36	43	30	31	42
200 μ - 50 μ	41	40	42	39	32	34
50 μ - 20 μ	19	10	7	13	17	12
20 μ - 2 μ	6	6	4	4	8	4
2 μ	8	8	4	14	12	8

COUNTRY	PROJECT	LAND UNIT	PROFILE 16

GEOG COORDS E | N

HORIZON	THICKNESS & DEPTH	BDY (CLAR, SHAP)	PREDOMINANT COLOUR: PED INTERIOR (DRY), PED INTERIOR (WET), PED SURFACE (DRY), PED SURFACE (WET)	OTHER COLOURS: ABUND %, SIZE mm, CONT., COLOUR, ABUND %, SIZE mm, CONT., COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE: DEV, SIZE, TYPE, DEV, SIZE, TYPE	MOISTURE	CONSISTENCE: D SM, M VM, W, W, CEMN	ROOTS: No., SIZE mm, TYPE
0 0 0 0 0		0 0	5Y 0 0 5Y 0 0 5Y 0 0 5Y 0 0	0 0 0 5Y 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1 2.5Y 1 1 2.5Y 1 1 2.5Y 1 1	1 <5 ft 2.5Y 1 1 1 1 <5 ft 2.5Y 1 1	By C C	1-5	w vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2 10YR 2 2 10YR 2 2 10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3 7.5YR 3 3 7.5YR 3 3 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3 3 3 >15 pr 7.5YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4 5YR 4 4 5YR 4 4 5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5 2.5YR 5 5 2.5YR 5 5 2.5YR 5 5	5 5 2.5YR 5 5 5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6 10R 6 6 10R 6 6 10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			7.5R 7 7 7.5R 7 7 7.5R 7 7 7.5R 7 7	7 7 7.5R 7 7 7 7 7.5R 7 7	BA H CL	>60	pl pl		comy	
8 8 8			8 8 8 8 8 8 8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9	13	nr nr	nr nr nr nr nr nr nr nr nr nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0 0		0 0	5Y 0 0 5Y 0 0 5Y 0 0 5Y 0 0	0 0 0 5Y 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1 2.5Y 1 1 2.5Y 1 1 2.5Y 1 1	1 <5 ft 2.5Y 1 1 1 1 <5 ft 2.5Y 1 1	By C C	1-5	w vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2 10YR 2 2 10YR 2 2 10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3 7.5YR 3 3 7.5YR 3 3 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3 3 3 >15 pr 7.5YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4 5YR 4 4 5YR 4 4 5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5 2.5YR 5 5 2.5YR 5 5 2.5YR 5 5	5 5 2.5YR 5 5 5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6 10R 6 6 10R 6 6 10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			7.5R 7 7 7.5R 7 7 7.5R 7 7 7.5R 7 7	7 7 7.5R 7 7 7 7 7.5R 7 7	BA H CL	>60	pl pl		comy	
8 8 8			8 8 8 8 8 8 8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9	58	nr nr	nr nr nr nr nr nr nr nr nr nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0 0		0 0	5Y 0 0 5Y 0 0 5Y 0 0 5Y 0 0	0 0 0 5Y 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1 2.5Y 1 1 2.5Y 1 1 2.5Y 1 1	1 <5 ft 2.5Y 1 1 1 1 <5 ft 2.5Y 1 1	By C C	1-5	w vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2 10YR 2 2 10YR 2 2 10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3 7.5YR 3 3 7.5YR 3 3 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3 3 3 >15 pr 7.5YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4 5YR 4 4 5YR 4 4 5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5 2.5YR 5 5 2.5YR 5 5 2.5YR 5 5	5 5 2.5YR 5 5 5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6 10R 6 6 10R 6 6 10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			7.5R 7 7 7.5R 7 7 7.5R 7 7 7.5R 7 7	7 7 7.5R 7 7 7 7 7.5R 7 7	BA H CL	>60	pl pl		comy	
8 8 8			8 8 8 8 8 8 8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9	101	nr nr	nr nr nr nr nr nr nr nr nr nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0 0		0 0	5Y 0 0 5Y 0 0 5Y 0 0 5Y 0 0	0 0 0 5Y 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1 2.5Y 1 1 2.5Y 1 1 2.5Y 1 1	1 <5 ft 2.5Y 1 1 1 1 <5 ft 2.5Y 1 1	By C C	1-5	w vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2 10YR 2 2 10YR 2 2 10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3 7.5YR 3 3 7.5YR 3 3 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3 3 3 >15 pr 7.5YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4 5YR 4 4 5YR 4 4 5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5 2.5YR 5 5 2.5YR 5 5 2.5YR 5 5	5 5 2.5YR 5 5 5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6 10R 6 6 10R 6 6 10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			7.5R 7 7 7.5R 7 7 7.5R 7 7 7.5R 7 7	7 7 7.5R 7 7 7 7 7.5R 7 7	BA H CL	>60	pl pl		comy	
8 8 8			8 8 8 8 8 8 8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9	135	nr nr	nr nr nr nr nr nr nr nr nr nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0 0		0 0	5Y 0 0 5Y 0 0 5Y 0 0 5Y 0 0	0 0 0 5Y 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1 2.5Y 1 1 2.5Y 1 1 2.5Y 1 1	1 <5 ft 2.5Y 1 1 1 1 <5 ft 2.5Y 1 1	By C C	1-5	w vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2 10YR 2 2 10YR 2 2 10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3 7.5YR 3 3 7.5YR 3 3 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3 3 3 >15 pr 7.5YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4 5YR 4 4 5YR 4 4 5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5 2.5YR 5 5 2.5YR 5 5 2.5YR 5 5	5 5 2.5YR 5 5 5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6 10R 6 6 10R 6 6 10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			7.5R 7 7 7.5R 7 7 7.5R 7 7 7.5R 7 7	7 7 7.5R 7 7 7 7 7.5R 7 7	BA H CL	>60	pl pl		comy	
8 8 8			8 8 8 8 8 8 8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9	250	nr nr	nr nr nr nr nr nr nr nr nr nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0 0		0 0	5Y 0 0 5Y 0 0 5Y 0 0 5Y 0 0	0 0 0 5Y 0 0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1 2.5Y 1 1 2.5Y 1 1 2.5Y 1 1	1 <5 ft 2.5Y 1 1 1 1 <5 ft 2.5Y 1 1	By C C	1-5	w vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2 10YR 2 2 10YR 2 2 10YR 2 2	2 2 5-15 di 10YR 2 2 2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl stg	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3 7.5YR 3 3 7.5YR 3 3 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3 3 3 >15 pr 7.5YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4 5YR 4 4 5YR 4 4 5YR 4 4	4 4 5YR 4 4 4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5 2.5YR 5 5 2.5YR 5 5 2.5YR 5 5	5 5 2.5YR 5 5 5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6			10R 6 6 10R 6 6 10R 6 6 10R 6 6	6 6 10R 6 6 6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			7.5R 7 7 7.5R 7 7 7.5R 7 7 7.5R 7 7	7 7 7.5R 7 7 7 7 7.5R 7 7	BA H CL	>60	pl pl		comy	
8 8 8			8 8 8 8 8 8 8 8	8 8 8 8 8 8 8 8	Oth					
9 9 9		nr nr	nr nr nr nr nr nr nr nr nr nr nr nr	9 9 nr nr nr nr nr 9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No. 10²dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD D/S	SHAP	TYPE	ABUN %	SIZE mm	HARD D/S	SHAP	TYPE			
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0 0 0 0		
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1 1 1 1 1		
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2 2 2 2 2		
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3 3 3 3 3		
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4 4 4 4 4		
*			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5 5 5 5 5		
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6 6 6 6 6		
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7 7 7 7 7		
			>2000			>2000			>2000																					8	8												8 8 8 8 8		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9 9 9 9 9		

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0 0 0 0		
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1 1 1 1 1		
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2 2 2 2 2		
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3 3 3 3 3		
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4 4 4 4 4		
*			* 50-200			50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5 5 5 5 5		
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6 6 6 6 6		
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7 7 7 7 7		
			>2000			>2000			>2000																					8	8												8 8 8 8 8		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9 9 9 9 9		

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0 0 0 0		
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1 1 1 1 1		
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2 2 2 2 2		
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3 3 3 3 3		
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4 4 4 4 4		
*			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5 5 5 5 5		
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6 6 6 6 6		
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7 7 7 7 7		
			>2000			>2000			>2000																					8	8												8 8 8 8 8		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9 9 9 9 9		

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0 0 0 0		
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1 1 1 1 1		
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2 2 2 2 2		
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3 3 3 3 3		
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4 4 4 4 4		
*			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5 5 5 5 5		
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6 6 6 6 6		
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7 7 7 7 7		
			>2000			>2000			>2000																					8	8												8 8 8 8 8		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9 9 9 9 9		

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0 0 0 0		
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1 1 1 1 1		
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2 2 2 2 2		
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3 3 3 3 3		
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4 4 4 4 4		
*			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5 5 5 5 5		
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6 6 6 6 6		
			500-2000			600-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7 7 7 7 7		
			>2000			>2000			>2000																					8	8												8 8 8 8 8		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9 9 9 9 9		

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0 0 0 0		
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1 1 1 1 1		
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2 2 2 2 2		
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3 3 3 3 3		
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4 4 4 4 4		
*			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5 5 5 5 5		
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6 6 6 6 6		
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7 7 7 7 7		
			>2000			>2000			>2000																					8	8												8 8 8 8 8		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9 9 9 9 9		

Garko Association. Profiles 17, 18.

Location	The Garko Association occurs in a long, narrow belt stretching 90 km North and 50 km South of Gombe. (10° 50' - 11° 20' E and 9° 50' - 11° 00' N).
Altitude	240 to 400 m (720 to 1 200 ft).
Geology	Gombe sandstone. In the eastern part older rocks may be exposed in valley bottoms. Part of the soil material is derived from the Kerri Kerri Sandstone to the West.
Land form	The area consists of very gently undulating valley floors and colluvial fans with slightly convex to planar slopes. The streams are sharply incised. Relative relief is in the order of 15 m (50 ft). The drainage network is dendritic with a coarse texture.
Rock outcrops	Few outcrops of sandstone may occur anywhere along the slope. They are more frequent on upper slopes.
Ironpan	No ironpan was observed.
Dominant soils	Ferralic Arenosol - Kumo Series Chromic Luvisol - Dingaya Series. Garko Series - Orthic Luvisol

Profile 17.

SITE DATA.

Location	Gombe - Biu road. Mile Post 72.
Position	Upper slope
Slope	Convex slope 1°
Parent material	Unconsolidated material derived mainly from Gombe Sandstone.
Underlying rock	Gombe Sandstone.
Drainage	Well drained.
Vegetation	Tree savanna

FOR DISCUSSION

Soil Genesis

1. The soil is developed on material that is probably derived from Gombe Sandstone that has partly infilled this valley site.

Classification.

1. Horizon 4 can be considered as an argillic horizon and the soil is classified as a Luvisol.

2. The cation exchange capacity is greater than 24 meq. % clay so the soil is not a Ferric Luvisol and is classed as Chromic on the basis of the red colours.

F A O	Chromic Luvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)						
	1 0-14	2 14-51	3 51-81	4 81-102	5 102-132	6 132-178	7 178-210
pH 1:2.5 H_2O	6.2	6.2	6.3	6.4	6.4	6.5	6.6
Exch. Na meq %	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Exch. K meq %	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Exch. Mg meq %	0.3	0.5	0.3	0.9	0.9	0.8	0.8
Exch. Ca meq %	1.7	3.4	2.1	4.4	4.0	4.1	4.2
TEB. meq/100 g	2.1	4.0	2.5	5.4	5.0	5.1	5.2
CEC meq/100 g	2.4	4.4	3.2	6.4	6.2	6.1	5.7
Base saturation %	88	91	78	84	81	84	91
% org. C o.d.s.	43	44	24	24	20	13	10
Mechanical analysis 2 000 μ - 200 μ 200 μ - 50 μ 50 μ - 20 μ 20 μ - 2 μ 2 μ							

COUNTRY	PROJECT	LAND UNIT	PROFILE 17
GEOG COORDS E	N		

HORIZON	THICKNESS & DEPTH	BDY	PREDOMINANT COLOUR	OTHER COLOURS	TEXTURE	Coarse Material	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
1	14									
2	51									
3	81									
4	102									
5	178									
6	210									

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	mod	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

SITE DATA.

Location	Gombe - Biu road. Culvert 71/2.
Position	Lower slope
Slope	Concave slope 1^{o}
Parent material	Unconsolidated material derived from Gombe Sandstone.
Underlying material	Gombe Sandstone.
Drainage	Imperfectly drained.
Vegetation	Tree savanna.

FOR DISCUSSION.

Soil	1. The soil is developed on material that is probably derived from Gombe Sandstone, that has partly infilled this valley site.
Drainage	The colours of 7.5 6/3 and the presence of mottling in Horizon 3 means that the soil is imperfectly drained. (see Part III). This must be considered a borderline case for the underlying horizons have much brighter colours.
Classification	1. The cutans in Horizon 4 and 5 indicate an argillic horizon and the soil is classed as a Luvisol.
	2. The cation exchange capacity is greater than 24 meq. % clay. The soil is not strongly mottled so it is not a Ferric Luvisol. It must therefore be classed as an Orthic Luvisol.
F A O	Orthic Luvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1 0-24	2 24-46	3 46-74	4 74-96	5 96-148	6 148-200
pH 1:2.5 H_2O	6.6	6.4	6.3	5.6	5.8	6.5
Exch. Na meq %	Nil	Nil	Nil	0.1	0.2	0.2
Exch. K meq %	0.1	0.1	0.1	0.1	0.2	0.2
Exch. Mg meq %	0.6	0.3	0.3	0.7	1.2	2.0
Exch. Ca meq %	2.9	2.0	1.7	2.3	3.3	5.2
TEB. meq/100 g	3.6	2.4	2.1	3.2	4.9	7.6
CEC meq/100 g	3.9	3.7	2.4	4.1	5.0	8.9
Base saturation %	92	65	88	78	98	85
% org. C o.d.s.	52	32	18	12	09	12
Mechanical analysis 2 000 μ - 200 μ 200 μ - 50 μ 50 μ - 20 μ 20 μ - 2 μ 2 μ						

COUNTRY	PROJECT	LAND UNIT	PROFILE 18
GEOG COORDS E	N		

HORIZON	THICKNESS & DEPTH	BDY (CLAR / SHAP)	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS (ABUND % / SIZE mm / CONT. / COLOUR)	OTHER COLOURS (ABUND % / SIZE mm / CONT. / COLOUR)	TEXTURE	Coarse Material ABUND. %	STRUCTURE (DEV / SIZE / TYPE / DEV / SIZE / TYPE)	MOISTURE	CONSISTENCE (D/SM / M/VM / W / W / CEMN)	ROOTS (No. / SIZE mm / TYPE)
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	w vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gr FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	BaH H CL	>60	pl pl		comp	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	On					
9 9 9 9		nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

Horizon depths: 24, 46, 74, 96, 148, 200

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No./dm^2	SIZE mm	TYPE	No./dm^2	SIZE mm	SHAP	No./dm^2	SIZE	SHAP	No./dm^2	SIZE	SHAP	ABUN %	SIZE	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v. face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	cub	5-10	1-2	cub	5-10	1-2	cub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h. face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					

Kwaya Association. Profiles 19, 20, 21.

Location	The Kwaya Association occurs on the Basement Complex area to the south west of Biu, between 11° 40' and 12° 10' E and 10° 00' and 10° 30' N.
Altitude	300 to 500 m (1 200 to 1 600 ft).
Geology	Basement Complex, predominantly coarse granite and migmatite.
Land form	This unit forms an undulating plain with narrow, convex interfluves and concave valleys. Relative relief is in the order of 30 m (100 ft). There is a fine dendritic drainage pattern.
Rock outcrops	There are few to common medium outcrops, occurring mainly on upper and middle slopes as low whalebacks.
Ironpan	Ironpan has not been observed in this unit.
Dominant soils.	Busra Series - Eutric Lithosol. Kaltungo Series - Cambic Arenosol Barriki Series - Chromic Luvisol Gnoe Series - Orthic Luvisol

SITE DATA.

Location	Gombe - Biu road. 800 yards east of Mile Post 21.
Position	Upper slope
Slope	Convex slope 1°
Parent material	Granite of the Basement Complex
Underlying rock	Granite of the Basement Complex.
Drainage	Well drained.
Vegetation	Arable.

FOR DISCUSSION.

Soil genesis

The soil is developed on weathered granite. The clear boundary between Horizons 2 and 3 marks a discontinuity in the profile and it is probable that there has been some lateral movement of the material forming the upper part of the profile.

Classification

1. If Horizons 3 and 4 are considered to be part of the B horizon the soil can be classed as a Chromic Luvisol. If Horizons 3 and 4 are thought to be part of the C horizon then the soil is a Chromic Cambisol.

2. Many of the rock fragments in Horizon 3 and 4 are more than 2 mm in diameter, and as they occur within 100 cm of the surface they must constitute a stony phase. The rock is not coherent enough for the soil to be regarded as having a lithic phase.

3. Soils with a high proportion of coarse material are classified on the characteristics of a very small percentage of the whole soil. This is not very satisfactory.

SITE DATA

F A O	Chromic Luvisol - stony phase (Chromic Cambisol if Horizon 3 and 4 are thought to be part of the C horizon.
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)			
	1 0-27	2 27-43	3 43-87	4 87-137
pH 1:2.5 H_2O				
Exch. Na meq %	Nil	Nil	+	0.1
Exch. K meq %	0.4	0.2	0.2	0.3
Exch. Mg meq %	0.5	0.4	1.4	0.8
Exch. Ca meq %	2.6	3.3	5.1	5.3
TEB. meq/100 g	3.5	3.9	6.7	6.5
CEC meq/100 g	3.8	4.1	8.3	7.8
Base saturation %	92	95	81	83
% org. C o.d.s.				
Mechanical analysis 2 000 μ - 200 μ 200 μ - 50 μ 50 μ - 20 μ 20 μ - 2 μ 2 μ				

COUNTRY		PROJECT		LAND UNIT		PROFILE	19
GEOG COORDS E		N					

HORIZON	THICKNESS & DEPTH	BDY (CLAR, SHAP)	PREDOMINANT COLOUR: PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS: ABUND % / SIZE mm / CONT.	COLOUR	ABUND % / SIZE mm / CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE (DEV, SIZE, TYPE, DEV, SIZE, TYPE)	MOISTURE	CONSISTENCE (D/SM, M/VM, W, W, CEMN)	ROOTS (No. per dm², SIZE mm, TYPE)
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0	5Y 0 0	0 0 0 0	5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	1 1 <5 ft	2.5Y 1 1	1 1 <5 fr.	2.5Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl ws	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di	10YR 2 2	2 2 5-15 di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sty	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3 3 >15 pr.	7.5YR 3 3	3 3 >15 pr.	7.5YR 3 3	Gr L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4	5YR 4 4	4 4	5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans. downl	vm	h fm	
5 V 5 5 5			2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5 5	2.5YR 5 5	5 5	2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6	10R 6 6	6 6	10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7 7			7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7 7	7.5R 7 7	7 7	7.5R 7 7	Bk H CL	>60	pl pl		comp	
8 8 8 8			8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	Ow					
9 9 9 9	27	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr	nr nr nr	9 9 nr nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0	5Y 0 0	0 0 0 0	5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	1 1 <5 ft	2.5Y 1 1	1 1 <5 fr.	2.5Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl ws	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di	10YR 2 2	2 2 5-15 di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sty	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3 3 >15 pr.	7.5YR 3 3	3 3 >15 pr.	7.5YR 3 3	Gr L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4	5YR 4 4	4 4	5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans. downl	vm	h fm	
5 V 5 5 5			2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5 5	2.5YR 5 5	5 5	2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6	10R 6 6	6 6	10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7 7	43		7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7 7	7.5R 7 7	7 7	7.5R 7 7	Bk H CL	>60	pl pl		comp	
8 8 8 8			8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	Ow					
9 9 9 9	58	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr	nr nr nr	9 9 nr nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0	5Y 0 0	0 0 0 0	5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	1 1 <5 ft	2.5Y 1 1	1 1 <5 fr.	2.5Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl ws	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di	10YR 2 2	2 2 5-15 di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sty	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3 3 >15 pr.	7.5YR 3 3	3 3 >15 pr.	7.5YR 3 3	Gr L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4	5YR 4 4	4 4	5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans. downl	vm	h fm	
5 V 5 5 5			2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5 5	2.5YR 5 5	5 5	2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6	10R 6 6	6 6	10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7 7			7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7 7	7.5R 7 7	7 7	7.5R 7 7	Bk H CL	>60	pl pl		comp	
8 8 8 8			8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	Ow					
9 9 9 9	87	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr	nr nr nr	9 9 nr nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0	5Y 0 0	0 0 0 0	5Y 0 0	0 0 0	0	0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	1 1 <5 ft	2.5Y 1 1	1 1 <5 fr.	2.5Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl ws	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di	10YR 2 2	2 2 5-15 di	10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sty	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3 3 >15 pr.	7.5YR 3 3	3 3 >15 pr.	7.5YR 3 3	Gr L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4	5YR 4 4	4 4	5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans. downl	vm	h fm	
5 V 5 5 5			2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5 5	2.5YR 5 5	5 5	2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6	10R 6 6	6 6	10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7 7			7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7 7	7.5R 7 7	7 7	7.5R 7 7	Bk H CL	>60	pl pl		comp	
8 8 8 8			8 8	8 8	8 8	8 8	8 8	8 8	8 8	8 8	Ow					
9 9 9 9	180	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr	nr nr nr	9 9 nr nr	nr nr nr	nr nr nr	nr	nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	5-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab	fels	*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-16	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab	fels	*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000						1	1	4													8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000						1	1	4													8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	75				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			* 50-200			* 50-200			50-200			*		Fel			Fel	* 25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	* 25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000						1	1	4													8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

SITE DATA.

Location	Gombe - Biu road. Culvert 20/4.
Position	Mid slope
Slope	Convex 2^{o}
Parent material	Unconsolidated material derived from granite.
Underlying rock	Granite of the Basement Complex
Drainage	Well drained.
Vegetation	Tree savanna

FOR DISCUSSION

Soil Genesis

The abrupt boundary between Horizons 4 and 5 marks a discontinuity in the profile. The material of the upper horizons is derived from granite and has probably moved laterally. Horizon 5 is in situ granitic material.

Classification

1. As with Profile 19 the classification depends on whether Horizon 5 is considered to be a B or C horizon.

2. In Part III a limit of 1 m was suggested for the classification of soils with discontinuities. Here the discontinuity is at 74 cm. The extent to which Horizon 5 influences the agricultural potential of this soil is debatable.

F A O — Orthic Luvisol - stony phase. (Eutric Cambisol if Horizon 5 is thought to be part of the C horizon)

French

Ghana

U S D A

ANALYSES

Characteristic	Horizon (depth in cm)				
	1 0-12	2 12-23	3 23-43	4 43-60	5 60-132
pH 1:2.5 H_2O	6.2	5.8	5.9	6.0	6.2
Exch. Na meq %	Nil	T	0.1	0.1	0.2
Exch. K meq %	0.3	0.1	0.1	0.1	0.2
Exch. Mg meq %	1.3	0.8	0.8	0.6	1.6
Exch. Ca meq %	6.3	4.6	4.7	3.6	10.4
TEB. meq/100 g	7.9	5.5	5.7	4.4	12.4
CEC meq/100 g	8.3	7.1	6.8	4.8	13.6
Base saturation %	95	77	84	92	91
% org. C o.d.s.	68	44	21	09	07
Mechanical analysis					
2 000 μ - 200 μ	48	46	53	67	48
200 μ - 50 μ	26	26	19	18	28
50 μ - 20 μ	6	8	8	1	2
20 μ - 2 μ	6	6	4	4	6
2 μ	14	14	16	10	16

COUNTRY	PROJECT	LAND UNIT	PROFILE
			20

GEOG COORDS E | N

HORIZON	THICKNESS & DEPTH	BDY	PREDOMINANT COLOUR	OTHER COLOURS	TEXTURE	Coarse Material	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
	12									
	23									
	43									
	60 74									
	132									

Weathered granite.

20

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No. $/dm^2$	SIZE mm	TYPE	No./dm^2	SIZE mm	SHAP	No./dm^2	SIZE mm	SHAP	No./dm^2	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE					
0 0-10 10-10^2 >10^2 nr	0 <3 3-10 >10 nr	0 fib wdy nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 <5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 75 nr	0 pl cub nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz Fm Mi Fel Ca Mg nr	0 0-15 15-50 >50 1 nr	0 <.25 .25-.5 >.5 1 nr	0 Ind. Qz Fm Mi Fel Ca Mg 4 nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc. Qz ind nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc Qz ind Fels nr	0 wk mod stg nr	0 thin thick nr	0 v.face h.face pores 1+2 1+3 2+3 1+2+3 nr	5Y 2.5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	0 1 2 3 4 5 6 7 8 nr	0 1 2 3 4 5 6 7 8 nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
0 0-10 10-10^2 >10^2 nr	0 <3 3-10 >10 nr	0 fib wdy nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 <5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 75 nr	0 pl cub nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz Fm Mi Fel Ca Mg nr	0 0-15 15-50 >50 1 nr	0 <.25 .25-.5 >.5 1 nr	0 Ind. Qz. Fm Mi Fel Ca Mg 4 nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc. Qz ind nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc Qz ind Fels nr	0 wk mod stg nr	0 thin thick nr	0 v.face h.face pores 1+2 1+3 2+3 1+2+3 nr	5Y 2.5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	0 1 2 3 4 5 6 7 8 nr	0 1 2 3 4 5 6 7 8 nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
0 0-10 10-10^2 >10^2 nr	0 <3 3-10 >10 nr	0 fib wdy nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 <5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 75 nr	0 pl cub nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz Fm Mi Fel Ca Mg nr	0 0-15 15-50 >50 1 nr	0 <.25 .25-.5 >.5 1 nr	0 Ind. Qz Fm Mi Fel Ca Mg 4 nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc. Qz ind nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc Qz ind Fels nr	0 wk mod stg nr	0 thin thick nr	0 v.face h.face pores 1+2 1+3 2+3 1+2+3 nr	5Y 2.5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	0 1 2 3 4 5 6 7 8 nr	0 1 2 3 4 5 6 7 8 nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
0 0-10 10-10^2 >10^2 nr	0 <3 3-10 >10 nr	0 fib wdy nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 <5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 75 nr	0 pl cub nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz Fm Mi Fel Ca Mg nr	0 0-15 15-50 >50 1 nr	0 <.25 .25-.5 >.5 1 nr	0 Ind. Qz Fm Mi Fel Ca Mg 4 nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc. Qz ind nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 1 nr	0 2-20 20-75 75-250 >250 1 nr	0 rnd s.rnd irreg ang tab comb 2 nr	0 p.m. inh conc Qz ind Fels 2 nr	0 wk mod stg nr	0 thin thick nr	0 v.face h.face pores 1+2 1+3 2+3 1+2+3 nr	5Y 2.5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	0 1 2 3 4 5 6 7 8 nr	0 1 2 3 4 5 6 7 8 nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
0 0-10 10-10^2 >10^2 nr	0 <3 3-10 >10 nr	0 fib wdy nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 <5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	0 <1 1-2 2-5 >5 nr	0 pl cub nr	0 <5 5-10 10-20 20-50 50-200 200-500 600-2000 >2000 nr	0 <1 1-2 2-5 75 nr	0 pl cub nr	0 0-15 15-50 >50 nr	0 <.25 .25-.5 >.5 nr	0 Ind. Qz Fm Mi Fel Ca Mg nr	0 0-15 15-50 >50 1 nr	0 <.25 .25-.5 >.5 2 nr	0 Ind. Qz Fm Mi Fel Ca Mg 4 nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc. Qz ind nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 2-20 20-75 75-250 >250 nr	0 rnd s.rnd irreg ang tab comb nr	0 p.m. inh conc Qz ind nr	0 wk mod stg nr	0 thin thick nr	0 v.face h.face pores 1+2 1+3 2+3 1+2+3 nr	5Y 2.5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	0 1 2 3 4 5 6 7 8 nr	0 1 2 3 4 5 6 7 8 nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	0 <2 2-20 20-75 >75 nr	0 soft m.hd hd v.hd nr	0 rnd s.rnd irreg ang tab pl nr	0 clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

SITE DATA.

Location	Gombe - Biu road. Culvert 20/3
Position	Lower slope
Slope	Concave slope 1°
Parent material	Unconsolidated material, possibly old alluvium.
Underlying rock	Granite of the Basement Complex.
Drainage	Poorly drained.
Vegetation	Shrub savanna

FOR DISCUSSION

Soil genesis

1. The soil is probably formed in an old alluvium. There are three discontinuities in this profile. Horizons 1 and 2 are probably due to a recent wash of coarse granitic rubble, Horizons 3 and 4 are a fine alluvium and Horizon 5 is coarse material derived from granite. Horizon 6 is possibly another fine clayey alluvium.

Drainage

The low colour values of this soil make it impossible to apply colour criteria to assess the drainage of the soil. Vertisols are thus an exception to the colour criteria. (See Part III).

Classification

1. There is little evidence to suggest that the soil is receiving fresh fluviatile sediment so it cannot be considered a fluvisol.

2. The surface horizons are sandier than the lower part of the profile, and there is not at least 30 percent clay to a depth of 50 cm so the soil cannot be classed as a vertisol. However cracks 1 cm wide occur at 50 cm and cutans are well developed so the soil can be classed as a Vertic Luvisol.

SITE DATA.

F A O	Vertic Luvisol.
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1 0-10	2 10-30	3 30-93	4 93-141	5 141-182	6 182-202
pH 1:2.5 H_2O	6.3	6.6	7.7	8.0	7.4	7.2
Exch. Na meq %	0.2	0.6	1.8	1.8	0.7	1.0
Exch. K meq %	0.3	0.2	0.4	0.3	0.2	0.3
Exch. Mg meq %	3.1	2.4	5.0	5.4	2.4	5.8
Exch. Ca meq %	12.0	14.2	26.4	28.3	11.7	26.7
TEB. meq/100 g	15.6	17.4	33.6	35.8	15.0	33.8
CEC meq/100 g	16.0	18.4	31.9	32.0	13.7	35.5
Base saturation %	98	95	>100	>100	>100	95
% org. C o.d.s.	1.04	70	55	51	05	29
Mechanical analysis						
2 000 /u - 200 /u	46	36	10	14	33	6
200 /u - 50 /u	17	13	4	5	8	3
50 /u - 20 /u	7	9	12	11	1	15
20 /u - 2 /u	10	12	16	16	6	22
2 /u	20	30	58	54	52	54

COUNTRY	PROJECT	LAND UNIT	PROFILE	2 1
GEOG COORDS E	N			

HORIZON	THICKNESS & DEPTH	BDY CLAR SHAP	PREDOMINANT COLOUR: PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS: ABUND % SIZE CONT. COLOUR	ABUND % SIZE CONT. COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE: DEV SIZE TYPE DEV SIZE TYPE	MOISTURE	CONSISTENCE: D/SM M W W CEMN	ROOTS: No. SIZE TYPE
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0	0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gn FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh vfm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oh					
9 9 9	10	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0	0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gn FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh vfm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oh					
9 9 9	30	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0	0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gn FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh vfm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oh					
9 9 9	93	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0	0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gn FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh vfm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oh					
9 9 9	141	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0	0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gn FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh vfm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oh					
9 9 9	182	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.
0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 5Y 0 0	0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	vw vf cr vw vf cr simple	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy.
3 III 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gn FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh vfm	
6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh x.fm	
7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		comp	
8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oh					
9 9 9	202	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

Group	Field	Options
ROOTS	No./dm²	0, 0-10, 10-10², >10², nr
ROOTS	Size mm	0, <3, 3-10, >10, nr
ROOTS	Type	0, fib, wdy, nr
VOIDS	No./dm²	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr
VOIDS	Size mm	0, <1, 1-2, 2-5, <5, nr
VOIDS	Shap	0, pl, cub, nr
VOIDS	No./dm²	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr
VOIDS	Size mm	0, <1, 1-2, 2-5, >5, nr
VOIDS	Shap	0, pl, cub, nr
VOIDS	No./dm²	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr
VOIDS	Size mm	0, <1, 1-2, 2-5, 75, nr
VOIDS	Shap	0, pl, cub, nr
MINERAL GRAINS	Abun %	0, 0-15, 15-50, >50, nr
MINERAL GRAINS	Size mm	0, <.25, .25-.5, >.5, nr
MINERAL GRAINS	Type	0, Ind., Qz, Fm, Mi, Fel, Ca Mg, nr
MINERAL GRAINS	Abun %	0, 0-15, 15-50, >50, nr
MINERAL GRAINS	Size mm	0, <.25, .25-.5, >.5, 1, nr
MINERAL GRAINS	Type	0, Ind., Qz, Fm, Mi, Fel, Ca Mg, 4, nr
STONES (inert or decaying)	Abun %	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr
STONES (inert or decaying)	Size mm	0, 2-20, 20-75, 75-250, >250, nr
STONES (inert or decaying)	Shap	0, rnd, s.rnd, irreg, ang, tab, comb, nr
STONES (inert or decaying)	Type	0, p.m., inh conc, Qz, ind, nr
STONES (inert or decaying)	Abun %	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr
STONES (inert or decaying)	Size mm	0, 2-20, 20-75, 75-250, >250, nr
STONES (inert or decaying)	Shap	0, rnd, s.rnd, irreg, ang, tab, comb, nr
STONES (inert or decaying)	Type	0, p.m., inh conc, Qz, ind, Feh, nr
CUTANS	Dev.	0, wk, md, stg, nr
CUTANS	Thkness	0, thin, thick, nr
CUTANS	Position	0, v.fac, h.fac, pores, 1+2, 1+3, 2+3, 1+2+3, nr
CUTANS	Colour	5Y, 10YR, 7.5YR, 5YR, 2.5YR, 10R, 7.5R, nr
CUTANS	Type	0, 1, 2, 3, 4, 5, 6, 7, 8, nr
CUTANS		0, 1, 2, 3, 4, 5, 6, 7, 8, nr
OTHER CONCENTRATIONS	Type	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr
OTHER CONCENTRATIONS	Abun %	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr
OTHER CONCENTRATIONS	Size mm	0, <2, 2-20, 20-75, >75, nr
OTHER CONCENTRATIONS	Hard's	0, soft, m.hd, hd, v.hd, nr
OTHER CONCENTRATIONS	Shap	0, rnd, s.rnd, irreg, ang, tab, pl, nr
OTHER CONCENTRATIONS	Type	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr
OTHER CONCENTRATIONS	Abun %	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr
OTHER CONCENTRATIONS	Size mm	0, <2, 2-20, 20-75, >75, nr
OTHER CONCENTRATIONS	Hard's	0, soft, m.hd, hd, v.hd, nr
OTHER CONCENTRATIONS	Shap	0, rnd, s.rnd, irreg, ang, tab, pl, nr
OTHER CONCENTRATIONS	Type	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr
		0, 1, 2, 3, 4, 5, 6, 7, 8, 9

(The same form block is printed six times down the page, each with hand-written entries "1 1 4" under the mineral grains columns.)

Palma Association | **Profiles 22, 23, 24.**

Location	The Palma Association forms part of the Biu basalt plateau. It occurs between 11° 45' and 12° 30' E and 10° 20' and 11° 10' N.
Altitude	500 to 850 m (1 600 to 2 800 ft)
Geology	Basalt
Landform	The unit forms gently undulating plains, which are separated by scarps. The slopes are convex to planar. Relative relief is in the order of 15 - 30 m (50 - 100 ft). The narrow, concave valleys form an irregular network.
Rock outcrops	Rock outcrops and large boulders are common throughout most of this unit.
Ironpan	There are no outcrops of ironpan but some strongly ferruginised basalt occurs.
Dominant soils	Gokwal Series - Chromic Luvisol.

SITE DATA.

Location	Gombe - Biu road. 200 yards west of Culvert 13/2.
Position	Upper slope
Slope	Convex slope 1^{o}
Parent material	Basalt
Underlying rock	Basalt.
Drainage	Well drained.
Vegetation	Arable.

FOR DISCUSSION.

Soil genesis

1. The clear boundary between Horizons 3 and 4 marks a discontinuity in the profile. The upper horizons are of reworked basaltic material that has moved laterally.

2. The concretions in the soil are thought to be fragments of ferruginised basalt.

Classification

1. The discontinuity in this soil is at 82 cm and clearly illustrates the problems of classification posed by layered soils. Horizon 4 has moderately well developed cutans and can be considered an argillic horizon. The soil is therefore classed as a Chromic Luvisol.

2. The soil is classed as concretionary phase, but as the concretions are mainly ferruginised basalt it might also be correct to class the soil as stony phase.

F A O	Chromic Luvisol - concretionary phase.
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)				
	1 0-15	2 15-43	3 43-82	4 82-134	5 134-175
pH 1:2.5 H_2O					
Exch. Na meq %	0.1	Nil	Nil	T	0.1
Exch. K meq %	0.4	0.4	0.3	0.2	0.2
Exch. Mg meq %	5.5	5.9	7.2	9.0	15.0
Exch. Ca meq %	8.3	7.0	7.8	9.5	15.5
TEB. meq/100 g	14.3	13.3	15.3	18.7	30.8
CEC meq/100 g	17.4	7.8	20.4	25.2	36.7
Base saturation %	82	>100	75	74	84
% org. C o.d.s.					
Mechanical analysis 2 000 μ - 200 μ 200 μ - 50 μ 50 μ - 20 μ 20 μ - 2 μ 2 μ					

COUNTRY		PROJECT		LAND UNIT		PROFILE	22
GEOG COORDS E		N					

HORIZON	THICKNESS & DEPTH	BDY	PREDOMINANT COLOUR	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
	15									
	43									
	82									
	134									
	175									

Weathered basalt.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No. $/dm^2$	SIZE mm	TYPE	No./dm^2	SIZE mm	SHAP	No./dm^2	SIZE mm	SHAP	No./dm^2	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE	ABUN %	SIZE mm	HARD'S	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

Profile 23.

SITE DATA.

Location	Gombe - Biu road. Mile Post 12.
Position	Mid slope
Slope	Planar to slightly convex slope 1^{o}
Parent material	Basalt
Underlying rock	Basalt
Drainage	Imperfectly drained
Vegetation	Tree savanna

FOR DISCUSSION.

Soil genesis	The soil is developed in situ on basalt. The pit shows the irregular depth of soil development, probably due to irregular weathering of the basalt. The carbonates are probably derived from lime infilled vesicles in the basalt. Concretions in the profile are fragments of ferruginised basalt.
Drainage	Horizon 4 has a colour of 10YR 5/1 so the soil is imperfectly drained. (See Part III).
Classification	1. Although the soil has well developed cracks it does not have slichensides or wedge shaped structural aggregates so it cannot be classed as a Vertisol. 2. There are cutans in Horizons 2 and 3. If Horizon 1 is considered to be eluvial it has more than 40% clay, but Horizons 2 and 3 have at least 8% more clay, so they meet the textural requirements for an argillic horizon. The soil is therefore classed as a Luvisol. It is regarded as a Vertic Luvisol by virtue of the cracking.
F A O	Vertic Luvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)			
	1 0-18	2 18-48	3 48-72	4 72-90
pH 1:2.5 H_2O	7.4	7.8	7.6	7.6
Exch. Na meq %	T	T	0.1	0.1
Exch. K meq %	0.8	0.6	0.9	1.0
Exch. Mg meq %	4.1	3.8	6.0	6.4
Exch. Ca meq %	34.9	45.7	>50	>50
TEB. meq/100 g	39.8	>50	>50	>50
CEC meq/100 g	41.0	40.3	39.4	36.8
Base saturation %	97	>100	>100	>100
% org. C o.d.s.				
Mechanical analysis				
2 000 /u - 200 /u	5	6	8	20
200 /u - 50 /u	6	7	5	8
50 /u - 20 /u	33	21	23	20
20 /u - 2 /u	10	12	8	6
2 /u	46	54	56	46

COUNTRY	PROJECT	LAND UNIT	PROFILE 23
GEOG COORDS E	N		

HORIZON	THICKNESS & DEPTH	BDY (CLAR, SHAP)	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS (ABUND %, SIZE mm, CONT, COLOUR)	OTHER COLOURS (ABUND %, SIZE mm, CONT, COLOUR)	TEXTURE	COARSE MATERIAL ABUND. %	STRUCTURE (GRADE, SIZE, TYPE, GRADE, SIZE, TYPE)	MOISTURE	CONSISTENCE (D/SM, M/VM, W, W, CEMN)	ROOTS (No. /dm², SIZE mm, TYPE)
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	1 1 <5 ft 2.5Y 1 1	1 1 <5 ft 2.5Y 1 1	By C C	1-5	vw vf cr vw vf cr single	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3 3 >15 pr 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5 5 2.5YR 5 5	5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7 7			7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7 7 7.5R 7 7	7 7 7.5R 7 7	BA H CL	>60	pl pl		comp	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oth					
9 9 9 9	18	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	nr nr nr
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	1 1 <5 ft 2.5Y 1 1	1 1 <5 ft 2.5Y 1 1	By C C	1-5	vw vf cr vw vf cr single	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3 3 >15 pr 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5 5 2.5YR 5 5	5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7 7			7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7 7 7.5R 7 7	7 7 7.5R 7 7	BA H CL	>60	pl pl		comp	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oth					
9 9 9 9	48	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	nr nr nr
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	1 1 <5 ft 2.5Y 1 1	1 1 <5 ft 2.5Y 1 1	By C C	1-5	vw vf cr vw vf cr single	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3 3 >15 pr 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5 5 2.5YR 5 5	5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7 7			7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7 7 7.5R 7 7	7 7 7.5R 7 7	BA H CL	>60	pl pl		comp	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oth					
9 9 9 9	72	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	nr nr nr
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	1 1 <5 ft 2.5Y 1 1	1 1 <5 ft 2.5Y 1 1	By C C	1-5	vw vf cr vw vf cr single	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sh	10-10³ 3-10 wdy
3 III 3 3 3		gr ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3 3 >15 pr 7.5YR 3 3	3 3 >15 pr 7.5YR 3 3	Gm L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans down	vm	h fm	
5 V 5 5 5			2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5 5 2.5YR 5 5	5 5 2.5YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	My S S	40-60	col col		xh x.fm	
7 7 7 7			7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7 7 7.5R 7 7	7 7 7.5R 7 7	BA H CL	>60	pl pl		comp	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Oth					
9 9 9 9	90	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	nr nr nr
0 0 0 0 0		0 0												
1 I 1 1 1		ab sm												
2 II 2 2 2		cl wa												
3 III 3 3 3		gr ir												
4 IV 4 4 4		di br												
5 V 5 5 5														
6 6 6 6														
7 7 7 7														
8 8 8 8														
9 9 9 9	100	nr nr												

Weathered basalt

23

Roots No./dm²	Roots Size mm	Roots Type	Voids No./dm²	Size mm	Shap	No./dm²	Size mm	Shap	No./dm²	Size mm	Shap	Mineral grains Abun %	Size mm	Type	Abun %	Size mm	Type	Stones (inert or decaying) Abun %	Size mm	Shap	Type	Abun %	Size mm	Shap	Type	Cutans Dev.	Thkness	Position	Colour			Type	Other concentrations Abun %	Size mm	Hards	Shap	Type	Abun %	Size mm	Hards	Shap	Type					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10^2	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10^2	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10^2	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10^2	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10^2	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10^2	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10^2	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10^2	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr					

Profile 24.

SITE DATA

Location	Gombe - Biu road. 300 yards east of Culvert 11/2.
Position	Upper slope
Slope	Convex slope 1°
Parent material	Basalt
Underlying rock	Basalt
Drainage	Poorly drained
Vegetation	Shrub savanna

FOR DISCUSSION

Soil genesis

The soil is probably developed in situ on basalt. Red well drained soils are usually formed on upper slope sites in this area. The occurrence of this vertisol may be due to poor drainage on a long gentle slope or to a difference in the basalt.

Drainage

The low colour values make it impossible to assess the drainage by colour criteria and this soil forms an exception. (See Part III).

Classification.

F A O	Chromic Vertisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1 0-20	2 20-60	3 60-90	4 90-126	5 126-160	6 160-200
pH 1:2.5 H_2O	6.6	7.2	7.8	8.0	8.1	8.0
Exch. Na meq %	0.1	0.1	0.3	0.6	0.9	1.0
Exch. K meq %	0.6	0.6	0.6	0.5	0.5	0.4
Exch. Mg meq %	10.2	9.5	10.0	10.7	10.7	11.8
Exch. Ca meq %	22.2	24.8	27.3	26.7	25.4	23.9
TEB. meq/100 g	33.1	35.0	38.2	38.5	37.5	37.1
CEC meq/100 g	34.2	38.9	38.3	41.1	33.7	30.6
Base saturation %	97	90	100	94	>100	>100
% org. C o.d.s.	76	48	38	29	19	05
Mechanical analysis						
2 000 μ - 200 μ	5	5	12	4	4	5
200 μ - 50 μ	6	4	5	6	4	6
50 μ - 20 μ	25	21	23	18	24	19
20 μ - 2 μ	12	14	8	12	12	12
2 μ	52	56	52	60	56	58

COUNTRY	PROJECT	LAND UNIT	PROFILE
			24

GEOG COORDS E | N

HORIZON	THICKNESS & DEPTH	BDY (CLAR / SHAP)	PREDOMINANT COLOUR (PED INTERIOR DRY / PED INTERIOR WET)	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
1 (I)	20	gr / sm	10YR 5/4 / 2.5Y 4/2	0	C	1-5	mod. m sab; s c ab	dry	vh	0-10 <3 fib; 10-10³
2 (II)	60	gr / sm	2.5Y 5/2 / 2.5Y 4/2	0	C	1-5	s c ab; comp	s.m.	vh	0-10 <3 fib
3 (III)	126	di / sm	2.5Y 1/1 / 2.5Y 3/2	5, 5-15, di, 10YR 5/8	C	1-5	s c ab; comp	m.	vc pr; v.fm	0-10 <3 fib
4 (IV)	200	di / ir	10YR 5/1	2, 5-15, di, 10YR 5/8	C	1-5	s c ab; vc pr; comp	m.	f.m	0-10 <3 fib
5 (V)	220									

Weathered basalt

2 9.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No./dm²	SIZE mm	TYPE	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	No./dm²	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THICKNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE	ABUN %	SIZE mm	HARDS	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr				
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr				
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000									1	1	1	2									8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr				
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.fac	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.fac	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
																																											9	9	9	9	9
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr				

Location	The Wagur and Kanawa Associations occur within the Cretaceous region. They occur from 10° 35' to 12° 00' E and from 9° 30' to 11° 30' N.
Geology	A range of cretaceous sediments, but dominantly mudstones and shales.
Altitude	200 to 300 m (800 to 900 ft)
Land form	The associations form gently undulating plains with generally broad, convex to planar interfluves. Relative relief is less than 15 m (50 ft). The drainage network is dendritic and of variable density.
Rock outcrops	There are very few rock outcrops. They are mainly restricted to more resistant sandstones and limestones.
Ironpan	Ironpan was not observed.
Dominant soils.	The Wagur Association has a complex soil pattern, while the Kanawa Association has been mapped where large, homogeneous areas of Vertisols occur. Zangaya Series - Orthic Luvisol Kanawa Series - Chromic Vertisol

Profile 25.

SITE DATA.

Location	Gombe - Biu road. Mile Post 65.
Position	Mid slope
Slope	Convex slope 1°.
Parent material	Shale
Underlying rock	Shale
Drainage	Poor
Vegetation	Arable.

FOR DISCUSSION.

Soil genesis — The soil is probably derived almost in situ from the underlying shale. The presence of quartz stones and inherited concretions suggest that some material has been added by lateral movement, particularly in the surface horizon.

Drainage — The low chromas and values of the soil makes it impossible to assess the drainage of the soil from colour criteria.

Classification

F A O	Chromic Vertisol
French	
Ghana	
U S D A	

ANALYSES

Characheristic	Horizon (depth in cm)					
	1 0-20	2 20-44	3 44-77	4 77-107	5 107-146	6 146-175
pH 1:2.5 H_2O	7.9	8.0	8.2	8.4	8.4	8.2
Exch. Na meq %	0.1	0.3	0.8	1.3	2.5	2.5
Exch. K meq %	0.4	0.4	0.4	0.4	0.5	0.4
Exch. Mg meq %	3.0	3.9	5.1	5.1	6.4	6.1
Exch. Ca meq %	29.8	34.3	35.0	29.8	34.5	30.0
TEB. meq/100 g	33.3	38.9	41.3	36.6	43.9	39.0
CEC meq/100 g	39.8	39.1	40.2	41.1	39.6	40.0
Base saturation %	84	99	>100	89	>100	97
% org. C o.d.s.	62	57	47	43	43	32
Mechanical analysis						
2 000 μ - 200 μ	14	16	14	14	16	14
200 μ - 50 μ	7	7	7	8	3	3
50 μ - 20 μ	15	14	11	10	14	14
20 μ - 2 μ	12	12	12	12	9	9
2 μ	52	52	57	56	58	60

COUNTRY	PROJECT	LAND UNIT	PROFILE	2	5
GEOG COORDS E	N				

HORIZON	THICKNESS & DEPTH	BDY (CLAR, SHAP)	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS (ABUND %, SIZE mm, CONT., COLOUR)	OTHER COLOURS (ABUND %, SIZE mm, CONT., COLOUR)	TEXTURE	Coarse Material ABUND. %	STRUCTURE (GRADE, SIZE, TYPE, GRADE, SIZE, TYPE)	MOISTURE	CONSISTENCE (D/SM, M, W, W, CEMN)	ROOTS (No., SIZE mm, TYPE)
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	w vf cr vw vf cr simpl	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sly	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans downl	vm	h fm	
5 V 5 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh ex.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		cemy	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Ok					
9 9 9 9	20	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	w vf cr vw vf cr simpl	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sly	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans downl	vm	h fm	
5 V 5 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh ex.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		cemy	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Ok					
9 9 9 9	44	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	w vf cr vw vf cr simpl	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sly	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans downl	vm	h fm	
5 V 5 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh ex.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		cemy	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Ok					
9 9 9 9	77	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	w vf cr vw vf cr simpl	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sly	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans downl	vm	h fm	
5 V 5 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh ex.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		cemy	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Ok					
9 9 9 9	146	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

HORIZON	THICKNESS & DEPTH	BDY	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS	OTHER COLOURS	TEXTURE	Coarse Material ABUND. %	STRUCTURE	MOISTURE	CONSISTENCE	ROOTS
0 0 0 0 0		0 0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0 0 0 5Y 0 0	0 0 0 0 5Y 0 0	0 0 0	0	0 0 0 0 0 0 0	0	0 0 0 0 0	0 0 0
1 I 1 1 1		ab sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1 <5 ft 25Y 1 1	1 1 <5 ft. 25Y 1 1	By C C	1-5	w vf cr vw vf cr simpl	dry	lo lo s s wk	0-10 <3 fib
2 II 2 2 2		cl wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2 5-15 di 10YR 2 2	2 2 5-15 di 10YR 2 2	St Si Si	5-10	w f gr w f gr comp	s.m.	so vf st pl sly	10-10³ 3-10 wdy.
3 III 3 3 3		gr ir	75YR 3 3	75YR 3 3	75YR 3 3	75YR 3 3	3 3 >15 pr. 75YR 3 3	3 3 >15 pr. 75YR 3 3	Gra L L	10-15	m m sab m m sab trans	m.	sh f v v ind	>10³ >10
4 IV 4 4 4		di br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4 5YR 4 4	4 4 5YR 4 4	Gri FS FS	15-25	s c ab s c ab trans downl	vm	h fm	
5 V 5 5 5			25YR 5 5	25YR 5 5	25YR 5 5	25YR 5 5	5 5 25YR 5 5	5 5 25YR 5 5	Py CS CS	25-40	vs vc pr vs vc pr	w	vh v.fm	
6 6 6 6			10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6 10R 6 6	6 6 10R 6 6	Mg S S	40-60	col col		xh ex.fm	
7 7 7 7			75R 7 7	75R 7 7	75R 7 7	75R 7 7	7 7 75R 7 7	7 7 75R 7 7	Ba H CL	>60	pl pl		cemy	
8 8 8 8			8 8	8 8	8 8	8 8	8 8 8 8	8 8 8 8	Ok					
9 9 9 9	180	nr nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9 nr nr nr nr nr	9 9 nr nr nr nr nr	nr nr nr	nr	nr nr nr nr nr nr nr	nr	nr nr nr nr nr	n.r. n.r. n.r.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS						OTHER CONCENTRATIONS															
No./dm²	Size mm	Type	No/dm²	Size mm	Shap	No./dm²	Size mm	Shap	No./dm²	Size mm	Shap	Abun %	Size mm	Type	Abun %	Size mm	Type	Abun %	Size mm	Shap	Type	Abun %	Size mm	Shap	Type	Dev.	Thickness	Position	Colour			Type	Abun %	Size mm	Hard	Shap	Type	Abun %	Size mm	Hards	Shap	Type					
O 0-10 10-10² >10² nr	O <3 3-10 >10 nr	O fib wdy nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 <5 nr	O pl cub nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 >5 nr	O pl cub nr	O <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 75 nr	O pl cub nr	O 0-15 15-50 >50 * nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 0-15 15-50 >50 nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind * nr	O wk md stg nr	O thin thick nr	O v.fac h.fac pores 1+2 1+3 2+3 1+2+3 nr	5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	O 1 2 3 4 5 6 7 8 nr	O 1 2 3 4 5 6 7 8 nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
O 0-10 10-10² >10² nr	O <3 3-10 >10 nr	O fib wdy nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 <5 nr	O pl cub nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 >5 nr	O pl cub nr	O <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 75 nr	O pl cub nr	O 0-15 15-50 >50 * nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 0-15 15-50 >50 nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind * nr	O wk md stg nr	O thin thick nr	O v.fac h.fac pores 1+2 1+3 2+3 1+2+3 nr	5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	O 1 2 3 4 5 6 7 8 nr	O 1 2 3 4 5 6 7 8 nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
O 0-10 10-10² >10² nr	O <3 3-10 >10 nr	O fib wdy nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 <5 nr	O pl cub nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 >5 nr	O pl cub nr	O <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 75 nr	O pl cub nr	O 0-15 15-50 >50 * nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 0-15 15-50 >50 nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind * nr	O wk md stg nr	O thin thick nr	O v.fac h.fac pores 1+2 1+3 2+3 1+2+3 nr	5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	O 1 2 3 4 5 6 7 8 nr	O 1 2 3 4 5 6 7 8 nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
O 0-10 10-10² >10² nr	O <3 3-10 >10 nr	O fib wdy nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 <5 nr	O pl cub nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 >5 nr	O pl cub nr	O <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 75 nr	O pl cub nr	O 0-15 15-50 >50 * nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 0-15 15-50 >50 nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind * nr	O wk md stg nr	O thin thick nr	O v.fac h.fac pores 1+2 1+3 2+3 1+2+3 nr	5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	O 1 2 3 4 5 6 7 8 nr	O 1 2 3 4 5 6 7 8 nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
O 0-10 10-10² >10² nr	O <3 3-10 >10 nr	O fib wdy nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 <5 nr	O pl cub nr	O <5 5-10 10-20 20-50 *50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 >5 nr	O pl cub nr	O <5 5-10 10-20 20-50 50-200 200-500 500-2000 >2000 nr	O <1 1-2 2-5 75 nr	O pl cub nr	O 0-15 15-50 >50 * nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 0-15 15-50 >50 nr	O <.25 .25-.5 >.5 nr	O Ind. Qz Fm Mi Fel Ca Mg nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O 2-20 20-75 75-250 >250 nr	O rnd s.rnd irreg ang tab comb nr	O p.m. inh conc. Qz ind * nr	O wk md stg nr	O thin thick nr	O v.fac h.fac pores 1+2 1+3 2+3 1+2+3 nr	5Y 10YR 7.5YR 5YR 2.5YR 10R 7.5R nr	O 1 2 3 4 5 6 7 8 nr	O 1 2 3 4 5 6 7 8 nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol Salt nr	O 1-5 5-10 10-15 15-25 *25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	O 1-5 5-10 10-15 15-25 25-40 40-60 >60 nr	O <2 2-20 20-75 >75 nr	O soft m.hd hd v.hd nr	O rnd s.rnd irreg ang tab pl nr	O clay R_2O_3 MnO_2 SiO_2 Carb Gyp Sol. Salt nr	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

SITE DATA.

Location	Gombe - Biu road. 200 yards west of Culvert 63/2.
Position	Mid slope
Slope	Convex slope 1^{o}
Parent material	Sandstone or mudstone of the transitional formations.
Underlying rock	Sandstone or mudstone.
Drainage	Imperfect
Vegetation	Shrub savanna

FOR DISCUSSION

Soil genesis — The clear boundary between Horizons 2 and 3 probably marks a discontinuity in the profile. The sandy surface horizons may be a recent wash, though the sandy texture may be partly due to illuviation of clay. The lower part of the profile is probably developed almost in situ.

Drainage — The profile is considered to be imperfectly drained, for a colour of 10YR 5/3 occurs in Horizon 2 and 3.

Classification — 1. The soil has an argillic horizon and can be classed as a Luvisol.

2. There are no diagnostic criteria on which the soil may be assigned to a given sub-unit, so it must be considered an Orthic Luvisol.

3. The exchangeable sodium percentage is greater than 6 and less than 15 so it is possible that a Solodic sub-unit of the Luvisols is required corresponding to the Solodic sub-unit of Planosols.

F A O	Orthic Luvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)						
	1 0-14	2 14-32	3 32-49	4 49-85	5 85-125	6 125-170	7 170-200
pH 1:2.5 H_2O	5.9	6.1	6.6	8.8	8.0	8.9	9.0
Exch. Na meq %	0.1	0.6	1.6	1.7	2.4	2.8	2.9
Exch. K meq %	0.3	0.3	0.4	0.4	0.5	0.4	0.4
Exch. Mg meq %	1.2	1.5	2.5	2.8	3.8	4.2	4.2
Exch. Ca meq %	4.1	5.4	9.3	11.3	20.8	22.2	19.7
TEB. meq/100 g	5.7	7.8	13.8	16.2	27.5	29.6	27.2
CEC meq/100 g	6.8	11.1	16.0	16.1	21.1	22.2	22.2
Base saturation %	84	70	86	>100	>100	>100	>100
% org. C o.d.s.	73	42	27	33	14	11	07
Mechanical analysis							
2 000 /u - 200 /u	9	8	5	8	6	6	4
200 /u - 50 /u	51	36	27	32	26	21	14
50 /u - 20 /u	15	12	14	10	14	17	14
20 /u - 2 /u	6	12	8	8	8	10	18
2 /u	18	32	46	42	46	46	50

COUNTRY		PROJECT		LAND UNIT		PROFILE	26

GEOG COORDS E | N

HORIZON	THICKNESS & DEPTH	BDY CLAR	BDY SHAP	PREDOMINANT COLOUR PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS ABUND %	SIZE mm	CONT.	COLOUR	ABUND %	SIZE mm	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE DEV	SIZE	TYPE	DEV	SIZE	TYPE		MOISTURE	CONSISTENCE D/SM	M/VM	W	W	CEMN	ROOTS No. 3/dm²	SIZE mm	TYPE
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0	0	0	5Y 0 0	0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	2.5Y 1 1	1	<5	ft	2.5Y 1 1	1	<5	ft.	2.5Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2	5-15	di	10YR 2 2	2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	10-10³	3-10	wdy.
3 III 3 3 3		gr	ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3	>15	pr.	7.5YR 3 3	3	>15	pr.	7.5YR 3 3	Gm L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4			5YR 4 4	4			5YR 4 4	Gr FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5			2.5YR 5 5	5			2.5YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6 6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6			10R 6 6	6			10R 6 6	My S S	40-60			col			col			xh	x.fm						
7 7 7 7				7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7			7.5R 7 7	7			7.5R 7 7	Ba H CL	>60			pl			pl				comp						
8 8 8 8				8 8	8 8	8 8	8 8	8			8 8	8			8 8	Oh																	
9 9 9 9		nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9	nr	nr	nr nr nr	9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.

Horizon block	Thickness & depth
1	14
2	32
3	49
4	125
5	170
6	200

26

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No. dm^2	SIZE mm	TYPE	No./ dm^2	SIZE mm	SHAP	No./ dm^2	SIZE mm	SHAP	No./ dm^2	SIZE mm	SHAP	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	TYPE	ABUN %	SIZE mm	SHAP	TYPE	ABUN %	SIZE mm	SHAP	TYPE	DEV.	THXNESS	POSITION	COLOUR			TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE	ABUN %	SIZE mm	HARD	SHAP	TYPE					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	>5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	>5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	>5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	>5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			600-2000			600-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	>5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			600-2000			600-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	25Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc.	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	75YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	>5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			50-200			50-200			50-200					Fel			Fel	25-40		tab		25-40		tab				1+3	25YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	75R	7	7	Sol Salt	>60				Sol Salt	>60				Sol Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

SITE DATA.

Location	Gombe - Biu road. 100 yards east of Mile Post 63.
Position	Upper slope
Slope	Convex slope 1°
Parent material	Unconsolidated material derived from ironpan and sedimentary rocks.
Underlying rock	Sandstone of the transitional formations.
Drainage	Imperfect
Vegetation	Arable.

FOR DISCUSSION.

Soil genesis — The rounded fragments of ironpan and other inherited concretions in Horizon 6 indicate that the soil is developed from material that has moved laterally.

Drainage — 1. Horizon 5 has a colour of 10YR 6/1 and it occurs within 150 cm of the surface; mottling is also present so the soil is regarded as imperfectly drained. (See Part III).

2. It is arguable whether the mottling is present day or inherited. The paler yellow mottles (7.5YR 5/8) are thought to be present day for they have diffuse boundaries. The red (2.5YR 4/6) mottles are probably inherited for they have abrupt boundaries.

Classification — 1. Horizons 5 and 6 are argillic as cutans are present so the soil can be classed as a luvisol.

2. There are more than 20% red mottles in the lower part of the profile so it can be considered a Ferric Luvisol.

F A O	Ferric Luvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1 0-13	2 13-28	3 28-59	4 59-86	5 86-117	6 117-150
pH 1:2.5 H_2O	5.6	4.8	5.0	5.4	6.3	6.4
Exch. Na meq %	0.1	T	Nil	T	0.1	0.1
Exch. K meq %	0.2	0.2	0.4	0.7	0.8	0.8
Exch. Mg meq %	0.7	0.6	0.9	1.7	2.3	1.8
Exch. Ca meq %	3.6	3.6	4.8	6.8	8.5	7.1
TEB. meq/100 g	4.6	4.4	6.1	9.2	11.7	9.8
CEC meq/100 g	5.3	7.7	10.7	12.6	13.2	10.7
Base saturation %	87	57	57	73	89	92
% org. C o.d.s.	56	49	31	18	20	15
Mechanical analysis						
2 000 /u - 200 /u	14	12	10	11	8	17
200 /u - 50 /u	40	30	21	16	16	23
50 /u - 20 /u	20	14	17	17	20	23
20 /u - 2 /u	8	10	10	8	10	10
2 /u	18	34	42	48	46	40

COUNTRY	PROJECT	LAND UNIT	PROFILE 27
GEOG COORDS E	N		

Horizon					Thickness & Depth	BDY Clar	BDY Shap	Ped interior (dry)			Ped interior (wet)			Ped surface (dry)			Ped surface (wet)			Other colours Abund %		Size mm	Cont.	Colour			Abund %		Size mm	Cont.	Colour			Texture			Coarse material Abund. %	Structure Dev	Size	Type	Dev	Size	Type		Moisture	Consistence D/SM	M/VM	W	W	Cemn	Roots No.	Size mm	Type
0	0	0	0	0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1		ab	sm	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	1	1	<5	ft	2.5Y	1	1	1	1	<5	ft.	2.5Y	1	1	By	C	C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	$10-10^2$	3-10	wdy
3	III	3	3	3		gr	ir	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	Gm	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	$>10^3$	>10	
4	IV	4	4	4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5				2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	5	5			2.5YR	5	5	5	5			2.5YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
6		6	6	6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	Mg	S	S	40-60			col			col			xh	xfm						
7		7	7	7				7.5R	7	7	7.5R	7	7	7.5R	7	7	7.5R	7	7	7	7			7.5R	7	7	7	7			7.5R	7	7	Bx	H	CL	>60			pl			pl				comp						
8		8	8	8					8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9	13	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1		ab	sm	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	1	1	<5	ft	2.5Y	1	1	1	1	<5	ft.	2.5Y	1	1	By	C	C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	$10-10^2$	3-10	wdy
3	III	3	3	3		gr	ir	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	Gm	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	$>10^3$	>10	
4	IV	4	4	4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5				2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	5	5			2.5YR	5	5	5	5			2.5YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
6		6	6	6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	Mg	S	S	40-60			col			col			xh	xfm						
7		7	7	7				7.5R	7	7	7.5R	7	7	7.5R	7	7	7.5R	7	7	7	7			7.5R	7	7	7	7			7.5R	7	7	Bx	H	CL	>60			pl			pl				comp						
8		8	8	8	20				8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9	28	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1		ab	sm	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	1	1	<5	ft	2.5Y	1	1	1	1	<5	ft.	2.5Y	1	1	By	C	C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	$10-10^2$	3-10	wdy
3	III	3	3	3		gr	ir	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	Gm	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	$>10^3$	>10	
4	IV	4	4	4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5				2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	5	5			2.5YR	5	5	5	5			2.5YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
6		6	6	6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	Mg	S	S	40-60			col			col			xh	xfm						
7		7	7	7				7.5R	7	7	7.5R	7	7	7.5R	7	7	7.5R	7	7	7	7			7.5R	7	7	7	7			7.5R	7	7	Bx	H	CL	>60			pl			pl				comp						
8		8	8	8					8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9	59	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1		ab	sm	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	1	1	<5	ft	2.5Y	1	1	1	1	<5	ft.	2.5Y	1	1	By	C	C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	$10-10^2$	3-10	wdy
3	III	3	3	3		gr	ir	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	Gm	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	$>10^3$	>10	
4	IV	4	4	4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5				2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	5	5			2.5YR	5	5	5	5			2.5YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
6		6	6	6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	Mg	S	S	40-60			col			col			xh	xfm						
7		7	7	7				7.5R	7	7	7.5R	7	7	7.5R	7	7	7.5R	7	7	7	7			7.5R	7	7	7	7			7.5R	7	7	Bx	H	CL	>60			pl			pl				comp						
8		8	8	8					8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9	86	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1		ab	sm	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	1	1	<5	ft	2.5Y	1	1	1	1	<5	ft.	2.5Y	1	1	By	C	C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	$10-10^2$	3-10	wdy
3	III	3	3	3		gr	ir	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	Gm	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	$>10^3$	>10	
4	IV	4	4	4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5				2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	5	5			2.5YR	5	5	5	5			2.5YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
6		6	6	6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	Mg	S	S	40-60			col			col			xh	xfm						
7		7	7	7				7.5R	7	7	7.5R	7	7	7.5R	7	7	7.5R	7	7	7	7			7.5R	7	7	7	7			7.5R	7	7	Bx	H	CL	>60			pl			pl				comp						
8		8	8	8					8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9	117	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0		0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1		ab	sm	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	2.5Y	1	1	1	1	<5	ft	2.5Y	1	1	1	1	<5	ft.	2.5Y	1	1	By	C	C	1-5	w	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2		cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sh	$10-10^2$	3-10	wdy
3	III	3	3	3		gr	ir	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	3	3	>15	pr.	7.5YR	3	3	Gm	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	$>10^3$	>10	
4	IV	4	4	4		di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5				2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	2.5YR	5	5	5	5			2.5YR	5	5	5	5			2.5YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
6		6	6	6				10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	Mg	S	S	40-60			col			col			xh	xfm						
7		7	7	7				7.5R	7	7	7.5R	7	7	7.5R	7	7	7.5R	7	7	7	7			7.5R	7	7	7	7			7.5R	7	7	Bx	H	CL	>60			pl			pl				comp						
8		8	8	8					8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9	160	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.

ROOTS No./dm²	ROOTS Size mm	ROOTS Type	VOIDS No./dm²	VOIDS Size mm	VOIDS Shap	VOIDS No./dm²	VOIDS Size mm	VOIDS Shap	VOIDS No./dm²	VOIDS Size mm	VOIDS Shap	MINERAL GRAINS Abun %	MINERAL GRAINS Size mm	MINERAL GRAINS Type	MINERAL GRAINS Abun %	MINERAL GRAINS Size mm	MINERAL GRAINS Type	STONES (inert or decaying) Abun %	STONES Size mm	STONES Shap	STONES Type	STONES Abun %	STONES Size mm	STONES Shap	STONES Type	CUTANS Dev.	CUTANS Thickness	CUTANS Position	CUTANS Colour			CUTANS Type	OTHER CONCENTRATIONS Abun %	OTHER CONC. Size mm	OTHER CONC. Hard's	OTHER CONC. Shap	OTHER CONC. Type	OTHER CONC. Abun %	OTHER CONC. Size mm	OTHER CONC. Hard's	OTHER CONC. Shap	OTHER CONC. Type					
0, 0-10, 10-10^2, >10^2, nr	0, <3, 3-10, >10, nr	0, fib, wdy, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, <5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, wk, mod, stg, nr	0, thin, thick, nr	0, v.face, h.face, pores, 1+2, 1+3, 2+3, 1+2+3, nr	5Y, 2.5Y, 10YR, 7.5YR, 5YR, 2.5YR, 10R, 7.5R, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
0, 0-10, 10-10^2, >10^2, nr	0, <3, 3-10, >10, nr	0, fib, wdy, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, <5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, wk, mod, stg, nr	0, thin, thick, nr	0, v.face, h.face, pores, 1+2, 1+3, 2+3, 1+2+3, nr	5Y, 2.5Y, 10YR, 7.5YR, 5YR, 2.5YR, 10R, 7.5R, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
0, 0-10, 10-10^2, >10^2, nr	0, <3, 3-10, >10, nr	0, fib, wdy, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, <5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, wk, mod, stg, nr	0, thin, thick, nr	0, v.face, h.face, pores, 1+2, 1+3, 2+3, 1+2+3, nr	5Y, 2.5Y, 10YR, 7.5YR, 5YR, 2.5YR, 10R, 7.5R, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
0, 0-10, 10-10^2, >10^2, nr	0, <3, 3-10, >10, nr	0, fib, wdy, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, <5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, wk, mod, stg, nr	0, thin, thick, nr	0, v.face, h.face, pores, 1+2, 1+3, 2+3, 1+2+3, nr	5Y, 2.5Y, 10YR, 7.5YR, 5YR, 2.5YR, 10R, 7.5R, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
0, 0-10, 10-10^2, >10^2, nr	0, <3, 3-10, >10, nr	0, fib, wdy, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, <5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, wk, mod, stg, nr	0, thin, thick, nr	0, v.face, h.face, pores, 1+2, 1+3, 2+3, 1+2+3, nr	5Y, 2.5Y, 10YR, 7.5YR, 5YR, 2.5YR, 10R, 7.5R, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
0, 0-10, 10-10^2, >10^2, nr	0, <3, 3-10, >10, nr	0, fib, wdy, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, <5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, <5, 5-10, 10-20, 20-50, 50-200, 200-500, 500-2000, >2000, nr	0, <1, 1-2, 2-5, >5, nr	0, pl, cub, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 0-15, 15-50, >50, nr	0, <.25, .25-.5, >.5, nr	0, Ind., Qz, Fm, Mi, Fel, CaMg, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, 2-20, 20-75, 75-250, >250, nr	0, rnd, s.rnd, irreg, ang, tab, comb, nr	0, p.m., inh conc, Qz, ind, nr	0, wk, mod, stg, nr	0, thin, thick, nr	0, v.face, h.face, pores, 1+2, 1+3, 2+3, 1+2+3, nr	5Y, 2.5Y, 10YR, 7.5YR, 5YR, 2.5YR, 10R, 7.5R, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1-5, 5-10, 10-15, 15-25, 25-40, 40-60, >60, nr	0, <2, 2-20, 20-75, >75, nr	0, soft, m.hd, hd, v.hd, nr	0, rnd, s.rnd, irreg, ang, tab, pl, nr	0, clay, R_2O_3, MnO_2, SiO_2, Carb, Gyp, Sol. Salt, nr	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0, 1, 2, 3, 4, 5, 6, 7, 8, 9

SITE DATA.

Location	Gombe - Biu road. Mile Post 64.
Position	Upper slope
Slope	Planar slope 1^{o}
Parent material	Shale or mudstone of the transitional formations
Underlying rock	Shale or mudstone of the transitional formations.
Drainage	Poor
Vegetation	Tree savanna

FOR DISCUSSION.

Soil genesis	The soil is probably developed almost in situ but the presence of inherited concretions in Horizon 4 suggests that there has been some lateral movement of soil material on this slope.
Drainage	A colour of 10YR 5/2 occurs within 50 cm of the surface so the soil is considered poorly drained.
Classification	The soil is classed as a Luvisol as Horizons 3, 4 and 6 can be considered as argillic. Horizon 3 is gleyic because of its colour (See Part III) so the soil is a Gleyic Luvisol.
F A O	Gleyic Luvisol
French	
Ghana	
U S D A	

ANALYSES

Characteristic	Horizon (depth in cm)					
	1 0-14	2 14-31	3 31-54	4 54-115	5 115-165	6 165-200
pH 1:2.5 H_2O	8.1	8.0	8.3	8.4	8.4	8.4
Exch. Na meq %		0.1	0.1	0.4	0.9	1.0
Exch. K meq %		0.4	0.5	0.6	0.7	0.8
Exch. Mg meq %		1.3	1.7	2.4	3.6	4.0
Exch. Ca meq %		21.0	27.7	43.5	45.7	37.5
TEB. meq/100 g		22.8	30.0	46.9	50.9	43.3
CEC meq/100 g		25.2	23.8	22.9	26.9	28.0
Base saturation %		90	>100	>100	>100	>100
% org. C o.d.s.	92	44	28	19	10	10
Mechanical analysis						
2 000 μ - 200 μ	9	11	8	8	7	5
200 μ - 50 μ	27	23	22	19	17	17
50 μ - 20 μ	18	14	14	15	13	16
20 μ - 2 μ	10	10	12	12	12	12
2 μ	36	42	44	46	50	50

COUNTRY	PROJECT	LAND UNIT	PROFILE 28
GEOG COORDS E	N		

HORIZON	THICKNESS & DEPTH	BDY CLAR	BDY SHAP	PED INTERIOR (DRY)	PED INTERIOR (WET)	PED SURFACE (DRY)	PED SURFACE (WET)	OTHER COLOURS ABUND %	SIZE mm	CONT.	COLOUR	ABUND %	SIZE mm	CONT.	COLOUR	TEXTURE	Coarse Material ABUND. %	STRUCTURE DEV	SIZE	TYPE	DEV	SIZE	TYPE	MOISTURE	CONSISTENCE D SN	M VM	W	W	CEMN	ROOTS No.	SIZE mm	TYPE
0 0 0 0 0		0	0	5Y 0 0	5Y 0 0	5Y 0 0	5Y 0 0	0 0	0	0	5Y 0 0	0 0	0	0	5Y 0 0	0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 I 1 1 1		ab	sm	25Y 1 1	25Y 1 1	25Y 1 1	25Y 1 1	1 1	<5	ft	25Y 1 1	1 1	<5	ft.	25Y 1 1	By C C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2 II 2 2 2		cl	wa	10YR 2 2	10YR 2 2	10YR 2 2	10YR 2 2	2 2	5-15	di	10YR 2 2	2 2	5-15	di	10YR 2 2	St Si Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	sty	10-10³	3-10	wdy.
3 III 3 3 3		gr	ir	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	7.5YR 3 3	3 3	>15	pr.	7.5YR 3 3	3 3	>15	pr.	7.5YR 3 3	Gra L L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4 IV 4 4 4		di	br	5YR 4 4	5YR 4 4	5YR 4 4	5YR 4 4	4 4			5YR 4 4	4 4			5YR 4 4	Gri FS FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5 V 5 5 5				2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	2.5YR 5 5	5 5			2.5YR 5 5	5 5			2.5YR 5 5	Py CS CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	vfm						
6 6 6 6				10R 6 6	10R 6 6	10R 6 6	10R 6 6	6 6			10R 6 6	6 6			10R 6 6	Mg S S	40-60			col			col			xh	efm						
7 7 7 7				7.5R 7 7	7.5R 7 7	7.5R 7 7	7.5R 7 7	7 7			7.5R 7 7	7 7			7.5R 7 7	Ba H CL	>60			pl			pl				comp						
8 8 8 8				8 8	8 8	8 8	8 8	8 8				8 8			8 8	Oth																	
9 9 9 9	14 / 31 / 54 / 115 / 165 / 200	nr	nr	nr nr nr	nr nr nr	nr nr nr	nr nr nr	9 9	nr	nr	nr nr nr	9 9	nr	nr	nr nr nr	nr nr nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.

ROOTS			VOIDS									MINERAL GRAINS						STONES (inert or decaying)								CUTANS							OTHER CONCENTRATIONS														
No./dm^2	Size mm	Type	No./dm^2	Size mm	Shap	No./dm^2	Size mm	Shap	No./dm^2	Size mm	Shap	Abun %	Size mm	Type	Abun %	Size mm	Type	Abun %	Size mm	Shap	Type	Abun %	Size mm	Shap	Type	Dev.	Thickness	Position	Colour			Type	Abun %	Size mm	Hard	Shap	Type	Abun %	Size mm	Hard	Shap	Type					
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			*50-200			*50-200			50-200			*		Fel			Fel	*25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
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0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			*50-200			*50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
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0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			*50-200			*50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
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0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			*50-200			*50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			600-2000			600-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
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0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			*50-200			*50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl	0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.	wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
$10-10^2$	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub	15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc	5-10	20-75	s.rnd	inh conc	md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
$>10^2$	>10		10-20	2-5		10-20	2-5		10-20	2-5		>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz	stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
			20-50	<5		20-50	>5		20-50	>5				Mi			Mi	15-25	>250	ang	Ind	15-25	>250	ang	Ind			1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
			*50-200			*50-200			50-200			*		Fel			Fel	25-40		tab		25-40		tab		*		1+3	2.5YR	5	5	Carb	*25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
			200-500			200-500			200-500					Ca Mg			Ca Mg	40-60		comb		40-60		comb				2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
			500-2000			500-2000			500-2000									>60				>60						1+2+3	7.5R	7	7	Sol. Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
			>2000			>2000			>2000																					8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

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APPENDIX. ABBREVIATIONS USED ON SOIL PROFILE DESCRIPTION CARDS.

The abbreviations used on soil profile description cards are listed below. A blank card is included for reference.

	o	Not present	nr	not recorded.		
Colour		Munsell notations.				
Other colours		Contrast				
	ft	faint				
	di	distinct				
	pr	prominent				
Texture	By	bouldery	c	clay		
	st	stony	si	silt		
	Gra	gravelly	L	loam		
	Gri	gritty	FS	fine sand		
	Py	peaty	CS	coarse sand		
	My	mucky	S	sand		
	Bst	bouldery/stony	H	humic		
	Oth	other				
Structure	vw	very weak	vf	very fine	cr	crumb
	w	weak	f	fine	gr	granular
	m	moderate	m	medium	sab	sub angular blocky.
	s	stony	c	coarse	ab	angular blocky
	vs	very strong	vc	very coarse	pr	prismatic
					col	columnar
					pl	platy

simple	simple
comp	compound
trans.	transitional
Trans/ down	transitional downwards.

Moisture	dry	dry
	sm	slightly moist
	m	moist
	vm	very moist
	w	wet.

Consistence	lo	loose	lo	loose
	so	soft	vf	very friable
	sh	slightly hard	f	friable
	h	hard	fm	firm
	vh	very hard	v fm	very firm
	xh	extremely hard	x fm	extremely firm
			comp.	compact
	s	slightly sticky	s	slightly plastic
	st	sticky	pl	plastic
	v	very sticky	v	very plastic
	cemn.	cementation		
	wk	weak		
	stg.	strong		
	ind.	indurated		
Roots	fib	fibrous		
	wdy	woody		
Voids	pl	planar		
	tub	tubular		
Mineral grains.	Ind	indeterminate		
	Qz	quartz		
	Fm	ferromagnesian		
	Mi	mica		
	Fel	felspar		
	Ca/Mg	Calcium/magnesium.		
Stones	rnd	rounded	pm	parent material
	s rnd	sub rounded	inh. conc.	inherited concretion
	irreg	irregular	Qz	quartz
	ang	angular	Ind	indeterminate
	tab	tabular		
	comb.	combined		
Cutans	wk	weak	v face	vertical ped face
	mod	moderate	h face	horizontal ped face
	stg	strong		
Other concentrations.	soft	soft		
	m hd	Moderately hard		
	hd	hard		
	v hd	very hard.		

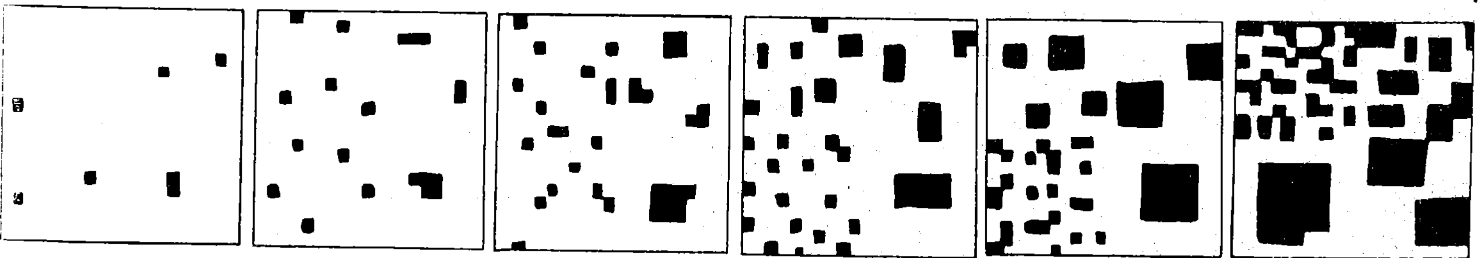
clay	clay
R_2O_3	sesquioxidic
MnO_2	manganiferous
SiO_2	siliceous
Carb.	carbonate
Gyp.	gypsiferous
sol salt	soluble salts.

COUNTRY				PROJECT			LAND UNIT									PROFILE				

GEOG COORDS E						N					

HORIZON					THICKNESS & DEPTH			BDY		PREDOMINANT COLOUR												OTHER COLOURS														TEXTURE			Coarse Material	STRUCTURE							MOISTURE	CONSISTENCE					ROOTS		
								CLAR	SHAP	PED INTERIOR (DRY)			PED INTERIOR (WET)			PED SURFACE (DRY)			PED SURFACE (WET)			ABUND %		SIZE mm	CONT.	COLOUR			ABUND %		SIZE mm	CONT.	COLOUR						ABUND. %	DEV	SIZE	TYPE	DEV	SIZE	TYPE			D/SM	M/VM	W	W	CEMN	No. 3^2dm^2	SIZE mm	TYPE
0	0	0	0	0				0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1				ab	sm	25Y	1	1	25Y	1	1	25Y	1	1	25Y	1	1	1	1	<5	ft	25Y	1	1	1	1	<5	ft.	25Y	1	1	By	C	C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2				cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10²	3-10	wdy.
3	III	3	3	3				gr	ir	75YR	3	3	75YR	3	3	75YR	3	3	75YR	3	3	3	3	>15	pr.	75YR	3	3	3	3	>15	pr.	75YR	3	3	Gra	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4	IV	4	4	4				di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5						25YR	5	5	25YR	5	5	25YR	5	5	25YR	5	5	5	5			25YR	5	5	5	5			25YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6		6	6	6						10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	My	S	S	40-60			col			col			xh	x.fm						
7		7	7	7						75R	7	7	75R	7	7	75R	7	7	75R	7	7	7	7			75R	7	7	7	7			75R	7	7	Bs	H	CL	>60			pl			pl				comp						
8		8	8	8							8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9				nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0				0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1				ab	sm	25Y	1	1	25Y	1	1	25Y	1	1	25Y	1	1	1	1	<5	ft	25Y	1	1	1	1	<5	ft.	25Y	1	1	By	C	C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2				cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10²	3-10	wdy.
3	III	3	3	3				gr	ir	75YR	3	3	75YR	3	3	75YR	3	3	75YR	3	3	3	3	>15	pr.	75YR	3	3	3	3	>15	pr.	75YR	3	3	Gra	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4	IV	4	4	4				di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5						25YR	5	5	25YR	5	5	25YR	5	5	25YR	5	5	5	5			25YR	5	5	5	5			25YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6		6	6	6						10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	My	S	S	40-60			col			col			xh	x.fm						
7		7	7	7						75R	7	7	75R	7	7	75R	7	7	75R	7	7	7	7			75R	7	7	7	7			75R	7	7	Bs	H	CL	>60			pl			pl				comp						
8		8	8	8							8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9				nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0				0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1				ab	sm	25Y	1	1	25Y	1	1	25Y	1	1	25Y	1	1	1	1	<5	ft	25Y	1	1	1	1	<5	ft.	25Y	1	1	By	C	C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2				cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10²	3-10	wdy.
3	III	3	3	3				gr	ir	75YR	3	3	75YR	3	3	75YR	3	3	75YR	3	3	3	3	>15	pr.	75YR	3	3	3	3	>15	pr.	75YR	3	3	Gra	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4	IV	4	4	4				di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5						25YR	5	5	25YR	5	5	25YR	5	5	25YR	5	5	5	5			25YR	5	5	5	5			25YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6		6	6	6						10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	My	S	S	40-60			col			col			xh	x.fm						
7		7	7	7						75R	7	7	75R	7	7	75R	7	7	75R	7	7	7	7			75R	7	7	7	7			75R	7	7	Bs	H	CL	>60			pl			pl				comp						
8		8	8	8							8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9				nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0				0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1				ab	sm	25Y	1	1	25Y	1	1	25Y	1	1	25Y	1	1	1	1	<5	ft	25Y	1	1	1	1	<5	ft.	25Y	1	1	By	C	C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2				cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10²	3-10	wdy.
3	III	3	3	3				gr	ir	75YR	3	3	75YR	3	3	75YR	3	3	75YR	3	3	3	3	>15	pr.	75YR	3	3	3	3	>15	pr.	75YR	3	3	Gra	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4	IV	4	4	4				di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5						25YR	5	5	25YR	5	5	25YR	5	5	25YR	5	5	5	5			25YR	5	5	5	5			25YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6		6	6	6						10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	My	S	S	40-60			col			col			xh	x.fm						
7		7	7	7						75R	7	7	75R	7	7	75R	7	7	75R	7	7	7	7			75R	7	7	7	7			75R	7	7	Bs	H	CL	>60			pl			pl				comp						
8		8	8	8							8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9				nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.
0	0	0	0	0				0	0	5Y	0	0	5Y	0	0	5Y	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	I	1	1	1				ab	sm	25Y	1	1	25Y	1	1	25Y	1	1	25Y	1	1	1	1	<5	ft	25Y	1	1	1	1	<5	ft.	25Y	1	1	By	C	C	1-5	vw	vf	cr	vw	vf	cr	simple	dry	lo	lo	s	s	wk	0-10	<3	fib
2	II	2	2	2				cl	wa	10YR	2	2	10YR	2	2	10YR	2	2	10YR	2	2	2	2	5-15	di	10YR	2	2	2	2	5-15	di	10YR	2	2	St	Si	Si	5-10	w	f	gr	w	f	gr	comp	s.m.	so	vf	st	pl	stg	10-10²	3-10	wdy.
3	III	3	3	3				gr	ir	75YR	3	3	75YR	3	3	75YR	3	3	75YR	3	3	3	3	>15	pr.	75YR	3	3	3	3	>15	pr.	75YR	3	3	Gra	L	L	10-15	m	m	sab	m	m	sab	trans	m.	sh	f	v	v	ind	>10³	>10	
4	IV	4	4	4				di	br	5YR	4	4	5YR	4	4	5YR	4	4	5YR	4	4	4	4			5YR	4	4	4	4			5YR	4	4	Gri	FS	FS	15-25	s	c	ab	s	c	ab	trans down	vm	h	fm						
5	V	5	5	5						25YR	5	5	25YR	5	5	25YR	5	5	25YR	5	5	5	5			25YR	5	5	5	5			25YR	5	5	Py	CS	CS	25-40	vs	vc	pr	vs	vc	pr		w	vh	v.fm						
6		6	6	6						10R	6	6	10R	6	6	10R	6	6	10R	6	6	6	6			10R	6	6	6	6			10R	6	6	My	S	S	40-60			col			col			xh	x.fm						
7		7	7	7						75R	7	7	75R	7	7	75R	7	7	75R	7	7	7	7			75R	7	7	7	7			75R	7	7	Bs	H	CL	>60			pl			pl				comp						
8		8	8	8							8	8		8	8		8	8		8	8	8	8				8	8	8	8				8	8	Oth																			
9		9	9	9				nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	9	9	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	n.r.	n.r.	n.r.

CHARTS FOR ESTIMATING PROPORTIONS. (Each fourth of any one square has the same amount of black)



2% 5% 10% 15% 25% 40%

D.O.S. 2671 B

ROOTS			VOIDS								
No./dm²	Size mm	Type	No./dm²	Size mm	Shap	No./dm²	Size mm	Shap	No./dm²	Size mm	Shap
O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5	
			20-50	<5		20-50	>5		20-60	>5	
			50-200			50-200			50-200		
			200-500			200-500			200-500		
			500-2000			500-2000			500-2000		
			>2000			>2000			>2000		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5	
			20-50	<5		20-50	>5		20-50	>5	
			50-200			50-200			50-200		
			200-500			200-500			200-500		
			500-2000			500-2000			500-2000		
			>2000			>2000			>2000		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5	
			20-50	<5		20-50	>5		20-50	>5	
			50-200			50-200			50-200		
			200-500			200-500			200-500		
			500-2000			500-2000			500-2000		
			>2000			>2000			>2000		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5	
			20-50	<5		20-50	>5		20-50	>5	
			50-200			50-200			50-200		
			200-500			200-500			200-500		
			500-2000			500-2000			600-2000		
			>2000			>2000			>2000		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O
0-10	<3	fib	<5	<1	pl	<5	<1	pl	<5	<1	pl
10-10²	3-10	wdy	5-10	1-2	tub	5-10	1-2	tub	5-10	1-2	tub
>10²	>10		10-20	2-5		10-20	2-5		10-20	2-5	
			20-50	<5		20-50	>5		20-50	>5	
			50-200			50-200			50-200		
			200-500			200-500			200-500		
			500-2000			500-2000			600-2000		
			>2000			>2000			>2000		
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr

MINERAL GRAINS						STONES (inert or decaying)							
Abun %	Size mm	Type	Abun %	Size mm	Type	Abun %	Size mm	Shap	Type	Abun %	Size mm	Shap	Type
O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-15	<.25	Ind.	0-15	<.25	Ind.	1-6	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.
15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc
>50	>.5	Fm	>50	>.5	Fm	10-16	75-250	irreg	Qz	10-15	75-250	irreg	Qz
		Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind
		Fel			Fel	25-40		tab		25-40		tab	
		Ca Mg			Ca Mg	40-60		comb		40-60		comb	
						>60				>60			
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.
15-50	.25-.5	Qz	15-50	.25-.5	Qz.	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc
>50	>.5	Fm	>50	>.5	Fm	10-16	75-250	irreg	Qz	10-15	75-250	irreg	Qz
		Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind
		Fel			Fel	25-40		tab		25-40		tab	
		Ca Mg			Ca Mg	40-60		comb		40-60		comb	
						>60				>60			
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.
15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc
>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz
		Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind
		Fel			Fel	25-40		tab		25-40		tab	
		Ca Mg			Ca Mg	40-60		comb		40-60		comb	
						>60				>60			
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.
15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc
>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz
		Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind
		Fel			Fel	25-40		tab		25-40		tab	
		Ca Mg			Ca Mg	40-60		comb		40-60		comb	
						>60				>60			
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr
O	O	O	O	O	O	O	O	O	O	O	O	O	O
0-15	<.25	Ind.	0-15	<.25	Ind.	1-5	2-20	rnd	p.m.	1-5	2-20	rnd	p.m.
15-50	.25-.5	Qz	15-50	.25-.5	Qz	5-10	20-75	s.rnd	inh conc.	5-10	20-75	s.rnd	inh conc
>50	>.5	Fm	>50	>.5	Fm	10-15	75-250	irreg	Qz	10-15	75-250	irreg	Qz
		Mi			Mi	15-25	>250	ang	ind	15-25	>250	ang	ind
		Fel			Fel	25-40		tab		25-40		tab	
		Ca Mg			Ca Mg	40-60		comb		40-60		comb	
						>60				>60			
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr

CUTANS							OTHER CONCENTRATIONS														
Dev.	Thickness	Position	Colour			Type	Abun %	Size mm	Hardness	Shap	Type	Abun %	Size mm	Hardness	Shap	Type					
O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
		1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
		1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
		2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
		1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
				8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
		1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
		1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
		2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
		1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
				8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
		1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
		1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
		2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
		1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
				8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
		1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
		1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
		2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
		1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
				8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9
O	O	O	5Y	O	O	O	O	O	O	O	O	O	O	O	O	O	0	0	0	0	0
wk	thin	v.face	2.5Y	1	1	clay	1-5	<2	soft	rnd	clay	1-5	<2	soft	rnd	clay	1	1	1	1	1
md	thick	h.face	10YR	2	2	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	5-10	2-20	m.hd	s.rnd	R_2O_3	2	2	2	2	2
stg		pores	7.5YR	3	3	MnO_2	10-15	20-75	hd	irreg	MnO_2	10-15	20-75	hd	irreg	MnO_2	3	3	3	3	3
		1+2	5YR	4	4	SiO_2	15-25	>75	v.hd	ang	SiO_2	15-25	>75	v.hd	ang	SiO_2	4	4	4	4	4
		1+3	2.5YR	5	5	Carb	25-40			tab	Carb	25-40			tab	Carb	5	5	5	5	5
		2+3	10R	6	6	Gyp	40-60			pl	Gyp	40-60			pl	Gyp	6	6	6	6	6
		1+2+3	7.5R	7	7	Sol Salt	>60				Sol. Salt	>60				Sol. Salt	7	7	7	7	7
				8	8												8	8	8	8	8
nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	nr	9	9	9	9	9

NOTES.