

**THE RECONNAISSANCE SOIL
SURVEY OF NIGERIA
(1:650,000)**

SOILS REPORT

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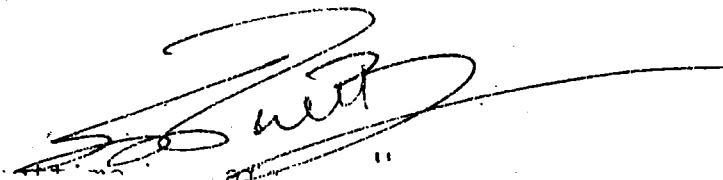
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FOREWORD

Land is one of the natural resources that determine the survival of mankind on earth. However, if this resource is to play its crucial role in man's survival, its component resources, must be known, so that they can be used rationally.

The reconnaissance survey of Nigeria's soil resources which has been going on for the past eight years or so has been an attempt by the Federal Ministry of Agriculture and Natural Resources to obtain information on the types, occurrence and distribution of the different soils that are found in the land mass of Nigeria. The results of these survey are presented in the reports contained in this book. The reports are complemented by a reconnaissance soil survey map of Nigeria which is presently being printed.

The soils reports contained in this book are by no means exhaustive since the surveys were undertaken at the reconnaissance level. However, they contain a lot of information that will be of indepth value in planning agricultural production in particular and, land use generally. The book is therefore highly recommended for use by academicians, agriculturalists, planners, and in fact, all land users.



Shettima Mustafa
Honourable Minister of Agriculture
and Natural Resources

PREFACE

After the Oil Wealth of the 1970s, Nigeria was faced with the problem of Massive food importation. Viewed from any angle, it was clear to all that the country could not sustain such a situation for long. It was then that the country once again turned her attention to local agricultural production. Consequently, such programmes as the green revolution, operation feed the Nation (OFN) and currently structural Adjustment Programme (SAP), were evolved by various administrations. All these programmes emphasize the use of our natural resources, especially the land to promote massive agricultural production.

It is generally agreed that Nigeria is blessed with enough land resources to support massive agricultural production. What is required of her is to use these resources judiciously and optimally. It was precisely for the purpose of optimal utilization of land resources that the Government created a department of agricultural Land Resources in the Federal Ministry of Agriculture. The first task of the department was to take inventory of the land resources of this country. The starting point was naturally the soil, which is the major component of land. That is why the systematic and correlated soil map of Nigeria project was started in 1980.

Before the systematic reconnaissance soil survey project was started, however, there had been several soil survey reports and maps of parts or whole of the country by various workers and agencies. The FAO World Soil Map edited by D'Hoore, the Overseas Development Administration (ODA) central Nigeria Project, the many adhoc soil survey reports on parts of the country produced to support developmental and research projects all provided very useful information on the land resources of this country. However they did not cover the whole country and were not easily available to agricultural planners. They nevertheless created the awareness for the need to have a systematic and coordinated knowledge of the types, location and extent of the different soil resources of this country.

In 1979, the Government of the United States of America (USA) offered a technical assistance to the Government of the Federal Republic of Nigeria to help in the production of a reconnaissance soil maps of Nigeria. Consequent upon this offer officials of the U.S. Department of Agriculture visited this country for preliminary discussions. Field work on the project started in 1980 and was completed in 1985. The scale at which the final maps were produced resulted in a total of 39 map sheets with 178 mapping units. Many correlation meetings were held at the end which the total number of map sheets was reduced to 8 with 58 soil mapping units.

The soil maps are being presented at two scales:

- (I) Correlated scale of 1:650,000 and
- (II) displayable scale of 1:1,000,000.

The reports covering the field survey and soil analyses are presented in four volumes:-

- Volume I Kano, Bauchi, Borno and Gongola states sheets 2, 3 & 6
- Volume II Sokoto, Kaduna, Katsina, Plateau, Niger, Kwara & Federal Capital Territory (FCT) sheets 1, 4 & 5
- Volume III Lagos, Ogun, Oyo, Ondo and Bendel States Sheet 7
- Volume IV Rivers, Akwa Ibom, Cross River, Imo, Anambra and Benue States (Sheet 8)

Finally, the tremendous reduction in the number of soil mapping units indicates that the legend is highly generalised. This is bound to affect the details of some information which the maps can provide. In spite of this we believe that the maps and the accompanying reports will provide useful soil data for planning agricultural production.

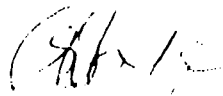

S. Anande-Kur,
Director
1991

ACKNOWLEDGEMENT

Many individuals, organizations and higher institutions (too numerous to list) have played important part in the conduct of this first phase of the Soil Map of Nigeria Project.

In this connection, mention must be made of Mr. A. O. Nnodi, pedologist-Director, Federal Department of Agric. Land Resources 1980-1984 whose experience in the field of Soil Survey proved an invaluable asset in the task of Soil Surveying of different areas of the country; Mr. Alville Touchet, the U.S. Soil Scientist who led the U.S. team of experts on preliminary discussions with their Nigerian counterparts for the take off of the initial field work; U.S.D.A. team of soil scientists, Messrs H. L. Huckle, Donald White, W. Campbell and J. Wilson who worked side by side with their Nigerian counterparts in the execution of the project during their two year contract engagement in the country; Prof. W. Verhaye, F.A.O. consultant in Soil Survey and land Evaluation who reviewed the progress at the final stages of this work and offered useful advice for the completion and the second phase operation; the senior members of staff of the other divisions of F.D.A.L.R. for assistance and advice at some stages of the project execution and the entire secretarial staff of the Department which carried on the burden of typing all documents and reports on the project; the Soil Science Society of Nigeria and the various Departments of Agriculture and Forestry of Nigeria Universities and the Institutes of Agriculture and Research in the country for their contributions especially in the area of physical and chemical analyses of Soil Samples from the project.

Various Departments of the Federal Ministry of Agric. and Natural Resources have been particularly helpful for useful comments and advice on some aspects of the project execution during Ministerial discussions on the project. These have, in no small measure, contributed to the Ministerial support necessary for the completion and early release of the first approximation of the National Maps and Reports.



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CHAPTER I

Introduction

The idea of producing a systematic and correlated soil map of the country which would provide a good guide in agriculture and other land development, was a subject for lectures, seminars and workshops by various interest groups in the country towards the late '70s.

A country-wide soil survey plan by the Soil Survey Division of the Federal Department of Agriculture received a boost in 1979 with the United States Department of Agriculture (U.S.D.A) technical assistance to Nigeria for the production of a reconnaissance soil map of the country. A United States Department of Agriculture official headed by Mr. Alville Touchet visited various agricultural establishments (including Universities and Research Institutes) in the country in respect of the project between 1978 and 1979. At the end of these visits the group held various meetings with the key staff of the Federal Department of Agricultural land resources and representative soil scientists from Agricultural Research Institutes, Faculties of Agriculture of the nation's Universities and the Soil Science Society of Nigeria. It was during these meetings that the level of survey, the approach to field work, the level and method of classification to be employed and thus, the nature of assistance from U.S.D.A. were agreed upon.

In October 1980, the Soil Survey Staff of the Federal Department of Agricultural Land Resources commenced the field work for the Soil Map of Nigeria Project operating from four (4) zones namely, North West, North East, South West and South East Zones respectively with Kaduna as the project coordinating headquarters.

The four U.S.D.A. soil scientists who assisted in the programme arrived in Nigeria after their contract formalities were concluded in U.S.A. between 1981 and 1982.

The reconnaissance soil survey of Nigeria (scale 1:250,000) was completed in 1985. Ammonia prints of the soil maps and corresponding soil survey reports were produced for each State of the Federation and the Federal Capital Territory, Abuja. Limited copies of these prints were presented to the National Council for Agriculture meeting held at Owerri, Imo State in February, 1986.

The Scale at which the final maps were produced resulted in a total of 39 map sheets with 178 soil mapping units for the entire country. The resultant soil map of Nigeria from the mosaic of these map sheets cannot be displayed in a normal wall because of the enormity of its size. There was, therefore, the need to correlate the earlier work of 1:250,000 and evolve a displayable and reproducible soil map of the Country in colour with descriptive legends.

This task was approached with the setting up of an editorial committee with the National Coordinator of the Soil Map of Nigeria Project as Chairman and all the Zonal Coordinators and a Professor in one of the nation's leading Universities as members. In addition, six subcommittees were also set up with the following responsibilities:

1. Subcommittee on the review of soil descriptions, analytical data and soil classification.
2. Subcommittee on rewording of soil mapping unit descriptions and recasting of legend.
3. Subcommittee on cartography.
4. Subcommittee on storage and retrieval of information.
5. Subcommittee on report printing; and
6. Subcommittee on colour map printing.

Meetings of subcommittee Chairmen and their members were held regularly to address specific problems. In some cases, the problems necessitated limited soil surveys and analyses of soil samples. Periodic review meetings of the subcommittees, Chairmanned by the National Coordinator formed important instrument of the achieving the soil correlation goal. This goal is achieved with the production of 4 volumes of reports covering the whole country and two levels of maps, one at scale 1:650,000 and the other at 1:1,000,000.

In order that we do not loose grip of the target and the major objectives of the soil map of Nigeria project, the Federal Department of agricultural land Resources intends to exploit the presence of the newly established Land Resources Divisions in the State Ministries of Agriculture to educate the end users of these documents on how to make optimum use of the information contained therein. This, we expect to achieve through workshops and close liaison between the technical and the extension staff of the State Ministries of Agriculture.

CHAPTER 2

THE ENVIRONMENT

2.1 Location and Size

Nigeria is located between longitudes 3° 30', and 15°E, and between latitudes 14° and 4°N of the equator and occupies an area of 923, 768Km²

2.2 Physiography

Nigeria is a country with varying landforms. Although much of the country is dominated by plains, generally less than 609.5m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978) above sea level, the eastern border with the Republic of Cameroun is lined by an almost continuous range of mountains which rise to about 2,419m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978) in the Chappal Waddi, the highest known point in Nigeria.

In the North, the Jos Plateau rises abruptly from a general level of about 609.5m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978) in the Hausa Plains to an average level of some 1,219m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978) but reaches 1,781.6m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978) in Shere Hills. The area west of the River Niger is dominated by the plain which rises gently from the coast northwards to the area of crystalline rocks where inselbergs rise abruptly above the surrounding plains. The Idanre Hills, the highest point of these inselbergs, rises to about 981m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978) above sea level.

In general the land surface of the country could be classified into three broad physical units or major relief features namely: the plains; the highlands; the troughs and the river-valleys. Within each of these could be identified features of lower order. Only the plains have been discussed, because of their dominance.

The Plains

The plains which are the dominant feature in the country have resulted from alternating denudational and aggradational activities. The African denudational surface high plains of Hausa land are composed of crystalline rocks of the basement complex. They form wide plains dissected by mature valleys, an example is the

Kaduna river valley. Above the plains are inselbergs and castle Kopjes which rise to over 304.8m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978). The post - African younger denudational land surface is the main landform in the area of Pre-Cambrian to Cambrian basement complex rocks mainly granite gneiss, quartzite and schist west of the Niger.

This area is generally referred to as the western plains and ranges. Due to the folding of the rocks, they trend mainly in a North-South direction and typical landforms are the structural ridges and inselbergs protruding from an almost flat plains consisting of pediments, and sloping generally from the water divide between the Niger and the Gulf of Guinea from about 183m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978) to 106.5m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978). The plains of this unit are of the post-African late Cainozoic denudational origin.

The aggradational land surface in the country are usually found in the areas bordering the denudational land surface and they comprise most of the remaining plains.

The Sokoto plain belongs to the post-African aggradational surface of the late Cainozoic age and is composed of sedimentary rocks of Cretaceous and tertiary age, namely, sandstones, shales and sands. The plain is about 244m to 304.m (The National Atlas of the Federal Republic of Nigeria. First Edition 1978) above sea level.

East of the Jos Plateau lie the hills and the plains of Kerri-Kerri and Gombe which are composed of sedimentary rocks of tertiary age in the west and of Cretaceous age in the east, consisting mainly of sandstones and shales.

The plains merge northwards with the Chad Basin which is composed of young sedimentary rocks of Quarternary age. Modern aggradational land surfaces extend over the area which borders the southern margins of the western plains and ranges. It is composed of sedimentary rocks which are largely sandstones, shales, and clays of Cretaceous and tertiary ages. At Ewekoro, south of Abeokuta, these rocks are interbedded with limestone.

The most recent aggradational land surfaces lie further south along the coast of the Gulf of Guinea and comprise the coastal plains, islands and sandbars. These Quaternary deposits are sandy in the west and muddy in their eastern part. The plains extend into the Niger Delta which is a swampy area of about 388 square kilometers and composed of the coastal plain sands and lignite series of Cainozoic age in its northern part and of alluvial mud in its southern part. The plain extends further eastwards across the river Niger from the Anambra plains to the Cross River plains at the foot of the eastern highlands but is interrupted in the centre by the Awka - Orlu upland and the Nsukka - Okigwe Cuesta which is composed of resistant cretaceous sedimentary rocks and marked by two distinct escarpments. These escarpments are composed of false-bedded sandstones and coal measures.

Drainage

The rivers of Nigeria can be classified into five drainage systems: the Niger system, the Benue system, the Chad system (a remarkable inland drainage system), the Cross and the Atlantic systems. Most of the rivers of the Atlantic systems are short, north-south coastal streams which follow through more or less regular courses. Apart from the Chad system of inland drainage, almost all the rest of Nigeria's river systems are exoreic (i.e., drain into the sea). The Niger and its major tributary the Benue cover very outstanding features of physical geography of Nigeria. They have not only punctuated the land surface of the Republic in a remarkable way but also greatly influenced the life of its people. Entering Nigeria from the northwest, the Niger flows for 1,271 kilometers (The National Atlas of the Federal Republic of Nigeria. First Edition 1978) reaching the sea in a series of tributaries. In the west, the western plains and ranges constitute the major divide which stretches from neighbouring Republic of Benin in a fairly simple line to near the Niger valley and separating the Atlantic-oriented north-south rivers from the right bank tributaries of the Niger. On the basement rocks of this unit, stream directions are largely controlled by the trend of the foliated rocks and by joining particularly on the more resistant rocks. This structural control is well displayed by the Ogun river, north of Olokomeji. Most of the rivers (Ogun, Oshun, Shasha, Yewa, Oluwa) are generally

parallel but each individual river displays a dendritic pattern of drainage with its tributaries.

In the areas of coastal plains where the gradient of river valleys is very low, the rivers deposit their load, thereby giving rise to the formation of braided channels.

In the southeast, the irregular scarp of the Nsukka-Okigwe Cuesta forms the major divide separating the rivers that drain into the Niger and the Imo from those that drain into the Cross. Major rivers in this area, the Imo and the Cross, are oriented towards the sea while the Anambra joins the sea at Onitsha. The highlands of the eastern border form another water divide separating some tributaries of the Benue and Cross rivers from those that flow into and through the Republic of Cameroun.

In the North, the central highland and Jos Plateau form a major hydrographical centre from which a radial pattern of drainage develops with streams draining to the Zamfara, Sokoto, and the Chad Basin. The major streams which drain into the Chad namely, the Yobe and its main tributaries, the Ngade, the Mbudi, and the Goma form a Centripetal pattern. Gradients of these streams are low and very little water ultimately reaches Lake Chad.

Most of the water is lost by percolation or by evaporation from the swamps and marshes, in which the streams lose themselves altogether.

Lake Chad, of which only a part lies in Nigeria, varies considerably in area which fluctuates with seasonal variations in climate.

CLIMATE OF NIGERIA

The climate of Nigeria is characterised by two regimes - the dry season and the wet season. This regime of climate is dependent on two prevailing air-masses blowing over the country at different times of the year: the dry north-easterly air-mass of Saharan origin and the humid maritime air-mass blowing from over the Atlantic. The two air-masses blowing from nearly opposite directions, meet at a zone of discontinuity stretching east-west across West Africa and variously called the Inter-Tropical Front (ITF), the inter-tropical discontinuity (ITD) and the inter-tropical convergence zone (ITCZ). The influence of the north-easterly air-mass causes dry season while that of the humid maritime air-mass causes the rainy season.

Rainfall

The Wet Season

The commencement of the wet season is earlier in the south where it occurs in February or March. The rainy season then continues to the end of October or even November. The length of the wet season in the south lasts, at least, seven months including the period of a little dry spell known as "August Break".

Northwards, the onset of the wet season becomes progressively more delayed occurring from late April to June in the central north and as late as July in the extreme north eastern part of the country. The rainy season also ends early in these northern parts often terminating at the end of September. This gives a wet season of only three to four months in the extreme north of the country. (See figure 3).

The Dry Season

During the winter in the northern Hemisphere the Saharan anticyclone causes dry and dust-laden airmass to blow from the Sahara Desert. This "east, north of east" air stream is known as the Harmattan. It extends its influence over the whole of West Africa reaching its southern most limit in late December or early January.

Most of the country (except the coastal areas) is dry during this period. The length and intensity of the dry season increase with continentality. While the coastal areas may have a dry season lasting from less than one month to three months (November to February) the extreme north-east experiences a dry season lasting from 8 - 9 months (October to June). (See figure 4).

Relative Humidity

The monthly variation of mean relative humidity (R.H.) at 10.00 a.m. and 16 hours have been derived from readings of dry - bulb and wet bulb thermometers (Source: The National Atlas of the Federal Republic of Nigeria. First Edition 1978). Throughout the year the R.H. have their highest values along the coast decreasing gradually towards the north. The highest values (80% - 90%) in the south and (76% - 86%) in the north occur around August and the lowest values (60% - 85%) in the south, (10% - 30%) in the north, from November to March. Near the coast the seasonal variation of relative humidity is slight, normally 80% -

100% but periods of few days of very low relative humidity (20% - 40%) may occur in January and February during a harmattan spell. Northwards from the coast the Relative Humidity decreases steadily and changes abruptly with the seasons in accordance with the prevailing influence of the moist south-westerly airmass and the dry north easterly airmass.

The relative humidity ranges between 70% and 95% under the influence of the south westerlies and between 20% and 40% under the influence of the dry north-easterlies. In the extreme north the humidity may be as low as 10% - 20% in January and February. (Source: The National Atlas of the Federal Republic of Nigeria. First Edition 1978).

Sunshine and Cloudiness

Mean Annual Sunshine Hours

The general pattern shows that the number of sunshine hours is lowest in the coastal areas and increases, although not uniformly, to the highest values in the extreme northeast of the country. Port-Harcourt in the extreme south records a mean annual value of 1,378 hours while Nguru in the extreme northeast records a mean value of 3,177 hours. These figures represent 31% and 71% of the maximum possible amount of sunshine at Port Harcourt and Nguru respectively. (Source: The National Atlas of the Federal Republic of Nigeria. First Edition 1978).

The generally low amount of sunshine in the south is due to the increased cloud cover and consequent rainfall characteristic of the southern part of the country. Altitudinal effect causes the drop in value observable in the region around the Jos Plateau. Much lower values are recorded all over the country during July and August due to generally increased cloud cover throughout the country in these months.

TEMPERATURE

In the south, the mean daily temperatures have their highest values 28°C - 30°C around March and their lowest values 23°C - 24°C around August. While in the north the highest values 32°C - 33°C are observed between April and May. Generally, all over the country the months of March, April and May show high values than the rest of the year (See figure 7).

Soil temperature varies in response to changes in the radiant, thermal and latent energy exchange processes which take place primarily through the soil surface. The effect of these phenomena are propagated into the soil profile by a complex series of transport processes, the rates of which are affected by time-variable and space-variable soil properties.

GEOLOGY

Studies of the geology of Nigeria have revealed that the rocks of the various units of the geological succession range in age from the pre-cambrian to the Quarternary. (Source: The National Atlas of the Federal Republic of Nigeria. First Edition 1978).

The Basement Complex

The basement complex constitutes the oldest exposed rocks in Nigeria. Although they were regarded as pre-cambrian, the basement complex comprises the remnants of an ancient sedimentary series, the metasediments, which have been transformed into anatectic migmatites and granites. The metasediments include quartzo-felspathic, biotite and hornblende-gneisses, schists, quartzites, marbles and Calc-silicate rocks.

The basement complex covers about half the total of Nigeria, occupying four main areas. The largest of these areas lies north of Niger and Benue rivers and includes parts of north-western and north-central States (Kano, Kaduna, Benue and Plateau) and north-east States (Borno and Gongola States). This is connected through a narrow neck near Bussa, on the Niger, to another large area that covers the greater part of Kwara and Western States as far south as Abeokuta.

The third area lies in the east, in parts of the south-eastern States extending north, almost to Yola. The fourth and the smallest area lies north of the Benue in the north-eastern States (Bauchi).

Northern Fringe

In the northwest fringe bordering Sokoto State, two major geological formations are recognised - a region of pre-cambrian basement complex rocks in the southeast and a region of cretaceous and tertiary sedimentary rocks in the north and west parts of the State. Regions of recent alluvial materials are confined to the

Sokoto and Rima river valleys. In the north central fringe bordering Kano State, 2 major geological formations are found:

- the basement complex which covers the southern and western portions,
- the Chad formation which covers the northern and eastern portion.

Alluvial deposits are associated with the major rivers in Kano. These deposits have been subdivided into older and younger alluvium. The older alluvium is partly colluvial in origin. Aeolian deposits overlies the older alluvium hence the varied soils developed on those flood plains. Other minor geological formations include Aeolian deposits which had been subdivided into dunes and continuous deposits. The Dune deposits can be found around Birnin Kudu running west as far as Maiduguri. North of Kano through Kazaure, continuous aeolian deposits, sometimes loosely described as 'drift' or loess are found in scattered formations. In some parts of the State there are thin to thick aeolian cappings over Basement Complex or alluvium and/or Chad sediments. These have also contributed to different soils depending on thickness, mode of deposition and the structure/texture of the underlying parent material.

The north-eastern fringe, bordering Borno State, falls within the Quarternary Chad Basin formation, the tertiary Kerri-Kerri sandstone and the recent alluvium.

Recent Alluvium

This occurs along most of the water courses and ranges in extent from their discontinuous sands occurring in the smallest streams to thick broad alluvial sands and back swamps of the major rivers (Yedseram and Yobe rivers).

Old Alluvium

The sand plains and dunefields are overlain by alluvial sands and clays related to former courses of the Yobe river and its tributaries. In many cases, these sands and clays have been partially resorted by wind action and are now associated or overlain by aeolian sands from adjacent sand plains and dunefields.

Aeolian Sands

North of the line from Azare in Bauchi State through Maiduguri and Bida to Mongonu, the near horizontal Strata of the Chad formation are overlain by

predominantly unconsolidated aeolian sands. The sands form extensive hummocky plains in which are developed sand dunes.

North of Maiduguri the sands are partially buried by more recent lagoonal deposits.

Kerri Kerri Formation

Lacustrine and lagoonal sediments are the most frequently occurring strata in the Kerri-Kerri formation. The formation constitutes only a small portion of the geological succession of the area between Potiskum and Damaturu.

Southern Fringe

In the southwest areas bordering Lagos State, the geology is mainly coastal sedimentary deposits, consisting of recent sediments and the coastal plain sands. On the coast, there are the beach ridges which are a product of accretion of the throwback of sand from the sea. They separate the mangrove swamps and the mud flat from the open sea. The mudflat was produced by sedimentation of the finest materials brought down from the hitherlands into the delta. While coarse fractions reach the sea through the estuaries, the finer fractions especially clay are carried far into the sea or are spilled out behind the levees of rivers and creek during the floods or hightides. In addition, there are the littoral and lagoonal deposits occupying the low-lying region further inland.

Bordering the southcentral fringe of the country the landscape is underlain by sediments of the Ogoni sands (Anderson, 1967) or Benin formation (Kogbe, 1979) which are alluvial deposits of miocene and pleistocene origin along the Niger and its tributaries.

It consists of the following:

1. Coastal plain sands
2. Bende Ameki group
3. Imo Shale group
4. Upper and lower coal measures
5. False bedded sandstone.

Based on the descriptions of Jones and Hockey (1964), the coastal plain sands consist of soft, very poorly sorted clayey sands, sandy clays and rare thin

lignites. They are indistinguishable in the field from much of the Ilaro formation (Bende - Ameki and Imo shale Groups) and from the basal continental beds of Abeokuta formation, False bedded sandstone and lower coal measures which show similar red and brown sandy earths and clayey grits.

The Bende - Ameki and the Imo shale groups include both marine and continental deposits. The sands are usually coarse angular and poorly sorted and contain considerable clay fraction.

In the southeastern fringes bordering Rivers and Cross River States, the main geological formations are the mangrove swamp, coastal plain sands, alluvium meander belts and beach ridges.

The Mangrove Swamps

These constitute a significant geological formation in these areas. They exist along the network of creeks found mainly along the coast in the vicinity of the mouths of the Niger, Imo and Cross Rivers.

The Coastal Plain Sands

Between the Cross and Imo rivers where the coastal plain exists, the underlying geological material consists of the coastal plain sands. The tertiary sandy deposits have different textures which range from coarse to fine sands.

Alluvium

The alluvium occurs extensively on the flood plains of the Niger, those of the other rivers and the Niger Delta. Beach ridges consist of coarse sands along the coastlines while the topography comprises low sandy ridges and mounds.

2.5 VEGETATION AND LANDUSE

Much of the natural vegetation of Nigeria has been altered or even obliterated by human interference through cultivation, animal grazing and fire over a long period of time. The natural vegetation of the country depends heavily on the amount and distribution of rainfall, where the rainfall is heavy as found along the southern coasts, the resultant vegetation is forest. With the decrease in rainfall northwards of the country, the forests thin out into Savannah with scattered trees and tall grasses.

The entire vegetation of the country has therefore been delineated into six broad zones based on bioclimatic parameters (KEAY, 1940). These zones are lowland forest, derived Savannah, Southern Guinea Savannah, Northern Guinea Savannah, Sudan and Sahel.

These zones do not indicate homogeneous belts of vegetation, rather they represent a mixture of types, each zone being characterised by the most extensive type which occurs within it. Land use follows closely the vegetational pattern. In the lowland forest covering Rivers, Cross River, Lagos and Bendel States, the dominant crops grown are Yam, Cassava, Maize, Oil palm, Rubber, Cocoa. In the derived Savannah covering Anambra, Ondo, Ogun, Bendel States, the dominant crops grown are Maize, Potato, rainfed rice.

In the Southern Guinea Savannah covering Benue and parts of Kwara and Gongola States, the dominant crops grown are Yam, Sorghum, Maize and Cassava.

In the Northern Guinea Savannah covering Abuja, Kaduna, Plateau States, dominant crops grown are groundnuts, Millet, Maize, Sorghum.

The Sudan Savannah covering Kano, Sokoto, Borno and Gongola States, the dominant crops grown are Cotton, Millet, Sorghum, Groundnuts, Onions.

The Sahel Savannah covering Chad and some parts of Borno States, dominant crops grown are Millet, Sorghum, Cowpea.

CHAPTER 3

METHODS OF SOIL SURVEY

3.1 Survey and Classification

Discussions on the method of soil survey, physical and chemical analysis of soil samples formed important part of the planning sessions which involved the United States Soil Scientists (Pedologists), their Nigerian counterparts and representatives of the Universities and the Soil Science Society of Nigeria. It was agreed in this meeting that classification of the soils would be at the subgroup level of the U.S.D.A. (Soil Taxonomy) with side-by-side correlation with the UNESCO/FAO Soil Map of the World Legend.

The use of U.S.D.A. system is well understood for its wide use in literature and the easiness with which it can relate to other systems. The UNESCO/FAO system has been developed in consultation with the developments of other countries of the world, notably, U.S.A. Its use here is also in conformity with the decision of the meeting of Soil Correlation Committee for West Africa to adopt UNESCO/FAO system for the West African sub-continent.

3.2 Sources of Base Maps

It has not been possible to advance the use of the same base map for all parts of the country.

Although aerial photographs, landsat and SLAR imageries existed in some States of the Federation, the initial lack of expertise in their interpretation and the initial difficulties of acquiring them, precluded their use as country-wide base maps. Zonal Project Leaders were, therefore, allowed use of particular source of base maps in their area of operation. Thus, in the South Western Zone compilation of the base map was from previously concluded State surveys and the SLAR imageries which formed part of the work of Landuse and Vegetation Survey of Federal Department of Forestry.

In the South Eastern Zone, the source was largely geology map and Landuse and vegetation survey of FDF, while in the North East and North West Zones, the sources were mostly Land Resource Surveys of Land Resources Division of British

Oversea Development Agency, Landsat imageries and some soil survey work by Institute of Agriculture, Samaru of Ahmadu Bello University, Zaria.

3.3 Environmental and Soil Profile Descriptions

Prior to the commencement of field work, various levels of workshop and seminars were conducted in order to familiarise members of the various field parties not previously acquainted with the U.S.D.A. system of soil description and classification with their requirements. This task was made easy by the fact that the National Programme Co-ordinator and the four (4) Zonal Co-ordinators of the programme were trained in this system and also by the able assistance of the U.S.D.A. Soil Scientists attached to the programme.

The content of the workshops and seminars include:

- Revision for Designations of Soil Horizons and Layers;
- Field Guide to Soil Properties in Profile Description;
- Soil Pedon Description;
- Map Unit Description;
- Classification to Order, Great Group and Sub-Group;
- Guide for Correlation to UNESCO/FAO System.

3.4 FIELD WORK

Auger borings were made along traverses, foot paths, tracks and roads. Observation intervals varied depending on the physiographic and vegetational changes observed. However, at each observation point, auger borings were made to a depth of 120cm - 150cm or to an impenetrable layer. Each auger boring was described in addition to the description of the environmental conditions.

The soils were grouped and soil profile pits located to reflect the various soil groups identified or differences determined from auger samples. In some areas profile pits were located along topo-sequences to reflect crestal, upper, middle and lower slopes as well as valley bottom soils.

Each profile pit was dug to a depth of 2 metres or more or to an impenetrable layer. The descriptions regarded the full range of morphological characteristics which included the kind and arrangement of individual horizons, drainage, colour, texture, structure, consistence and inclusions etc. Environmental

observations on vegetation, land use, surface characteristics and soil slope were made and recorded. Soil horizons in each representative pit were sampled and soil samples collected were consigned to laboratories for analysis.

3.5 Laboratory Analyses of Soils

Both physical and chemical analyses of supportive soil samples from representative pedons were carried out by designated laboratories in the country.

These laboratories are:

- a) State Ministry of Agriculture Plant and Soil Laboratory, Kano.
- b) Faculty of Agriculture Soil Laboratory of Ahmadu Bello University, Zaria.
- c) Institute of Agriculture and Research (I.A.R.) of the Obafemi Awolowo University of Ife, Soil Laboratory, Moor Plantation, Ibadan.
- d) Soil Science Laboratory of the Faculty of Agriculture, University of Nigeria, Nsukka.
- e) Nigeria Institute for Oilpalm Research, (NIFOR) Soil and Plant Laboratory, Benin.
- f) National Root Crops Research Institute, Umudike Soil Laboratory.

Initial meetings of the various laboratories and the Soil Chemists in the country were necessary at the planning stage of the programme to standardise methods of soil analysis. In some cases, trials were carried out to establish a correlation between a known U.S.D.A method and the method in vogue in many local laboratories. The following methods were adopted in the routine analysis of soil samples:

- All analyses were made on air-dried soil samples, ground to pass through 2mm sieve.
- Soil pH was determined in 1:1 soil/water suspension ratio using a glass electrode.
- Particle size analysis was conducted by the hydrometer method of Bouyoucos (1941).
- Organic carbon was determined by the Walkley - Black wet combustion method.
- Total Nitrogen was by Kjeldahl method

- Exchangeable cations was determined in 1N NH_4OAC at pH 7 soil extract; Ca and Mg by atomic absorption spectrophotometry.
- Cation Exchange Capacity (C.E.C.) by saturating soil with 1N NH_4OAC at pH 7 followed by direct distillation and determination of absorbed ammonia.
- Base Saturation (%) was obtained by dividing the sum of the bases (Ca, Mg, K and Na) by the C.E.C. and multiplying the quotient by 100.
- Exchangeable acidity was determined by the barium chloride - triethanolamine method at pH 8.2 and
- Available phosphorus determined by Bray 1 method.

CHAPTER 4

DESCRIPTION OF SOILS

4.1 Soil Mapping Descriptions.

This chapter deals with the summary of the descriptions of the various soils delineated throughout the country during the National Soil Survey Project.

The Soil Mapping Units are soil associations. These are groups of geographically associated soils which cannot be separated at small scales of soil survey.

In all, 58 soil mapping units were delineated throughout the country based on three broad ecological zones, twenty four broad geomorphic units as well as parent materials. The soil mapping units are numbered from 1a to 24b all totalling 58.

The dominant mapping units in the country are those with soils that were derived from Undifferentiated Basement Complex materials in the Savannah ecological zone.

In order to correspond with the 4 volumes of this report, the 58 soil mapping units have been grouped into 4. Each group is made up of mapping units in a given number of contiguous states that make up the volume.

In this volume, made up of Akwa Ibom, Anambra, Benue, Cross River, Imo and Rivers States, 26 soil mapping units are presented. The summarised descriptions of each of the mapping units, their major areas of occurrence, their compositions, as well as the physical and chemical properties of their soils are given below. The comprehensive soils legend for the entire country is also presented at the end of this chapter for reference purposes.

Mapping Unit 1a - Nearly level coastal plains on deltaic Basins and Tidal Flats, 0-2 percent slopes.

This soil mapping unit occupies 5,323.75 square kilometers or 0.58 percent of the total land area of Nigeria. It occurs in Rivers, Bendel, Ondo, Ogun and Lagos States, mainly along the Creeks, lagoons and tidal flats. It could be found around Port-Harcourt, Ndoni, Sagbama, Aziama and Yenagoa areas of Rivers State; Ipota town and the Omu creeks in Ogun and also around Igbokoda in the coastal areas of Ondo State. In Bendel State it occurs extensively in the coastal and creek area extending through Forcardos, Awoye, Sara and Inyanagu areas. In Lagos State, beginning from the Nakoue Lagoon in Benin Republic it extends through the lagos and Lekki Lagoon areas.

The landscape is nearly level with a general maximum elevation of about 5 metres above sea level. Slopes range from 0-2%.

Soils of this mapping unit are derived from alluvium of fine littoral and lagoonal sediments.

The mapping unit is composed of very deep, poorly drained Typic Tropaquents; very deep, moderately well drained, Typic Tropopsamments; very deep, poorly drained Typic Tropaqualfs and other minor soils.

The Typic Tropaquents (sandy phase) occur mainly on the areas surrounding the creeks and lagoons. These soils are very deep and poorly drained. They have dark grey, sandy surfaces over light brownish grey to light grey, sandy subsoils. In the top soil, the soil reaction ranges from extremely acid to very strongly acid (pH 4.1 - 4.5). Exchangeable bases are low for Ca, K and Na but moderate for Mg. The cation exchange capacity and base saturation percentage are low. In the subsoil, the soil reaction is very strongly acid (pH 4.6 - 5.0). Exchangeable bases are low for all cations. The cation exchange capacity values and base saturation percentage are low to moderate.

The Typic Tropopsamments are found generally on the coastal fringes between the lagoons and the sea on slightly elevated terrain above the creeks and lagoon floors. The soils are very deep and moderately well drained. They have

greyish brown loamy sand surface underlain by dark yellowish brown to very pale brown loamy sand subsoils. The soil reaction in the top soils is very strongly acid (pH 5.0 - 5.8). In the subsoil, the soil reaction is strongly acid (pH 5.2 - 5.3). The exchangeable bases are moderate for Ca, Mg and Na but low for K. The cation exchange capacity and base saturation percentages are low.

The Typic Tropaqualfs are generally found associated with the Typic Tropaquents in areas surrounding the creeks and lagoons. The soils are very deep and poorly drained. Typically they have dark grey sandy loam to sandy clay loam surfaces over grey sandy clay loam to sandy clay subsoils. In the top soils, the soil reaction is very strongly acid (pH 4.5 - 5.0). Exchangeable bases are moderate to high for Ca, Mg and Na but low for K. The cation exchange capacity and base saturation percentages are high. In the subsoil, the soil reaction ranges from very strongly acid to extremely acid (pH 4.5 - 4.4). Exchangeable bases are high to moderate for Ca, Mg and Na but low for K. The cation exchange capacity and percentage base saturation are high.

The major crops grown are - Yams, Maize, Rice, Cassava, Oilpalms, Cocoa, Coconuts and vegetables.

Mapping Unit 1b - Nearly Level Plains on Mangrove Swamps; 0 - 2 Percent Slopes.

This mapping unit occupies 8,128.33 square kilometers or 0.88 percent of the total land area of Nigeria. The unit can be found in the South Western parts of Bendel State such as in Abarra, Obotobo, Yeye in Burutuu L.G.A. It could also be found in areas around Degema, Opobo, Bonny Creek, Ogonokon and Kono Watersides in Rivers State.

The landscape is nearly level with slopes of 0-2 percent.

This mapping unit is composed mainly of deep, poorly drained Typic Fluvaquents, Typic Tropopsamments, Tropic Sulfic Fluvaquents and Typic Tropofibrists and other minor soils.

The typic Fluvaquents are encountered in areas around the Ogonokon and Opobo Watersides. They are deep, poorly drained and often flooded. Typically the surface layers range from very dark grey to dark grey fine sandy clay loam to grey silt loam to silty clay loam while the subsoils are dark grey to mottled dark grey clay or fibroid silt loam to silt clay loam. In the top soil, the soil reaction ranges from very strongly acid to extremely acid (pH 4.5 - 5.0). Exchangeable bases are moderate for all cations while the cation exchange capacity and base saturation values are also moderate.

The Typic Tropopsamments are very deep somewhat poorly drained. They have very dark to dark grey fine sandy surfaces over greyish brown to olive grey sand to loamy fine sand with greyish brown or dark reddish brown mottled subsoils. In the top soils reaction ranges from strongly acid to extremely acid (pH 4.4 - 5.0). Exchangeable bases are low to moderate for all cations. The cation exchange capacity and base saturation percentages are also low to moderate. In the subsoils, the soil reaction is very strongly acid (pH 4.5 - 5.2). The exchangeable cation values are low for all cations. The cation exchange capacity and base saturation are also low.

The Tropic Sulfic Fluvaquents occur around Opobo Waterside, Degema, Kono and Bonny creeks of Rivers State. They are moderately deep, poorly drained and almost daily flooded with brackish or saline water. They have dark grey or grey

fibroid sandy clay, silty clay loam or silty clay surfaces underlain by dark grey or mottled dark grey silty clay or silty loam or silty clay loam with sand and thick strata of decomposed organic matter residues. The soil reaction for both the surface layers and the subsoils ranges from very strongly acid to extremely acid (pH 4.4 - 5.0). Exchangeable bases are moderate while the CEC values and base saturation are also moderate for the top soils.

The major crops grown are - Yams, Rice, Cassava, Fruits, Oilpalms, Coconuts, Vegetables.

Mapping Unit 1c - Nearly Level Plains on Beach Ridge Sands and Mounds; 0-2 percent slopes.

This soil mapping unit occupies about 1,772.15 square kilometers or 0.19 percent of the total land area of Nigeria. It is found in Cross River, Rivers, Bendel and Akwa Ibom States, mainly close to the coast lines. It occurs in such area as Sokobolon, Ile-Sameri, Elolikokiri in Bendel State and Ayambo, Brass and Bonny in Rivers State.

The landscape is nearly level with slopes of 0 - 2 percent.

The soils of this mapping unit are derived from Beach Ridge sands and mounds.

The mapping unit is composed of deep, well drained Typic Udipsamments, Typic Tropopsamments; moderately deep poorly drained Typic Psammaquents, Typic Tropaquents and moderately deep Aquic tropopsamments as well as other minor soils.

The typic Udipsamments occur around Abalambie, Ugede, Bonny in Rivers State. They are deep and well drained. They have greyish brown to light gray sandy surfaces over grey to dark reddish brown or yellowish brown sandy subsurfaces. In the top soils the soil reaction ranges from strongly acid to slightly acid (pH 5.1 - 6.1). Exchangeable bases are very low for all the cations. The CEC values are very low while the base saturation percentages are low to moderate. In the subsoil the soil reaction ranges from strongly acid to very strongly acid (pH 5 - 5.5). Exchangeable bases are very low for all cations. The cation exchange capacity and base saturation values are low.

The Typic Psammaquents are deep to very deep, imperfectly or poorly drained. They have grey to light grey sands all through the profile. In the top soils the soil reaction is very strongly acid to extremely acid (pH 4.5 - 5.1). Exchangeable cations are very low to low for all the cations. The CEC values as well as the base saturation are very low to low. In the subsoil the soil reaction is strongly acid to very strongly acid (pH 5.0 - 5.5). Exchangeable bases are very low to trace for all cations. The CEC and base saturation percentage values are very low to low.

The Typic Tropopsamments are deep and somewhat poorly drained. They have very dark greyish brown to brown sandy surfaces underlain by yellowish brown to light yellowish brown sandy subsoils. In the top soil the soil reaction ranges from very strongly acid to extremely acid (pH 4.4 - 4.7). The exchangeable bases are low for all cations. The cation exchange capacity and base saturation values are very low.

The Aquic Udipsamments are very deep, imperfectly or poorly drained. They have grey to light grey sands all through the profile. In the top soil, the soil reaction ranges from extremely acid to very strongly acid and strongly acid (pH 4.5 - 5.5). The exchangeable cations, the cation exchange capacity and base saturation percentage values are very low to low.

The major crops grown are - Yams, Rice, Cassava, Plantain, Banana, Cocoa, Oilpalm, Vegetables, Fruits.

Mapping Unit 1d - Nearly Level Plains on Aeolian Sands over Alluvium; 0-2 percent slopes.

This soil mapping unit occupies 3,968.03 square kilometers or 0.43 percent of the total land area of Nigeria. It is found in areas around Serrifurri, Barnawa, Normari, Bombali, Dingari, Marki, Hage, Warwade and Shafara all in Kano State.

The landscape is nearly level with depressional flood plains and slopes of 0 - 3 percent. The soils are found mainly on lower slopes of dune and interdune.

The soils in this mapping unit are derived from Aeolian sands and alluvial deposits.

The mapping unit is composed mainly of the moderately well drained to well drained Typic Ustropepts, Typic Ustipsamments, Alfic Ustipsamments, Fluventic Ustropepts, and other minor soils.

The Typic Ustropepts are found mainly in areas around Serrifurri. The soils are moderately well drained to well drained with loamy sand to sandy loam surfaces over sandy clay loam subsoils. In the top soil, the soil reaction ranges from strongly acid to slightly acid (pH 5.2 - 6.4). Exchangeable bases are low to moderate for Ca and Mg and very low for K and Na. The cation exchange capacity is very low to low while the base saturation percentage is low to high. In the subsoil, the soil reaction ranges from very strongly acid to moderately acid (pH 5.0 - 5.8). Exchangeable bases are very low to moderate for Ca and Mg, very low to low for K and low to moderate for Na. The cation exchange capacity ranges from very low to low while the percentage base saturation ranges from low to very high.

The Typic Ustipsamments are found mainly in Barnawa areas. These are moderately well to well drained. The surface layers are dark brown to yellowish brown loamy sand while the subsoils and underlying materials are dark yellowish brown to brownish yellow loamy sand to fine sand. In the top soil, the soil reaction is generally neutral (pH 6.6 - 7.0). Exchangeable bases, Ca, Mg, K and Na are generally very low to low. The cation exchange capacity values are low while the base saturation percentages are moderate to very high.

The Alfic Ustipsamments are found mainly in areas around Dingari. They are well drained soils with dark yellowish brown fine sandy loam surface soils overlying brownish yellow and brown to dark brown sandy clay loam to clay subsoils. In the top soil, the soil reaction is slightly acid (pH 6.1 - 6.3). Exchangeable bases are very low to low for Ca, Mg and K but moderate for Na. The cation exchange capacity values are very low while the base saturation percentages are moderate to high. In the subsoil, the soil reaction is neutral (pH 6.6 - 9). Exchangeable bases are very low to low for Ca, Mg and K but moderate for Na. The cation exchange capacity values are very low while the base saturation percentages are moderate to high.

The Fluventic Ustropepts are found mainly in areas around Marki. They are moderately well drained. The surface layers are very dark grayish brown clay loam to clay underlain by yellowish brown sandy clay loam to clay loam or sandy clay and light yellowish brown fine sand.

The major crops grown are - Groundnuts, Millet, Maize, Cotton, Sorghum, Tobacco and Vegetables.

Mapping Unit 2a - Nearly Level to Gently Undulating Flood Plains on Recent Alluvium, 0 - 2% slopes

This mapping unit occupies 76,515.95 square kilometers or 8.28 percent of the total land area of Nigeria. The unit occurs on active flood plains of major rivers and their tributaries all over the country. Extensive areas of the unit can be found along the course of River Niger - north and south of Onitsha in Anambra State, around Ifite, Nsugbe, Otuocha, Atani, Ozubulu; in Bendel state around Atawa; in Kwara State around Pategi, Lafiagi, Shonga; in Niger State around Baro, Rabba and extends to Kainji Lake region; in Sokoto State around Kaoje. Along the Benue river, the unit can be found around Makurdi, Icheu, Bidaji in Benue State and around Numan, Lau, Jimeta and Donga in Gongola State, and along the course of Benue river in Plateau State. This mapping unit also occurs along the fringes of Lake Chad and can be found around Baga, north of Ngala, Damasak, Gashua and Dapchi in Borno State. Along the course of the Cross River, this unit occurs around Okurike, Ikot Okpora, Atan Onoyom, Obioko and Bansara in Cross River State and at Ekeya, Nwaniba, Oku Iboku, and Itu in Akwa Ibom State. This unit occurs to a lesser extent along the courses of minor rivers nation-wide. For example, along Imo River, the unit can be found around Akwete, Owaza in Imo State and around Obigbo in Rivers State. In Bendel State, the unit can be found around Sapele and on the courses of rivers Osse and Ossiomo. The unit also occurs along the courses of rivers Watari, Chalawa and Hadejia in Kano State; along the Kaduna river in Kaduna State and around Kankiya, Batsari, Jibiya and Kaita in Katsina State. It can also be found at Kari, Gunta, Disina and along the Gongola river in Bauchi State. This unit can also be found around Ojota, the northern fringes of Lagos Lagoon and Ajebo, south of Ikorodu in Lagos State. The unit extends from Lagos State into Ogun State along rivers Ogun and Yawa. In Ondo State, the unit occurs around Akotogbe and Iyanssau along river Siluko, and also along river Shasha in Oyo State. In Gongola State, the unit occurs along Yobe, Yedseram, Ngadda and Gongola flood plains and in Rivers State along the

frequently flooded basins of the lower delta of river Niger. This unit can also be found along the Rima and Sokoto rivers flood plains in Sokoto State.

The landscape is nearly level to gently undulating with slopes of 0 - 2 percent. The unit occurs on low terraces, upland depressions, valley bottoms and drainage-ways as narrow tracts predominantly along river flood plains, and are mostly bordered by interfluvial slopes that drop gently into the flood plains.

The soils in this mapping unit are derived from alluvial materials of varied origin. Some of the alluvial materials are of weathered basement complex origin, while others are of either aeolian origin or of sandstone, or shale of sedimentary upland origin. Some members are derived from heterogeneous alluvium.

This mapping unit is composed of deep, poorly drained soils occurring directly along the river courses of major flood plains, namely Typic Tropaquents, Aeric Tropaqualfs, Typic Tropaqualfs and Typic Psammaquents. There are also the deep well drained soils that occur in the middle and higher terraces within the flood plains. This group includes Typic Paleudults, and Oxic Tropudalfs. Other soils of minor extent do occur within the flood plains.

Typic Tropaquepts occur extensively along the almost flat depressions and valley bottoms along river drainageways in Rivers, Plateau, Kwara, Gongola, Bauchi, Oyo, Benue, Imo and Cross River States. These soils are very deep, poorly drained with variable textures which vary greatly over short distances. Variability in the texture of these soil regionally are dependent on the nature of the alluvial deposits constituting the parent materials. These soils are generally subject to flooding and redeposition of sediments. Typically, the surface layer is very dark greyish brown or dark reddish brown coarse sand to very gravelly loamy sand about 40cm thick. The substratum is mottled grey sandy loam to sandy clay loam that extends to the water table. In the top soil, the reaction is slightly acid (pH 6.3). Exchangeable bases are low for Ca, Mg, Na and moderate for K. The cation exchange capacity values are low while the base saturation is very high. In the subsoil, the soil reaction is moderately acid (pH 5.5 - 6.0). Exchangeable bases are low for Ca, moderate for Mg, low for K and moderate for Na. The values for CEC and base saturation are very high.

Aeric Tropaqualfs occur on the flat plain directly along the river courses. They can be found in Borno State west of Chymbozco villages on Nguru-Gashua road. They are deep, imperfectly drained soils. Typically the surface layer is light yellowish brown loamy sand to sandy loam about 32cm thick. The subsoil is brown sandy clay, sandy clay loam with a fine sandy mottled lower horizon that extends 140cm or more. In the top soil, the reaction ranges from neutral to very strongly acid (pH 7.2 - 5.0). Exchangeable bases are low for Ca, moderate for Mg, high for K and very low for Na. The CEC is low while base saturation is high.

Typic Paleudults occupy the higher terraces or the nearly level flood plains. They can be found around Iyaba and Banasara in Cross River on the Cross River flood plain. They are deep well drained soils. Typically the surface layer is strong brown clay over yellowish red clay while the subsoil is greyish brown clay or strongly cemented sandy clay loam. In the top soil, the soil reaction is strongly acid (pH 5.3 - 5.4). Exchangeable bases are very low for Ca, low for Mg, K and Na. The CEC is high and percentage base saturation is very low. In the subsoil, the reaction is strongly acid (pH 5.5 - 5.2). Exchangeable bases are very low for Ca, low for Mg, K and Na. The cation exchange capacity values are low and percentage base saturation are very low.

Oxic Tropudalfs occur on the higher terraces in the flood plain and these soils border the reddish, well drained soils of the coastal plain sand. Oxic Tropudalfs can be found for example in extensive areas around Ikeja, Oregun, and Ojota in Lagos State. They are very deep and well drained soils. Typically the upper surface layer is dark brown, sandy loam about 18cm thick. The lower part of the surface layer is dark reddish brown sandy loam, about 19cm thick. The upper subsoil is dark red, sandy clay loam, about 44cm thick, while the lower subsoil is red sandy clay loam that extends to about 155cm. In the top soil, the soil reaction is slightly acid. Exchangeable bases are very low for Ca, low for Mg and Na. The CEC is very low and base saturation is high. In the subsoil, the soil reaction is very strongly acid (pH 5.9 - 4.9). Exchangeable bases are very low. The CEC values are very low while the base saturation percentage is moderate.

The major crops grown are - Yams, Cassava, Rice, Maize, Cocoa, Oilpalm, Millet, Sorghum, tobacco, Groundnuts. In the subsoil, the soil reaction ranges from very strongly acid to neutral (pH 4.7 - 7.2). Exchangeable bases are high for Ca and Mg and low for K and Na. The CEC are moderate while base saturation values are high.

Typic Tropoqualfs occur on flat flood plains and lower terraces and channels liable to seasonal flooding. It can be found for instance in the flood plains of Borno, Benue, Gongola and Lagos States. They are deep, poorly drained soils. The surface soils are generally dark grey to dark greyish brown sandy loam to sandy clay loam over greyish brown to grey sandy clay and sandy lower horizons. In the top soil, the soil reaction is neutral (pH 6.8 - 7.2). Exchangeable bases are high for Ca, Mg, moderate for K and low for Na. Base saturation values are high to very high.

Typic Psammaquents occur extensively in the Niger flood plain around Kaoje in Sokoto State. They are deep poorly drained, loose, stratified soils. Typically the surface layers are olive gray to pale yellow sand, over grey loamy sand. The subsoil is white sand. Mottles occur at 41cm depth. In the top soil, the soil reaction is slightly acid (pH 6.4 - 6.2). Exchangeable bases are very low for Ca, Mg, K and Na. The CEC is very low while percentage base saturation is moderate to high. In the subsoil, the soil reaction is slightly acid to neutral (pH 6.3 - 7.1). Exchangeable bases and CEC values are very low while the percentage base saturation values are high.

Mapping Unit 2b - Nearly Level to Gently undulating Flood Plains on Old and Subrecent Alluvium; 0 - 2 percent slopes.

This soil mapping unit occupies 15,517.11 square kilometers or 1.68 percent of the total land area of Nigeria. It occurs extensively in Borno and Gongola States.

The mapping unit occurs on level to gently undulating plains with low circular dunes, and, in some areas, partially drift-covered alluvial plains, with sand islands and occasional clay flats and depressions. The slopes range from 0 - 2%

The geological formation of this unit consists of heterogenous alluvium derived from calcareous shale.

The mapping unit is composed mainly of deep imperfectly drained Aquic Ustipsamment, deep poorly drained Eutric Chromustert and deep, well drained Typic Torripsamment, and other minor soils.

Aquic Ustipsamments constitutes about 25% of the mapping unit. They occur in Damaturu, Gashua, and Ngamdu L.G.As of Borno State. These soils are deep imperfectly drained with dark yellowish brown fine sand surface horizons; and yellowish brown and white fine sand lower horizons. The soils are strongly to moderately acid (pH 5.3 - 6.8) in reaction. The exchangeable cations are low for calcium, magnesium, potassium and sodium. The cation exchange capacity is very low while the base saturation is high.

Typic Torripsamments form about 50% of the mapping unit. They exist in Geidam, Gashua, Baga, Maiduguri, Arege, Abadan, Dikwa, Mongonu and Kukawa L.G.A's of Borno State. The soils are deep well drained to poorly drained. The texture varies from loamy fine sand to clay loam surface horizons and fine sand to gravelly clay lower horizons. These soils are slightly acidic to moderately alkaline (pH 6.0 - 8.1) in reaction. The cation exchange capacity is moderate, while the base saturation is low to moderate.

Eutric Chromusterts form about 20% of the mapping unit. They are encountered in Malabu, Borrong and Shelleng in Gongola State and extend into Borno State. The soils are deep, poorly drained, and Calcareous. The texture is clay loam to gravelly clay surface horizons and clay lower horizons. The soils are slightly acid to slightly alkaline (pH 6.5 - 7.8) in reaction. The exchangeable cations are high for all cations. The cation exchange capacity and the base saturation are also very high. The major crops grown are - Sorghum, Millet, Maize, Rice, Yams, Cowpea, Cotton, Vegetables.

Mapping Unit 2c - Nearly Level to gently undulating Plains on Lagoonal Marshes, back and fresh water Swamp; 0 - 2% slopes.

This mapping unit occupies about 8,743.47 square kilometers or 0.95 percent of the total land area of Nigeria. It could be encountered around Mbiama, Kreigani, Kiama, Oloibiri, Sagbama, Yenagoa all in Rivers State as well as Bomadi and Warri areas of Bendel State.

The landscape is nearly level to gently undulating, with slopes of 0 - 2%. The soils of the mapping unit are derived from alluvium of lagoonal marshes, back and freshwater swamps on the Niger Delta.

The mapping unit consists mainly of deep poorly drained Typic Tropaquents; moderately deep to deep poorly drained Typic Tropaquepts; moderately deep, poorly drained Typic Tropofibrists; Aquic Tropopsammments and other soils.

The Typic Tropaquents can be found around Mbiama, Kiama and Oloibiri areas in Rivers State. They are moderately deep and poorly drained. They have greyish brown - black loam to loamy sand or sandy loam surfaces overlying light greyish brown to dark greyish brown or grey loamy sand to sandy loam or sandy clay loam subsoils. In the top soil, the soil reaction is strongly acid (pH 5.1 - 5.5). Exchangeable bases are low to very low for Ca, Mg and Na but low to moderate for K. The values for CEC and base saturation percentage are low to very low. In the subsoil, the soil reaction range from moderately acid to strongly acid (pH 5.5 - 5.9). Exchangeable bases are low to moderate for Ca, Mg and K but very low for Na. The CEC values are low while the base saturation percentages are very low.

The Typic Tropaquepts may be found around Sagbama and Mbiama and Yenagoa areas of Rivers State. The soils are moderately deep to deep and poorly drained. They have dark grey to greenish grey silt to silt loam surfaces overlying dark grayish brown to grey silt loam or silty clay loam subsoils. Some of the soils have fine sand to fine sandy loam strata deep down the profile. In the top soil, the soil reaction is strongly acid to very strongly acid (pH 4.5 - 5.0). Exchangeable bases are low to very low for Ca, Mg and K and trace for Na. The values for CEC are low to moderate while the base saturation is very low. In the subsoil, the soil

reaction is strongly acid (pH 5.1 - 5.6). Exchangeable bases are low to moderate for Ca, Mg and K and very low for Na. The cation exchange capacity values are moderate while the base saturation percentages are moderate to high.

The moderately deep, poorly drained Typic Tropofibrists may be encountered in the thick net-work of meander belts east of River Ase in Southern Bendel State as well as around Kreigani and Oloibiri in Rivers State. The soil surface is generally, dark, very dark greyish brown with humic very fine sandy loam texture while the subsoils are generally greyish brown to grey with fine sandy clay texture. In the top soil, the soil reaction is strongly acid to slightly acid (pH 5.6 - 6.0). Exchangeable bases are low. The CEC values and base saturation are low to moderate.

The Aquic Tropopsamments occur on the fringes of river courses on fresh alluvial deposits. They are deep, somewhat poorly drained. They have black humic fine sandy loam surfaces over light grey to white coarse sand with faint yellowish brown mottles.

In the top soils the soil reaction is strongly acid (pH 5.1 - 5.5). Exchangeable bases are low for all cations. The CEC and base saturation are low.

The major crops grown are - Yams, Rice, Cassava, Plantain, Bananas, Cocoa, Oilpalms, Vegetables.

Mapping Unit 5a - Nearly Level Plains on Sombreiro-Warri Deltaic Alluvial Plains, 0 - 2 percent slopes.

This soil mapping unit occupies 4,716.39 square kilometers or 0.51 percent of the total land area of Nigeria. The unit can be found in such areas as Akabuka, Omoku, Abua in Rivers; Oguta - Egbeima areas of Imo State and Osemele, Oriah, Ogbole - Oguma, Kwale area, Asaba and Ibusa in Bendel State.

The landscape is nearly level with slopes of 0 - 2 percent. In Bendel State the land form has a very dense net-work of fossil abandoned streams.

The soils of the unit are derived from sub-recent alluvium on flat flood plains.

This mapping unit is composed of deep well drained Typic Paleudults, Typic Tropudults, Arenic Paleudults, and Oxic Dystropepts as well as deep, poorly drained Aeric Tropaquepts and Aquic Tropopsamments. There are other minor soils in the unit.

The Typic Paleudults occur mainly in areas around Akabuka Omoku, Abua, Ahoada and Elele in Rivers State. They can also be encountered in Asaba and Ibusa areas of Bendel State. These soils are very deep and well drained. They have very dark grayish brown to dark brown sandy loam surface layers over yellowish brown or reddish yellow sandy clay loam to sandy clay subsurfaces. In the top soils, the soil reaction is extremely acid to very strongly acid (pH 4.5 - 5.0). Exchangeable bases are low to very low for all the cations - Ca, Mg, K and Na. The cation exchange capacity values are low to moderate while the percentage base saturation is very low to low. In the subsoil, the soil reaction is very strongly acid to strongly acid (pH 4.7 - 5.1). Exchangeable bases are very low for all cations. The CEC and base saturation percentage values are low.

The Typic Tropudults occur around the areas of Kwale Osemele, Oriah and Ogbole - Ogume in Bendel State; and around Oguta, Eziorsu in Imo State. The soils are deep and well drained. They have darkbrown to reddish brown sand, loamy sand or sandy loam surface layers overlying yellowish red sandy clay loam, clay loam or sandy clay subsurface layers. In the surface soil the soil reaction is very strongly acid (pH 4.7 - 5.2). Exchangeable bases are very low to low for all

cations. The CEC values and base saturation percentage are very low. In the subsoil, the soil reaction is also very strongly acid (pH 4.7 - 5.2). Exchangeable cations are very low for all cations. The CEC and base saturation are also very low.

The Arenic Pleudults are deep and well drained. They have dark greyish brown to greyish brown sand or loamy sand surfaces underlain by brown or yellowish brown loamy sand or sandy loam subsoils. In the top soil, the soil reaction is very strongly acid (pH 4.5 - 5.7). Exchangeable bases are very low for Ca, low to moderate for Mg and low for K and Na. In the subsoil, the soil reaction is extremely acid (pH 4.2 - 4.5). Exchangeable bases are very low to low for Ca, low for Mg and very low for K and Na.

The Oxic Dystropepts occur around the areas of Ikwerre-Etche in Rivers State. They are deep and well drained. They have greyish brown, sandy loam surfaces overlying dark brown or yellowish brown sandy loam to loamy subsoils. All through the horizons the soil reaction is very strongly acid (pH 4.5 - 5.0). The exchangeable bases are low to moderate while the percentage base saturation values are low.

The Aeric Trophaquepts occur around Abua area of Rivers State. The soils are deep but imperfectly drained. They have very dark grey sandy loam to loamy surfaces underlain by dark greyish brown to yellowish brown silty loam or silty clay loam subsurfaces. The soil reaction on the top soil is moderately acid (pH 5.6 - 6.0). The exchangeable bases are low for Ca, low to moderate for Mg and K and low for Na. The cation exchange capacity is low to moderate while the base saturation percentage is high to very high. In the subsoil, the soil reaction is strongly acid to moderately acid (pH 5.3 - 5.6). Exchangeable bases are low to very low for Ca, low for Mg, K and Na. The values for cation exchange capacity are very low while the saturation is moderate.

The Aquic Tropoamments are minor and occur around Asaba and Ibusa areas of Bendel State. The soils are deep, poorly or somewhat poorly drained. They have greyish brown to brown sandy surfaces over yellowish or yellowish red sandy subsoils. The soil reaction in the top soil ranges from very strongly acid to strongly acid (pH 4.5 - 5.3). Exchangeable bases are low to very low for Ca, Mg,

K and Na. The values for cation exchange capacity and base saturation are also low to very low. In the subsoil, the soil reaction is strongly acid (pH 5.1 - 5.3) Exchangeable bases are also very low for all cations, CEC and base saturation values are very low.

The major crops grown are - Yams, Cassava, Rice, Plantain/Bananas, Cocoa, Oilpalm, Vegetables.

Mapping Unit 5d -Nearly Level Plains on Transitional Materials of Sub-Recent Alluvium and Coastal Plain Sands; O - 2% Slopes.

This mapping unit occupies 5, 445.54 square kilometers or 0.59 percent of the total land area of Nigeria; occurring in four states namely Bendel, Ogun, Ondo and Rivers States. Bendel State has the largest area of occurrence where it forms the northern cap of the Coastal Plain Terrace. It can for instance be found around Uromi, Ekpoma and Irrua areas of Bendel State.

The landscape is nearly level with little or no relief in Ogun and Rivers States. In Bendel State however, some fluvial dissection of the landscape is discernible. The slopes generally range from 0 - 2%.

The soils of the mapping unit are derived from Ilaro Formation (Bende-Ameke group) which includes both marine and continental deposits.

This mapping unit is composed dominantly of Typic Paleudults, Rhodic Paleustalfs, Oxic Tropudalfs, Othoxic Tropudults (gravelly subsoil) and other soils of minor extent.

The Typic Paleudults occupy the nearly flat terrains between the major rivers in the areas covered by this mapping unit. They could be encountered around Isiokpo, Igirrita and Ikwerre-Etche in Rivers State. The soils are very deep and well drained. The soil surfaces are very dark brown sands; while the subsoils are yellowish red or red sandy clay loams. In the top soil, the soil reaction is strongly acid to moderately acid (PH 5.1 - 5.7). The exchangeable bases, cation exchange capacity and base saturation percentage values are low to moderate. In the subsoil, the soil reaction ranges from extremely acid to very strongly acid (PH 3.9 - 4.7). The exchangeable bases, cation exchange capacity and base saturation are low.

The Rhodic Paleustalfs are very deep well drained soils. They could be found around Uromi and Ekpoma areas of Bendel State. Typically the surface soils are dark brown loamy sands. The subsurfaces are clay loamy soils. In the top soil, the reaction is extremely acid to moderately acid (PH 4.0 - 6.0). The exchangeable bases, the cation exchange capacity and base saturation percentage are low to moderate. In the subsoil, the reaction ranges from extremely acid to very strongly acid (PH 4.5 - 5.0). Exchangeable bases, the cation exchange capacity and base saturation percentage values are low to very low.

The Oxidic Tropudalfs (Sedimentary) occupy large tracts of almost flat slope crests around Araomi, Irogun-Akere and Iweke villages south of Ilaro. The soils are very deep well drained. Typically the soil surfaces are dark reddish brown sandy loam to sandy clay loam. The subsurfaces are reddish brown clay loams.

In the top soil the soil reaction is moderately acid to slightly acid (PH 5.7 - 6.4). Exchangeable bases, cation exchange capacity and base saturation percentages are moderate to high. In the subsoil, the soil reaction ranges from strongly acid to moderately acid (PH 5.2 - 6.0). Exchangeable bases, cation exchange capacity and percentage base saturation values are low to moderate.

The Orthoxic Tropudults (gravelly subsoil) are common in the areas having some relief, especially at the fringes near the boundary with adjoining mapping units. They are moderately deep to well drained soil. Typically the surface layers are very dark greyish brown sandy loams while the subsurfaces are dark brown to strong sandy clay loam to sandy clay soils underlain by yellowish red gravelly sandy clay soil materials, or hard iron pans. In the top soil, the soil reaction is very strongly acid to strongly acid (PH 5.9 - 5.4). The exchangeable bases, cation exchange capacity and base saturation percentages are low to moderate. In the subsoils the soil reaction ranges from extremely acid to very strongly acid (PH 4.2 - 4.7). The exchangeable bases, cation exchange capacity and base saturation percentage values are very low to low.

The major crops grown are - Yams, Cassava, Rice, Cocoa, Oilpalms, Fruits, Vegetables.

Mapping Unit 6a - Nearly Level to Gently Undulating Plains on Coastal plain Sands; 0 - 2% Slopes.

This soil unit occupies 1,523.52 square kilometers or 0.16 percent of the total land area of Nigeria. It occurs in Imo, Cross River, Akwa Ibom, Ogun, Bendel and Ondo States. It lies between Umuahia to Owerri in Imo State, stretching to Ikot Ekpene, Abak, Uyo, Etinan in Akwa-Ibom; Aba to Port Harcourt in Rivers. It also occurs around Asaba-Benin and continues into Ondo State.

The landscape is nearly level to gently undulating with slopes of 0 - 2%. It is nearly level in parts of Imo and Akwa Ibom States. In Bendel, it is also nearly level though close to gently undulating in some areas where it is punctuated by north-south series of parallel ridges and corresponding rivers and streams.

The mapping unit is composed of very deep, well drained Typic Paleudults, Orthoxic Tropudults, Arenic Paleudults and Oxic Dystropepts as well as other minor soils.

The Typic Paleudults can be found around Mgbidi, Orji, Owerri-Ebeiri, Ikeduru, Asa, Obigbo, Akwete all in Imo State. It can also be encountered around Uyo, Abak, Etinan, Ekparakwa Nung in Akwa Ibom and Cross river States and also from Asaba to Benin in Bendel State. The soils are very deep and well drained. They have dark brown to reddish brown sandy loam to sandy clay loam surfaces underlain by yellowish red to dark red sandy clay subsoils. In the top soil, the soil reaction is very strongly acid (PH 5.1 - 5.5). The Exchangeable bases are low to very low for all cations.

The cations exchange capacity and base saturation percentage values are low to moderate. In the subsoil, the soil reaction is very strongly acid to strongly acid (PH 4.5- 5.5). Exchangeable cations are generally low. The cation exchange capacity and percentage base saturation are very low.

The Orthoxic Tropudults may be encountered along Asaba-Benin Road, in particular around the new Uromi junction. They soils are very deep and well drained. They have dark yellowish brown, thick sandy to loam surfaces over red to dark red sandy clay loam to sandy clay subsoils. In the top soil, the soil reaction is strongly acid (PH 5.1 - 5.5). The exchangeable bases are low to very low for all cations. The cation exchange capacity values are very low to low. The saturation percentage values are also low.

The Arenic Paleudults occur around Akwete in Imo state and Ikot-Abasi in Akwa Ibom State. The soils are deep and well drained. They have dark greyish brown to dark greyish brown loamy sand surfaces underlain by brown to yellowish brown loamy sand to sandy loam subsoils. In the top soil, the soil reaction is very strongly acid to strongly acid (PH 4.5 - 5.5). The exchangeable bases are generally low for all cations. The values for cation exchange capacity are low to moderate while the percentage base saturation is low. In the subsoil, the soil reaction is strongly acid (pH 5.1 - 5.5). The exchangeable bases are very low. The cation exchange capacity and base saturation percentage are low to moderate.

The Oxic Dystropepts can be encountered around Ikot Etim, Ikot Udo Abia in Cross river State. The soils are deep and well drained. They have loamy sand to sandy clay loam surfaces over sandy loam or sandy clay subsoils. In the top soil, the soil reaction is very strongly acid to strongly acid (pH 4.5 - 5.5). The exchangeable bases are very low for all cations. The cation exchange capacity values are very low to low, while the base saturation percentage is low to moderate. In the subsoil, the soil reaction is strongly acid to moderately acid (pH 5.1 - 5.9). The exchangeable bases are very low for all cations. The values for cation exchange capacity are very low while the percentage base saturation is low.

The major crops grown are Cassava, Yams, Rice, Plantain, Maize, Oil-Palms, and vegetables.

Mapping Unit 6b - Nearly Level to Gently Undulating Plains on Basalt; 0 - 2% slope.

This soil mapping Unit occupies 352.81 square kilometers or 0.04 percent of the total land area of Nigeria, mainly in Cross River State.

The landscape is nearly level to gently undulating with slope range of 0 - 2%.

The soils of the mapping unit are derived from Basalt. The major soils of this unit include the deep, well drained Typic Hapludults, deep well drained Typic Tropudults, deep poorly or imperfectly drained Aeric Tropaquepts as well as other minor soils.

The Typic Hapludults are very deep, well drained soils with dark brown to dark reddish brown sandy loam to sandy clay loam surfaces over yellowish red to brownish yellow, sandy clay loam to clay subsoils. In the top soil, the soil reaction ranges from strongly acid to moderately acid (pH 5.1 - 5.6). The exchangeable cations are very low to low for Ca, low to moderate for Mg and K and very low for Na. The CEC values and the percentage Base saturation are low to moderate. In the subsoil, the soil reaction ranges from very strongly acid to strongly acid (pH 5.0 - 5.5). The exchangeable cations are low for Ca; low to moderate for Mg and K and very low for Na. The CEC are very low to low while the percentage base saturation are moderate to high.

The Typic Tropudults are deep and well drained, with dark brown to dark grayish brown, sandy clay to clay loam surfaces over brown to strong brown sandy clay loam to clay subsoils. In the top soils, the soil reaction ranges from very strongly acid to strongly acid. The exchangeable bases are very low to low for Ca, low to moderate for Mg and K and very low for Na. The CEC values and the percentage base saturation are low to moderate. In the subsoil, the soil reaction ranges from extremely acid to very strongly acid (pH 4.4 - 4.8). The exchangeable bases are low to very low for Ca and Na but moderate to high for Mg and K.

The Aeric Tropaquepts occupy the valley bottom or depressions along River/stream courses. The soils are deep, poorly to imperfectly drained with dark grayish brown to dark brown, sandy clay loam to clay surfaces over brown, yellowish or reddish brown to gray or pale gray clayey subsoils. In the topsoil, the soil reaction ranges from strongly acid to moderately acid (pH 5.0 - 5.5). The exchangeable bases are low to moderate for Ca and Mg, moderate to high for K and very low for Na. The CEC values are low to moderate

and the percentage base saturation values are moderate to high. In the subsoil, the soil reaction is also strongly acid to moderately acid (pH 5.0 - 5.5). The exchangeable bases are moderate to high for Ca, Mg and K and very low for Na. The CEC values and base saturation are moderate to high.

The major crops grown are - Cassava, yam, rice, banana, plantain, cocoa, oil palm, vegetables.

Mapping Unit 7a - Undulating Plains on Coastal Plain Sands 0 - 6% Slopes.

This mapping unit occupies 1,500.49 square kilometers or 0.16 percent of the total land area of Nigeria; mainly on both sides of River Ogun's flood plains. It extends through Ijoko, Flaro and Ilaro forest reserve up to the boundary of River Yewa's flood plain (North of Oke-Odan and Ajilete).

The landscape is undulating and consists of long narrow ridges alternated by narrow V-shaped valleys. The slope crests are connected to the valley bottom by fairly short side slopes. Generally the slope ranges from 0 - 6%.

The soils in this mapping unit are derived from the coastal plain sands of Ilaro formation.

This mapping unit is composed of very deep, well drained Oxic Tropudalfs; very deep, poorly drained Typic Tropaqualfs; very deep, well drained Oxic Rhodustalfs and other soils of minor extent.

The Oxic Tropudalfs occupy the gently sloping slope crests as well as fairly short connecting side slope positions on the landscape. They occur extensively north of Isaga, Ajilete and Oke-Odan areas. The soils are very deep and well drained. They have dark brown loamy sand to sandy loam surface layers over yellowish brown clay loam and dark red clay loam subsoils. In the topsoil, the soil reaction ranges from moderately acid to slightly acid (pH 5.9 - 6.2). Exchangeable bases are low to moderate for all cations. The cation exchange capacity and the base saturation percentages are moderate. In the subsoils, the soil reaction ranges from moderately acid to very strongly acid (pH 4.9 - 5.6). Exchangeable bases are low for all cations. The cation exchange capacity and the percentage base saturation are low to moderate.

The Typic Tropaqualfs are generally extensive along the valley bottoms of major rivers and streams. They are very deep, poorly drained soils. Typically the surface layers are dark grey sandy loam to sandy clay loam while the subsoils are grey sandy clay. In the topsoil, the soil reaction ranges from moderate to strongly acid (pH 6.0 - 5.3). Exchangeable bases are moderate for Ca, Mg and Na but low for K. The cation exchange capacity are low, and the base saturation percentages are high. In the subsoil, the soil reaction ranges from strongly acid to extremely acid (pH 5.5 - 4.4). Exchangeable bases

are moderate for Ca, Mg and Na but low for K. The cation exchange capacity and base saturation percentages are moderate to high.

The Oxic Rhodustalfs are generally found in association with the Oxic Tropudalfs in areas occupied by this mapping unit. They are however, extensive along Ilaro-Oja Odan. The soils are very deep and well drained. Typically the surface layers are dark reddish brown loamy sand while the surface layers are dark brown sandy clay loam to clay loam or dark red clay loam. In the topsoil, the soil reaction ranges from moderately acid to strongly acid (pH 6.0 - 5.4). Exchangeable bases are low for Ca, K and Na but moderate for Mg. The cation exchange capacity and the base saturation percentages are low to moderate. In the subsoil, the soil reaction ranges from strongly acid to moderately acid (pH 5.0 - 5.8). Exchangeable bases are low for all cations. The cation exchange capacity and the base saturation percentages are low to moderate.

The major crops grown are - Maize, rice, yams, cassava, cocoa, oil palms.

Mapping Unit 9a - Gently Undulating Plains on Sandstone and Shale, 0 - 6 percent slopes

This mapping unit occupies 6,496.88 square kilometers or 0.70 percent of the total land area of Nigeria. It occurs in Anambra, Bendel, Imo, Kwara and Akwa Ibom states.

The landscape is gently undulation to undulating with slopes of about 0 - 6 percent. Residual hills and rolling or contiguous ridges with narrow and sometimes wide valleys often with streams or rivers are common.

The soils of the mapping unit are derived from sandstones and shales; principally of the Bende-Ameke, Imo Shales (Ihoro formation) and the False-bedded sandstones (Abeokuta formation). The unit is composed of deep, well drained Typic Paleudults; Typic Hapludults; Oxic Dystropepts and Lithic Hapludalfs, and other soils of minor extent.

The Typic Paleudults of this mapping unit occur at the upper slopes and crests of the gently undulating areas. They are deep to very deep and well drained. They have dark brown, brown or reddish brown sandy loam or loamy sand surfaces underlain by strong brown yellowish red or red sandy clay loam to clay loam subsoils. The soil reaction ranges from very strongly acid to strongly acid (PH 4.5 - 5.5). The exchangeable cations are low to very low for all cations. The cation exchange capacity values are low and the base saturation is low to moderate.

The Typic Hapludults are deep, moderately well drained to imperfectly drained. Some are gravelly or concretionary. They have dark gray sandy loam to sandy clay loam surfaces underlain by dark brown to brown, sometimes mottled sandy clay loam or clay loam subsoils. They have a soil reaction range of very strongly acid to strongly acid. (PH 4.5 - 5.5).

The cation exchange capacity values are low to moderate while the base saturation is very low to low.

The Oxic Dystropepts of this mapping unit are encountered on summits and upper slopes of the hills and undulating landscape. They are deep to moderately deep and well drained. Some are concretionary. They have dark brown to reddish brown loam surfaces over reddish yellow, red, or dark red sandy clay loam to clay subsoils. They are strong to moderately acid in reaction (PH 5.1 - 6.0). The Exchangeable bases are low for all

cations. The cation exchange capacity values are low while the base saturation is moderate.

The Lithic Hapludalfs, occur around the Auchi area of Bendel State. They are shallow to rock material and are well drained. They have brown to strong brown concretionary, strongly cemented rock materials. The soil reaction ranges from very strongly acid to moderately acid (PH 4.8 - 5.9). The exchangeable bases are very low to low for all cations. The cation exchange capacity values are low to moderate while the base saturation is also very low.

The major crops grown are Yams, Cassava, Rice, Plantain, Maize, Oil-Palms, Vegetables, Cocoa and Rubber .

Mapping Unit 10a - Undulating Plains on Undifferentiated Basement Complex: 0 -6 percent slopes.

This mapping unit occupies 16,051.30 square kilometers or 1.74 percent of the total land area of Nigeria. It is encountered around Ibadan, Iwo, Ikire and Apomu in the South eastern parts of Oyo State and around Oban, Ekang, Nsan, Uyanga, Awi and Nyaje in Cross River State.

The landscape is undulating with slopes of about 0 - 6 percent.

The soils of this unit are derived from granite, gneiss, schists and quartzite and from alluvium derived from these rocks. Inselbergs common to some portions of the basement complex are largely absent from this unit.

This mapping unit is composed of deep well drained Oxidic Tropudalfs (very gravelly subsoil); Oxidic Tropudalfs thick, sandy surface); Typic Tropudalfs; Oxidic Dystopepts and other soils of minor extent.

The Oxidic Tropudalfs (very gravelly subsoil), occur on upper and middle pediment slopes. They occur on the grounds of IITA in Ibadan. The soils are very deep and well drained. Typically, the surface layers are brown sandy loam. The subsoils are reddish brown and variegated red, reddish yellow very gravelly sandy clay loam and very gravelly sandy clay. In the top soil, the soil reaction range from moderately acid to slightly acid (pH 5.6 - 6.5). Exchangeable bases are low for Ca, K, Mg and Na. The cation exchange capacity values are low and base saturation is moderate to high.

The Oxidic Tropudalfs (thick sandy surface), occur on middle and lower pediment slopes. They occur on the grounds of IITA in Ibadan. The soils are very deep and well to somewhat excessively drained. Typically, the surface layer is brown loam and gravelly loamy sand. The sub soil are brown very gravelly sandy clay loam or sandy clay, while the substratum is gravelly sandy loam and strongly weathered rock. In the top soil, the soil reaction ranges from strongly acid to mildly alkaline (PH 5.1 - 7.8). Exchangeable bases are low for Ca and Mg and very low for Na and K. The cation exchange capacity values and base saturation are low and high respectively. In the subsoil, the soil reaction ranges from strongly acid to neutral (PH 5.1 - 7.3). Exchangeable bases are low. The cation exchange capacity values and base saturation are low and high respectively.

The Typic Tropudults, occupy nearly level to gently undulating plains. They can be found around Awi in Cross River State. They are deep and well drained. Typically, the surface layer is yellowish brown to dark brown sandy loam to sandy clay loam. The upper part of the subsoil is strong brown to brown gravelly clay loam to gravelly clay while lower part of the subsoil is brown gravelly clay loam to gravelly clay. In the top soil, the soil reaction ranges from strongly acid to slightly acid. (PH 5.1 - 6.5). In the subsoil, the soil reaction also ranges from strongly acid to slightly acid (PH 5.1-6.5).

The Oxic Dystropepts occur on nearly level to gently undulating plains. They can be found around Nsan in Cross River State. They are deep and well drained. Typically, the surface layer is dark grayish brown to yellowish brown sandy loam. The upper part of the subsoil is yellowish brown to brownish yellow sandy loam, while the lower part of the subsoil is brownish yellow sandy loam. In the top soil, the soil reaction from strongly acid to slightly acid. (PH 5.1 - 6.5). In the subsoil, the soil reaction ranges from strongly acid to slightly acid (PH 5.1 - 6.5).

The major crops grown are Cassava, Yams, rice, Cocoa, Oil-Palms, Plantain, Banana, Vegetables.

Mapping Unit 12a - Undulating dissected plains with Hills, on Coastal Plain sands and Sandstones; 0 - 6 percent slopes.

This mapping unit occupies 5,390.44 square kilometers or 0.58 percent of the total land area of Nigeria. It occurs in Imo, Cross river, Akwa Ibom and Bendel States. In Imo State, it occurs on the eastern parts of the state extending through Isiukwuato, Abiriba, Ohafia and Arochukwu areas to the fringes of the Cross River flood plains. It also occurs around Umuahia and at the south eastern parts from where the unit stretches into the northern parts of Akwa Ibom state, (Ibieku area). In the Cross River State the unit is found on the north western parts through to the eastern parts, extending through Ugep, Uku-Iboku, Nung-Ikot, Item and Odukpani areas. In Bendel, it covers small areas of south and south west of Ogwashi-uku town.

The landscape is undulating and dissected, with minor hills and corresponding rivers and streams at some of the valleys, with slopes of about 0 - 6 percent.

The soils of this mapping unit are derived from Coastal plain sands and sandstones.

This mapping unit is composed of deep and well drained Typic Paleudults, Typic Tropudults, Typic Tropaquents, and Typic Tropopsamments and other soils of minor extent.

The Typic Paleudults, occur at the crests and mid-slopes. They have dark grayish brown to yellowish red sandy loam and sandy clay loam subsoils. They are deep and well drained.

In the top soils, the soil reaction ranges from strongly acid to moderately acid (pH 5.1 - 6.0). Exchangeable bases are very low to low for Ca, Mg, K and Na. The cation exchange capacity values are very low while the base saturation is low to moderate. In the subsoils, the soil reaction ranges from strongly acid to very moderately acid (5.1 - 6.0). The exchangeable bases are low to very low for all cations. The cation exchange capacity values are very low and the base saturation is low to very low.

The Typic Tropaquents, occur at the nearly level or flat crests and mid-slopes. They are deep and well drained. They have very dark brown to very dark grey sandy loam to sandy clay loam surfaces over dark brown to dark yellowish brown sandy clay to clay subsoils. In the top soils, the soil reaction ranges from very strongly acid to strongly acid

(pH 4.5 - 5.5). The exchangeable bases are low to very low for all cations. The cation exchange capacity values are low to moderate while the base saturation is low to moderate. In the subsoils, the soil reaction is very strongly acid to strongly acid (pH 4.5 - 5.5). The exchangeable bases are very low for all cations while the cation exchange capacity values are low to moderate. The base saturation is low.

The Typic Tropudults, may occur at the mid slopes and valley bottoms. They are shallow or moderately deep, and poorly drained. They have dark brown clay loam or gravelly clay surfaces over dark reddish brown to grayish brown or grey clay or gravelly clay subsoils, often with mottles. In the top soil, the soil reaction is moderately acid to slightly acid (pH 5.6 - 6.5). The exchangeable bases are low to moderate for Ca, Mg and K and low to very low for Na. The cation exchangeable capacity values and base saturation are moderate to high.

The Typic Tropopsamments constitute over 70% of the individual soil units of this mapping unit in Bendel State area. They are deep to very deep and well drained. They have dark grayish brown to weak red, thick, sandy surfaces over dark red to red sandy loam to sandy clay loam subsoils. The base saturation is low.

The major crops grown are - Yam, Cassava, Rice, Plantain, Maize, Oilpalm, Vegetables.

Mapping Unit 15d - Nearly level to gently undulating plains on sandstone and shale, 0 - 6% slopes.

This mapping unit occupies 33,720.12 square kilometers or 3.65 percent of the total land of Nigeria. It occurs mainly in Borno and Gongola States with greater occurrence in areas around Kudu and along Rafin Kada-Wukari road in Gongola state as well as areas around Mazawan, Lalori, Bama and along Potiskum-Gombe road in Borno state.

The landscape is nearly level to gently undulating with slopes of about 0 - 6 percent.

Soils of this mapping unit are derived from sandstones, shales, mudstones and occasionally volcanic materials.

The mapping unit is composed mainly of deep well drained Aeric Paleustalfs; Typic Paleustalfs; Typic Rhodustalfs and other soils of minor extent.

The Aeric Paleustalfs, occur mainly in Borno State. The soils are deep and well drained with dark grayish brown sandy surface horizons and brown to reddish brown sandy clay loam lower horizons. They are slightly acid to neutral in reaction (pH 6.1 - 7.3). The exchangeable cations are low for calcium and magnesium, low for potassium in the surface horizons but moderate to high in the lower horizons; and very low for sodium. The cation exchange capacity values are very low in the surface horizons. The base saturation is high to very high.

The Typic Paleustalfs are found in Fufore, Mapeo, Numan and Kurkau local government areas of Gongola State. The soils are deep, well drained and strong brown. The top soils are loamy sand to sandy loam while the subsoils are sandy clay. They are neutral (pH6.8) in the surface horizons and slightly acid (pH5.6) in the lower horizons. The cation exchange capacity values are low while the base saturation is moderate to high.

The Typic Rhodustalfs, are found mainly in Lawarde, Danra, Numan, Jalingo and Dong areas of Gongola State. The soils on the crest and middle slope positions, are deep and well drained. They have loamy sand or sandy loam surface horizons, and sandy loam to clay loam lower horizons (pH6.6 - 7.3) and slightly acid to neutral in the lower horizons (pH6.1 - 7.3). The cation exchange capacity values are low while the base saturation is moderate to high.

The major crops grown are - Sorghum, Millet, Maize, Rice, Cassava, Cotton, Cowpea, Banana, Vegetables.

Mapping Unit 17a - Gentle Undulating Plains on Shales: 0 - 22 Percent slopes.

This mapping unit occupies 25,243.45 square kilometres or 2.73 percent of the total land area of Nigeria. It can be found in Anambra, Benue and Plateau State. It occurs around Igbariam, Ugwuoba, Ebenebe, between Achalla and Awka in Anambra State; Kadarko in Plateau State south-west of Lafia and in a very small area in Benue State.

The landscape is gently undulating with slopes of about 0-2 percent.

The soils of this mapping unit are derived from shales. This mapping unit is composed of deep, well drained Typic Paleustalfs; Typic Haplustalfs; Arenic Haplustalfs and Ustoxic Dystropepts and other soils of minor extent.

The Typic Paleustalfs, Haplustalfs, Arenic Haplustalfs and Ustoxic Dystropepts occur on the summits of convex landforms. The imperfectly drained and poorly drained Aquic Haplustalfs and Typic Tropaquepts occur on the nearly level plains, for instance between Awka and Amanse in Anambra State.

The soils are mostly deep and well drained. The surface layers are dark yellowish brown to yellowish brown loamy sand to sandy loam. The subsoils are dark reddish brown to dark red sandy clay loam and sandy clay. The deep poorly drained soils are sometimes underlain by weak cementation of ferruginised materials. The soil reaction of the top soil is generally strongly acid (pH 5.1 - 5.5) while the subsoil is very strongly acid to strongly acid (pH 4.5 - 5.5). The exchangeable bases are low for all the cations. The cation exchange capacity values are low to very low while the base saturation is low to moderate.

The major crops are - Cassava, Yams, Rice, Maize, Plantain, Oil palm, Irish potatoes, Millets, Acha, Sorghum.

Mapping Unit 17b - Gently Undulating Land On Sandstone (Abeokuta Formation)
0 - 2 Percent Slopes.

This mapping unit occupies 1,358,28 square kilometres or 0.15 percent of the total land area of Nigeria. It occurs mainly in Ogun State in the vicinity of Abeokuta. These include Ibese, Wasimi, Aiyetoro, Isaga, Igbogila and the surrounding towns and villages.

The landscape is gently undulating with slopes of about 0 - 2 percent, especially in Aiyetoro areas.

The soils of this mapping unit are derived from ferruginized sandstone (Abeokuta formation).

This mapping unit is composed of very deep and well drained Oxic Paleustalfs; very deep, well drained Arenic Paleustalfs (sandy); shallow, well drained, Typic Haplustalfs (gravelly) and other soils of minor extent.

The Oxic Paleustalfs, occupy the middle to upper long connecting slopes of the gently undulating to undulating landscape of the Abeokuta formation especially around Maria, Isaga, Igan-Okoto and Aiyetoro. The soils are very deep and well drained. Typically, the surface layer is reddish brown loamy fine sand to fine sandy loam. The subsoil is red sandy clay to dark red clay loam. In the topsoil, the soil reaction is moderately acid (pH5.8). Exchangeable bases are high for Ca and Mg but low for K and Na. The cation exchange capacity values and base saturation are high. In the subsoil however, the soil reaction ranges from very strongly acid to strongly acid (pH 4.5 - 5.5). Exchangeable bases are low for Ca, K and Na but high for Mg. The cation exchange capacity values and percentage base saturation are low to moderate.

The Arenic paleustalfs (sandy), occupy the lower to middle slopes of the long connecting gently undulating slopes of the Abeokuta formation. The soils are very deep and well drained. Typically, the layer is dark brown loamy fine sand. The subsoil is red fine sandy loam. In the topsoil, the soil reaction ranges from moderately acid to strongly acid (pH5.2 - 5.8). Exchangeable bases are high for Ca and Mg but low for K and Na. The cation exchange capacity values and percentage base saturation are high. In the subsoil, the reactions range from moderately acid to strongly acid (pH4.4 - 5.7). Exchangeable bases

are moderate for Ca and Mg but low for K and Na. The cation exchange capacity values and percentage base saturation are high.

The Typic Haplustalfs (gravelly), occupy the almost plain Plateau of the Abeokuta formation especially around Meko, Olorunda and Isaga, Orile in Ogun State. The soils are shallow. The shallowness is often caused by continuous layer of ferruginized sandstone which may occur before the depth of 100cm. The soils are generally gravelly and very well drained. Typically, the surface layer is reddish brown loamy fine sandy loam. The subsoil is red sandy clay loam. In the topsoil, the reaction is moderately acid (pH 6.0). Exchangeable bases are moderately high for Ca and Mg but low for K and Na. The cation exchange capacity values and base saturation are high. In the subsoil, the reactions are moderately acid (pH 5.6 - 5.8). Exchangeable bases are generally low for all cations. The cation exchange capacity values are low and base saturation is high. The major crops grown are - Maize, Rice, Yams Cassava, Cocoa, Oil palms.

Mapping Unit 18d - Gently Undulating Plains with Scattered Hills, rock and iron pan outcrops and Inselberges, 0 - 2 percent slopes.

This mapping unit occupies 92, 048.48 square kilometres or 9.96 percent of the total land area of Nigeria. It occurs mainly in Bauchi, Bendel, Borno, Kaduna, Kwara, Ondo, Oyo, Plateau and Katsina States. The soils of the unit can be found in areas around Balabulin, Danboa, Maiduguri and Kwomala in Borno States; Shika, Kimba, Kankara, Ungwar Danda and Dogon Yargoji in Kaduna State; Kagara, Kakau and Malumfashi in Katsina State; Kabba in Kwara State; Bauchi, Baurso, Gakaru and Liman Katagun in Bauchi State; Fonyan, Shendam, Shermagi and Yelwa in Plateau State; Apomu in Oyo State as well as Akure and Ondo town in Ondo State.

The landscape is gently undulating with scattered hills, rock outcrops, few iron pans and inselbergs with the slope range of about 0 - 2 percent.

The soils of the mapping unit are developed from basement complex rocks especially granite gneiss and schists.

The unit is made up of deep, well drained Typic Haplustalfs; deep, well drained gravelly Oxic Paleustalfs; the moderately deep to deep, well drained Ustoxic Dystropepts.

Other minor soils include the shallow well drained Lithic Ustorthents; the deep somewhat poorly drained to poorly drained gravelly Aquic Haplustalfs found on lower slopes.

The Typic Haplustalfs, occur on the lower middle slopes. They are deep, well drained soils. The surface layers are dark brown sandy loam and strong brown loam. The subsoils are strong brown clay loam and brownish yellow to very pale brown silt loam. The soil reaction ranges between moderately acid to neutral (pH 6.0 - 6.8). Values of exchangeable bases are low for Ca, moderate to high for Mg, very low for K and low to moderate for Na. Cation exchange capacity values are very low to low and the base saturation is high.

The Oxic Paleustalfs, occur on upper and middle slopes. The soils are deep to very deep and well drained. The surface layers are reddish brown loamy fine sand and red sandy clay loam. The lower layers are red sandy clay loam and red sandy clay. Some are gravelly in the lower layers. Soil reaction ranges between extremely acid to moderately

acid (pH 4.0 - 6.0). Exchangeable bases are very low to low for Ca, moderate for Mg, very low for K and very low for Na. Cation exchange capacity values are low and base saturation is moderate to high.

The Ustoxic Dystropepts, occur on nearly level terrain. The soils are moderately deep to deep and well drained. The upper layers consist of very dark grayish brown loamy sand. The lower layers are strong brown loamy sand to sandy loam and yellowish red sandy clay loam. Soil reaction ranges between strongly acid and slightly acid (pH 5.5 - 6.3). Values of exchangeable bases are very low to low for Ca, low for Mg, very low to low for K and moderate for Na. Cation exchange capacity values are very low and base saturation is moderate to high.

The major crops grown are - Sorghum, Millet, Cowpea, Cotton, Maize, Groundnuts, Beans, Yams, Sugarcane, Cocoa/Rubber, Irish Potatoes, Acha, Cassava, Oilpalms.

Mapping Unit 19a - Gently undulating to undulating plains on Sandstones and Shales, 0 - 6 percent slopes.

This mapping unit occupies 21,172.57 square kilometres or 2.29 percent of the total land area of Nigeria. It can be found in Anambra, Benue, Bauchi, Borno and Gongola States. It occurs mainly in the savanna areas especially around Ikem in the northeast of Anambra; Makurdi, Itobi, Ayangba, Oturkpo, Ofugo and Ugbokolo in Benue State as well as areas between Gombe and Biu in Bauchi State.

The landscape is gently undulating to undulating with slope range of about 0 - 6 percent. Low hills, sometimes rocky or concretionary outcrops are common in the landscape.

The soils of this mapping unit are derived from sandstones and shales or colluvium from these rock materials.

The major soils of this mapping unit are the Oxidic Paleustults; Oxidic Haplustults; Typic Paleustalfs; Typic Haplustults; Typic Chromusterts and Rhodic Paleustalfs. Other minor soils are the Oxidic Ustropets, Arenic Haplustalfs, Alfic Ustipsamments, Aquic Haplustults and Typic Rhodustults.

The Oxidic Paleustults, occur at the nearly level crests and midslopes. They are deep and well drained. They have dark brown to brown, sandy loam to sandy clay loam surfaces underlain by dark red to red clay subsoils. The soil reaction (pH) ranges from strongly acid to moderately acid (pH 5.1 - 6.0). The exchangeable bases are low to very low for Ca, Mg, K and Na. The cation exchange capacity values are also low to very low while the base saturation is moderate.

The Typic Paleustalfs may be encountered at the plains and low slopes of the landscape. They are deep and well drained. They have brown, dark brown to dark reddish brown sand to loamy sand surfaces underlain by yellowish brown, brown or pale brown sandy clay loam to sandy clay subsoils. The soil reaction ranges from moderately acid to slightly acid (pH 5.6 - 6.5). The exchangeable bases are low to moderate for Ca, Mg and K and low for Na. The values of cation exchange capacity are low while the base saturation is high to very high.

The Typic Haplustalfs, are moderately deep, well drained and gravelly. They occur mostly at the summits and upper slopes. They have gravelly loam surfaces over yellowish brown to yellowish red, gravelly clay loam subsoils. Varying sizes of quartz, gravels and hard ferruginized concretions occur in some profiles. The soil reaction ranges from moderately acid to slightly acid (pH 5.6 - 6.5). The values of exchangeable bases are moderate to high for Ca, Mg and K and low to moderate for Na. The cation exchange capacity values are low to very low and the base saturation is high to very high.

The Typic Chromusterts which commonly occur on midslopes and lower slopes are derived from the calcareous sediments of shales and sandstones. They have grayish brown clay loam to clay surfaces over yellowish brown, reddish grey or dark reddish grey clay subsoil. The soils are very strongly to strongly alkaline (pH 8.5 - 9.1). The exchangeable bases are high to very high for the cations. The cation exchange capacity values and the base saturation are high to very high.

The Rhodic Paleudstalfs which also occur at the plains and lower slopes are deep and well drained. They have dark red sand to sandy loam surfaces underlain by red, sandy clay loam to clay loam subsoils. The soil reaction ranges from moderately acid to slightly acid (pH 5.6 - 6.5). The exchangeable bases are low for Ca, Mg and K and very low to low for Na. The cation exchange capacity values are low while the base saturation is moderate.

The major crops grown are - Cassava, Yams, Rice, Maize, Oilpalms, Sorghum, Millets, Cowpea, Cotton, Groundnuts.

Mapping Unit 19b - Gently undulating to undulating plains on shales 0 - 6 percent Slopes.

This mapping unit occupies 586.36 square kilometres or 0.03 percent of the total land area of Nigeria. It occurs mainly in Anambra State, in the derived savanna areas. It occurs extensively in the broad plains of the south western parts of Nsukka area, through Umumbo, Adani, Adaba and along the narrow basins of Mamu River. The unit also occupies the gently undulating and slightly dissected tracts of land adjoining the northern slopes of the Enugu-Agwu escarpment thus extending through Enugu and Nike areas.

The landscape is gently undulating to undulating with slope range of about 0 - 6 percent.

The soils of this unit are derived from shale. This mapping unit is composed of moderately deep to deep, imperfectly to poorly drained, Aquic Paleustalfs; Ustoxic Dystropepts and Oxidic Paleustalfs.

The Aquic Paleustalfs, are deep, poorly drained with dark grayish brown to grayish brown silt loam, loam to clay loam surfaces over grayish to pale brown or reddish brown to dark reddish brown silty clay or clay, mottled subsoils. In the top soils, the soil reaction ranges between very strongly acid and strongly acid (pH 4.5 - 5.5). The exchangeable bases are low to very low for Ca, K and Na, but low to moderate for Mg. The cation exchange capacity values are low to moderate and the base saturation is low to moderate for some soils but high for others. In the subsoil, the soil reaction is strongly acid (pH 5.1 - 5.5). The exchangeable bases are low for all the cations. The cation exchange capacity values and the base saturation is low to moderate for some soils but high for others. In the subsoil, the soil reaction is strongly acid (pH 5.1 - 5.5). The exchangeable bases are low for all the cations. The cation exchange capacity values and the base saturation are low to moderate.

The Ustoxic Dystropepts may be encountered around the Enugu-Emene-Nike axis. They are deep to moderately deep, imperfectly drained to well drained soils. They have yellowish brown to dark yellowish brown clay loam surfaces over light grey to light brownish grey clay (sometimes gravelly) subsoils. Soil reaction for the top soils ranges from strongly acid to moderately acid (pH 5.1 - 6.0). The exchangeable bases are very low for Ca; low to moderate for Mg; and low to very low for K and Na. The cation exchange

capacity values for the top soils are very low to low and the base saturation is low to moderate. In the subsoil, the soil reaction ranges from moderately acid to slightly acid (pH 5.6 - 6.5). The exchangeable bases are low to very low for Ca, low to moderate for Mg; low to very low for K and Na. The cation exchange capacity values and the base saturation are low.

The Oxic Paleustalfs, occur mainly along the narrow basins of Mamu River. They also occur in scattered patches within the Southern portions of Omasiagu area. They are moderately deep to deep, mostly imperfectly to poorly drained. A few are well drained. They have dark brown to dark reddish brown, sandy loam to sandy clay loam surfaces over dark red, to red clay subsoils. In the top soils, soil reaction ranges from very strongly acid to strongly acid (pH 4.5 - 5.5). The cation exchange capacity values are low and the base saturation is low to moderate. In the subsoil, the soil reaction is strongly acid (pH 5.1 - 5.5). The exchangeable bases are low for all the cations except for Mg which is moderate. The cation exchange capacity values are low, while the base saturation is moderate to high. The major crops grown are - Cassava, Yams, Rice, Plantain, Maize, Oilpalms, Vegetables.

Mapping Unit 19c - Gently undulating to undulating plains on Sandy Materials, 0 - 6 Percent Slopes.

This mapping unit occupies 1,651.56 square kilometres or 0.18 percent of the total land area of Nigeria. It can be found in Anambra, Imo and Benue States. Principally, it occurs between Nachi and Amaokwe in Anambra State. It is of very insignificant occurrence in Imo and Benue States.

The landscape is gently undulating with slopes of about 0 - 6 percent. The unit comprises Plateau-like landform covering most parts of Udi and extending some kilometres northwards.

The soils of this mapping unit are derived from sandy materials.

This mapping unit is composed of deep, well-drained Typic Paleustults and Oxic Dystropepts, as well as other soils of minor extent.

The Typic Paleustults, occur on the summits of the slope. The soils are deep and well-drained. The surface layers are dark brown loamy sand to dark reddish brown sandy loam. The subsoils are dark reddish brown to dark red sandy clay loam to sandy clay. The soil reaction ranges from very strongly acid to strongly acid (pH 4.5 - 5.5). The exchangeable bases are very low to low for all the cations. The cation exchange capacity values are low to moderate while the base saturation is low to very low.

The Oxic Dystropepts also occur on the summits of the slope. They are deep and well drained. They have sand to loamy sand surface layers underlain by sandy loam to sandy clay loam subsoils. The soil reaction ranges between very strongly acid and slightly acid (pH 4.7 - 6.4). Exchangeable bases are very low to low for Ca and K and low to moderate for Mg and Na. The cation exchange capacity values are moderate to high while the base saturation is low.

The major crops grown are - Cassava, Yams, Maize; Plantain, Oilpalm, Vegetables.

Mapping Unit 20b - Gently Undulating to Undulating Plains with scattered rock outcrops and Inselbergs on Undifferentiated Basement Complex and Older Granite 0 - 6 Percent Slopes.

This mapping unit occupies 5,076.02 square kilometres or 0.55 percent of the total land area of Nigeria. It occurs mainly in Gongola State especially in areas around Takum, Bali, Gayam, Yola, Badewa, Kungana and Zaga.

The landscape is gently undulating to undulating with scattered rock outcrops and inselberges. The slopes range from 0 - 6%.

The soils of the unit are derived from undifferentiated basement complex materials and older granite.

The mapping unit is composed of the deep well drained to somewhat poorly drained Oxic Haplustalfs, deep well drained Oxic Haplustults, moderately deep well drained Typic Usthorvents, shallow to moderately deep Petroferric Haplustults and other soils of minor extent.

The Oxic Haplustalfs occur largely on the upper and mid-slopes and sometimes on the lower slopes. The soils on the upper and midslopes have loamy sand surfaces underlain by sandy loam subsoils. These soils have moderately acid reaction. The value of exchangeable bases is generally low. The cation exchange capacity is very low and the percentage base saturation is high. The soils on the lower slopes have sandy loam surface horizons and loam, silt loam and sandy loam subsoils. These soils are strongly acid in reaction. The values of exchangeable bases are low for Calcium, low to moderate for Magnesium, low to moderate for potassium and trace for sodium. The cation exchange capacity is very low and the percentage base saturation is high.

The Oxic Haplustults occur mainly on the upper slopes. These soils have loamy sand to sandy loam surface horizons underlain by sandy clay loam subsoils. These soils are moderately to strongly acid in reaction. The values of exchangeable bases are generally low. The cation exchange capacity is very low and the percentage base saturation is low.

The Typic Haplustults occur on the steep slopes. They have loamy sand and sandy loam surface horizons overlying sandy clay loam, clay loam or sandy clay lower horizons. The soil reaction ranges from moderately acid to strongly acid. The values of

exchangeable bases are low for calcium and potassium and low to moderate for magnesium and sodium. The cation exchange capacity is low to moderate and the percentage base saturation is low.

The Typic Usthorvents occur mainly on the side slopes. They have loamy sand and sandy loam surface horizons underlain by sandy loam to loam subsoils. These soils are moderately acid in reaction. The values of exchangeable bases are moderate for calcium and magnesium and low for potassium and sodium. The cation exchange capacity is moderate on the surface and low in the subsoils. The percentage base saturation is low.

The Petroferric Haplustults also occur on the steep slopes. They have loamy sand and sandy loam surface horizons underlain by sandy loam to sandy clay loam subsoils. The major crops grown are - Sorghum, Millets, Maize, Rice, Yams, Cassava, Bananas, Vegetables.

Mapping Unit 21a - Undulating dissected plains on Nupe Sandstones, 0 - 6 Percent Slopes.

This mapping unit occupies 7,515.42 square kilometres or 0.81 percent of the total land area of Nigeria. It occurs mainly in the Savanna areas of Anambra, Cross River, Benue, Niger, Plateau and Borno States. The unit can be found in areas around Ehamufu in Anambra State; Ogoja, Okpoma, Okpudu, Okuku, Balop in Cross River State; Kutigi in Niger State as well as Chibak, Ahir and Butuku in Borno State.

The landscape is undulating and dissected with prominent escarpments, incised valleys, and associated nearly level plains as well as steep, flat-topped ironstone masses. The slopes generally range from 0 - 6 percent and 6 - 25 percent for the hills and escarpments.

Soils of this unit are derived from fine and coarse cretaceous Nupe sandstones.

The major soils of this mapping unit are the Oxic Haplustalfs, Typic Haplustalfs, Ustic Dystropepts, Typic Paleustults and Aquic Haplustalfs. The minor soils include Ustoxic Dystropepts, and Typic Haplustults.

The Oxic Haplustalfs are mostly deep and moderately well drained to imperfectly drained. They have dark grayish brown or dark brown clay loam surfaces over pale brown to light gray clay subsoils. The soil reaction (pH) ranges from strongly acid to moderately acid. The values of exchangeable cations are low to very low for Ca, K and Na, while Mg ranges from low to moderate. The cation exchange capacity values are low to very low while the base saturation percentages are also low to very low.

The Typic Haplustalfs occur at the intervening nearly level plains. They are moderately deep and well drained. They have dark to very dark grayish brown loamy or sandy loam surfaces underlain by dark yellowish brown, yellowish brown to red sandy clay loam to clay loam subsoils. The soil reaction (pH) ranges from moderately acid to slightly acid or neutral (5.6 - 6.9). The exchangeable cations are moderate to high for Ca, Mg and K and low to moderate for Na. The CEC values are low to moderate while the percentage base saturation is moderate to high.

The Ustic Dystropepts occur at the upper slopes. They are deep to moderately deep and well drained. They have dark reddish brown sandy loam surfaces over dark red to red clay subsoils. The soils are strongly acid, and the exchangeable cation values are

low for Ca, K and Na and low to moderate for Mg. The CEC values and percentage base saturation are low to moderate.

The Typic Paleustults are moderately deep and well drained. They have dark brown to dark reddish brown sandy loam to sandy clay loam surfaces over strong brown to yellowish red sandy clay subsoils. These soils have a soil reaction (pH) of strongly acid to moderately acid. The exchangeable cations are very low to low, while the CEC values are low to moderate. The percentage base saturation is also low to moderate.

The Aquic Haplustalfs occur at the incised valley bottoms and depressions. They are deep and poorly drained. They have very dark grayish brown sandy loam surfaces over brown or light brownish gray sandy clay loam subsoils with reddish mottles. The soil reaction (pH) ranges from neutral to slightly acid. The exchangeable cations are moderate for Ca and Mg but low for K and Na. The CEC values are low while the percentage base saturation is high to very high.

The major crops grown are - Cassava, Yams, Rice, Maize, Plantain, Oilpalm, Vegetables, Sorghum, Millet, Cotton, Cowpea.

Mapping Unit 21b - Undulating dissected Plains on Sandstone and shale, 0 - 6 Percent Slopes

This mapping unit occupies 8,463.62 square kilometres or 0.92 percent of the total land area of Nigeria. It occurs mainly in Borno State, especially in areas along Damaturu - Biu Road.

The landscape occurs on undulating dissected plains. The slopes are 0 - 6%. The soils of the unit are derived from sandstone and shale.

The unit is composed mainly of deep well drained Typic Paleustalfs and deep poorly drained Aquultic Paleustalfs as well as other minor soils.

The Typic Paleustalfs occur generally on the upper and midslopes. They have loamy sand and sandy loam surface horizons underlain by loamy sand and sandy clay loam subsoils. The soil reaction (pH) ranges from very strongly acid to neutral. The values of exchangeable bases are low to moderate for calcium and very low for sodium. The cation exchange capacity is low and the percentage base saturation is moderate to low.

The Aquultic Paleustalfs occur on the lower slopes. They have sandy loam surfaces underlain by sandy clay loam subsoils. The soil reaction (pH) ranges from slightly acid to moderately acid. The values of exchangeable bases are low for calcium, magnesium, potassium and sodium. The cation exchange capacity is low and the percentage base saturation is moderate.

The major crops grown are - Sorghum, Millets, Cowpea, Cotton, Maize.

Mapping Unit 24a - Hills and Ridges on Sandstones and Shales; 13 - 55 Percent Slopes.

This mapping unit occupies 6,350.88 square kilometres or 0.69 percent of the total land area of Nigeria mostly in areas around Maku in Anambra State.

The landscape consists of hills and ridges, the dominant being the Enugu - Awgu escarpment with slopes ranging from 13 - 55 percent.

The soils of the unit are derived from shales and sandstones.

The dominant soils of the unit are the shallow to moderately deep or deep imperfectly drained Oxic Dystropepts. There are other minor soils.

The Oxic Dystropepts occur on side slopes and in a few scattered areas of deep colluvial accumulation along water courses and shallow valleys. They are generally moderately deep to deep and imperfectly drained. They have yellowish red sandy clay loam surface horizons over light brownish grey clay subsoils which are in many cases gravelly or concretionary. Soil reaction is strongly acid to moderately acid (pH 5.1 - 5.6) throughout the profile. Generally, exchangeable cations, cation exchange capacity and percentage base saturation are all moderate to high throughout the profile.

The major crops grown are - Cassava, Yams, Rice, Plantain, Maize, Oilpalm and Vegetables.

4.2 Taxonomic Classification of the Soils

The soils have been classified taxonomically according to the USDA Soil Taxonomy (Soil Survey Staff, 1975) and the FAO/UNESCO Soil Map of the World Legend (FAO/UNESCO, 1974). These international soil classification systems have been used since Nigeria does not have a national system. Furthermore, the utilisation of these systems will, among other things, facilitate agro-technology transfer.

The details of the classification of the major soils are given in Table 4.2.

Fuller details of the classification of the soils are given in Appendix 1.

TABLE 4.2 TAXONOMIC CLASSIFICATIONS OF (MAPPING UNITS) SOILS

<u>MAPPING UNIT NO</u>	<u>USDA CLASSIFICATION</u>	<u>FAO CLASSIFICATION</u>
1a	Typic Tropaquent Typic Tropopsamment Typic Tropaqualf	Dystric Fluvisol Dystric Regosol Gleyic Luvisol
1b	Typic Fluvaquent Typic Tropopsamment Tropic Sulfic Fluvaquent Typic Tropofibrist	Humic Gleysol Dytric Regosol Humic Gleysol
1c	Typic Udipsamment Typic Tropopsamment Typic Psammaquent Typic Tropaquent	Dytric Regosol Gleyic Regosol Dystric Regosol
1d	Typic Ustropept Typic Ustipsamment Alfic Ustipsamment Fluvic Ustropept	Eutric Cambisol Dystric Regosol Dystric Cambisol
2a	Typic Tropaquent Aeric Tropaqualf Typic Tropaqualf Typic Psammaquent	Gleyic Luvisol Gleyic Regosol
2b	Aquic ustipsamment Chromustert Typic Torripsamment	Gleyic Regosol Dystric Fluvisol
2c	Typic Tropaquent Typic Tropaquept Typic Tropofibrist Aquic Tropopsamment	Eutric Gleysol Gleyic Cambisol
5a	Typic Tropudult Arenic Paleudult Oxic Dystropept Aeric Tropaquept	Ferric Acrisol Dystric Nitosol Dystric Cambisol Gleyic Cambisol
5d	Typic Paleudult Rhodic Paleustalf Oxic tropudalf	Dystric Nitosol Chromic Luvisol Orthic Luvisol

	Orthoxic Tropudult	Dystric Acrisol
6a	Typic Paleudult Orthoxic Tropudult Arenic Paleudult Oxic Dystropept	Dystric Nitosol Dystric Acrisol Dystric Nitosol Dystric Cambisol
6b	Typic Hapludult Typic tropudult Aeric Tropaquept	Orthic Acrisol Ferric Acrisol Gleyic Cambisol
7a	Oxic Tropudalf Typic tropaqualf Oxic Rhodustalf	Orthic Luvisol Gleyic Luvisol Chromic Luvisol
9a	Typic Paleudalf Typic Hapludult Oxic Dystropept Lithic Hapludalf	Orthic Luvisol Orthic Acrisol Dystric Cambisol Orthic Luvisol
10a	Oxic Tropudalf Typic Tropudult Oxic dystropept	Gleyic Luvisol Ferric Acrisol Dystric Cambisol
12a	Typic Paleudult Typic Tropudult Typic Tropaquept	Dytric Nitosol Ferric Acrisol Eutric Gleysol
15d	Arenic Palenstalf Typic Paleustalf Typic Rhodustalf	Chromic Luvisol Chromic Luvisol
17b	Oxic Paleustalf Arenic Paleustalf Typic Haplustalf	Chromic Luvisol Orthic Luvisol Chromic Luvisol
18d	Typic Haplustalf Oxic Paleustalf Ustoxic Dystropept Lithic Ustorhent	Chromic Luvisol chromic Luvisol Dystric Cambisol Lithosol
19a	Oxic Paleustult Oxic Haplustult Typic Paleustalf Oxic Ustropept	Dystric Nitosol Ferric Acrisol Chromic Luvisol Entric Cambisol

19b	Aquic Paleustalf Ustoxic Dystropept Oxic Pateustalf	Orthic Luvisol Dystric Cambisol Chromic Luvisol
19c	Typic Paleustult Oxic Dystropept	Dystric Nitosol Dystric Cambisol
20b	Oxic Haplustult Oxic Haplustalf Typic Haplustult Typic Ustortent	Orthic Acrisol Ferric Luvisol Ferric Acrisol
21a	Oxic Haplustalf Typic Haplustalf Ustic Dystropept Typic Paleustult	Ferric Luvisol Orthic Luvisol Dystric Cambisol Dystric Nitosol
21b	Typic Paleustalf Aquultic Paleustalf	Chromic Luvisol
24a	Oxic Dystropept	Dystric Cambisol

LEGEND

SOIL MAP OF NIGERIA

ECOLOGICAL ZONE	MAPPING UNIT NO.	GEOLOGY	RELIEF	SOIL DESCRIPTION
WET LAND SOILS	1a	Deltaic basins and tidal flats	Nearly level plains	Very deep, poorly drained and moderately well drained soils; sandy, sandy loam or sandy clay loam surfaces over sandy, sandy loam to sandy clay loam subsoils.
	1b	Mangrove swamps	Nearly level plain	Deep to very deep poorly drained soils; fine sand, silt, silty loam or silty clay loam surfaces over fibric fine sandy silty clay, silty clay, silty clay loam, or silty loam subsoils.
	1c	Beach Ridge sands and mounds	Nearly level plains	Deep, well drained and moderately deep poorly or imperfectly drained soils; sandy surfaces over sandy subsoils.
	1d	Aeolian sands over alluvium	Nearly level plains	Deep to moderately deep well drained and moderately well drained soils; sandy loam to loamy sand or clay loam surfaces over sandy clay loam or sandy clay subsoils.
	2a	Recent alluvium	Nearly level to gently undulating plains	Deep well drained and deep poorly drained soils; sand, sandy loam, loamy sand or sandy clay loam surfaces over sand, sandy clay, sandy clay loam, clay, clay loam or loamy sand, sometimes gravelly subsoils.

WET LAND SOILS

2b	Old and subrecent alluvium	Nearly level to gentle undulating plains	Deep imperfectly to poorly drained and well drained soils, sand, loamy fine sand or clay loam surfaces over fine sand, clay or gravelly clay subsoils.
2c	Lagoonal marshes and back fresh water swamps	Nearly level to gentle undulating plains.	Deep to moderately deep poorly drained soils; loam to loamy sand, sandy loam, silt or silty loam surfaces over fine sandy loam, silt loam, silty clay loam or sandy clay subsoils.
3a	Aeolian sand over alluvium	Gently undulating plains	Deep well drained and imperfectly to poorly drained soils; sandy, loamy sand or sandy loam surfaces over sandy loam, loam or sandy clay subsoils.
4a	Aeolian sands over alluvium	Gentle undulating dissected plains	Deep poorly drained and deep well drained soils; sandy, loamy sand or clayey surfaces over sandy clay loam, sandy clay or clayey subsoils.

RAIN FOREST SOILS

5a	Sombreiro - Warri Deitzaic plains	Nearly level plains	Deep well drained and deep poorly drained soils; sandy, sandy loam or loamy sand surfaces over sandy loam, sandy clay loam, loam or sandy clay subsoils.
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RAIN FOREST SOILS

5b	Coastal plain sands I (Alfisols)	Nearly level plains	Very deep well drained soils; loamy sand, sandy loam or sandy clay loam surfaces over sandy clay loam, clay loam, sometimes gravelly subsoils.
5c	Coastal plain sands II (Ultisols)	Nearly level plains	Very deep well drained soils; sand, loamy sand, or loamy surfaces over loam, sandy loam or sandy clay loam subsoils.
5d	Transitional materials of subrecent alluvium and coastal plains sands	Nearly level plains	Very deep to deep and moderately deep well drained and few imperfectly drained soils; sand, sandy loam or loamy sand surfaces over sandy loam, sandy clay loam or gravelly sandy clay loam subsoils.
5e	Ewekoro formations (Upper coal measure)	Nearly level plains	Very deep well drained and poorly drained soils; sandy loam, loam, or loamy sand surfaces over clay loam, gravelly clay or sandy clay loam subsoils.
5f	Sandstone (Abeokuta formation)	Nearly level plains	Very deep well drained soils; loam, sandy loam or loamy sand surfaces over clay loam, gravelly clay or sandy clay loam subsurfaces.
6a	Coastal plain sands	Nearly level to gently undulating plains	Very deep well drained soils; loamy sand to sandy loam surfaces over sandy clay loam to sandy clay subsoils.
6b	Basalt	Nearly level to gentle undulating	Deep well drained, deep poorly or imperfectly

		plains	drained soils, sandy clay loam, clay loam or sandy clay surfaces over clay loam, clay or sandy clay loam subsoils.
7a	Coastal plain sands	Gently undulating plains	Very deep well drained and very deep poorly drained soils; sandy, sandy loam or sandy clay loam surfaces over sandy loam, sandy clay loam, sandy clay or clay loam subsoils.
7b	Sandstone (Abeokuta formation)	Gently undulating plains	Very deep well drained soils; sandy loam, loam or loamy sand surfaces over clay loam, sandy clay loam or sandy clay subsoils.
7c	Undifferentiated Basement Complex	Gently undulating plains	Very deep well drained and very deep poorly drained soils; sandy loam, sandy loam, sandy clay loam or loamy sandy surfaces over gravelly sandy clay loam or sandy clay, clay loam or loamy sand subsoils.
8a	Undifferentiated Basement Complex	Gently undulating plains with scattered inselbergs	Very deep and deep well drained soils; loam, loamy sand or sandy loam surfaces over gravelly or stony sandy clay, sandy clay loam or clay loam subsoils.
8b	Quartzites, quartzschists and Amphibolites	Gently undulating plains with scattered inselbergs	Deep and very deep well drained soils; sandy clay or sandy loam surfaces over gravelly or stony sandy clay loam, sandy clay or clayey subsoils.

RAIN FOREST SOILS

9a	Sandstone and shales	Gently undulating to undulating plains	Deep, moderately deep and shallow well or imperfectly drained soils; loam, sandy loam, sometimes concretionary surfaces over sandy clay loam, clay loam, or clay sometimes mottled and concretionary subsoils.
10a	Undifferentiated Basement Complex	Undulating plains	Deep to very deep well drained soils; loam, loamy sand, sandy loam or sandy clay loam surfaces over gravelly sandy clay, clay loam, clay or sandy loam subsoils.
11a	Undifferentiated Basement Complex	Undulating plains with scattered inselbergs	Deep well drained soils; sandy loam, loamy sand, sometimes gravelly surfaces over gravelly sandy clay loam, sandy clay or clay loam, sometimes mottled subsoils.
12a	Coastal plain sands and sandstone	Undulating dissected plains with minor hills	Deep to moderately deep well drained and moderately deep poorly drained soils; sand, sandy loam, loamy sand or sandy clay loam to clay surfaces over sandy loam, sandy clay loam, clay loam or clay, sometimes gravelly and mottled subsoils.
13a	Undifferentiated Basement Complex	Hills and Ridges	Deep well drained and shallow well drained soils, sandy loam surfaces over stony sandy clay subsoils or bedrock.

14a	Sandstone (Ilaro-Abeokuta Formation)	Nearly level plains	Very deep well drained and very deep poorly drained soils; loamy sand, sandy loam surfaces over sandy clay loam or sandy clay, sometimes mottled subsoils.
14b	Upper coal measure Ewekoro Formation)	Nearly level plains	Very deep poorly drained, moderately well drained, and well drained soils; sand, sandy loam to sandy clay loam surfaces over sand, sandy clay loam or sandy clay subsoils.
15a	Aeolian Sands	Nearly level to gently undulating plains	Deep to very deep, well, imperfectly and poorly drained soils; fine sand to loamy sand surfaces over loamy sand to sandy loam subsoils.
15b	Aeolian sands over sandstone	Nearly level to gentle undulating plains	Deep well and poorly drained soils; sand to loamy sand surfaces over loamy sand subsoils.
15c	Sand dunes over Chad Sediments and Basement Complex	Nearly level to gently undulating plains	Very deep, well drained soils, fine sand to loamy sand surfaces over loamy sand to sandy loam subsoils.
15d	Sandstones, mudstones and Shales	Nearly level to gently undulating plains with iron pan sheets and few rock outcrops	Deep, well drained soils; loamy sand to sandy loam surfaces over sandy loam to sandy loam subsoils.
15e	Nupe sandstone	Nearly level to gently undulating plains	Deep well drained and few somewhat poorly drained soils; loamy sand to sandy loam surfaces over sandy loam to sandy clay loam and sometime gravelly subsoils.

15f	Newer Basalts over Basement Complex	Nearly level to gently undulating plains	Deep to very deep well drained; some shallow poorly drained and very deep poorly drained soils; loam to clay loam and sometimes gravelly surfaces over sandy clay loam to clay and sometimes gravelly subsoils.
15g	Undifferentiated Basement Complex	Nearly level to gently undulating plains	Very deep well drained soils; sandy loam surfaces, sometimes gravelly over sandy clay loam to sandy clay and sometimes gravelly subsoils.
16a	Basalts	Nearly level to gently undulating plains with scattered rock outcrops and inselbergs	Deep poorly drained soils; sandy clay loam surfaces over clay loam to sandy clay subsoils..
16b	Undifferentiated Basement Complex	Nearly level to gently undulating plains with scattered rock outcrops and inselbergs	Deep to very deep well drained and some poorly drained soils; loamy sand to sandy loam and few gravelly surfaces over sandy clay loam to sandy clay and sometimes gravelly subsoils.
17a	Shales	Gently undulating plains	Mostly deep well drained, few poorly drained soils; loamy sand to sandy loam surfaces over sandy clay loam to sandy clay and few ferruginized subsoils.
17b	Sandstone(Abeokuta Formation)	Undulating plains	Very deep well drained, few shallow ferruginised and gravelly soils; loamy sand to sandy loam surfaces over sandy loam to sandy clay loam and sandy clay subsoils.

18a	Sandstone on Basement Complex	Gently to undulating plains with scattered rock outcrops, iron pans and inselbergs	Deep to very deep well drained soils; sand to loamy sand surfaces over sandy loam to sandy clay loam subsoils.
18b	Colluvial deposits over granitic materials	Gently undulating to undulating plains with scattered rock outcrops iron pans and inselbergs	Mostly deep, well drained and few poorly drained soils loamy sand to sandy loam, sometimes gravelly surfaces over sandy clay loam to sandy clay and sometimes gravelly subsoils.
18c	Colluvial deposits over granitic materials	Gently to undulating plains with scattered rock and inselbergs	Moderately deep to deep mostly poorly drained and few shallow well drained soils; mostly sandy loam and sometimes gravelly surfaces over sandy clay loam .
18d	Undifferentiated Basement Complex	Gently undulating plains with scattered rock outcrops and inselbergs	Generally deep well drained with few poorly drained soils; loamy sand surfaces over sandy loam to sandy clay loam and sometimes gravelly subsoils.
19a	Sandstone and shale	Gently undulating to undulating plains	Mostly deep well drained with few poorly drained soils; mostly sandy loam with very few gravelly surfaces over sandy clay loam to sandy clay or clay and very few gravelly subsoils.
19b	Shale	Gently undulating to undulating plains	Moderately deep to deep, mostly imperfectly to poorly drained with few well drained soils; sandy loam to sandy clay loam surfaces over clayey and sometimes gravelly subsoils.

SAVANNA SOILS

19c	Sandy Material	Gently undulating to undulating plains	Deep well drained soils; loamy sand to sandy loam surfaces over sandy clay loam to sandy clay subsoils.
20a	Undifferentiated Basement Complex	Gently undulating to undulating plains with scattered rock outcrops and inselbergs	Moderately deep to deep well drained and somewhat poorly drained to poorly drained soils; sandy loam and sometimes gravelly surfaces over sandy clay loam to sandy clay and sometimes gravelly subsoils.
20b	Undifferentiated Basement Complex and older granitics	Gently undulating to undulating plains with scattered rock outcrops and inselbergs	Moderately deep to deep few shallow, well drained and few somewhat poorly drained soils; loamy sand to sandy loam surfaces over sandy clay loam to sandy clay subsoils.
21a	Nupe and other cretaceous sandstones	Undulating and dissected plains	Moderately deep to deep well drained and some imperfectly to poorly drained soils; sandy loam surfaces over sandy clay loam to sandy clay subsoils.
21b	Sandstones and Shale	Undulating dissected plains	Deep well and somewhat poorly drained soils; loamy sand to sandy loam surfaces over sandy loam to sandy clay loam subsoils.

21c	Undifferentiated Basement Complex	Undulating dissected plains	Deep to very deep and very shallow to moderately deep well drained soils; sand, loamy sand to sandy loam surfaces over sandy loam to sandy clay loam and sometimes gravelly subsoils
22a	Sandstone	Undulating dissected plains with scattered rock outcrops and hills	Shallow and moderately deep to deep well drained soils; loamy sand to sandy loam surfaces over sandy loam subsoils.
22b	Undifferentiated Basement Complex	Undulating plains with scattered rock outcrops and hills	Generally deep with some shallow well drained soils; loamy sand to sandy loam and sometimes gravelly surfaces over sandy clay loam to sandy clay sometimes gravelly subsoils.
22c	Undifferentiated Basement Complex	Undulating plains with scattered rock outcrops and hills	Shallow and moderately deep to deep well drained and somewhat poorly to poorly drained soils; loamy sand to sandy loam and sometimes gravelly surfaces over sandy clay loam to sandy clay and sometimes gravelly subsoils.
23a	Undifferentiated Basement Complex	Dissected Plateau plains	Deep well drained, few poorly drained soils; loamy sand surfaces over sandy clay loam to sandy clay subsoils.
24a	Sandstone and Shale	Hills and Ridges	Deep imperfectly drained soils; sandy clay loam surfaces over gravelly or concretionary clay subsoils.
24b	Undifferentiated Basement Complex	Hills and Ridges	Very shallow to shallow and deep well drained soils; loamy sand to sandy loam surfaces, sometimes gravelly and over bedrock, over sandy clay loam subsoils, sometimes gravelly.

CHAPTER 5

AGRICULTURAL DEVELOPMENT POSSIBILITIES

5.1 Introduction

Presently the country has no national accepted land suitability classification method. Nevertheless one of the major objectives of the soil map of Nigeria project (1:650,000) is the identification of the agricultural potential areas for crop production and more detailed study. Therefore evaluation at this reconnaissance scale should constitute one of the best ways of indicating the development possibilities of large areas relatively quickly and cheaply. Land evaluation/soil suitability assessment at this scale might enable developers to see, for example, where the best areas for large scale food crop production are to be found. Identification of alternative development projects can follow. Such evaluations are based on current land use suitability and provide qualitative classification of suitabilities for major kinds of land use.

In assessing the suitability of the soil mapping units for agricultural production, the following identified characteristics will be taken into consideration among others:

- Soil morphological properties
- Soil physico - chemical characteristics
- Drainage (internal and external)
- Soil slope, moisture retention and liability to flooding
- Accessibility

Suitability of the soils will also take into account the occurrence of deep, well-aerated root zone.

5.1.2 The data generated during the reconnaissance study are comparatively inadequate for the application of the USDA Land Capability Classification which interalia effectively utilises data from detailed soil surveys. However attempts will involve combinations of the modified USDA Land Capability System (Obeng, 1970) used in Northern Nigeria by the Soil Survey Staff IAR A.B.U. Zaria. Table 5.1.1. gives details of the system.

There are five classes (I - V) with three subclasses. Classes I, II, III and arable lands (suitable for mechanical cultivation) while classes IV and V are non-arable that is not suitable to mechanical cultivation. The three subclasses are e - erosion hazard; w - poor or excessive drainage; and s - soil physical and fertility limitations. Soil properties, therefore, are the major considerations in the system.

Dent and Young (1981) proposed land suitability evaluation based on four categories or levels of classification: Land suitability orders, classes, subclasses and units (Table 5.1.2). These suitability classes are assessed separately for each kind of land use under consideration, with respect to each land mapping unit. The same classes are applied to qualitative, quantitative or economic evaluation, and to assessment of current or potential land suitability.

TABLE 5.1.1 Land Capability Classes: Northern Nigeria (After Ghana Modified from USDA Soil Conservation System):

Class Definition	Class and Sub Class Characteristics		
<p>I Very good land with minor or no physical Limitations to mechanical cultivation</p>	One class only - no sub classes		
	<p>Deep to very deep Well drained Medium textured Nearly Level to gently sloping Moderately permeable</p>	<p>Moderate to high water holding capacity Medium inherent fertility Good capacity for fertilizer utilisation Slight erosion No damaging overflows</p>	
<p>Moderate to high productivity can be sustained with a few but good management practices such as 1) maintenance of fertility (mulching, manuring, addition of fertilizers establishment of a legume in the rotation 2) contour ploughing</p>			
<p>II Moderate to good land with few physical limitations to mechanised cultivation but which can be corrected.</p>	Ile	IIw	IIs
	<p>Moderate to high erosion hazard Sloping or undulating topography Gravelly or stony texture</p>	<p>Imperfect to poor internal drainage Excessive wetness Heavy texture Presence of salts Occasional to moderate overflow hazard</p>	<p>Moderate to shallow depth Low or moderate water holding capacity Either very slow or very rapid permeability Low inherent fertility Fair or low capacity to utilise added fertilizer</p>
<p>Moderate productivity can be maintained by following recommendations for Class I. with additional water control measures such as grass waterways, close strip cropping based on contour terraces or bunds.</p>			

<p>III</p> <p>Fair to good land best suited for vegetation that can be mechanically farmed with great care. Hand cultivation or bullock can be practised.</p>	<p>IIIe</p> <p>Moderate to high erosion hazard Sloping to hilly topography Very gravelly or stony texture</p>	<p>IIIw</p> <p>Poor or excessively drained soils Heavy textured soils Moderate overflow hazard</p>	<p>IIIs</p> <p>Shallow depth, to bedrock, ironpan, concretions or clays. Poor drainage Light textured and/or gravelly or stony soils. Either very rapid or very slow permeability, Low water holding capacity to utilise added fertilizers.</p>
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The productivity of these soils may be maintained by following intensely the same practices recommended for II soils but rotations to be practised should include long periods of forage or tree crop production.

Class Definition

Class and Sub Class Characteristics

<p>IV</p> <p>Land not suited to mechanical cultivation but suited for limited clearing, grazing and hand cultivation for the production of perennial crops. These soils commonly occur on hilly or steep topography and are subject to moderate or severe erosion</p>	<p>IVe</p> <p>Moderate to severe erosion hazard Steep or rocky slopes Excessive drainage Very shallow depth and stoniness</p>	<p>IVs</p> <p>Extremes in texture, Very light or very heavy Rapid or slow permeability Low or very low moisture holding capacity, Low inherent fertility Fair or poor capacity to utilise added fertilizers.</p>
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The productivity of these soils for perennial crops can best be maintained by raising their fertility level through mulching, application of manure and/or the inclusion of leguminous crops in the rotation. The establishment of stringent erosion control practices is essential even when such soils are hand cultivated.

V These lands have a severe erosion hazard and are too steep, too shallow, too stony, too dry or too wet to be suitable for any type of mechanical cultivation. With care, limited clearing and very limited hand cultivation may be carried out. Perennial tree crops, forestry, controlled grazing, recreation and watershed protection are recommended.

Table 5.1.2 Structure of land suitability classification

Category			
	Class	Subclass	Unit
Suitable -----	S1	S2m	S2e-1
	S2 -----	S2e	S2e-2
	S3	S2me	etc.
	etc.	etc.	
Phase:Sc. conditionally suitable			
	Sc2	Sc2m	
not suitable	N1 -----	N1m	
	N2	N1e	
		etc.	

Definitions

Suitability orders
order S. Suitable

Land on which sustained use of the kind under consideration is expected to yield benefits which justify the inputs without unacceptable risk of damage to land resources.

Order N, not suitable

Land which has qualities that preclude sustained use of the kind under consideration.

Suitability Classes Class S1,
highly suitable

Land having no significant limitations to sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits and will not raise inputs above an acceptable level.

Class S2,
Moderately suitable

Land having limitations which in aggregate are moderately severe for sustained application of a given use the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive will be appreciably inferior to that expected on class S1 land

Class S3,
Marginally suitable

Land having limitations in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.

Class N1,
Currently not suitable

Land having limitations which may be surmountable in time but which cannot be corrected with existing knowledge at currently acceptable cost; the limitations are so severe as to preclude successful sustained use of the land in the given manner

Class N2,
Permanently not suitable

Land having limitations which appear so severe as to preclude any possibilities of successful sustained use of the land in the given manner

Nr, not relevant

Land which has not been assessed for a given use because the application of the use to that area is precluded by the initial assumptions of the evaluation.

Source: Dent and Young (1981)

5.2 Agricultural Development Possibilities:

5.2.1 This volume contains twenty five (25) mapping units spanning three ecological regions. viz. Wetlands, Forest and Savanna. The mapping units occur mostly in the five Eastern States viz. Anambra, Akwa Ibom, Cross River, Imo, Rivers States; and Benue State.

- The Wetland soils are found on nearly flat to flat and gently undulating floodplains. The parent materials range from mangrove swamps, tidal flats, beach sands to alluvial materials. Most of the soils are poorly drained.
- The Forest and Savanna soils occur on nearly level, gently undulating to undulating plains with scattered inselbergs and hills. The parent materials range from Coastal Plain Sands, Sandstones, Shales to undifferentiated Basement Complex. Most of the soils are well-drained to moderately well-drained.

5.3 Class 1 - Soils

There are no class one soils i.e. very good land with minor or no physical limitations to mechanical cultivation.

5.4 Class II-Soils - Fairly Highly Suitable(S1)

In this class are moderate to good land with few physical limitations to mechanized cultivation but which can be corrected.

This class will include mapping units 5a, 5d, 6a, 6b, 7a, 9a, 15d and 17b. The soils are found on nearly level to gently undulating plains with slope ranges of 0 - 2%. They are derived from Coastal Plain Sands, Sandstones, Basalt and Shales. The soils are mostly deep, well-drained. They have loamy sand to sandy loam surfaces underlain by sandy clay loam to sandy clay subsoils. The class II soils (S1) cover about 55,114.03km² (5.96% of the country).

The major crops grown in these soils include yams, maize, cassava, oil palm.

5.5.1 Class IIs-Soils - Moderately Suitable (S2)

In this class are moderately suitable land with limitations such as moderate to shallow depth due to the presence of rock outcrops and inselbergs. This class includes mapping units 10a, 12a, 18d, 19a, 19b, 19c and 20b.

The soils occur on gently undulating to undulating plains with scattered inselbergs and hills. The slope ranges are 2-6%. The soils are derived from Coastal Plains, Sandstones, Shales and undifferentiated Basement Complex.

The soils are shallow to moderately deep to deep, well-drained. They have sands to sandyloam surfaces underlain by sandy clay loam to sandy clay subsoils.

The soils of this unit cover about 141,976.73km² (15.33% of the country)

The major crops grown in these soils include maize, cassava, cocoa, oil palm and yams.

5.5.2 Class IIw, Soils - Moderately Suitable (S2)

Just as in 5.5.1, in this class are moderately suitable lands but with the limitation due to wetness. This results from imperfect to poor internal drainage. This class includes mapping units 1a, 1b, 1c, 1d, 2a, 2b and 2c.

The soils are found on nearly level, level and gently undulating floodplains with slope ranges of 0 - 2%.

The parent materials range from mangrove swamps, tidal flats, beach sand to alluvium. The soil are deep, poorly to very poorly drained. They have sands to sandy loam, silty, clay surfaces underlain by sands, clay, and silty clay subsoils.

The class IIW soils (S2) cover about 119,968.79km² (12.99% of the country)

The major crops grown include rice, coconut, plantain and vegetables.

5.6 Class IIIe,s Soil - Marginal Suitability (S3)

In this class are fair to good lands that can be mechanically farmed with great care. There are moderate to high erosion hazards owing to undulating dissected topography. Other limitations include shallow depth to ironpan, concretions or stony/gravelly substratum.

This class includes mapping units 21a and 21b. The soils are found on undulating dissected plains; with slope range of 6 - 13%. The parent materials include cretaceous sandstone and shales. The soils are shallow and moderately deep, well drained. They have sand to sandy loam surfaces underlain by loamy sand, loam to sandy clay loam subsoils. Major crops grown include maize, cassava and oil palm.

The soils of the unit cover about 1,979.04km² (1.73% of the country)

5.7 Class IVe,s soils - currently Not Suitable (N1)

In this class are lands not suited to mechanical cultivation but suited for limited clearing and hand cultivation for the production of perennial crops. The soils commonly occur on hilly or steep topography. Soils are better used for forest reserve and wildlife.

The limitations include moderate to severe erosion hazards; steep or rocky slopes, very shallow depth and stoniness. Other limitations characteristics are slow permeability, low moisture holding capacity and poor capacity to utilise added fertilizers. The establishment of stringent erosion control practices is essential even when such soils are hand cultivated.

This class includes mapping unit 24a. The shallow soils occur on hills and ridges. The slope ranges are 13 to 55% while the soils are derived from sandstone and shale. The soils have sands to sandy loam surfaces underlain by bedrock.

The soils of the unit cover about 6,350.88km² (0.69% of the country) The soils are sparingly cultivated though at the lower slopes, valley bottoms and foot hills. Major crops grown include maize, cassava, and vegetables.

APPENDIX I
SOIL PROFILE DESCRIPTIONS

SOIL MAPPING UNIT NO. 1a
 SOIL CLASSIFICATION: Typic Tropaquent (USDA)
 Eutric Gleysol (FAO)
 SOIL PROFILE PIT NO. RV 1a - 01
 LOCATION: Port Harcourt
 GEOLOGY/PARENT MATERIAL: Alluvium, Coastal Plain Sands/Tidal Flats
 TOPOGRAPHY/SLOPE: Nearly flat, 1%
 VEGETATION/LAND USE: Cassava, Oil palm, Raphia Palm
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: 170cm
 DATE DESCRIBED: 13/9/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0-8	Grey (5Y 6/1) silty loam; moderate medium subangular blocky; prismatic; many fine medium roots; common distinct rust spots; clear wavy boundary.
A	8-35	Grey (5Y 6/1) clay; moderate medium prismatic; many medium roots; common distinct rust spots; gradual wavy boundary.
C ₁	35-87	Grey (5Y 5/1) clay; moderate medium prismatic; common distinct rust spots; diffuse wavy boundary.
C ₂	87-145	Grey (5Y 5/1) silty clay; weak fine prismatic; few distinct rust spots; gradual wavy boundary.
C ₃	145-160	Dark grey (5Y 4/1) silty clay loam; weak medium subangular blocky-prismatic; gradual wavy boundary.
C ₄	160-170	Grey (5Y 6/1) sandy loam; weak coarse subangular blocky; common distinct rust spots.

SOIL MAPPING UNIT NO. 1a
 SOIL CLASSIFICATION: Typic Tropaqueant (USDA)
 Eutric Gleysol (FAO)
 SOIL PROFILE PIT NO. RV 1a - 02
 LOCATION: Odoni Sagbama LGA
 GEOLOGY/PARENT MATERIAL: Tidal flats, Alluvium
 TOPOGRAPHY/SLOPE: Flat; 0-1%
 VEGETATION/LAND USE: Ferns
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: 140cm
 DATE DESCRIBED: 13/9/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0-17	Grey (5Y 5/1) silty clay; moderate medium subangular blocky; many medium roots; common distinct rust spots; abrupt smooth boundary.
C ₁	17-85	Greyish brown (2.5Y 5/2) clay; strong coarse angular blocky; few medium roots; common distinct rust spots; clear wavy boundary.
C ₂	85-140	Greyish brown (2.5Y 5/2) clay; strong coarse prismatic; common distinct rust spots.

SOIL MAPPING UNIT NO. 1b
SOIL CLASSIFICATION: Tropic Fluvaquents (USDA)
 Humic Gleysol (FAO)
SOIL PROFILE PIT NO. RV 1b - 01
LOCATION: Ogonokon Waterside, Ahoada LGA
GEOLOGY/PARENT MATERIAL: Mangrove Swamp deposits swamp alluvium deposit
TOPOGRAPHY/SLOPE: Flat, 0.5%
VEGETATION/LAND USE: Mangrove trees - Rhizophora spp.
DRAINAGE: Very poorly drained
DEPTH TO WATER TABLE: Flooded
DATE DESCRIBED: 07/10/83
DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ag	0-39	Very dark grey (10YR 3/1) coarse sand with silty loam.
C _{1g}	39-55	Very dark grey (10YR 3/1) strongly fibroid clay -sandy clay.
C _{2g}	55-130	Dark grey (5Y 4/1) fibroid silt loam; non plastic.

SOIL MAPPING UNIT NO. 1b
 SOIL CLASSIFICATION: Tropic Sulfic Fluvaquent (USDA)
 Humic Gleysol (FAO)
 SOIL PROFILE PIT NO. RV 1b - 02 (Boring)
 LOCATION: Degema, Degema LGA
 GEOLOGY/PARENT MATERIAL: Mangrove swamp deposits, swamp deposits
 TOPOGRAPHY/SLOPE: Flat; 1%
 VEGETATION/LAND USE: Mangrove trees - Rhizophora spp.
 DRAINAGE: Very poorly drained
 DEPTH TO WATER TABLE: Flooded
 DATE DESCRIBED: 07/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ag	0-15	Grey (N5/) silt loam; structureless; slightly sticky; common strata of sandy loam and loamy sand; thick strata of decomposed organic residues.
C _{1b}	15-60	Dark grey (N4/) silty clay loam and dark greyish brown (10YR 4/2) sandy loam; thick strata of decomposed organic matter residues.
C _{2b}	60-87	Dark grey (5Y 4/1) clay; slightly plastic, sticky; thick strata of decomposed organic matter residues.

SOIL MAPPING UNIT NO. 1c
 SOIL CLASSIFICATION: Typic Psammaquent (USDA)
 Gleyic Regosol (FAO)
 SOIL PROFILE PIT NO. RV 1c - 01
 LOCATION: Abalambie Bonny LGA
 GEOLOGY/PARENT MATERIAL: Beach sands
 TOPOGRAPHY/SLOPE: Flat; 0.5 - 1%
 VEGETATION/LAND USE: Coconut, Cassava
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 14/11/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0-35	Grey (10YR 5/1) sands; single grain; many fine-medium roots; clear smooth boundary.
C _{1g}	35-105	Light brownish grey (10YR 6/2) sands; single grain; many medium roots; abrupt smooth boundary.
C _{2g}	105-180	Light yellowish brown (10YR 6/4) sands; single grain; few iron oxide stains; clear smooth boundary.
C _{3g}	180-230	Greyish brown (10YR 5/2) sands; single grain.

SOIL MAPPING UNIT NO. 1c
 SOIL CLASSIFICATION: Typic Udipsamments (USDA)
 Dystric Regosols (FAO)
 SOIL PROFILE PIT NO. RV 1c - 02
 LOCATION: Uguede Bonny LGA
 GEOLOGY/PARENT MATERIAL: Beach ridges
 TOPOGRAPHY/SLOPE: Nearly flat
 VEGETATION/LAND USE: Cassava, Coconut
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 14/11/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0-30	Brown (7.5YR 5/4) sands; single grain; many fine-medium roots; clear smooth boundary.
C ₁	30-95	Strong brown (7.5YR 5/8) sands; single grain; few medium roots; gradual smooth boundary.
C ₂	95-180	Light grey (10YR 7/2) sands; single grain; very few fine roots.

SOIL MAPPING UNIT NO. 1c
 SOIL CLASSIFICATION: Aquic Udipsamments (USDA)
 "Gleyic" Regosol (FAO)
 SOIL PROFILE PIT NO. RV 1c - 03
 LOCATION: Peterside Bonny, Bonny LGA
 GEOLOGY/PARENT MATERIAL: Beach sands
 TOPOGRAPHY/SLOPE: Flat; 0.5%
 VEGETATION/LAND USE: Bush fallow
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below 180cm
 DATE DESCRIBED: 14/11/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ag	0-44	Light grey (5YR 7/1) sands; single grains; many fine roots; clear smooth boundary.
C _{1g}	44-110	Grey (5YR 5/1) sands; structureless, single grain; few fine roots; abrupt smooth boundary.
C ₂	110-180	Black (5YR 2.5/1) sands; structureless, single grain; very few roots.

SOIL MAPPING UNIT NO. 1d
 SOIL CLASSIFICATION: Typic Tropaquept (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO. RV 1d - 01
 LOCATION: Nwuba Ikwerre-Etche LGA
 GEOLOGY/PARENT MATERIAL: Alluvial flood plain, alluvium
 TOPOGRAPHY/SLOPE: Nearly flat; 1%
 VEGETATION/LAND USE: Cassava, Yams
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: 90cm
 DATE DESCRIBED: 27/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0-28.	Dark reddish brown (5YR 3/2) coarse sand; structureless, single grains; many fine medium roots; gradual wavy boundary.
ABg	28-57	Light brownish grey (2.5Y 6/2) loamy sand; weak very fine subangular blocky; abrupt wavy boundary.
Bg	57-90	Light grey (N7/2) loamy sand - sandy loam; weak fine subangular blocky.

SOIL MAPPING UNIT. 1d
 SOIL CLASSIFICATION Oxic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO. RV 1d - 02
 LOCATION: Eketa - Igbodo, Ikwerre-Etche LGA
 GEOLOGY/PARENT MATERIAL: Alluvial flood plain, alluvium
 TOPOGRAPHY/SLOPE: Gently undulating; 1 - 2%
 VEGETATION/LAND USE: Yam, Cassava, Maize, Vegetables
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 27/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0-6	Greyish brown (10YR 5/2) coarse loamy sand; structureless, single grain; many fine medium roots; clear wavy boundary.
A	6-22	Dark greyish brown (10YR 4/2) sandy loam; weak fine subangular blocky; many fine medium roots; clear smooth boundary.
AB	22-41	Dark brown (10YR 4/3) sandy loam; weak fine subangular blocky; few medium roots; gradual smooth boundary.
BA	41-89	Yellowish brown (10YR 5/6) sandy loam; weak fine subangular blocky; clear smooth boundary.
B	89-146	Yellowish brown (10YR 5/8) sandy loam; weak fine subangular blocky; clear smooth boundary.
BC	146-206	Yellowish brown (10YR 5/8) sandy loam; weak, fine subangular blocky.

SOIL MAPPING UNIT NO. 1d
 SOIL CLASSIFICATION: Typic Tropaquept (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO. RV 1d - 04
 LOCATION: Umuagbai, Bori LGA
 GEOLOGY/PARENT MATERIAL: Alluvium
 TOPOGRAPHY/SLOPE: Flat; 0.5%
 VEGETATION/LAND USE: Oil Palms, Plantain, Cassava
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: 125cm
 DATE DESCRIBED: 27/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0-15	Very dark greyish brown (10YR 3/2) sandy loam; weak fine subangular blocky; many fine-medium roots; abrupt wavy boundary.
AB	15-47	Dark greyish brown (10YR 4/2) sandy loam; fine subangular blocky; fine roots; clear smooth boundary.
BA	47-65	Greyish brown (10YR 5/2) sandy loam; moderate medium subangular blocky; clear smooth boundary.
B	65-125	Light brownish grey (2.5Y 6/2) sandy loam; moderate medium subangular blocky.

SOIL MAPPING UNIT NO. 2a
 SOIL CLASSIFICATION: Aeric Tropaquept (USDA)
 Eutric Cambisol (FAO)
 SOIL PROFILE PIT NO. CR 2a - 01
 LOCATION: Itu, 5km after bridge towards Calabar
 GEOLOGY/PARENT MATERIAL: Alluvium
 TOPOGRAPHY/SLOPE: Nearly flat, 1 - 2%
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 21/06/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soil unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 4	Very dark grey (10YR 3/1) sand; weak fine granular; friable; many fine medium pores; few fine and medium roots; clear smooth boundary.
A	4 - 17	Dark brown (10YR 3/3) loamy sand; weak fine granular; friable; many fine and medium pores; few fine and medium roots; clear smooth boundary.
AB	17 - 34	Dark brown (10YR 4/3) loamy sand; weak fine subangular blocky; few fine and medium pores' few fine and medium roots clear smooth boundary.
BA	34 - 74	Dark brown (10Yr 4/3) sandy loam; weak fine subangular blocky; few fine and medium pores; few fine and medium roots gradual smooth boundary.
BC	116 - 143	Pale brown (10YR 6/3) sandy loam; brownish yellow (10YR 6/8) mottles; weak fine subangular blocky; few fine pores; few fine and medium roots; clear smooth boundary.
C	143 - 175	Light grey (10YR 7/2) sandy loam; very prominent strong brown (7.5YR 5/8) mottles; few fine and medium roots.

SOIL MAPPING UNIT NO. 2a
 SOIL CLASSIFICATION: Typic Tropudult (USDA)
 Dystric Acrisol (FAO)
 SOIL PROFILE PIT NO. CR 2a - 02
 LOCATION: Idundun, Calabar 11km
 GEOLOGY/PARENT MATERIAL: Coastal plains sands
 TOPOGRAPHY SLOPE: Nearly level; 2%
 VEGETATION/LAND USE: Bush fallow
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE; Below profile depth
 DATE DESCRIBED: 15/09/81
 DESCRIBED BY: C. Equere

(All colours are for moist soil unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 4	Very dark greyish brown (10YR 3/2) loamy sand; weak coarse granular; friable, non-sticky, non-plastic; many fine roots; many medium pores abrupt wavy boundary.
E	4 - 26	Dark yellowish brown (10YR 4/4) loamy sand; weak coarse angular blocky; friable, non-plastic; many coarse roots; many medium pores; gradual wavy boundary.
AB	26- 58	Dark yellowish brown (10YR 4/6) sandy loam; moderate coarse angular blocky; firm, slightly sticky, slightly plastic; few coarse roots; common fine pores gradual wavy boundary.
Bt ₁	58 - 114	Dark yellowish brown (10YR 4/6) sandy clay loamy; strong coarse angular blocky; firm, sticky, plastic, very few medium roots, common few pores; diffuse irregular boundary.
Bt ₂	114 - 160	Yellowish brown (10YR 5/6) sandy clay loam; strong coarse angular blocky; firm very sticky, very plastic; very few medium roots; few fine pores.

SOIL MAPPING UNIT NO. 2a
 SOIL CLASSIFICATION: Vertic Tropaquept (USDA)
 Eutric Fluvisol (FAO)
 SOIL PROFILE PIT NO. BN 2a - 02
 LOCATION: About 1 km south of Idah
 GEOLOGY/PARENT MATERIAL: Allvial terrace, alluvium
 TOPOGRAPHY/SLOPE: Almost flat, 0 - 2%
 VEGETATION/LAND USE: Savanna Grassland
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED 21/5/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 12	Dark grayish brown (10YR 4/2) silty clay loam; weak subangular blocky; friable, slightly sticky, slightly plastic; many roots; common fine and medium pores; clear smooth boundary.
AB	12 - 24	Dark grayish brown (2.5YR 4/2) silty clay; common faint medium brown mottles; moderate medium subangular blocky; slightly firm, sticky, slightly plastic; common roots; few fine pores; clear smooth boundary.
BC	24 - 35	Grayish brown (2.5YR 5/2) clay; many distinct medium coarse yellowish brown mottles; moderate coarse angular blocky; firm, sticky, plastic, few roots; few fine pores; gradual wavy boundary.
IIC ₁	35 - 65	Brown (10YR 5/2) clay; common fine/medium distinct brownish yellow mottles; massive; hard, firm, sticky, plastic; very few fine pores, diffuse wavy boundary.

IIC ₂	65 - 90	Brown (10YR 5/2) clay; common/fine medium distinct brownish yellow mottles; massive; hard, firm, sticky, plastic; very few fine pores; diffuse wavy boundary.
IIC ₃	90 - 121	Dark brown (10YR 4/3) clay; moderate coarse angular blocky; very hard, very firm.

SOIL MAPPING UNIT NO. 2a
 SOIL CLASSIFICATION: Typic Ustifluvents (USDA)
 Eutric Fluvisol (FAO)
 SOIL PROFILE PIT NO. BN 2a - 03
 LOCATION: Idah (about 10km south of Idah, along Idah -
 Abujaga road)
 GEOLOGY/PARENT MATERIAL: Terrace Alluvium
 TOPOGRAPHY/SLOPE: Almost flat - Plain 0 - 2%
 VEGETATION/LAND USE: Fadama grassland
 DRAINAGE: Somewhat poorly drained
 DEPTH TO WATER TABLE: 105 cm
 DATE DESCRIBED: 22/5/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 27	Very dark grayish brown (10YR 3/3) silt loam; weak fine subangular blocky; very friable, non-sticky, non-plastic; many fine to medium roots; few pores; clear smooth boundary.
IIC ₁	27 - 55	Dark grayish brown (10YR 3/4) silty clay loam; many faint medium very dark brown (10YR 2/2) mottles; moderate medium subangular blocky; friable, sticky, slightly plastic; very few roots; few pores; clear wavy boundary.
IIC ₂	55 - 72	Dark grayish brown (10YR 4/4) silty clay loam; many common distinct dark brown mottles (10YR 3/4); weak medium subangular blocky; slightly sticky; non-plastic; very few roots; few fine pores; clear wavy boundary.
IIIC ₁	72 - 81	Dark yellowish brown (10YR 4/4) silt loam; common faint medium dark brown mottles; weak fine subangular blocky; non-sticky, non-plastic; very few roots; few fine pores; clear wavy boundary.
IIIC ₂	81 - 109	Dark brown (10YR 3/3) silty clay loam; many distinct very dark brown mottles (10YR 2/2); weak fine subangular blocky; friable, non-sticky, non-plastic.

SOIL MAPPING UNIT NO. 2a
 SOIL CLASSIFICATION: Typic Trophaquept (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO: AN 2a - 01
 LOCATION: 1Km North of Nzam
 GEOLOGY/PARENT MATERIAL: Old Alluvium on weakly consolidated sand
 TOPOGRAPHY/SLOPE: Almost flat
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 28/01/82
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0 - 15	Dark brown (10YR 4/3) sandy clay loam; moderate medium blocky; friable; many roots; many pores; diffuse wavy boundary.
AB	15 - 43	Dark brown (10YR 4/3) clay loam; moderate medium coarse angular blocky; firm; common roots; common pores; diffuse wavy boundary.
BA	43 - 85	Light brownish grey (10YR 5/3) clay loam; common distinct coarse dark brown (7.5YR 4/3) to brown (7.5YR 5/2) mottles; moderate medium to coarse angular blocky; firm; common roots; few pores; gradual wavy boundary.
B	85 - 113	Light brownish grey (2.5YR 6/2) sandy loam; many distinct medium brownish yellow (10YR 6/6) mottles; crumb; loose; common roots; few pores; diffuse wavy boundary.
BC	113 - 136	Brownish yellow (10YR 4/4) sandy loam; many faint medium to coarse strong brown (7.5YR 4/6) mottles; crumb; loose; common roots; clear smooth boundary.

SOIL MAPPING UNIT NO.: 2b
 SOIL CLASSIFICATION: Typic Tropudult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO.: IM 2b - 01
 LOCATION: Oguta 1
 GEOLOGY/PARENT MATERIAL: Subrecent Alluvium
 TOPOGRAPHY/SLOPE: Gently undulating plain, 0 - 2%
 VEGETATION/LAND USE: Rainforest
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 11/05/82
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 19	Dark brown (7.5YR 3/2) sandy loam; weak fine granular; friable; many medium roots; abundant fine and medium pores; gradual smooth boundary.
Bt ₁	19 - 60	Dark brown (2.5YR 5/4) sandy clay loam; moderate fine granular; friable; many fine and medium roots; many fine and medium pores; abrupt smooth boundary
Bt ₂	60 - 110	Yellowish red (5YR 5/6) sandy loam; moderate fine granular; friable; few fine roots; many fine pores; gradual smooth boundary.
Bt ₃	110 - 209	Yellowish red (5YR 5/8) sandy loam; weak fine granular; friable; few fine roots; many pores.

SOIL MAPPING UNIT NO.: 2b
 SOIL CLASSIFICATION: Typic Tropudult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO.: IM 2b - 02
 LOCATION: Eziorsu, on Oguta-Ahoadada road
 GEOLOGY/PARENT MATERIAL: Subrecent Alluvium
 TOPOGRAPHY/SLOPE: Gently undulating plains, 2 - 4%
 VEGETATION/LAND USE: Oil palm bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 03/06/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 15	Dark reddish brown (5YR 3/2) sand; fine single grained; very friable; common fine and medium roots; many fine and medium pores; clear wavy boundary.
AB	15 - 30	Dark red (7.5YR 4/4) sandy loam; fine single grained; many fine and medium roots; many fine and medium pores; clear wavy boundary.
Bt ₁	30 - 73	Dark red (7.5YR 4/4) sandy loam; weak fine single grained to granular; common fine and medium roots; common fine and medium pores; abrupt wavy boundary.
Bt ₂	73 - 125	Red (2.5YR 4/6) sandy clay loam to sandy clay; moderate fine subangular blocky; friable; few medium roots; few fine pores clear smooth boundary.
BC	125 - 180	Red (2.5 4/8) sandy clay; moderate fine subangular blocky; friable; few fine roots; common fine pores.

SOIL MAPPING UNIT NO. 2c
 SOIL CLASSIFICATION: Typic Tropaquent (USDA)
 Eutric Gleysol (FAO)
 SOIL PROFILE PIT NO. RV 2c-01
 LOCATION: Aziama, Yenagoa LGA
 GEOLOGY/PARENT MATERIAL: Alluvium
 TOPOGRAPHY/SLOPE: Flat, 1%
 VEGETATION AND USE: Raphia palms, ferns
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: 135cm
 DATE DESCRIBED: 12/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0-7	Dark greyish brown (10YR 4/2) loam; weak fine crumb; many fine roots; abrupt smooth boundary.
C ₁	7-64	Light brownish grey (2.5Y 6/2) silty loam; moderate fine subangular blocky; few strong brown (7.5YR 5/8) rust spots; abrupt smooth boundary.
C ₂	64-135	Grey brown (2.5Y 5/2) loam over sandy loam - loamy sand; weak fine subangular blocky; yellowish red (5YR 4/6) rust spots.

SOIL MAPPING UNIT NO. 2c
 SOIL CLASSIFICATION: Typic Tropaquent (USDA)
 Dystric Gleysol (FAO)
 SOIL PROFILE PIT NO. RV 2c - 02
 LOCATION: Aziama, Yenagoa LGA
 GEOLOGY/PARENT MATERIAL: Alluvium
 TOPOGRAPHY/SLOPE Gently undulating plain, 2%
 VEGETATION/LAND USE: Raphia palms, ferns
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: 135cm
 DATE DESCRIBED: 12/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0-20	Light brownish grey; (10YR 6/2) silt; weak fine granular - subangular blocky; many fine medium roots; abrupt smooth boundary.
C ₁	20-96	Grey (5Y 6/1) silty clay; weak fine subangular blocky; few fine roots; clear smooth boundary.
C ₂	96-135	Greenish grey (5BG 5/1) sandy loam - clay loam; moderate medium subangular blocky.

SOIL MAPPING UNIT NO. 5a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO. RV 5a - 01
 LOCATION: Akabuka Ahoada LGA
 GEOLOGY/PARENT MATERIAL: Alluvium (Sombreiro Warri Deltaic Plain)
 TOPOGRAPHY/SLOPE: Almost flat, 1-2%
 VEGETATION/LAND USE: Cassava, Maize, Oil palm
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 7/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0-15	Dark brown (7.5YR 3/2) sandy loam; weak granular; many fine to medium roots; many fine pores; clear smooth boundary.
AB	15-53	Dark brown (7.5YR 4/2) sandy clay loam; weak very fine subangular blocky; many fine roots; gradual smooth boundary.
Bt ₁	53-92	Yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky; few medium roots; gradual smooth boundary.
Bt ₂	92-140	Yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular to angular blocky; gradual wavy boundary.
Bt ₃	140-167	Light yellowish brown (2.5YR 6/4) sandy clay loam; moderate coarse subangular blocky; gradual smooth boundary.
C	167-195	Light brown grey (2.5YR 6/2) sandy clay loam; moderate coarse angular blocky.

SOIL MAPPING UNIT NO. 5a
 SOIL CLASSIFICATION: Aquic Tropaquept (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO. RV 5a - 03
 LOCATION: Abua Ahoada LGA
 GEOLOGY/PARENT MATERIAL: Alluvium
 TOPOGRAPHY/SLOPE: Nearly flat, 1%
 VEGETATION/LAND USE: Rubber, Oil palm
 DRAINAGE: Imperfectly drained
 DEPTH TO WATER TABLE: 130cm
 DATE DESCRIBED: 7/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0-6	Very dark grey (10YR 3/1) sandy loam - loam; weak fine crumb; many fine roots; abrupt smooth boundary.
AB	6-24	Dark greyish brown (10YR 4/2) silty loam; weak fine subangular blocky; few fine-medium roots; diffuse wavy boundary.
BA	24-45	Yellowish brown (10YR 5/6) silty loam; weak fine, subangular blocky; diffuse wavy boundary.
B	45-60	Brownish yellow (10YR 6/6) silty loam; moderate medium subangular blocky; gradual smooth boundary.
BC	60-107	Reddish yellow (7.5YR 7/6) silty loam - silty clay loam; moderate medium subangular blocky; clear smooth boundary.
C	107-130	Grey (5YR 6/1) silty clay loam; moderate medium subangular blocky.

SOIL MAPPING UNIT NO. 5a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO. RV 5a - 07
 LOCATION: Elele Ikwerre-Etche LGA
 GEOLOGY/PARENT MATERIAL: Transition subrecent alluvium to coastal plain
 sands, unconsolidated sedim. material
 TOPOGRAPHY/SLOPE: Nearly flat, 1%
 VEGETATION/LAND USE: Cassava, Vegetables, Plantain
 DRAINAGE: Well drained.
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 10/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0-13	Dark brown (10YR 4/3) loamy sand; weak, granular structure; many, fine medium roots; abrupt and wavy boundary.
AB	13-42	Strong brown (7.5YR 5/4) sandy loam; weak, very fine subangular blocky; many fine medium roots; gradual and wavy boundary.
Bt ₁	42-95	Strong brown (7.5YR 5/6) sandy clay loam; moderate, medium subangular blocky; few medium roots; clear smooth boundary.
Bt ₂	95-147	Strong brown (7.5YR 5/6) sandy clay loam; moderate, coarse subangular blocky; gradual smooth boundary.
BC	147-180	Strong brown (7.5YR 5/8) sandy clay; moderate, coarse angular blocky.

SOIL MAPPING UNIT NO. 5a
 SOIL CLASSIFICATION: Oxic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO. RV 5a - 08
 LOCATION: Ndele Ikwerre-Etche LGA
 GEOLOGY/PARENT MATERIAL: Alluvium
 TOPOGRAPHY/SLOPE: Nearly flat, 0.5 - 1.5%
 VEGETATION/LAND USE: Oil palm bush (fallow); *Eupatorium odoratum*
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 7/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0-15	Greyish brown (10YR 5/2) sandy loam; weak fine subangular blocky; many fine medium roots; clear smooth boundary.
AB	15-57	Dark brown (10YR 4/3) sandy loam; weak fine subangular blocky; many medium roots; gradual smooth boundary.
B	57-135	Yellowish brown (10YR 5/6) sandy loam; weak fine subangular blocky; clear smooth boundary.
BC	135-190	Yellowish brown (10YR 5/8) sandy loam; weak fine subangular blocky.

SOIL MAPPING UNIT NO. 5d
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO. RV 5d - 01
 LOCATION: Isiokpo, Ikwerre-Etche LGA
 GEOLOGY/PARENT MATERIAL: Subrecent alluvium
 TOPOGRAPHY/SLOPE: Almost flat, 0-2%
 VEGETATION/LAND USE: Oil palm, Cassava
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 24/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0-15	Dark brown (7.5YR 3/2) sandy loam; weak granular; many fine to medium roots; many fine pores; clear smooth boundary.
AB	15-45	Dark brown (7.5YR 4/2) sandy clay loam; weak fine, subangular blocky; many fine-medium roots; many fine pores; gradual wavy boundary.
Bt ₁	45-91	Yellowish brown (10YR 5/4) sandy clay loam; moderate fine subangular blocky; many, fine roots; few micropores; gradual wavy boundary.
Bt ₂	91-140	Yellowish brown (10YR 5/6) sandy clay loam; moderate medium angular blocky; few fine roots; gradual wavy boundary.
Bt ₃	140-174	Light yellowish brown (2.5Y 6/4) sandy loam; common fine reddish yellow (7.5Y 6/8) mottles; moderate medium angular blocky; few fine roots; gradual smooth boundary.
C	174-200	Light brownish grey (2.5Y 6/2) sandy clay loam; medium distinct strong brown (7.5YR 5/6) mottles; moderate medium angular blocky.

SOIL MAPPING UNIT NO. 5d
 SOIL CLASSIFICATION: Oxic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO. RV 5d - 02
 LOCATION: Isiokpo, Ikwerre-Etche LGA
 GEOLOGY/PARENT MATERIAL: Subrecent alluvium, Coastal Plain Sands
 TOPOGRAPHY/SLOPE: Plain, 1%
 VEGETATION/LAND USE: Secondary bush - Oil palm
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 24/10/83
 DESCRIBED BY: FDALR Staff.

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0-10	Greyish brown (10YR 5/6) loamy sand; structureless; single grain; many fine roots; gradual smooth boundary.
A	10-45	Dark yellowish brown (10YR 4/4) loamy sand; weak fine granular; many fine roots; gradual smooth boundary.
AB	45-87	Light yellowish brown (2.5YR 6/4) loamy sand; weak very fine granular; few fine medium roots; gradual smooth boundary.
BA	87-125	Yellowish brown (10YR 5/8) loamy sand; weak fine granular; gradual smooth boundary.
B	125-159	Brownish yellow (10YR 6/6) loamy sand; weak fine subangular blocky; clear smooth boundary.
BC	159-200	Brownish yellow (10YR 6/8) sandy loam; weak fine subangular blocky.

SOIL MAPPING UNIT NO. 5d
 SOIL CLASSIFICATION: Aquic Paleudult (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO: RV 5d - 03
 LOCATION: Igirita, Ikwerre-Etche LGA
 GEOLOGY/PARENT MATERIAL: Subrecent alluvium
 TOPOGRAPHY/SLOPE: Gently undulating, 2%
 VEGETATION/LAND USE: Oil palm, Cassava
 DRAINAGE: Imperfectly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 25/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0-8	Dark greyish brown (10YR 4/2) sandy loam; weak very fine crumb; many fine to medium roots; many fine pores; gradual smooth boundary.
Bt ₁	8-47	Dark brown (10YR 4/3) sandy loam - sandy clay loam; weak fine subangular blocky; many fine to medium roots; few fine pores; gradual smooth boundary.
Bt ₂	47-86	Yellowish brown (10YR 5/4) clay loam; moderate fine subangular blocky; few fine roots; gradual smooth boundary.
Bt ₃	86-115	Light yellowish brown (10YR 6/4) clay loam; strong coarse subangular - angular blocky; few clay skins; gradual wavy boundary.
Bt ₄	115-141	Light brownish grey (10YR 6/2) sandy clay; many fine brownish yellow (10YR 6/4) mottles; strong coarse angular blocky; gradual smooth boundary.
Cg	141-155	Light greyish brown (10YR 6/2) sandy clay; many fine brown - yellow (10YR 6/4) mottles; strong coarse subangular.

SOIL MAPPING UNIT NO: 6a
 SOIL CLASSIFICATION: Arenic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO: IM 6a - 02
 LOCATION: Akwete Town
 GEOLOGY/PARENT MATERIAL: Sandy Alluvium (Coastal plain sands)
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Secondary bush, dominated by
 Eupatorium Odoratum
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 23/04/82
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 12	Very dark greyish brown (10YR 3/2) coarse loamy sand; weak fine granular; very friable; many fine and medium roots; many fine and medium irregular pores; clear smooth boundary.
A	12 - 43	Dark greyish brown (10YR 4/2) loamy sand; moderate medium granular; very friable; many fine and medium pores; clear smooth boundary.
BA	43 - 58	Brown (10YR 5/3) loamy sand; moderate medium subangular blocky; very friable; few fine roots; many fine irregular pores; clear smooth boundary.
AB	58 - 87	Dark yellowish brown (10YR 4/6) sandy loam; moderate medium subangular blocky; very friable; few fine roots; many fine irregular pores; clear smooth boundary.
Bt ₁	87 - 124	Yellowish brown (10YR 5/6) sandy loam; moderate medium subangular blocky; friable; few

SOIL MAPPING UNIT NO.: 6a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO.: IM 6a - 02
 LOCATION: Eziama Obiato , Mbaitoli
 GEOLOGY/PARENT MATERIAL: Coastal plain sands
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 12/5/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 17	Dark brown (10YR 3/3) sandy clay loam; weak fine granular; friable; many fine to medium roots; many fine and medium pores; gradual smooth boundary.
Bt ₁	17 - 31	Dark brown (7.5YR 4/4) sandy clay; weak fine subangular blocky; friable; many fine to medium roots; many and medium pores; gradual smooth boundary.
Bt ₂	31 - 52	Yellowish red (5YR 5/6) sandy clay to sandy clay loam; moderate fine subangular blocky; common fibrous roots; many fine and medium pores; gradual smooth boundary.
Bt ₃	52 - 82	Dark red (7.5YR 3/4) sandy clay loam; moderate medium subangular blocky; friable; many medium fibrous roots; many fine and medium pores; clear smooth boundary.

Bt ₄	82 - 125	Dark red (7.5YR 3/4) sandy clay; moderate medium subangular blocky; friable; few roots; many fine and medium pores; clear smooth boundary.
BC	125 - 183	Red (2.5YR 4/6) sandy clay; moderate medium subangular blocky; friable; common fine roots; many fine to medium pores.

SOIL MAPPING UNIT NO.: 6a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOL PROFILE PIT NO.: IM 6a - 03
 LOCATION: Atta - Ikeduru
 GEOLOGY/PARENT MATERIAL: Coastal plain sands
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Cassava, Maize
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 12/05/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 13	Dark greyish brown (10YR 4/2) sandy loam; weak very fine granular; friable; many roots; many fine pores; clear smooth boundary.
AB	13 - 34	Dark brown (7.5YR 4/4) sandy clay; weak fine subangular blocky; friable; many fine to medium roots; many fine to medium pores; clear smooth boundary.
Bt₁	34 - 75	Reddish brown (5YR 4/40) sandy clay; moderate medium subangular blocky; common roots; many fine pores; gradual smooth boundary.
Bt₂	75 - 130	Dark red (2.5YR 3/6) sandy clay to clay; moderate medium subangular blocky; friable; few roots; common fine pores; gradual smooth boundary.
Bt₃	130 - 190	Red (2.5YR 4/6) sandy clay; moderate medium subangular blocky; few roots; common fine and medium pores.

SOIL MAPPING UNIT NO.: 6a
 SOIL CLASSIFICATION: Typic Tropudult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO.: IM 6a - 04
 LOCATION: Obigbo, 3km from Imo River on the Imo River/Port Harcourt road.
 GEOLOGY/PARENT MATERIAL: Sandy material derived from the coastal plain sands.
 TOPOGRAPHY/SLOPE: Nearly level plains; 0 - 2%
 VEGETATION/LAND USE: Oil palm bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/05/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 16	Very dark greyish brown (10YR 3/2) sandy loam; structureless, single grained; loose; many fine and medium roots; many fine medium pores; gradual smooth boundary.
AB	16 - 36	Dark yellowish brown (10YR 4/4) sandy loam; weak very fine granular; very friable; many fine and medium roots; many fine and medium pores; gradual smooth boundary.
Bt ₁	36 - 82	Yellowish brown (10YR 3/6) sandy clay; moderate fine subangular blocky; few roots; common fine pores; clear smooth boundary.
Bt ₂	82 - 137	Yellowish brown (10YR 5/8) sandy clay loam; moderate fine subangular blocky; friable; very few roots; many fine pores; gradual smooth boundary.
BC	137 - 180	Strong brown (7.5YR 5/8) clay; moderate fine subangular blocky; friable; few roots; common fine pores.

SOIL MAPPING UNIT NO.: 6a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO.: IM 6a - 05
 LOCATION: Owerri Ebeiri, Orlu L.G.C
 GEOLOGY/PARENT MATERIAL: Coastal plain sands
 TOPOGRAPHY/SLOPE: Nearly level plains, 0- 2%
 VEGETATION/LAND USE: Cassava farm
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 12/03/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 13	Reddish brown (5YR 4/3) sandy clay loam; weak fine crumb; very friable; many fine and medium roots; many fine and medium pores; gradual smooth boundary.
Bt ₁	13 - 38	Yellowish red (5YR 4/6) sandy clay; weak fine subangular blocky; friable; many fine and medium roots; many fine pores; gradual smooth boundary.
Bt ₂	38 - 78	Dark red (2.5YR 3/6) clay; moderate medium subangular blocky; friable; many fine and medium roots; many fine pores; clear smooth boundary.
Bt ₃	78 - 127	Red (2.5YR 4/6) clay; moderate medium subangular blocky; common fine and medium roots; many fine pores; gradual smooth boundary.
BC	127 - 190	Red (2.5YR 4/6) sandy clay; moderate medium subangular blocky; friable; few fine and medium roots; many fine pores.

		fine roots; common fine irregular pores; clear smooth boundary.
Bt ₂	124 - 158	Yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky; friable; few fibrous roots; common fine irregular pores; clear smooth boundary.
BC	158 - 185	Yellowish brown (10YR 5/8) sandy clay loam; moderate medium granular; very friable; few fibrous roots; common fine irregular pores.

SOIL MAPPING UNIT NO. 6a
 SOIL CLASSIFICATION: Typic Paleudults (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO. RV 6a - 01
 LOCATION: Otu-Eleme
 GEOLOGY/PARENT MATERIAL: Coastal plainsands,
 TOPOGRAPHY/SLOPE: Nearly flat, 1%
 VEGETATION/LAND USE: Cassava, Oil palms
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 6/9/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0-16	Dark brown (7.5YR 4/2) sandy loam; weak medium subangular blocky; many fine medium roots; many fine medium pores; clear smooth boundary.
Bt ₁	16-35	Dark brown (10YR 4/3) sandy clay loam; moderate medium subangular blocky; many fine-medium roots; many fine pores;
Bt ₂	35-72	Yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky; few medium roots; few micropores; clear smooth boundary.
Bt ₃	72-112	Yellowish brown (10YR 5/6) sandy clay; fine moderate subangular blocky; few fine roots; gradual smooth boundary.
Bt ₄	112-150	Yellowish brown (10YR 5/6) clay loam; fine-moderate subangular blocky; clear smooth boundary.

SOIL MAPPING UNIT NO. 6a
 SOIL CLASSIFICATION: Typic Trophaept (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO. RV 6a - 03
 LOCATION: Kono Bori LGA
 GEOLOGY/PARENT MATERIAL: Coastal plain sands
 TOPOGRAPHY/SLOPE: Nearly flat, 1.5%
 VEGETATION/LAND USE: Cassava, Oil palms
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 28/9/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0-18	Very dark greyish brown (10YR 3/2) sandy loam; weak fine subangular blocky; many fine to medium roots; abrupt smooth boundary.
AB	18-55	Dark greyish brown (10YR 4/2) sandy loam; weak fine subangular blocky; any fine to medium roots; clear smooth boundary.
B	55-130	Greyish brown (10YR 5/2) sandy loam; moderate medium subangular blocky; clear smooth boundary.
BC	130-183	Light brownish grey (2.5YR 6/2) sandy loam; moderate medium subangular blocky.

SOIL MAPPING UNIT NO. 6a
 SOIL CLASSIFICATION: Arenic Paleudult (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO. RV 6a - 04
 LOCATION: Kpopie Bori LGA
 GEOLOGY/PARENT MATERIAL: Coastal plain sands
 TOPOGRAPHY/SLOPE: Flat, 1%
 VEGETATION/LAND USE: Cassava, Oil palms
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 28/9/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0-16	Dark greyish brown (10YR 4/2) sand; structureless; single grain; many fine roots; abrupt smooth boundary.
AB	16-52	Dark brown (10YR 3/3) loamy sand; weak very fine granular subangular blocky; few fine roots; clear smooth boundary.
Bt ₁	52-115	Brown (7.5YR 4/4) sandy clay loam; weak fine subangular blocky; very fine to medium roots; gradual smooth boundary.
Bt ₂	115-190	Strong brown (7.5YR 5/6) sandy clay; moderate medium subangular blocky.

SOIL MAPPING UNIT NO. 6a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Eutric Nitosol (FAO)
 SOIL PROFILE PIT NO. CR 6a - 02
 LOCATION: Obotum Nsit Ibom-Etinan LGA
 GEOLOGY/PARENT MATERIAL: Coastal Plain Sands.
 VEGETATION/LAND USE: Secondary bush fallow, Eupatorium Odoratum
 Oil Palm
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED. 8/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise states)

<u>Horizons</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 30	Dark brown (7.5YR 3/2) sandy clay loam' weak fine granular; friable; many fine and medium pores; many fine and medium fibrous roots; clear smooth boundary.
AB	30 - 64	Dark brown (7.5YR 4/4) sandy clay loam; moderate fine and medium subangular blocky; friable; many fine and medium irregular pores; many fine and medium fibrous roots; clear smooth boundary.
Bt ₁	64 - 95	Dark yellowish brown (10YR 4/4) sandy clay loam; moderate fine and medium subangular blocky; friable; many fine and medium irregular pores; many fine and medium fibrous roots; gradual smooth boundary.
Bt ₂	95 - 154	Dark yellowish brown (10YR 4/4) sandy clay loam; moderate fine and medium subangular blocky; friable; few fine irregular pores; few fine fibrous roots; clear smooth boundary.
Bt ₃	154 - 180	Strong brown (7.5Yr 5/6) sandy clay loam; moderate fine and medium subangular blocky' friable; few fine irregular pores; few fine fibrous roots.

SOIL MAPPING UNIT NO. 6a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO. CR 6a - 06
 LOCATION: Abak, Akwa Ibom State
 GEOLOGY/PARENT MATERIAL: Coastal plain sand
 TOPOGRAPHY/SLOPE: Nearly flat, 1%
 VEGETATION/LAND USE: Cassava, Yams, Telfaira, Oil Palm. Maize
 DRAINAGE Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 22	Dark brown (7.5Yr 3/2) sandy loam; weak fine granular, friable; many fine and medium roots; many fine and medium irregular pores; gradual smooth boundary.
Bt ₁	22 - 50	Dark brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky; firm; few fine and medium fibrous roots; few fine and medium irregular pores; clear smooth boundary.
Bt ₂	50 - 80	Brown (7.5YR 5/4) sandy clay loam; moderate medium subangular blocky; firm; few fine and medium fibrous roots; few fine and medium irregular pores; clear smooth boundary.
Bt ₃	80 - 136	Strong brown (7.5YR 5/6) sandy clay loam; moderate subangular blocky; firm; few fine fibrous roots; few fine irregular pores; gradual smooth boundary.
BC	136 - 190	Strong brown (7.5YR 5/8) sandy clay loam; moderate medium subangular blocky; firm; few fine fibrous roots few fine irregular pores.

SOIL MAPPING UNIT NO. 6a
 SOIL CLASSIFICATION: Arenic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO.: CR 6a - 10
 LOCATION: Ikot Esang - Ikot Abasi LGA
 GEOLOGY/PARENT MATERIAL: Costal plain sand
 TOPOGRAPHY/SLOPE: Almost flat, 1%
 VEGETATION/LAND USE: Cassava, Yams, Maize, Oil palm
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 1983

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 18	Dark brown (7.5YR 3/2) loamy sand; weak fine subangular blocky; friable; many fine and medium fibrous roots; many fine and medium irregular pores; clear smooth boundary.
AB	18 - 60	Dark brown (7.5YR 5/4) sand; weak single grained; loose; many fine and medium fibrous roots; many fine and medium irregular pores; gradual smooth boundary.
Bt ₁	60 - 107	Yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular blocky; firm; few fibrous roots; few fine irregular pores; clear smooth boundary.
Bt ₂	107 - 148	Yellowish brown (10YR 5/8) sandy clay loam; moderate medium subangular blocky; firm; few fibrous roots; few fine irregular pores; clear smooth boundary.
BC	148 - 180	Yellowish brown (10YR 5/8) sandy clay loam; moderate medium subangular blocky; firm; very few fibrous roots; few fine irregular pores.

SOIL MAPPING UNIT NO. 6a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO.: CR 6a - 11
 LOCATION: Ikot Ntot - C.R.S.
 GEOLOGY/PARENT MATERIAL: Costal plain sand
 TOPOGRAPHY/SLOPE: Nearly flat, 1%
 VEGETATION/LAND USE: Fallow Rafia palm and Oil palm
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 23/6/83

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 12	Dark brown (7.5YR 3/2) sand; weak fine crumb; friable; fine and medium pores; many fine and medium roots; clear smooth boundary.
AB	12 - 30	Dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky; friable; many fine and medium pores; many fine and medium roots; clear smooth boundary.
Bt ₁	30 - 65	Brown (7.5YR 5/4) sandy clay loam; moderate medium subangular blocky; friable; few fine pores; few fine roots; gradual smooth boundary.
Bt ₂	65 - 108	Strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky; friable; few fine pores; few fine roots; gradual smooth boundary.
BC	108 - 150	Strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky; friable; few fine pores; few fine roots; gradual smooth boundary.
C	150 - 186	Strong brown (7.5YR 5/8) sandy clay loam; moderate medium subangular blocky; friable; few fine pores, few fine roots.

SOIL MAPPING UNIT NO.

6a

SOIL CLASSIFICATION:

Typic Paleudult (USDA)

Dystric Nitosol (FAO)

SOIL PROFILE PIT NO.1

CR 6a - 13

LOCATION:

Nung Ikot

GEOLOGY/PARENT MATERIAL

Costal plain sand

TOPOGRAPHY/SLOPE

Nearly flat, 1%

VEGETATION/LAND USE

Cassava, Yams, Telfaira, Oil palm, Maize

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below profile depth

DESCRIBED BY:

FDALR Staff

DATE DESCRIBED:

17/6/83

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 23	Dark brown (7.5YR 2/3) sand; weak very fine granular; very friable; many fine and medium fibrous roots; many fine and medium pores; clear smooth boundary.
Bt ₁	23 - 70	Dark brown (10YR 4/3) sandy loam; weak fine subangular blocky; friable; many fine and medium fibrous roots; many fine and medium irregular pores; gradual smooth boundary.
Bt ₂	70 - 105	Dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky; friable; many fine fibrous roots; many fine and medium irregular pores; clear smooth boundary.
Bt ₃	105 - 140	Dark yellowish brown (10YR 4/6) sandy loam; moderate medium subangular blocky; friable; few fibrous roots; few fine and medium irregular pores; clear smooth boundary.
Bt ₄	140 - 188	Dark yellowish brown (10YR 4/6) sandy clay loam; moderate medium subangular blocky; few fine fibrous roots; few fine and medium irregular pores.

SOIL MAPPING UNIT NO.

SOIL CLASSIFICATION:

SOIL PROFILE PIT NO.

GEOLOGY/PARENT MATERIAL:

TOPOGRAPHY/SLOPE

VEGETATION/LAND USE:

DRAINAGE:

DEPTH TO WATER TABLE:

DATE DESCRIBED:

DESCRIBED BY:

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 16	Dark greyish brown (10YR 4/2) sand; weak fine granular; friable; many fine and medium irregular pores; many fine and medium fibrous roots; clear smooth boundary.
BA	16 - 42	Dark brown (10YR 4/3) loamy sand; weak fine subangular blocky; friable; many fine and medium irregular pores; many fine and medium fibrous roots; gradual wavy boundary.
B	42 - 64	Dark Brown (10YR 4/3) loamy sand; weak fine subangular blocky; friable; many fine and medium fibrous roots; clear smooth boundary.
Bt1	64 - 112	Dark brown (7.5YR 4/4) sandy loam; weak fine subangular blocky; friable; many fine and few medium pores; many fine and few medium roots; clear smooth boundary.
BC	112 - 153	Strong brown (7.5YR 5/8) sandy loamy' weak fine subangular blocky' friable many fine medium pores; many fine few medium roots; gradual wavy boundary.
C	153 - 180	Strong brown (7.5YR 5/8) sandy loam; weak fine subangular blocky; friable; many fine and medium pores; very fine few fine roots.

6a

Gross arenic Paleudult (USDA)

Dystric Nitosol (FAO)

Mbiet Ebe - Uyo

Weakly consolidated sand deposit

Almost flat, 1%

Secondary bush fallow, Eupatorium odoratum,

Oil Palm

Well drained

Below profile depth

8/6/83

FDALR Staff

SOIL MAPPING UNIT NO. 6b
 SOIL CLASSIFICATION: Aeric Tropaquept (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO.: CR 6b - 01
 LOCATION: Abum Yaham - Ikom
 GEOLOGY/PARENT MATERIAL Shale
 TOPOGRAPHY/SLOPE Undulating, 5%
 VEGETATION/LAND USE Cassava, Yams, Maize, Vegetables
 DRAINAGE: Somewhat poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 20/7/81

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 15	Dark reddish brown (5YR 3/4) clay loam; weak fine subangular blocky; friable; many roots; clear smooth boundary.
BA	15 - 42	Yellowish red (5YR 5/6) clay; moderate medium subangular blocky; friable; many roots; clear smooth boundary.
B	42 - 63	Yellowish red (5YR 4/6) clay; moderate medium subangular blocky; friable; many roots clear smooth boundary.
BC	63 - 115	Brown (10YR 5/3) clay; moderate medium subangular blocky; friable; abundant reddish/yellowish mottles; clear smooth boundary.
C	115 - 200	Pale grey (7.5YR 6/2) clay; weak fine subangular blocky; firm; abundant reddish/yellowish mottles.

SOIL MAPPING UNIT NO.: 9a
 SOIL CLASSIFICATION: Aquic Hapludult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO.: IM 9a - 02
 LOCATION: Uturu, 1/2km to the Teachers Training College
 Campus.
 GEOLOGY/PARENT MATERIAL: Shale and sandstone
 TOPOGRAPHY/SLOPE: Undulating dissected plains, 4 - 6%
 VEGETATION/LAND USE: Oil palm bush
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 6/7/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
A	0 - 10	Dark brown (10YR 3/3) sandy clay loam; moderate medium to coarse subangular blocky; firm; many fine and medium roots; many fine and medium pores; few fine and medium ironstones; gradual smooth boundary.
BA	10 - 35	Dark brown (10YR 4/4) sandy clay loam; common faint fine dark red (2.5YR 3/6) mottle; moderate medium to coarse subangular blocky; firm; many fine woody roots; common fine and medium pores; few fine iron concretions; gradual smooth boundary.
AB	35 - 60	Brown (10YR 5/3) sandy clay loam; common distinct fine and medium dark red (2.5YR 3/6) and yellowish brown (10YR 5/6) mottles; strong fine to medium subangular blocky; firm; many fine and medium woody roots; common medium

		pores; few fine and medium iron concretions; gradual smooth boundary.
Bt ₁	60 - 95	Pale brown (10YR 6/3) sandy clay loam; many prominent fine and medium red (2.5YR 5/6) mottles; strong fine to medium angular blocky; firm; few medium woody roots; common medium pores; clear wavy boundary.
3t ₂	95 - 160	Light brownish grey (10YR 6/2) gravelly sandy clay; many prominent coarse red (2.5YR 5/6) and brownish yellow (10YR 6/6) mottles; moderate fine to medium subangular blocky; very firm; few roots; common medium pores; abundant medium and large iron concretions; clear wavy boundary.
IC	160 - 180	Light grey (10YR 7/2) clay; many prominent coarse red (2.5YR 5/6) and yellowish brown (10YR 6/6) mottles; moderate fine to medium subangular blocky; firm; very few roots; common medium pores; common soft red (2.5YR 5/6) iron concretions.

SOIL MAPPING UNIT NO. 9a
 SOIL CLASSIFICATION: Oxic Dystrypepts (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO. AN 9a - 01
 LOCATION: Between Abata (Nsugbe) and
 Nkwelle.
 GEOLOGY/PARENT MATERIAL: Sandstone
 TOPOGRAPHY/SLOPE: Steep, 10 - 13%
 VEGETATION/LAND USE: Cassava
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 24/04/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 12	Dark brown (7.5YR 3/4) sandy clay loam; weak crumb; loose; many fine to medium roots; many pores; clear wavy boundary.
AB	12 - 50	Yellowish red (5YR 5/6) sandy loam; moderate medium subangular blocky; firm; many roots; many pores; diffuse wavy boundary.
B	50 - 70	Red (2.5YR 4/8) sandy clay loam; weak medium to coarse subangular blocky; firm; few roots; few pores; abundant medium to coarse sandstone and boulders;
BC	70 - 103	Red (2.5YR 4/8) sandy clay loam; moderate medium to coarse subangular blocky; very firm; few roots; few pores; many medium to coarse sized sandstones and boulders.

SOIL MAPPING UNIT NO. 9a
 SOIL CLASSIFICATION: Typic Trophaquept (U.S.D.A.)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO. AN 9a - 02
 LOCATION: Agu Nteje
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/LAND USE: Andropogon spp and Eupatorium
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 12/12/80
 DESCRIBED BY: FDALR Staff

(A colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 11	Dark brown (10YR 4/3) clay; moderate to strong medium subangular blocky; friable; many fine fibrous roots; many irregular fine and medium pores; clear wavy boundary.
AB	11 - 32	Reddish brown (5YR 4/4) clay; strong medium angular blocky; friable; many fine fibrous roots; common irregular pores; few rounded, fine to medium iron concretions; clear wavy boundary.
BA	32 - 53	Dark red (2.5YR 3/6) clay; strong medium angular blocky; slightly firm; few fine roots; common irregular pores; few rounded fine to medium iron concretions; clear smooth boundary.
B	53 - 78	Strong brown (7.5YR 4/6) sandy clay; strong medium angular blocky; firm; few fine roots; common irregular pores; many medium to coarse rounded concretions; clear wavy boundary.
BC	78 - 115	Red (2.5YR 4/6) sandy clay; strong cemented; common ferruginised sandstone boulders and concretions; clear wavy boundary.
C1	115 - 160	Pale red (2.5YR 6/2) sandy clay.
C2	160 - 200	Bedrock of weathering shale materials.

SOIL MAPPING UNIT NO. 10a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO.: CR 10a - 02
 LOCATION: 1C. Seminary, Mfamosing Calabar 37km
 GEOLOGY/PARENT MATERIAL Basement Complex
 TOPOGRAPHY/SLOPE Undulating., 3 - 5%
 VEGETATION/LAND USE Bush fallow
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: C. Equere
 DATE DESCRIBED: 12/8/81

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 4	Dark brown (7.5YR 3/2) sandy loam; weak fine crumb; friable, non-sticky, non-plastic; abundant fine roots; many fine pores; clear wavy boundary.
A	4 - 11	Brown (7.5YR 4/4) sandy loam; moderate medium crumb; friable, sticky, non-plastic; abundant fine and coarse roots; common fine pores; clear irregular boundary.
AB	11 - 17	Brown (7.5YR 4/4) loamy sandy; strong medium angular blocky; slightly firm, slightly sticky; many fine and coarse roots; common fine pores; clear irregular boundary.
Bt ₁	17 - 62	Reddish brown (5YR 5/4) sandy loam to loam; strong coarse angular blocky; firm, sticky, plastic; few fine roots; many fine pores; clear irregular boundary.
Bt ₂	62 - 87	Reddish brown (5YR 5/4) gravelly loam; strong coarse angular blocky; firm, sticky, plastic; few

		fine roots; common coarse pores; gradual wavy boundary.
Bt ₃	87 - 112	Yellowish red (5YR 5/6) gravelly clay loam; few distinct, medium dark reddish brown (2.5YR 3/4) mottles; moderate medium angular blocky; slightly firm, very sticky, plastic; few fine roots; few coarse pores; diffuse wavy boundary.
BC	112 - 180	Yellowish red (5YR 3/6) gravelly clay loam; common distinct coarse dark reddish brown (2.5YR 3/4) mottles; moderate medium angular blocky; slightly firm, very-sticky, plastic; few fine roots; common medium pores.

SOIL MAPPING UNIT NO. 10a
 SOIL CLASSIFICATION: Typic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO.: CR 10 - 03
 LOCATION: Ayip Eku Oil Palm Project Calabar 87km
 GEOLOGY/PARENT MATERIAL Basement Complex
 TOPOGRAPHY/SLOPE Undulating; 6%
 VEGETATION/LAND USE Oil Palm Estate
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: C. Equere
 DATE DESCRIBED: 17/7/81

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 19	Dark brown (10YR 4/3) gravelly sandy clay; weak medium to coarse subangular blocky; slightly sticky, slightly plastic; many fine roots; many fine pores; abundant coarse rounded quartz gravels; clear wavy boundary.
AB	19 - 47	Yellowish brown (10YR 5/6) gravelly sandy clay; weak coarse angular blocky; slightly firm, slightly sticky, slightly plastic; few fine roots; few medium pores; abundant coarse rounded quartz gravels; clear wavy boundary.
BA	47 - 70	Yellowish brown (10YR 5/8) gravelly sandy clay; few medium faint red (2.5YR 4/6) mottles; moderate fine angular blocky; firm, sticky, plastic; few fine roots; common medium pores; abundant coarse rounded quartz gravels.
B	70 - 120	Strong brown (7.5YR 5/6) sandy clay loam; many coarse prominent reddish brown (2.5YR 4/4)

mottles; moderate fine angular blocky; firm, sticky, plastic; few roots; many coarse pores; gradual wavy boundary.

BC 120 +

Strong brown (7.5YR 5/6) sandy clay loam; many coarse prominent red (2.5YR 7/6) mottles; strong coarse angular blocky; firm, sticky, plastic; very few roots; few medium pores.

SOIL MAPPING UNIT No.: 10a
 SOIL CLASSIFICATION: Typic Hapludult (USDA)
 Ferric Acrisol (FAO)
 SOIL PROFILE PIT NO.: CR 10a - 05
 LOCATION: Community Mixed Farm Ekong, Calabar 55km
 GEOLOGY/PARENT MATERIAL: Basement Complex
 TOPOGRAPHY/SLOPE; Undulating; 6%
 VEGETATION/LAND USE: Oil Palm Plantation
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below Profile Depth
 DATE DESCRIBED: 6/8/81
 DESCRIBED BY: C. Equere

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 3	Very dark greyish brown (10YR 3/2) sandy loam; weak medium crumb; friable; non-sticky, non-plastic; common medium roots; many very fine pores; clear wavy boundary.
AB	3 - 10	Yellowish brown (10YR 5/4) sandy loam; weak medium angular blocky; friable; non-sticky, many medium roots; common fine pores; clear wavy boundary.
Bt ₁	10 - 21	Yellowish brown (10YR 5/6) gravely sandy clay loam; few faint medium dusty red (10YR 3/4) mottles; weak fine angular blocky; slightly sticky, slightly plastic; many coarse roots; few fine pores; gradual irregular boundary.
Bt ₂	21 - 58	Yellowish brown (10YR 5/8) sandy clay; few medium red (10YR 3/4) mottles; weak fine angular blocky; slightly firm, sticky, plastic; gradual irregular boundary.

Bt ₃	58 - 108	Reddish yellow (7.5YR 6/6) clay loam; many distinct medium dusty red (10YR 3/4) mottles; weak fine angular blocky; slightly firm, sticky, plastic; few fine roots; common fine pores; diffuse irregular boundary.
Bt ₄	108 - 147	Reddish yellow (7.5YR 6/6) gravelly sandy clay; many distinct medium dusty red (10YR 3/4) mottles, weak fine subangular blocky; slightly firm, sticky, plastic; very few fine roots; common coarse pores; diffuse irregular boundary.
BC	147 - 170	Strong brown (7.5YR 5/6) sandy clay; common distinct (10YR 3/4) mottles; strong fine subangular blocky; fine roots; few coarse pores.

SOIL MAPPING UNIT No.: 10a
 SOIL CLASSIFICATION: Typic Hapludult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO.: CR 10 - 06
 LOCATION: Ekang Police Station
 GEOLOGY/PARENT MATERIAL: Asu River Group
 TOPOGRAPHY/SLOPE: Undulating; 5%
 VEGETATION/LAND USE: Bush fallow
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below Profile Depth
 DATE DESCRIBED: 3/8/81
 DESCRIBED BY: C. Equere

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 15	Dark brown (10YR 4/3) sandy clay loam; weak medium, crumb; slightly firm, slightly sticky, slightly plastic; few medium roots, common medium pores; clear wavy boundary.
AB	15 - 38	Strong brown (7.5YR 5/6) sandy clay; moderate fine angular blocky; slightly firm, sticky, plastic; few fine roots; common medium pores; gradual wavy boundary.
Bt ₁	38 - 73	Strong brown (7.5YR 7/8) gravely clay; few fine faint red (2.5YR 5/8) and very pale brown (10YR 8/4) mottles; moderate fine angular blocky; firm, sticky, plastic; few fine roots; common medium pores, diffuse irregular boundary.
Bt ₂	73 - 140	Reddish yellow (7.5YR 6/6) sandy clay; many coarse prominent red (2.5YR 5/8) and very pale brown (10YR 8/4) mottles; strong medium angular blocky; firm, sticky, plastic; few fine roots; common coarse pores; diffuse irregular boundary.
Bt ₃	140 - 160	Reddish yellow (7.5YR 6/6) sandy clay; very many coarse prominent red (2.5YR 5/8) and very pale brown (10YR 8/4) mottles; strong medium angular blocky; firm, sticky plastic; common coarse pores.

SOIL MAPPING UNIT No.: 10a
 SOIL CLASSIFICATION: Typic Tropudult (USDA)
 Ferric Acrisol (FAO)
 SOIL PROFILE PIT NO.: CR 10a - 08
 LOCATION: Mbeban (about 11km to Ekang, 115km from Calabar)
 GEOLOGY/PARENT MATERIAL: Basement Complex
 TOPOGRAPHY/SLOPE: Moderately steep to undulating terrain 4 - 6%
 VEGETATION/LAND USE: Bush fallow
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below Profile Depth
 DATE DESCRIBED: 19/9/81
 DESCRIBED BY: C. Equere

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 8	Very dark greyish brown (10YR 3/2) gravelly clay; weak medium to coarse crumb; slightly firm, slightly sticky, slightly plastic; abundant medium roots; many medium pores; abrupt wavy boundary.
AB	8 - 14	Brown (7.5YR 4/4) gravelly clay loam, few faint medium dark red (10YR 3/6) mottles; weak fine angular blocky; slightly firm; sticky, plastic; abundant coarse roots; many medium pores; clear wavy boundary.
Bt ₁	14 - 44	Strong brown (7.5YR 4/6) gravelly clay loam; few distinct medium dark red (10YR 3/6) mottles; moderate medium angular blocky; firm, sticky, plastic; many medium roots; many medium pores; gradual wavy boundary.

Bt ₂	44 - 71	Brown (7.5YR 4/4) gravelly clay; few faint medium dark red (10YR 3/6) mottles; strong medium angular blocky; firm, very sticky, plastic; few medium roots; gradual wavy boundary.
Bt ₃	71 - 107	Strong brown (7.5YR 4/6) gravelly clay; common distinct coarse dark red (10YR 3/6) and brownish yellow (10YR 6/8) mottles; moderate medium angular blocky; firm, very sticky, plastic; diffuse irregular boundary.
Bt ₄	107 - 170	Strong brown (7.5YR 4/6) gravelly clay; many prominent coarse dark red (10YR 3/6) and brownish yellow (10YR 6/8) mottles; moderate medium angular blocky; slightly firm, very sticky, plastic; very few fine roots; few fine pores.

SOIL MAPPING UNIT No.: 10a
 SOIL CLASSIFICATION: Typic Tropudult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO.: CR 10a - 09
 LOCATION: Awi
 GEOLOGY/PARENT MATERIAL: Gravelly colluvium over quartz schist
 TOPOGRAPHY/SLOPE: Undulating; 6%
 VEGETATION/LAND USE: Fallow dominated by Eupatorium
 Odoratum, Urena Lobata, Oil Palm and Cassava
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below Profile Depth
 DATE DESCRIBED: 19/10/82
 DESCRIBED BY: C. Equere

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 7	Very dark greyish brown (10YR 4/2) gravelly loam; weak medium granular; friable; slightly sticky, non-plastic; many fine and medium roots, many fine and medium irregular pores; clear wavy boundary.
Bt ₁	7 - 29	Strong brown (7.5YR 5/6) gravelly clay loam; moderate medium to coarse sub-angular blocky; firm, sticky, slightly plastic; many fine and medium roots; many fine and medium irregular pores; gradual wavy boundary.
Bt ₂	29 - 83	Strong brown (7.5YR 5/6) gravelly clay loam; moderate medium to coarse sub-angular blocky; firm, sticky, plastic; common fine roots; many fine and medium roots; many fine and medium irregular pores; gradual wavy boundary.

Bt ₃	83 - 140	Strong brown (7.5YR 5/8) gravelly clay loam; moderate medium to coarse sub-angular blocky; firm, sticky, plastic; few fine and medium irregular pores; few thin clay films on ped surfaces; many fine and medium irregular ferruginous concretions; clear smooth boundary.
Bt ₄	140- 175	Strong brown (7.5YR 5/8) gravelly clay loam; moderate coarse sub-angular blocky; firm, sticky, plastic; few fine roots; many fine irregular pores; common distinct clay films on ped surfaces, many fine and medium irregular ferruginous concretions.

SOIL MAPPING UNIT NO. 10b
 SOIL CLASSIFICATION: Typic Dystropepts (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO.: CR 10b - 01
 LOCATION: Oban Oil Palm Estate Calabar 64km
 GEOLOGY PARENT MATERIAL Basement Complex
 TOPOGRAPHY/SLOPE Gently undulating; 3%
 VEGETATION/LAND USE Oil Palm Estate
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 16/7/81

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 19	Dark grey (5YR 4/1) sandy clay loam; weak medium crumb; slightly firm; non-sticky, non-plastic; many very fine roots; common medium pores; clear irregular boundary.
AB	19 - 35	Yellowish red (5YR 4/6) sandy clay loam; weak fine angular blocky; slightly firm, non-sticky, non-plastic; few medium roots; many medium pores; clear irregular boundary.
B	35 - 118	Reddish brown (2.5YR 4/4) sandy clay loam; moderate medium subangular blocky; slightly plastic; few coarse roots; many medium pores; very few small rounded weathered granitic stones; gradual irregular boundary.
BC	118 +	Red (2.5YR 4/6) sandy clay loam; moderate fine subangular blocky; firm; slightly sticky, slightly plastic; few fine roots; many medium pores; few angular weathered large granitic stones.

SOIL MAPPING UNIT No.: 12a
 SOIL CLASSIFICATION: Typic Tropudult (USDA)
 Dystric Acrisol (FAO)
 SOIL PROFILE PIT NO.: CR 12a - 01
 LOCATION: 7.5km from Okonokpan Ekang - Ikang Road
 GEOLOGY/PARENT MATERIAL: Coastal plain sands
 TOPOGRAPHY/SLOPE: Undulating, 6%
 VEGETATION/LAND USE: Tropical rain forest
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below Profile Depth
 DATE DESCRIBED: 16/9/81
 DESCRIBED BY: C. Equere

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
A	0 - 7	Very dark grey (10YR 3/1) sandy clay loam; moderate medium angular blocky, slightly firm, slightly plastic; many medium roots; many medium pores; clear wavy boundary.
AB	7 - 21	Dark yellowish brown (10YR 4/6) sandy clay loam, strong medium angular blocky; firm, slightly sticky, plastic; many coarse roots; many medium pores; clear wavy boundary.
Bt ₁	21 - 38	Yellowish brown (10YR 5/6) sandy clay; strong coarse angular blocky; firm, sticky plastic; many coarse roots; many medium pores; gradual wavy boundary.
Bt ₂	38 - 73	Strong brown (7.5YR 5/6) sandy clay; strong coarse angular blocky; firm, sticky, plastic; few medium roots; common few pores; gradual wavy boundary.

Bt ₃	73 - 105	Strong brown (7.5YR 4/6) clay; strong coarse angular blocky; firm, sticky, plastic; very few medium roots; common few pores; gradual wavy boundary.
Bt ₄	105 +	Strong brown (7.5YR 4/6) clay; strong coarse angular blocky; firm, very sticky, very plastic; very few fine roots; few fine pores.

SOIL MAPPING UNIT No.: 12a
 SOIL CLASSIFICATION: Typic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO.: CR 12a - 03
 LOCATION: 3.7km from Okonokpan Ekang - Ikang Road
 GEOLOGY/PARENT MATERIAL: Shale (Asu River Group)
 TOPOGRAPHY/SLOPE: Steep Undulating terrain, 12%
 VEGETATION/LAND USE: Tropical rain forest
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below Profile Depth
 DATE DESCRIBED: 16/9/81
 DESCRIBED BY: C. Equere

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 5	Very dark brown (10YR 2/2) gravelly sandy loam; moderate coarse crumb; slightly sticky, slightly plastic; many fine roots; common medium pores; abrupt wavy boundary.
AB	5 - 15	Strong brown (7.5YR 4/6) clay loam; few distinct coarse dark red (2.5YR 3/6) mottles; strong coarse angular blocky; sticky, plastic; many fine roots; common fine pores; clear irregular boundary.
BA	15 - 32	Strong brown (7.5YR 4/6) clay; common distinct coarse dark red (2.5YR 3/6) and brownish yellow (10YR 6/8) mottles; strong coarse angular blocky; very sticky, very plastic; few fine roots; few fine pores; clear wavy boundary.
B	32 - 68	Strong brown (7.5YR 4/6) clay; many prominent coarse dark red (2.5YR 3/6) and brownish yellow (10YR 6/8) mottles; strong coarse angular blocky;

very sticky, very plastic; few fine roots; few fine pores; clear wavy boundary.

BC 68 - 105 Strong brown (7.5YR 4/6) clay; many prominent coarse dark red (2.5YR 3/6) and brownish yellow (10YR 6/8) mottles; strong coarse angular blocky; very sticky, plastic; very few fine roots; few fine pores; clear wavy boundary.

C 105 - 180 Strong brown 7.5YR 4/6) clay; many prominent coarse dark red (2.5 YR 3/6) and brownish yellow (10YR 6/8) mottles; strong very coarse angular blocky; very sticky, plastic; very few fine roots; few fine pores

SOIL MAPPING UNIT No.: 12a
 SOIL CLASSIFICATION: Aeric Tropaquept (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO.: CR 12a - 04
 LOCATION: 30km North of Calabar Road
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Undulating, 6%
 VEGETATION/LAND USE: Tropical rain forest
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below Profile Depth
 DATE DESCRIBED: 11/8/81
 DESCRIBED BY: C. Equere

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 4	Very dark greyish brown (10YR 3/2) sandy clay loam; weak coarse crumb; friable, slightly sticky slightly plastic; many medium roots; many medium pores; clear wavy boundary.
A	4 - 10	Brown (10YR 5/3) sandy clay loam; moderate coarse angular blocky; slightly firm, sticky, plastic few fine roots; few medium pores; clear irregular boundary.
AB	10 - 38	Yellowish brown (10YR 5/4) gravelly clay; strong medium angular blocky; firm, very sticky, plastic many fine roots; many medium pores; few angular weathered large stones; diffuse irregular boundary
BA	38 - 73	Brownish yellow (10YR 6/6) silty clay; common faint medium reddish yellow (7.5YR 6/8) mottles strong medium angular blocky; very sticky, plastic few roots; few coarse pores; diffuse irregular boundary.

B	73 - 99	Pale yellow (2.5YR 7/4) silty clay; many prominent medium reddish yellow (7.5YR 6/8) mottles; strong medium angular blocky; very firm, very sticky, plastic; few medium roots; few coarse pores; diffuse smooth boundary.
BCg	99 - 131	Light grey (2.5YR 7/2) clay; many prominent medium reddish yellow (7.5YR 6/8) mottles; strong coarse angular blocky; very firm, very sticky, plastic; few coarse pores; few fine roots; clear irregular boundary.
Cg	131 - 155	White (2.5YR 6/0) clay; many prominent medium reddish yellow (7.5YR 6/8) mottles; strong medium angular blocky; very firm, very sticky, plastic; few medium pores.

SOIL MAPPING NO. 12a
 SOIL CLASSIFICATION: Rhodic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO: IM 12a - 01
 LOCATION; Ozu Abam; between the Igwu bridge and the
 town.
 GEOLOGY/PARENT MATERIAL: Sands and sandstones.
 TOPOGRAPHY/SLOPE: Undulating highly dissected plain, 4 - 6%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained.
 DEPTH TO WATER TABLE: Below profile depth.
 DATE DESCRIBED: 17/06/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0 - 13	Dark brown (10YR 3/3) loamy sand, weak fine granular to fine subangular blocky; friable; common fine and medium roots; many fine and medium pores; gradual smooth boundary.
BA	13 - 41	Yellowish red (5YR 4/6) loamy sand; weak fine subangular blocky; friable; common fine and medium roots; common fine and medium pores; clear smooth boundary.
AB	41 - 65	Yellowish red (5YR 4/6) sandy loam; weak fine subangular blocky; friable; common fine and medium roots; common fine and medium pores; clear smooth boundary.
Bt ₁	65 - 94	Dark red (2.5YR 3/6) sandy clay loam; moderate medium subangular blocky; friable; few fine roots; few fine pores; clay films; gradual smooth boundary.

Bt ₂	94 - 135	Red (2.5YR 4/6) sandy clay loam, moderate medium subangular to angular blocky; friable; few fine roots; few fine pores; clear smooth boundary.
BC	135 - 180	Red (2.5YR 4/8) sandy clay loam; moderate medium subangular to angular blocky; friable; few fine roots; few fine pores.

SOIL MAPPING UNIT NO. 12a
 SOIL CLASSIFICATION. Typic Tropaquept (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO. IM 12a - 01
 LOCATION: Isieke Ibeku
 GEOLOGY/PARENT MATERIAL: Shale and Sandstones
 TOPOGRAPHY/SLOPE: Undulating dissected plains, 4 - 6%
 VEGETATION/LAND USE: Cassava/maize farm
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 02/06/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0 - 13	Dark brown (7.5YR 3/2) gravelly clay; moderate medium angular blocky; friable; common fine roots; many fine and medium pores; clear smooth boundary.
AB	13 - 36	Very dark grey (5YR 3/1) gravelly clay; strong coarse angular blocky; firm; few fine roots; common fine and medium pores; clear smooth boundary.
BA	36 - 66	Dark reddish brown (5YR 3/3) very gravelly clay; strong coarse subangular blocky; firm; few roots; common medium pores; abrupt wavy boundary.
BG	66 - 103	Greyish brown (10YR 5/2) clay; strong coarse angular blocky; very firm; very few roots; few pores; clear smooth boundary.
BC	103 - 131	Light brownish grey (10YR 6/2) clay; strong coarse angular blocky; very firm; very few roots; few pores; clear smooth boundary.
C	131 - 180	Grey (10YR 6/1) clay; strong coarse angular blocky; very firm; few roots; few pores.

SOIL MAPPING UNIT NO. 12a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO: IM 12 a - 02
 LOCATION: Udara Abuo, about 1Km off the General
 Hospital along Amaekpu - Okigwe Road
 GEOLOGY/PARENT MATERIAL: Sands and sandstones
 TOPOGRAPHY/SLOPE Nearly level to undulating terrain , 0-2%.
 VEGETATION/LAND USE Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/06/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0 - 14	Very dark greyish brown (10YR 3/2) sand; weak fine single grained to granular; very friable; common fine and medium roots; many fine and medium pores; gradual smooth boundary.
AB	14 - 31	Dark brown (10YR 3/3) loamy sand; weak fine single grained to granular; very friable; common fine and medium roots; many fine and medium pores; gradual smooth boundary.
Bt ₁	31 - 73	Dark brown (2.5YR 4/6) sandy loam; weak fine subangular blocky; friable; few medium roots; common fine and medium pores; clear smooth boundary.
Bt ₂	73 - 120	Yellowish red (5YR 4/8) sandy clay loam; moderate fine subangular blocky; friable; few medium roots; common fine and medium pores; clear smooth boundary.
Bt ₃	120 - 180	Yellowish red (5YR 4/8) sandy clay loam to sandy clay; moderate medium subangular blocky; friable; few roots; few medium pores.

SOIL MAPPING UNIT NO. 12a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO: IM 12a - 03
 LOCATION: Akanu Ohafia, off Akanu-Arochukwu Road.
 GEOLOGY/PARENT MATERIAL: Sands and sandstones
 TOPOGRAPHY/SLOPE: Undulating and highly dissected plains, 4 - 6%
 VEGETATION/LAND USE: Secondary bush.
 DRAINAGE: Well drained.
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/06/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 16	Very dark greyish brown (10YR 3/4) loamy sand; weak fine granular; friable; common fine to medium roots; common fine and medium pores; clear smooth boundary.
Bt ₁	16 - 57	Dark red (7.5YR 4/4) sandy loam to sandy clay loam; weak fine subangular blocky; friable; common fine and medium roots; common medium pores; clear smooth boundary.
Bt ₂	57 - 116	Strong brown (7.5YR 5/6) sandy clay loam; moderate fine subangular blocky; friable; common medium roots; common medium pores; gradual smooth boundary.
Bt ₃	116 - 167	Yellowish red (5YR 4/6) sandy clay loam to sandy clay; moderate medium subangular blocky; friable; common medium roots; common fine and medium pores; gradual smooth boundary.
BC	167 - 180	Yellowish red (5YR 4/8) sandy clay loam; moderate medium subangular blocky; friable; few medium roots; common pores.

SOIL MAPPING UNIT NO. 12a
 SOIL CLASSIFICATION: Typic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO. IM 12a - 04
 LOCATION: Ihechiowa; 1Km off Ohafia-Arochukwu
 Road along Ikot-Okpora Road.
 GEOLOGY/PARENT MATERIAL: Sands and sandstone.
 TOPOGRAPHY/SLOPE: Undulating/highly dissected plains, 10-13%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained.
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/06/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0 - 17	Dark yellowish brown (10YR 3/4) sandy loam; moderate fine and medium granular; friable; common medium roots; common fine and medium pores; gradual smooth boundary.
AB	17 - 37	Dark brown (7.5YR 4/4) sandy loam; moderate fine and medium roots; common subangular blocky; firm; few roots; common fine and medium pores; gradual smooth boundary.
Bt ₁	37 - 79	Strong brown (7.5YR 5/6)s andy clay; moderate medium subangular blocky; firm; few medium roots; few pores; gradual smooth boundary.
Bt ₂	79 - 111	Yellowish red (5YR 5/6) sandy clay to clay; strong medium angular blocky; firm; few roots; few pores; gradual smooth boundary.
BC	111 - 171	Yellowish red (5YR 5/6) sandy clay to clay; strong medium angular blocky; very firm; few medium roots; few pores; abrupt wavy boundary.
C	171	Impenetrable layer of iron stones.

SOIL MAPPING UNIT NO. 12a
 SOIL CLASSIFICATION: Dystropeptic Tropudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO: IM 12a - 05
 LOCATION: Okon Ohafia, along Okon Erei Road
 GEOLOGY/PARENT MATERIAL: Sands and sandstones
 TOPOGRAPHY/SLOPE: Undulating plains, 4 - 6%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained.
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/06/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0 - 10	Dark greyish brown (10YR 4/2) sandy clay loam; moderate medium subangular blocky; friable; common fine roots; many fine and medium pores; gradual smooth boundary.
Bt ₁	10 - 50	Dark yellowish brown (10YR 4/4) sandy clay; moderate medium subangular blocky; friable; few medium roots; common fine and medium pores; diffuse wavy boundary.
Bt ₂	50 - 80	Strong brown (7.5YR 5/6) gravelly sandy clay; moderate coarse subangular to angular blocky; firm; few roots; common fine and medium pores; diffuse wavy boundary.
Bt ₃	80 - 135	Strong brown (7.5YR 5/8) gravelly sandy clay loam; moderate coarse subangular to angular blocky; firm; few fine roots; few fine and medium pores; diffuse wavy boundary.
BC	135 - 180	Weathering ferruginised sandstones and ironstones.

SOIL MAPPING UNIT NO. 12a
 SOIL CLASSIFICATION: Typic Dystropepts (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO. IM 12a - 06
 LOCATION: Igbere, about 100m from the Igbere junction on
 Umuahia - Abiriba Road.
 GEOLOGY/PARENT MATERIAL: Sandstone
 TOPOGRAPHY/SLOPE Undulating, highly dissected plains, 4-6%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 22/06/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
AP	0 - 13	Dark reddish brown (5YR 3/2) sand; moderate fine to medium granular; friable; many fine and medium roots; many fine and medium pores; clear smooth boundary.
AB	13 - 37	Reddish brown (5YR 4/3) loamy sand; weak fine and medium subangular blocky friable; many fine and medium roots; many pores; clear smooth boundary.
B ₃	7 - 70	Reddish brown (2.5YR 4/4) sandy loam; weak medium subangular blocky; friable; fine and medium roots; many pores; clear smooth boundary.
BC	70 - 123	Red (2.5YR 4/6) sandy loam; moderate medium to coarse subangular blocky; friable; common medium roots; few pores; gradual smooth boundary.
C	123 - 180	Red (2.5YR 4/6) sandy loam; moderate coarse angular blocky; friable; very few medium roots; few pores.

SOIL MAPPING UNIT NO:

12a

SOIL CLASSIFICATION:

Typic Paleudult (U.S.D.A.)

Dystric Nitosol (F.A.O.)

SOIL PROFILE PIT NO:

IM 12a - 08

LOCATION:

Nguzu Edda; behind the community

Secondary School farm

GEOLOGY/PARENT MATERIAL:

Sands and sandstones

TOPOGRAPHY/SLOPE:

Undulating and highly dissected plain, 10 -13%

VEGETATION/LAND USE

Cassava and Yam farm

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIPTION:

29/06/83

DESCRIBED BY:

F.D.A.L.R.

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 16	Dark brown (7.5YR 4/2) sandy loam; weak fine to medium granular; friable; many fine and medium roots; fine and medium pores; gradual clear boundary.
BA	16 - 44	Dark brown (7.5YR 4/4) loamy sand; moderate fine to medium subangular blocky; slightly firm; common fine and medium roots; many fine many medium pores; clear smooth boundary.
2Bt ₁	44 - 79	Strong brown (7.5YR 5/6) sandy clay loam; moderate coarse subangular blocky; firm; few medium roots; common fine and medium pores; gradual smooth boundary.
2Bt ₂	79 - 135	Yellowish red (5YR 5/8) sandy loam; moderate coarse subangular blocky; firm; few roots; common medium pores; gradual clear boundary.

SOIL MAPPING UNIT NO: 12a
 SOIL CLASSIFICATION: Typic Tropaquept (U.S.D.A.)
 Dystric Gleysols (F.A.O.)
 SOIL PROFILE PIT NO: IM 12a - 11
 LOCATION: Atani Village, Arochukwu
 GEOLOGY/PARENT MATERIAL: Shales and sandstones
 TOPOGRAPHY/SLOPE: Undulating highly dissected
 plains, 4 - 6%
 VEGETATION/LAND USE: Oil palm bush/Rice paddy
 DRAINAGE: Imperfectly to poorly drained
 DEPTH TO WATER TABLE: 102cm
 DATE DESCRIBED: 08/07/83
 DESCRIBED BY: F.D.A.L.R. Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 11	Reddish brown (5YR 4/4) clay loam, moderate medium to coarse subangular blocky; firm; many fine and medium roots; many fine and medium pores; few fine iron concretions; clear smooth boundary.
AB	11 - 35	Yellowish red (5YR 5/6) sandy clay; few faint pale brown (10YR 5/2) mottles strong coarse subangular blocky; very firm; common roots; common fine and few medium pores; few fine iron concretions; clear smooth boundary.
BA	35 - 70	Light brownish grey (2.5YR 6/2) sandy clay; many distinct fine and medium yellow (10YR 6/6) and red (2.5YR 5/6) mottles; strong coarse subangular blocky; firm; common pores; common small pieces of shale materials; gradual smooth boundary.

- B** 70 - 100 Grey (10YR 6/1) sandy clay loam; brown (10YR 5/6) and red (2.5YR 5/6) mottles; moderate medium and angular blocky; firm; few roots; few fine and medium pores; many small pieces of shale materials; gradual smooth boundary.
- C** 100 - 180 Grey (10YR 6/1) loam; many distinct yellowish brown (10YR 5/4) and yellowish red 5YR 5/6) mottles; moderate fine and medium platty; firm; few roots; few pores; many pieces of shale materials.

SOIL MAPPING UNIT NO. 15d
 SOIL CLASSIFICATION: Oxic Haplustalf (U.S.D.A.)
 Orthic Luvisol (F.A.O.)
 SOIL PROFILE PIT NO. AN 15d - 01
 LOCATION: Ezamuhali near Nkalagu cement Factory
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Nearly flat, 0 - 2%
 VEGETATION/LAND USE: Secondary bush (Eupatorium spp.)
 Drainage: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/11/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 14	Brown (10YR 5/3) clay loam; strong medium subangular blocky; firm; many medium and fine roots; moderate few to many irregular and tubular pores; diffuse wavy boundary.
Bt1	14 - 40	Yellowish brown (10YR 5/4) clay; weak medium subangular blocky; firm; many medium and many fine to medium irregular and tubular pores; clear smooth boundary.
Bt2	40 - 70	Yellowish brown (10YR 5/4) clay; weak medium subangular blocky; slightly firm; many fine roots; many fine to medium irregular and tubular pores; clear smooth boundary.
Bt3	70 - 105	Yellowish brown (10YR 5/6) clay; weak medium subangular blocky; slightly firm; few fine roots; many fine to moderate irregular and tubular pores; gradual smooth boundary.
BC	105 - 137	Yellowish brown (10YR 5/6) clay; weak medium subangular blocky; slightly firm; few fine roots; many fine to medium irregular and tubular pores; clear smooth boundary.
C	137 - 182	Grey (5Y 6/1) clay; weak medium subangular blocky; firm; few roots; few irregular fine pores.

SOIL MAPPING UNIT NO.
SOIL CLASSIFICATION:

15d
Oxic Ustropept (USDA)
Eutric Cambisol (FAO)

SOIL PROFILE PIT NO.
LOCATION:

BN 15d - 01
Oturkpo; 153km to Makurdi on Ugbokolo -
Makurdi road

GEOLOGY/PARENT MATERIAL:

Sandstone and shale

TOPOGRAPHY/SLOPE:

Undulating plains, 6%

VEGETATION/LAND USE:

Secondary bush

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIBED:

12/10/83

DESCRIBED BY:

FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 21	Dark brown (7.5YR 3/2) sandy clay loam; moderate fine to medium blocky; many fine and medium roots; many fine pores; clear smooth boundary.
AB	21 - 55	Yellowish red (5YR 4/6) gravelly sandy clay; moderate fine to medium subangular blocky; slightly firm; many fine roots; many fine and medium pores; clear wavy boundary.
B	55 - 79	Strong brown (7.5YR 4/6) gravelly sandy clay; weak fine to medium subangular blocky; firm; many fine roots; many fine pores; clear wavy boundary.
R	79 - 130	Strong cemented layer of ferruginised concretions and few fine and medium quartz gravels.

SOIL MAPPING UNIT NO. 15d
 SOIL CLASSIFICATION: Oxic Ustropept (USDA)
 Eutric Cambisol (FAO)
 SOIL PROFILE PIT NO. BN 15d - 02
 LOCATION: 17 km North of Taranaki
 GEOLOGY/PARENT MATERIAL: Shale/Sandstone
 TOPOGRAPHY/SLOPE: Undulating plains, 2 - 6%
 VEGETATION/LAND USE: Scrub woodland
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 9/5/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 10	Dark reddish brown (5YR 5/2) sandy clay loam; moderate fine subangular blocky; many pores; clear smooth boundary.
AB	10 - 30	Reddish brown (2.5YR 4/4) clay; moderate medium subangular blocky; firm; many roots; many pores; clear smooth boundary.
B	30 - 65	Red (2.5YR 4/8) clay; strong coarse subangular blocky; very firm; common roots; few pores; clear smooth boundary.
BC	65 - 120	Red (2.5YR 5/8) sandy clay loam; strong coarse subangular blocky; very firm; very few roots; few pores; clear smooth boundary.
C	120 - 180	Yellowish red (5YR 5/8) sandy loam; strong coarse subangular blocky; very firm; few pores.

SOIL MAPPING UNIT NO. 15d
 SOIL CLASSIFICATION: Typic Ustropept (USDA)
 Eutric Cambisol (FAO)
 SOIL PROFILE PIT NO. BN 15d - 03
 LOCATION: Egga, 20 km from Egga on Egga - Oturkpo road
 GEOLOGY/PARENT MATERIAL: Shale/Sandstone
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 13/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 13	Dark brown (7.5YR 3/3) fine sandy loam; moderate firm crumb; friable; many fine and medium roots; many fine and medium pores; clear smooth boundary.
AB	13 - 25	Dark yellowish brown (10YR 4/6) fine sandy loam; moderate medium crumb; friable; many medium roots; many fine pores; clear smooth boundary.
BA	25 - 43	Yellowish brown (10YR 5/6) sandy loam; moderate medium to coarse subangular blocky; slightly firm; many medium roots; many medium and large pores; abrupt wavy boundary.
2B	43 - 65	Yellowish brown (10YR 5/8) sandy clay; moderate medium to coarse subangular blocky; slightly firm; common medium and large roots; common medium pores; diffuse wavy boundary.

2BC	65 - 115	Light yellowish brown (10YR 6/4) sandy clay; moderate fine to medium subangular blocky; firm; many fine roots; common fine and medium pores; diffuse wavy boundary.
2BC	115 - 160	Light yellowish brown (10YR 6/4) sandy clay; moderate fine to medium subangular blocky; firm; many fine roots; common fine and medium pores; diffuse wavy boundary.
2C	160 - 180	Light grey (10YR 7/1) clay; moderate medium to coarse subangular blocky; firm; few roots; few fine and medium pores.

SOIL MAPPING UNIT NO.

15d

SOIL CLASSIFICATION;

Oxic Ustropept (USDA)

Eutric Cambisol (FAO)

SOIL PROFILE PIT NO.

BN 15d - 04

LOCATION:

Otobi, 13 km to Oturkpo from
along Utokon - Oturkpo road

GEOLOGY/PARENT MATERIAL:

Shale / Sandstone

VEGETATION/LAND USE:

Scrub land with Pennisetum

TOPOGRAPHY/SLOPE:

Undulating Plains, 2 - 6%

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIBED:

11/5/83

DESCRIBED BY:

FDALR staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 16	Dark red (2.5YR 3/6) sandy clay loam; moderate fine to medium subangular blocky; friable; many fine to medium roots; many fine pores; clear smooth boundary.
AB	16 - 55	Dark red (2.5YR 3/6) sandy clay loam; moderate medium to coarse subangular blocky; slightly firm; many fine and common medium roots; many pores; clear smooth boundary.
B	55 - 82	Red (10YR 3/6) sand clay; weak coarse subangular blocky; firm; common roots; common pores; diffuse wavy boundary.
BC	82 - 106	Red (10YR 4/6) fine sandy clay; weak coarse subangular blocky; firm; few roots; common pores.

SOIL MAPPING UNIT NO. 15d
 SOIL CLASSIFICATION: Oxic Haplustalf (USDA)
 Orthic Luvisol (FAO)
 SOIL PROFILE PIT NO. BN 15d - 05
 LOCATION. Oturkpo, 96km along Oturkpo -
 Makurdi road
 GEOLOGY/PARENT MATERIAL: Shale/sandstone
 TOPOGRAPHY/SLOPE: Gently undulating plains, 0 -2%
 VEGETATION/LAND USE: Secondary Savanna bush
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 21/ 6 /83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>depth(cm)</u>	<u>Description</u>
Ap	0 - 33	Dark brown (7.5YR 3/4) fine sandy loam; moderate to fine medium crumb; friable; many medium and coarse roots; many fine pores; clear smooth boundary.
Bt ₁	33 - 50	Dark brown (10YR 3/3) sandy loam; moderate fine to medium subangular blocky; firm; many medium and fine roots; many pores; gradual smooth boundary.
Bt ₂	50 - 120	Yellowish brown (10YR 5/6) clay; moderate medium subangular blocky; firm; many fine roots; many pores; clear smooth boundary.
Bt ₃	120 - 180	Light yellowish brown (10YR 6/4) sandy clay loam; moderate medium subangular blocky; few fine roots; few pores.

SOIL MAPPING UNIT NO. 15d
 SOIL CLASSIFICATION: Ustoxic Dystropept (USDA)
 Eutric Regosol (FAO)
 SOIL PROFILE PIT NO. BN 15d - 06
 LOCATION: Oturkpo, 115km from Enugu
 on Enugu - Oturkpo road
 GEOLOGY/PARENT MATERIAL: Weakly consolidated sand
 TOPOGRAPHY/SLOPE: Undulating plains, 6%
 VEGETATION/LAND USE: Derived Savanna bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 18/5/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
A	0 - 20	Reddish brown (2.5YR 4/4) sand; single grained; very friable; many fine roots; many pores; clear wavy boundary.
AB	20 - 58	Dark red (2.5YR 3/5) sand; single grained; very loose; many fine roots many pores; diffuse wavy boundary.
BA	58 - 120	Red (10YR 4/6) sand; single grained; very friable; common roots; common pores; diffuse wavy boundary.
B	120 - 140	Red (10YR 4/8) coarse sandy loam; weak fine to medium subangular blocky; friable; very few roots; common pores; diffuse wavy boundary.
BC	140 - 180	Red(10YR 4/8) coarse sandy loam; weak fine to medium subangular blocky; friable; very few roots; common pores.

SOIL MAPPING UNIT NO. 15d
 SOIL CLASSIFICATION: Oxic Haplustult (USDA)
 Orthic Acrisol(FAO)
 SOIL PROFILE PIT NO. BN 15d - 08
 LOCATION: Ojoma, 27km along Oturkpo - Utonkon road
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Scrubland within Penisetum
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 6/5/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 10	Dark grayish brown (10YR 3/2) loam; weak fine subangular blocky; loose; many fine and medium roots; many fine to medium pores; clear wavy boundary.
AB	10 - 29	Dark brown(10YR 4/3) slit loam; moderate fine subangular blocky; friable; many fine and medium roots; many fine pores; clear smooth boundary.
Bt ₁	29 - 50	Dark brown (7.5YR 4/4) fine sandy loam; strong fine subangular blocky; firm; many roots; many pores; diffuse wavy boundary.
Bt ₂	50 - 121	Strong brown(7.5YR 5/6) sandy clay; strong fine to medium subangular blocky; very firm; few roots; few pores; abrupt boundary.
Bt ₃	121 - 180	Reddish yellow (7.5YR 6/6) sandy clay loam; strong fine subangular blocky; very firm; few roots; few pores.

SOIL MAPPING UNIT NO.

SOIL CLASSIFICATION:

SOIL PROFILE PIT NO.

LOCATION:

GEOLOGY/PARENT MATERIAL:

TOPOGRAPHY/SLOPE

VEGETATION/LAND USE:

DRAINAGE:

DEPTH TO WATER TABLE:

DATE DESCRIBED:

DESCRIBED BY:

(All colours are for moist soils unless otherwise stated)

Horizon Depth(cm)

A

0 - 15

BA

15 - 35

B

35 - 54

2BC₁

54 - 107

2C₂ 107 - 138

15d

Ustoxic Dystropept (USDA)

Dystric Cambisol (FAO)

BN 15d - 09

Oturkpo

Sandstones

Undulating plains, 0 - 6%

Guinea savanna

Well drained

Below profile depth

19/10/83

FDALR Staff

Description

Dark grayish brown(10YR 4/2)loamy sand to sandy loam; moderate fine to medium to crumb; friable; common fine and medium roots; many fine and medium pores; clear smooth boundary.

Yellowish red (5YR 5/6) clay; moderate fine to medium subangular blocky; very firm; common fine, medium and large roots; common fine, medium and large pores; clear smooth boundary.

Red (2.5YR 5/8) clay; moderate medium to coarse subangular blocky; firm; many medium, few and large roots; many medium pores; abrupt wavy boundary.

Red (2.5YR 4/8) gravelly clay; moderate medium to coarse subangular blocky; firm; many fine and medium roots; common fine, medium and large pores; clear wavy boundary;

Reddish yellow (7.5YR 7/8) gravelly clay; moderate fine to medium angular blocky; firm; many fine roots; common fine and medium pores.

SOIL MAPPING UNIT NO. 15d
 SOIL CLASSIFICATION: Typic Dystropept(USDA)
 Eutric Cambisol(FAO)
 SOIL PROFILE PIT NO. BN 15d - 11
 LOCATION: 33Km from Taraku - Naka road
 GEOLOGY/PARENT MATERIAL Shale
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Fallow grassland
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 21/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
A	0 - 15	Very dark brown (10YR 2/2) loam; moderate medium crumb; firm; many fine roots; many fine and medium pores; clear smooth boundary.
AB	15 - 30	Dark reddish brown (5YR 3/4) clay loam; moderate medium to coarse subangular blocky; firm; many roots; common pores; diffuse wavy boundary.
2B	30 - 55	Dark brown (7.5YR 4/4) gravelly sandy loam; moderate fine to medium subangular blocky; firm; many pores; common fine roots; clear smooth boundary.
2BC	55 - 102	Dark yellowish brown (10YR 4/4) gravelly sandy clay loam; moderate fine to medium subangular blocky; firm; common roots; common pores; diffuse smooth boundary.
2C	102 - 180	Yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky; very firm; few fine roots; common pores.

SOIL MAPPING UNIT NO. 15d
 SOIL CLASSIFICATION: Oxic Ustropept (U.S.D.A.)
 Entic Cambisol (F.A.O.)
 SOIL PROFILE PIT NO. BN 15d - 13
 LOCATION: Aliade, 15km along Aliade - Akechi road
 GEOLOGY/PARENT MATERIAL: Sandstone
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/ AND USE Fallow guinea Savanna
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 26/11/83
 DESCRIBED BY: F.D.A.L.R. Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (am)</u>	<u>Description</u>
A	0 - 19	Dark grayish brown (10YR 4/2) sand; moderate fine crumb; loose; many fine and medium roots; many fine pores; gradual smooth boundary.
AB	19 - 30	Brown (10YR 5/3) sand; weak to crumb; many fine and medium roots; many fine and medium pores; gradual smooth boundary.
BA	30 - 60	Brown (7.5YR 5/3) loamy sand; single grained; loose; many fine and medium pores; abrupt smooth boundary.
2B	60 - 150	Red (2.5YR 5/8) sandy clay; coarse subangular blocky; very firm; common fine roots; common fine pores; diffuse smooth boundary.
2BC	150 - 180	Red (2.5YR 4/8) sandy clay; coarse subangular blocky; very firm; few fine roots; common fine pores; abrupt smooth boundary.
2C	180 - 200	Yellowish brown (10YR 5/6) gravelly sandy clay; moderate to strong fine, medium to coarse subangular blocky; few fine roots; many pores.

SOIL MAPPING UNIT. 15d
 SOIL CLASSIFICATION: Oxic Haplustalf (U.S.D.A.)
 Orthic Luvisol (F.A.O.)
 SOIL PROFILE PIT NO. BN 15d - 15
 LOCATION Ikunbur 18km from Aliade on
 Aliade Gboko road
 GEOLOGY/PARENT MATERIAL: Sandstones
 TOPOGRAPHY/LAND USE Fallow Guinea Savanna
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 29/11/83
 DESCRIBED BY: F.D.A.L.R. Staff

(All colours are for moist soils unless otherwise stated)

Horizon	Depth (cm)	Description
AP	0 - 25	Brown (10YR 5/3) loamy sand; moderate fine crumb; soft; many fine and medium roots; many fine pores; gradual smooth boundary.
A	25 - 45	Dark brown (10YR 4/3) loamy sand; weak fine crumb and moderate medium subangular blocky; hard; many fine, medium and coarse roots; many fine and medium pores; diffuse smooth boundary.
Bt ₁	45 - 69	Strong brown (7.5YR 5/8) sandy loam; weak medium to coarse subangular blocky; hard; common fine roots; many fine pores; gradual smooth boundary.
Bt ₂	69 - 112	Yellowish red (5YR 5/8) sandy clay; weak coarse subangular blocky; very firm; common fine roots; common pores; gradual smooth boundary.
3t3	112 - 151	Yellowish red (5YR 5/8) sandy clay; weak coarse subangular blocky; very firm; common fine roots; common pores; gradual smooth boundary.
Bc	151 - 189	Yellowish brown (10YR 5/6) sandy clay; moderate medium to coarse subangular blocky; slightly firm; few roots; many pores.

SOIL MAPPING UNIT NO. 15d
 SOIL CLASSIFICATION: Typic Paleustult (U.S.D.A.)
 Dystric Nitosol (F.A.O.)
 SOIL PROFILE PIT NO. BN 15d - 17
 LOCATION: Km 145 on Enugu - Makurdi road
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Undulating Plains, 0 - 6%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: below profile depth
 DATE DESCRIBED: 12/10/83
 DESCRIBED BY: F.D.L.R. Staff

(All colours are for moist soils unless otherwise)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 15	Very dark grayish brown (10YR 3/1) sandy clay loam; moderate fine crumb; friable; many fine roots; many fine and medium pores; clear smooth boundary.
Bt ₁	15 - 36	Strong brown (7.5YR 3/4) gravelly clay; moderate fine to medium subangular blocky; firm; many fine roots; many fine and medium pores; clear smooth boundary.
Bt ₂	36 - 90	Strong brown (7.5YR 5/6) gravelly clay; moderate medium to coarse subangular blocky; firm; common fine roots; many fine and medium pores; diffuse wavy boundary.
Bt ₃	90 - 131	Yellowish red (5YR 4/6) gravelly clay; moderate medium to coarse subangular blocky; firm; common fine and medium roots; common fine pores; diffuse wavy boundary.
Bt ₄	131 - 152	Yellowish red (5YR 4/) gravelly clay; moderate medium to coarse subangular blocky; very firm; few roots; few pores; clear wavy boundary.
BC	152 - 180	Predominantly weathering shale comprising matrix of grey and dark red; slightly stratified layers.

SOIL MAPPING UNIT NO: 15d
 SOIL CLASSIFICATION: Plinthic Tropudult (U.S.D.A.)
 Plinthic Acrisol (F.A.O.)
 SOIL PROFILE PIT NO: IM 15d - 01
 LOCATION: Uwanna, Afikpo; 5 km off the
 town along Uwanna - Erei road
 GEOLOGY/PARENT MATERIAL: Shale and sandstones
 TOPOGRAPHY/SLOPE: Undulating plains, 4 - 6%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 30/6/83
 DESCRIBED BY: F.D.A.L.R. Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 14	Dark brown (10YR 4/3) sandy loam; moderate fine to medium crumb; friable; many fine and medium roots; many fine and medium pores; few fine to medium ironstones; clear smooth boundary.
AB	14 - 40	Dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky; slightly firm; many fine and medium roots; many fine and medium many fine and medium pores; clear wavy boundary.
Bt ₁	40 - 60	Yellowish red (5YR 5/6) gravelly sandy clay; moderate medium subangular blocky; very firm; common fine and wood roots; many fine medium pores; abundant gravels and medium ferruginised ironstones; clear smooth boundary.

Bt ₂	60 - 120	Yellowish red (5YR 5/6) gravelly sandy clay; moderate medium subangular blocky; very firm; common roots; many fine and medium pores; many compact gravels and ironstones; gradual smooth boundary.
Bt ₃	120 - 180	Yellowish red (5YR 5/8) gravelly sandy clay; moderate medium subangular blocky; few roots; many fine pores; many gravels; ironstones and boulders.

SOIL MAPPING UNIT NO.: 15d
 SOIL CLASSIFICATION: Aquic Paleudult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO.: IM 15d - 02
 LOCATION: Akaeze
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Gently undulating plains, 0- 2%
 VEGETATION/LAND USE: Yams, Rice Paddy and Oil Palms
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: 55cm
 DATE DESCRIBED: 06/7/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 15	Dark brown (10YR 3/3) loam to clay loam; moderate coarse subangular blocky; firm; common fine and medium roots; common fine pores; common fine iron concretions; clear smooth boundary.
Bt ₁	15 - 36	Yellowish brown (10YR 5/6) clay loam; many distinct fine to medium yellowish red (5YR 5/8) mottles; strong medium angular blocky; firm; common fine roots; common fine pores; common fine iron concretions; gradual smooth boundary.
Bt ₂	35 - 55	Light Olive brown (2.5YR 5/4) clay loam; many distinct fine to medium red (2.5YR 4/6) mottles; moderate coarse angular blocky; few roots; few medium pores; common pieces of medium to large ironstones and gravels.
	55 +	Ponded.

SOIL MAPPING UNIT NO.: 15d
 SOIL CLASSIFICATION: Typic Tropudult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO.: IM 15d - 03
 LOCATION: Uburu
 GEOLOGY/PARENT MATERIAL: Fine Silt over Shale
 TOPOGRAPHY/SLOPE: Gently undulating plains, 0 - 2%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 30/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 12	Dark yellowish brown (10YR 4/4) sandy loam; weak fine granular; very friable; many fine and medium roots; many fine pores; gradual smooth boundary.
AB	12 - 31	Brown (7.5YR 5/4) sandy loam; weak subangular blocky; friable; many medium pores; gradual smooth boundary.
Bt ₁	31 - 68	Strong brown (7.5YR 5/6) sandy loamy; weak medium subangular blocky; slightly firm; common medium roots; common fine and medium pores; clear smooth boundary.
Bt ₂	68 - 90	Brownish yellow (10YR 6/6) sandy clay loam; common distinct red (2.5YR 4/8) mottles; moderate medium to coarse subangular blocky; firm; common medium roots; common medium pores; clear smooth boundary.

Bt ₃	90 - 123	Light yellowish brown (10YR 6/4) sandy clay loam; prominent red (2.5YR 4/8) mottles; moderate coarse angular blocky; firm; few roots; common medium pores; common soft medium red (2.5YR 4/8) iron concretions; clear smooth boundary.
Bt ₄	123 - 180	Very pale brown (10YR 7/4) sandy clay loam; many red (2.5YR 4/8) and yellow (10YR 7/8) mottles; moderate coarse angular blocky; very firm; few fine roots; common medium pores; abundant hard and soft red (2.5YR 4/6) iron concretions.

SOIL MAPPING UNIT NO.: 15d
 SOIL CLASSIFICATION: Plinthic Tropudult (USDA)
 Plinthic Acrisol (FAO)
 SOIL PROFILE PIT NO.: IM 15d - 04
 LOCATION: Okposi
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Gently undulating plains, 0 - 2%
 VEGETATION/LAND USE: Secondary bush, dominated by Eupatrorium
 and Oil Palm.
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 30/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 10	Dark brown (7.5YR 3/2) loamy sand; fine to medium subangular blocky; friable; many fine and medium roots; many fine and medium pores; common fine ironstones; clear wavy boundary.
Bt ₁	10 - 37	Strong brown (7.5YR 5/6) gravelly clay; moderate medium subangular blocky; slightly firm; many fine and medium roots; many fine and medium iron concretions; clear wavy boundary.
Bt ₂	37 - 56	Yellowish brown (10YR 5/6) sandy clay; moderate medium to coarse subangular blocky; firm; common medium roots; common fine and medium pores; common hard and soft red iron concretions; gradual smooth boundary.
Bt ₃	56 - 87	Yellowish brown (10YR 5/6) clay; distinct red (2.5YR 4/8) mottles; moderate medium to coarse subangular blocky; very firm; common medium

BC

87 - 124

roots; common medium pores; common soft medium red (2.5YR 4/8) Iron concretions; gradual smooth boundary.

Brownish yellow (10YR 6/6) sandy clay loam; distinct red (2.5YR 4/8) mottles; moderate coarse subangular blocky; very firm; common medium roots; few medium pores; few medium and large pieces of weathering sandstones; gradual wavy boundary.

C

124 - 180

Brownish yellow (10YR 6/6) sandy clay; distinct red (2.5YR 4/8) mottles; moderate coarse angular blocky; very firm; rare roots; very few medium pores; common medium to large pieces of weathering sandstones.

SOIL MAPPING UNIT NO.

15d

SOIL CLASSIFICATION:

Typic Tropudult (USDA)

Ferric Acrisol (FAO)

SOIL PROFILE PIT NO.

IM 15d - 05

LOCATION:

Owutu Edda

GEOLOGY/PARENT MATERIAL:

Shale and Sandstones

TOPOGRAPHY/SLOPE:

Undulating, dissected plains, 6-8%

VEGETATION/LAND USE:

Secondary bush

DRAINAGE:

Imperfectly to poorly drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIBED:

07/7/83

DESCRIBED BY:

FDALR Staff

(All colours are for moist soils unless otherwise stated)

Horizon Depth (cm)

Description

AP

0-15

Dark reddish brown (5YR 3/2) gravelly sandy clay loam; moderate fine to medium subangular blocky; friable; many fine and medium roots; many fine and medium pores; clear irregular boundary.

AB

15-25

Reddish brown (5YR 4/3) gravelly clay; moderate fine to medium subangular blocky; very friable; many fine and medium roots; many fine and medium pores; many fine and medium ironstones; clear smooth boundary.

Bt₁

25-60

Yellowish brown (10 YR 5/4) gravelly sandy clay loam; common faint red (10YR 4/6) mottles; moderate fine to medium subangular blocky; very friable; common fine and medium roots; common pores; common hard and soft iron concretions; gradual wavy boundary.

Bt ₂	60-100	Pale brown (10YR 6/3) clay; common distinct dark red (10YR 3/6) mottles; weak medium subangular blocky; very firm; common roots; common pores; common hard and soft iron concretions; clear wavy boundary.
Bt ₃	100-125	Light brownish grey (10YR 6/2) clay; many prominent dusky red (10YR 3/4) and yellowish brown (10YR 5/8) mottles; weak medium angular blocky; firm; few roots; common pores; gradual wavy boundary.
BC	125-180	Light brownish grey (10YR 6/2) clay; distinct pale red (2.5YR 6/2) and dusky red (10YR 3/4) mottles; moderate medium angular blocky; firm; few roots; few pores.

SOIL MAPPING UNIT NO. 17a
 SOIL CLASSIFICATION: Typic Tropaqualf (U.S.D.A.)
 Gleyic Luvisol (F.A.O.)
 SOIL PROFILE PIT NO. AN 17a - 02
 LOCATION: 7km east of Awka
 GEOLOGY/PARENT MATERIAL: Alluvium
 TOPOGRAPHY/SLOPE: Nearly level, 0 - 2%
 VEGETATION/LAND USE: Rice paddy
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 02/9/81
 DESCRIBED BY: FDALR Staff.

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 32	Weak red (2.5YR 5/2) sandy loam; granular; few fine and medium roots; common irregular pores; diffuse wavy boundary.
Bt1	32 - 58	Grayish brown (10YR 5/2) sandy loam; weak granular; friable; few fine roots; common pores; diffuse wavy boundary.
Bt2	58 - 102	Light grayish brown (2.5YR 6/2) sandy loam; many distinct yellow (10YR 7/8) and brown (10YR 5/4) mottles; fine granular; very friable; few roots; common pores; diffuse wavy boundary.
Bt3	102 - 150	Light grayish brown (2.5YR 6/2) sandy clay loam many distinct yellow (10YR 7/8) and brown (10YR 5/4) mottles; sandy fine granular; very friable; few very fine roots; common pores; diffuse wavy boundary.
Bc	150 - 200	Light grayish brown (1.5YR 6/2) sandy clay loam; abundant prominent yellow (10YR 7/8) and brown (10YR 5/4) mottles; fine granular; friable very few roots; common pores.

SOIL MAPPING UNIT NO: 17a
 SOIL CLASSIFICATION: Lithic Ustropept. (U.S.D.A.)
 Eutric Cambisol (F.A.O.)
 SOIL PROFILE PIT NO: BN 17a - 04
 LOCATION: Angba in Alloma
 PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Undulating plains (0-6%)
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH OF WATER TABLE: Below profile depth
 DESCRIBED BY: F.D.A.L.R. Staff
 DATE DESCRIBED: 25/6/83

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A1	0 - 10	Dark reddish brown (5YR 3/2) sandy clay loam; weak crumb; friable; many fine roots; many fine pores; clear smooth boundary.
AB	10 - 27	Dark reddish brown (2.5YR 3/4) gravelly sandy clay loam; weak fine to medium angular blocky; many fine and medium roots; many fine pores; gradual wavy boundary.
B	27 - 54	Dark red (10R 3/4) gravelly clay; moderate medium subangular blocky; firm; many large and medium roots, many pores; diffused wavy boundary.
BC	54 - 80	Dark red (10R 3/6) gravelly clay; moderate medium to coarse angular blocky; very firm; many medium roots; many fine pores; abrupt wavy boundary.
R	80+	Strong cemented layer of ferruginised material.

SOIL MAPPING UNIT NO: 17a
 SOIL CLASSIFICATION: Oxic Ustropept (USDA)
 Eutric Cambisol (F.A.O)
 SOIL PROFILE PIT NO: BN 17a - 06
 LOCATION: Agebenegba in Alloma (3km South Alloma)
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Undulating
 VEGETATION/LAND U.S.E. Secondary bush
 DRAINAGE: Well drained
 DEPTH OF WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 25/6/83

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 11	Dark reddish brown (2.5YR 3/4) sandy loam; weak fine to medium subangular blocky; friable; many fine and medium fine roots; many fine and medium pores; clear; smooth boundary.
AB	11 - 45	Dark red (5.5YR 3/6) gravelly sandy clay loam; moderate medium angular blocky; friable; many fine and medium roots; many fine pores; gradual wavy boundary.
BA	45 - 77	Red (10YR 4/6) gravelly sandy clay loam; moderate medium subangular blocky; very firm; common fine roots; diffused wavy boundary.
B	77 - 112	Red (10YR 4/8) gravelly sandy clay loam; moderate medium to coarse subangular blocky; very firm; few roots; many fine and medium pores; diffused wavy boundary.
BC	112 - 180	Red (10YR 4/6) gravelly clay; moderate medium subangular blocky; very firm; many fine pores;

SOIL MAPPING UNIT NO: 17a
 SOIL CLASSIFICATION: Typic Tropaquept (U.S.D.A.)
 Gleyic Cambisol (F.A.O)
 SOIL PROFILE PITH NO: BN 17a - 08
 LOCATION: 12Km from Igbor on Igbor -
 Apir road
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Gently undulating plains (2 - 6%)
 VEGETATION/LAND USE: Fallow Guinea Savanna
 DRAINAGE: Poorly drained
 DEPTH OF WATER TABLE: Below profile depth
 DESCRIBED BY: F.D.A.L.R. Staff
 DATE DESCRIBED: 25/4/84

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 20	Grayish brown (10YR 5/2) sandy clay loam; moderate medium subangular blocky; firm; many fine roots; many fine pores; gradual wavy boundary.
B _{Ag}	20 - 30	Light grayish brown (10YR 4/2) sandy loam; weak coarse subangular blocky; firm; common fine roots; many pores; clear wavy boundary.
B _g	30 - 51	Dark yellowish brown (10YR 6/6) clay loam; moderate medium to coarse angular blocky; firm; common roots; many pores; diffuse wavy boundary.
B _{Cg}	51 - 83	Light yellowish brown (10YR 5/4) clay loam; strong medium to coarse angular blocky; firm; many fineroots; many pores; diffused wavy boundary.
C _{1g}	83 - 133	Grayish brown (2.YR 6/2)clay; strong medium subangularblocky; firm; common fine roots; many pores; diffused wavy boundary.
C _{2g}	133 - 180	Grayish brown (7.5RY 5/2) gravelly clay; strong coarse angular blocky; firm; few roots; many pores.

SOIL MAPPING UNIT NO: 17a
 SOIL CLASSIFICATION: Lithic Ustrorthent (U.S.D.A.)
 Lithosol (F.A.O.)
 SOIL PROFILE PIT NO: BN 17a - 09
 LOCATION: 49km to Makurdi on Aliade - Makurdi road
 GEOLOGY/PARENT MATERIAL: Shale/Sandstones
 TOPOGRAPHY/SLOPE: Nearly level to gently undulating (0 - 2%)
 VEGETATION/LAND USE: Fallow Guinea Savanna
 DRAINAGE: Moderately well drained
 DEPTH OF WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR
 DATE DESCRIBED: 25/4/84

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A1	0 - 16	Grayish brown (7.5YR 3/2) fine loamy sand; weak medium subangular blocky; very friable; many fine roots; many pores; gradual wavy boundary.
AC	16 - 25	Light yellowish brown (7.5RY 5/4) loamy sand; moderate fine to medium subangular blocky; friable; common fine roots; many pores; gradual wavy boundary.
C	25 - 47	Brownish yellow (10YR 5/6) gravelly loam sand; moderate medium subangular blocky; firm; many fine roots; many pores; abrupt clear boundary.
R	47+	Strong cementation of predominantly ferruginised concretion.

SOIL MAPPING UNIT NO. 17a
 SOIL CLASSIFICATION: Typic Haplustalf (USDA)
 Orthic Luvisol (FAO)
 SOIL PROFILE PIT NO.: BN 17a - 11
 LOCATION: 27km to Makurdi - Aliade Road
 GEOLOGY/PARENT MATERIAL Sandstone over shale
 TOPOGRAPHY/SLOPE Gently undulating to undulating plains (0 - 6%)
 VEGETATION/LAND USE: Fallow Guinea Savanna
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 30/11/83

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 25	Brown (10YR 5/3) coarse loamy sand; moderate fine crumb; hard; many fine and medium roots; many fine medium and large pores; gradual smooth boundary.
IIBt ₁	25 - 46	Yellowish brown (10YR 5\6) sandy clay loam; moderate medium to coarse subangular blocky; hard many fine and medium roots; many medium and large pores; gradual smooth boundary.
IIBt ₂	46 - 70	Yellowish brown (10YR 5/8) sandy clay; moderate medium to coarse subangular blocky; hard; common fine and medium roots; many medium and large pores; abrupt wavy boundary.
IIBt ₃	70 - 105	Strong brown (7.5YR 5/5) gravelly sandy clay; moderate to strong fine to medium subangular blocky; many fine roots; many fine pores; abrupt wavy boundary.

IIBt ₄	105 - 145	Light yellowish brown (10YR 6/4) sandy clay; moderate medium to coarse subangular blocky; firm; common fine roots; many fine and medium pores gradual wavy boundary.
IIBC	145 - 182	Very pale brown (10YR 7/4) sandy clay; moderate fine medium to coarse subangular blocky; firm; few fine roots; common fine and medium pores.

SOIL MAPPING UNIT NO. 17a
 SOIL CLASSIFICATION: Typic Haplustalf (USDA)
 Orthic Luvisol (FAO)
 SOIL PROFILE PIT NO.: BN 17a - 12
 LOCATION: 41km from Makurdi on Makurdi - Yandev road
 GEOLOGY/PARENT MATERIAL Sandstone over shale
 TOPOGRAPHY/SLOPE Gently undulating plains (0-2%)
 VEGETATION/LAND USE: Fallow Guinea Savanna
 DRAINAGE: Well drained to moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 30/11/83

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A1	0 - 17	Dark brown (7.5YR 3/2) fine sandy loam; weak crumb; very friable; many fine and medium roots; many pores; gradual wavy boundary.
AB	17 - 28	Brown (7.5YR 5/4) sandy loam; moderate fine to medium subangular blocky; friable; many fine and medium roots; common pores; clear smooth boundary.
Bt ₁	28 - 43	Yellowish brown (7.5YR 5/6) sandy clay loam; moderate coarse subangular blocky; firm; many roots; common pores; clear wavy boundary.
Bt ₂	43 - 65	Brownish yellow (10YR 5/6) sandy clay; moderate medium to coarse subangular blocky; firm; common roots; common pores; diffuse wavy boundary.
Bt ₃	65 - 90	Brownish yellow (10YR 5/8) sandy clay; moderate medium to coarse subangular blocky; firm; few roots; common pores; diffuse wavy boundary.
BC	90 - 170	Soft, loose ferruginised concretion with some penetrations of grey (2.5Y 7/2) clay materials.
C	170 - 180	Soft, gray (5Y 7/2) clay shale, with little sandstone and iron concretions.

SOIL MAPPING UNIT NO. 17a
 SOIL CLASSIFICATION: Ustoxic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO.: BN 17a - 13
 LOCATION: Aliade, 28km off Aliade on Aliade-Gboko road
 GEOLOGY/PARENT MATERIAL Shale\Sandstone
 TOPOGRAPHY/SLOPE Gently undulating to nearly flat (0 - 2%)
 VEGETATION/LAND USE: Fallow Guinea Savanna
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 25/4/84

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 19	Dark brown (7.5 YR 4/2) sandy loam; moderate medium subangular blocky; firm; many fine roots; many pores; gradual wavy boundary.
B	19 - 31	Strong brown (7.5YR 6/6) sandy clay loam; moderate medium subangular blocky; firm; many fine roots; many pores; gradual wavy boundary.
BC	31 - 182	Yellowish red (5YR 4/6) gravelly sandy clay; moderate coarse blocky; very firm; common roots; many pores.

SOIL MAPPING UNIT NO. 17b
 SOIL CLASSIFICATION: Ustoxic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO.: BN 17b - 01
 LOCATION: Otukpa, 109km to Enugu on Enugu - Oturkpo road
 GEOLOGY/PARENT MATERIAL Weakly consolidated Sandstone
 TOPOGRAPHY/SLOPE Undulating plains (2 - 6%)
 VEGETATION/LAND USE: Secondary bush (oil palm, andropogon)
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 12/5/83

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A1	0 - 15	Dark red 2.5YR 3/6) coarse sand; weak fine crumb; loose many fine roots; many pores; diffuse wavy boundary.
AB	15 - 75	Dark red (2.5YR 3/6) loamy sand; weak fine subangular blocky; very friable; many fine roots; many pores; diffuse wavy boundary.
B	75 - 128	Red (2.5YR 4/6) coarse sandy loam; weak fine subangular blocky; friable; common roots; common pores; diffuse wavy boundary.
BC	128 - 200	Red (10YR 4/8) sandy clay loam; weak fine subangular blocky; friable; very few roots; common pores.

SOIL MAPPING UNIT NO. 17b
 SOIL CLASSIFICATION: Typic Haplustalf (USDA)
 Orthic Luvisol (FAO)
 SOIL PROFILE PIT NO.: BN 17b - 03
 LOCATION: Akpaher, 15km from Akpaher junction
 GEOLOGY/PARENT MATERIAL Sandstone
 TOPOGRAPHY/SLOPE Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Guinea Savanna
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff
 DATE DESCRIBED: 19/10/83

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 22	Greyish brown (10YR 5/2) fine loamy sand; loose: moderate fine to medium roots; common fine and medium pores; abrupt smooth boundary.
AB	22 - 40	Yellowish brown (10YR 5/6) fine sandy loam; weak fine to medium subangular blocky; friable; many fine and medium roots; many fine pores; gradual wavy boundary.
Bt ₁	40 - 70	Strong brown (7.5YR 5/6) sandy clay loam; moderate medium to coarse subangular blocky; firm; many fine and medium roots; many medium and large pores; gradual wavy boundary.
Bt ₂	70 - 103	Yellowish red (5YR 5/6) sandy clay; moderate coarse subangular blocky; firm; many fine roots; common fine pores; gradual smooth boundary.
Bt ₃	103 - 137	Yellowish red (5YR 5/8) sandy clay; moderate coarse subangular blocky; very firm; many fine roots; common fine pores; gradual smooth boundary.
Bt ₄	137 - 165	Reddish yellow (7.5YR 7/6) sandy clay; moderate coarse subangular blocky; very firm; few fine roots; common fine pores.

SOIL MAPPING UNIT NO 17b
 SOIL CLASSIFICATION: Oxic Ustropepts (USDA)
 Eutric Cambisol (FAO)
 SOIL PROFILE PIT NO. BN 17b - 05
 LOCATION: Ankpa, 23km on Ankpa - Ayangba road
 GEOLOGY/PARENT MATERIAL: Sandstones
 TOPOGRAPHY/SLOPE: Undulating plains, 4 -6%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well Drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED:
 DESCRIBED BY: FDALR STAFF

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 15	Dark reddish brown (2.5 YR 5/4) sand; weak fine crumb; loose; many fine roots; many fine to medium pores; gradual wavy boundary.
AB	15 - 46	Dark reddish brown (2.5YR 5/4) loamy sand; weak fine subangular blocky; loose; many fine roots; many fine pores; gradual wavy boundary.
BA	46 - 95	Dark red (2.5YR 3/6) loamy sand; weak fine subangular blocky; very friable; many roots; many pores; clear wavy boundary.
B	95 - 155	Red (10YR 4/6) sandy clay loam; moderate medium subangular blocky; firm; common fine roots; common pores; diffuse wavy boundary.
BC	155-180	Red (10YR 4/6) sandy clay loam; moderate medium subangular blocky; firm; few roots; common pores; diffuse wavy boundary.

SOIL MAPPING UNIT NO. 17b
 SOIL CLASSIFICATION: Typic Tropaquept (USDA)
 Gleyic Cambisol (FAO)
 SOIL PROFILE PIT NO. BN 17b - 07
 LOCATION Ansambele Village (Akpene)
 GEOLOGY/PARENT MATERIAL: Cretaceous sandstones
 TOPOGRAPHY/SLOPE: Gently undulating plain, 0 -2%
 VEGETATION/LAND USE: Fallow Savanna woodland
 DRAINAGE: Poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 17	Dark greyish brown (10YR 4/2) loamy sand; moderate subangular blocky; friable; many fine and medium roots; gradual smooth boundary.
BA _g	17-41	Dark greyish brown (10YR 4/2) sandy loam; moderate subangular blocky; friable; many fine and medium roots; clear smooth boundary.
B _g	41-80	Light grey (21.5Y 7/2) clay; strong coarse subangular blocky; firm; very few medium roots; gradual smooth boundary.
BC	80-126	Light brownish grey (2.5Y 6/2) clay; strong coarse subangular blocky; firm; rare roots; common pores; gradual smooth boundary.
C _g	126-180	Grey (5Y 6/1) clay; strong coarse subangular blocky; firm; rare roots; common pores.

SOIL MAPPING UNIT NO. 17b
 SOIL CLASSIFICATION: Typic Paleustult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO. BN 17b - 10
 LOCATION: Aliade, 17km on Aliade - Yandev road
 GEOLOGY/PARENT MATERIAL: Gently undulating plains, 0 - 2%
 VEGETATION/LAND USE: Guinea Corn farm
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED:
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 25	Dark brown (7.5YR 4/2) sandy clay loam; moderate fine to medium crumb; friable; many fine roots; many fine and medium pores; abrupt smooth boundary.
Bt ₁	25-70	Strong brown (7.5YR 5/6) sandy clay; moderate to coarse subangular blocky; very firm; common fine roots; common fine and medium pores; gradual smooth boundary.
Bt ₂	70-90	Reddish yellow(5YR 6/6) clay; moderate fine to medium subangular blocky; friable; few fine roots; many fine pores; diffuse wavy boundary.
Bt ₃	90-127	Light yellowish brown (10YR 6/4) clay; moderate to strong fine medium to coarse subangular blocky; friable; few fine roots; many fine and medium pores; diffuse wavy boundary.
Bt ₄	127-170	Light brownish grey (2.5Y 6/2) clay; moderate to strong fine to medium subangular blocky; many fine roots; many fine and medium pores.

SOIL MAPPING UNIT NO. 17b
 SOIL CLASSIFICATION: Oxic Ustropept (USDA)
 Eutric Cambisol (FAO)
 SOIL PROFILE PIT NO. BN 17b - 16
 LOCATION: Abeda Mbadyul
 GEOLOGY/PARENT MATERIAL: Cretaceous sandstones
 TOPOGRAPHY/SLOPE Gently undulating plains, 0 -2%
 VEGETATION/LAND USE; Cultivated-yams, millet and sorghum
 DRAINAGE| Well drained to imperfectly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 25/11/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0-20	Dark greyish brown (10YR 4/2) sand: single grained; loose; many fine and medium roots; many fine and medium pores; gradual smooth boundary.
AB	20-44	Brown (10YR 4/3) sand; weak, granular; many fine and medium roots; many fine to medium pores; gradual smooth boundary.
BA	44-66	Dark yellowish brown (10 YR 4/4) sand; weak fine granular; common fine roots; common pores; clear smooth boundary.
2B	66-109	Yellowish brown (10 YR 5/6) sandy clay; moderate fine to medium subangular blocky; slightly firm; common fine roots; common pores; clear smooth boundary.
2BC	109-147	Yellowish red (10YR 5/6) sandy clay; moderate medium subangular blocky; firm; few roots; common pores; clear smooth boundary.
2C		Light grey (10YR 7/2) sand clay; moderate medium subangular blocky; firm; few roots; common pores.

SOIL MAPPING UNITS NO. 18d
 SOIL CLASSIFICATION: Lithic Ustorthent (USDA)
 Lithosol (FAO)
 SOIL PROFILE PIT NO. BN 18d - 01
 LOCATION: Dogon Gawa, 15km to Takum
 GEOLOGY/PARENT MATERIAL: Basement Complex
 TOPOGRAPHY/SLOPE Gently undulating plains associated with scattered hills, 2 - 6%
 VEGETATION/LAND USE: Guinea Savanna - Adrogon Isoberlina and other fire resistant trees
 DRAINAGE: Well Drained
 DEPTH OF WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/11/83
 DESCRIBED BY: FDALR Staff

(All colours are for mosit soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A ₁	0 - 18	Very dark greyish brown (10YR 3/2) gravelly loamy sand; strong medium crumb; firm; many fine medium and large roots; many fine and medium pores.
AC	18+	Dark brown (10YR 4/4) gravelly loamy sand; strong medium to coarse subangular blocky; very firm; many fine and large roots; many fine and medium pores; abundant medium to large ferruginised ironstones and lateric materials.

SOIL MAPPING UNIT NO. 18d
 SOIL CLASSIFICATION: Ustoxic Dystropept (USDA)
 Ferralic Cambisol (FAO)
 SOIL PROFILE PIT NO. BN 18d - 03
 LOCATION: Tor Donga
 GEOLOGY/PARENT MATERIAL: Basement Complex
 TOPOGRAPHY/SLOPE: Gently undulating plains, 0-2%
 VEGETATION/LAND USE: Guinea Savanna Andropogon, Speargrass,
 Isoberlina and other fire resistant trees.
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/11/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 12	Dark greyish brown (10YR 4/2) gravelly sandy loam; moderate fine to medium subangular blocky; firm; many fine and medium roots; common fine and medium pores.
B	12-28	Dark brown (10YR 4/3) gravelly sandy clay; moderate medium subangular blocky; firm; few medium roots; common pores; clear irregular boundary.
BC	28 - 180	Basement Complex materials penetrated by gravelly clay soil materials; very firm.

SOIL MAPPING UNIT NO. 18d
 SOIL CLASSIFICATION: Oxic Haplustult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO. BN 18d - 20
 LOCATION: Abaji, 21km from Katsina-Ala on Katsina Ala
 Takum road

GEOLOGY/PARENT MATERIAL:
 TOPOGRAPHY/SLOPE: Gently undulating plain, 0 - 2%
 VEGETATION/LAND USE: Guinea Savanna - Andropogon and fire resistant
 trees

DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/11/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
AP	0 - 11	Dark greyish brown (10 YR 4/2) coarse loamy sand; weak very fine subangular blocky; friable; many fine and medium roots; many fine pores; gradual smooth boundary.
Bt ₁	11 - 37	Dark yellowish brown (10YR 4/4) sandy loam; weak very fine subangular blocky; friable; many fine roots; many fine pores; clear smooth boundary.
Bt ₂	37 - 71	Strong brown (7.5YR 4/6) sandy clay loam; weak fine subangular blocky; friable; very few roots; few pores; gradual smooth boundary.
Bt ₃	71-118	Strong brown (7.5YR 4/6) sandy clay loam; weak fine subangular blocky; firm; common roots; few pores; clear wavy boundary.
BC	118-144	Strong brown (7.5YR 5/8) gravelly sandy clay loam; moderate fine to medium subangular blocky; very firm; few roots; common pores; clear irregular boundary.
C	144 +	Weathering basement complex materials; very firm.

SOIL MAPPING UNIT NO. 19a
 SOIL CLASSIFICATION: Oxic Paleustult(U.S.D.A.)
 Ferric Acrisol (F.A.O.)
 SOIL PROFILE PIT NO. AN 19a - 01
 LOCATION: Nzute Ikem
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Almost flat, 0 - 2%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/11/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 13	Dark brown (7.5YR 4/2) sandy loam; weak fine subangular blocky; strong medium roots; many fine to medium irregular pores; clear smooth boundary.
Bt ₁	13 - 29	Brown (7.5YR 5/4) clay; strong medium subangular blocky; friable; many fine roots; clear smooth boundary.
Bt ₂	29 - 65	Dark red (2.5YR 3/6) clay; strong medium subangular blocky; friable; many few roots; many fine to medium irregular pores; clear wavy boundary.
Bt ₃	65 - 97	Red (2.5YR 4/6) clay; strong medium subangular blocky; friable; many fineroots; many fine to medium irregular pores; clear smooth boundary.
Bt ₄	97 - 125	Red (2.5YR 4/8) clay; moderate medium subangular blocky; friable; many fine roots; many fine to medium irregular pores.

SOIL MAPPING UNIT NO.

19a

SOIL CLASSIFICATION:

Oxic Paleustalfs (U.S.D.A.)

Chromic Luvisol (F.A.O.)

SOIL PROFILE PIT NO.

AN 19a - 03

LOCATION.

Ifitte Ogawari (Otube)

GEOLOGY/PARENT MATERIAL:

Sandstone and shale

TOPOGRAPHY/SLOPE.

Undulating, 2 - 6%

VEGETATION/LAND USE.

Mixture of herbaceous plants woody shrubs and grasses

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIBED:

06/5/81

DESCRIBED BY:

FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 10	Dark reddish brown (5YR 3/3) sandy loam; blocky; weak granular; very friable; many fineroots; common pores; clear smooth boundary.
Bt1	10 - 25	Dark red (2.5YR 3/6)sandy clay loam; weak fine subangular blocky; many fine roots;common pores; clear smooth boundary.
Bt2	25 - 51	Dark red (2.5YR 3/6) clay; moderate fine subangular blocky; firm; many roots; common pores;clear smooth boundary.
Bt3	51 - 97	Red (10YR 4/6) clay; moderate fine subangular blocky; firm common roots;common pores; diffuse wavy boundary.
Bt4	97 - 132	Red (10YR 4/6) clay; moderate medium subangular blocky; firm; common roots;common pores; diffuse wavy boundary.
Bt5	132 - 160	Red (10YR 4/6) clay; moderate medium to strong subangular blocky; firm; few roots; common pores.

SOIL MAPPING UNIT NO.

19a

SOIL CLASSIFICATION:

Typic Paleustalf (USDA)

Orthic Luvisol (FAO)

SOIL PROFILE PIT NO:

BN 19a - 01

LOCATION:

18km from Makurdi on Makurdi - Lafia road.

GEOLOGY/PARENT MATERIAL:

Sandstone over shale

TOPOGRAPHY/SLOPE:

Undulating plains, 4 - 6%

VEGETATION/ LAND USE:

Guinea Savanna

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIBED:

26/4/84

DESCRIBED BY:

FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 30	Brown (10YR 5/3) fine sand; weak granular; loose; many roots; common pores; clear smooth boundary.
AB	30 - 67	Light yellowish brown (10YR 4/6) loamy fine sand; weak medium subangular blocky; loose, many roots; common pores; clear wavy boundary.
Bt ₁	67 - 100	Pale brown (10YR 5/2) sandy clay loam; moderate medium subangular blocky; very firm; common roots; common pores; diffuse wavy boundary.
Bt ₂	100 - 128	Brown (10YR 5/4) coarse sandy clay loam; moderate coarse angular blocky; very firm; few roots; few pores; diffuse wavy boundary.
Bt ₃	128 - 170	Pale brown (10YR 6/3) sandy clay loam; moderate, coarse angular blocky; firm; few roots; few pores.

SOIL MAPPING UNIT NO. 19a
 SOIL CLASSIFICATION: Typic Haplustalf (USDA)
 Orthic Luvisol (FAO)
 SOIL PROFILE PIT NO. BN 19a - 03
 LOCATION: Itohe, 5km off the town on the new road
 GEOLOGY/PARENT MATERIAL: Sandstone over shale
 TOPOGRAPHY/SLOPE: Undulating plains, 0 - 6%
 VEGETATION/LAND USE: Secondary bush.
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 23/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 13	Very dark greyish brown (10YR 3/2) gravelly sandy loam; moderate fine to medium subangular blocky; friable; many fine and medium roots; many fine and medium pores; clear smooth boundary.
Bt ₁	13 - 38	Strong brown (7.5YR 4/6) very gravelly sandy clay loam; strong coarse angular blocky; firm; common fine roots; many pores; clear wavy boundary.
Bt ₂	38 - 79	Yellowish red (5YR 4/6) very gravelly sandy clay loam; strong coarse angular blocky; firm; very few roots; common pores; clear wavy boundary.
Bt ₃	79 - 121	Yellowish brown (10YR 5/6) gravelly sandy clay loam; strong coarse angular blocky; very firm; very few roots; common pores; diffuse wavy boundary.
BC	121 - 153	Yellow (10YR 7/8) gravelly clay loam; abundant coarse and platy fragments of basement complex materials; very firm; common medium to coarse, distinct reddish yellow (5YR 6/8) mottles.

SOIL MAPPING UNIT NO.

19a

SOIL CLASSIFICATION:

Oxic Ustropepts (USDA)

Eutric Gamberisol (FAO)

SOIL PROFILE PIT NO.

BN 19a - 4

LOCATION:

Iddah

GEOLOGY/PARENT MATERIAL:

Sandstones

TOPOGRAPHY/SLOPE:

Undulating landscape, 2 - 6%

VEGETATION/LAND USE:

Forest

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIBED:

21/5/83

DESCRIBED BY:

FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 15	Dark red (2.5YR 3/6) sandy loam; weak fine to medium subangular blocky; friable; many fine and medium roots; many fine to medium pores; gradual wavy boundary.
AB	15 - 43	Red (10YR 3/6) sandy loam; weak moderate subangular blocky; firm; many medium roots; many fine pores; diffuse wavy boundary.
BA	43 - 83	Red (10YR 3/6) sandy loam; weak moderate subangular blocky; firm; common roots; common pores; diffuse wavy boundary.
B	83 - 115	Red (10YR 3/6) sandy loam; weak medium subangular blocky; friable; very few roots; very few pores; diffuse wavy boundary.
BC	115 - 148	Red (10YR 3/6) sandy loam; weak moderate subangular blocky; very friable; very few roots; very few pores; diffuse boundary.
2C	148 - 195	Red (10YR 4/6) loamy sand; moderate fine subangular blocky; friable; few pores.

SOIL MAPPING UNIT NO. 19a
 SOIL CLASSIFICATION: Oxic Haplustult (USDA)
 Ferric Acrisol (FAO)
 SOIL PROFILE PIT NO. BN 19a - 05
 LOCATION: Ayamgba, 15km south west of Ayamgba town
 GEOLOGY/PARENT MATERIAL: Sandstones
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 21/5/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 15	Dark red (10YR 3/6) sand; single grained; loose; many fine and medium roots; many fine pores; clear smooth boundary
BA	15 - 41	Red (10YR 4/6) loamy sand; moderate fine to medium subangular blocky; friable; many medium roots; many medium pores; gradual wavy boundary.
Bt ₁	41 - 82	Red (10YR 4/8) sandy clay loam; moderate medium subangular blocky; firm; common medium and fine roots; common medium and fine pores; diffuse wavy boundary.
Bt ₂	82 - 103	Red (10YR 3/6) sandy clay; moderate medium subangular blocky; firm; few fine roots; common fine pores; diffuse wavy boundary.
Bt ₃	103 - 150	Red (10YR 3/6) sandy clay; moderate medium subangular blocky; firm; few fine roots; common fine pores; diffuse wavy boundary.
2BC	150 - 180	Red (10YR 3/6) sandy loam; weak coarse subangular blocky; firm; very few roots; very few fine pores.

SOIL MAPPING UNIT NO. 19a
SOIL CLASSIFICATION: Typic Haplustalf (USDA) Orthic Luvisol (FAO)
SOIL PROFILE PIT NO. BN 19a - 6
LOCATION: Bopo
GEOLOGY/PARENT MATERIAL: Sandstones over shale
TOPOGRAPHY/SLOPE: Undulating plains, 4 - 6%
VEGETATION/LAND USE: Secondary bush
DRAINAGE: Well drained
DEPTH TO WATER TABLE: Below profile depth
DATE DESCRIBED: 07/11/83
DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 13	Greyish brown (10YR 5/2) sandy loam; moderate fine to medium crumb; loose; many fine and medium roots; many fine and medium pores; abrupt smooth boundary.
AB	13 - 30	Dark greyish brown (10YR 4/2) gravelly sandy clay loam; moderate fine to medium angular blocky; firm; many fine and medium roots; many fine and medium pores; gradual wavy boundary.
Bt ₁	30 - 45	Dark greyish brown (10YR 4/2) gravelly sandy clay; moderate fine to medium angular blocky; firm; many fine and medium roots; many fine and medium pores; gradual wavy boundary.
Bt ₂	45 - 65	Dark yellowish brown (10YR 3/4) gravelly sandy clay; moderate medium to coarse subangular blocky; firm; common fine roots; common fine pores; gradual wavy boundary.

Bt ₃	65 - 85	Dark greyish brown (10YR 4/2) clay; moderate medium platy; firm; common fine roots; few fine pores; gradual wavy boundary.
BC	85 - 145	Light grey (2.5Y 7/0) clay; moderate medium to coarse platy; firm; few fine roots; gradual smooth boundary.
C	145 - 180	Light grey (2.5Y 7/2) clay; moderate medium to coarse platy; firm; few fine roots; few fine pores.

SOIL MAPPING UNIT NO. 19a
 SOIL CLASSIFICATION: Oxic Haplustalf (USDA)
 Chromic Luvisol (FAO)
 SOIL PROFILE PIT NO. BN 19a - 07
 LOCATION: Ugbokolo, 1km from Oturkpo/Ugbokolo road junction.
 GEOLOGY/PARENT MATERIAL: Sandstone
 TOPOGRAPHY/SLOPE: Undulating, 4 - 6%
 VEGETATION/LAND USE: Secondary bush with Oil palms
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 18/5/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 25	Dark brown (7.5YR 3/2) fine loamy sand; weak fine crumb; very friable; abundant fine roots; many fine pores; clear wavy boundary.
AB	25 - 36	Yellowish red (5YR 4/6) loam; weak <u>fine</u> subangular blocky; friable; common fine roots; many pres; clear wavy boundary.
Bt ₁	36 - 78	Red (2.5YR 4/6) clay; weak coarse subangular blocky; firm; very few roots; few pores; diffuse wavy boundary.
Bt ₂	78 - 106	Red (2.5YR 3/6) clay; weak coarse subangular blocky; firm; very few roots; few pores; diffuse wavy boundary.
Bt ₃	106 - 155	Red (2.5YR 5/6) clay loam; weak coarse subangular blocky; few pores.

SOIL MAPPING UNIT NO. 19a
SOIL CLASSIFICATION: Typic Rhodustult (USDA)
 Ferric Acrisol (FAO)
SOIL PROFILE PIT NO. BN 19a - 08
LOCATION: Ayamgba, 10km along Ayamgba - Dekina Road
GEOLOGY/PARENT MATERIAL: Sandstones
TOPOGRAPHY/SLOPE: Gently undulating plains, 0 - 2%
VEGETATION/LAND USE: Secondary bush (Oil palm/Eupatorim dominant)
DRAINAGE: Well drained
DEPTH TO WATER TABLE: Below profile depth
DATE DESCRIBED BY: 20/5/83
DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 15	Reddish brown (5YR 4/3) sandy loam; weak fine subangular blocky; loose; many fine to medium roots; many fine pores; clear smooth boundary.
AB	15 - 34	Yellowish red (5YR 4/6) loamy sand; weak fine subangular blocky; loose; many fine to medium roots; common pores; clear smooth boundary.
Bt ₁	34 - 67	Dark red (2.5YR 3/6) sandy loam; weak fine subangular blocky; friable; many fine and medium roots; common pores; clear smooth boundary.
Bt ₂	67 - 120	Red (2.5YR 4/6) sandy clay loam; moderate fine subangular blocky; firm; few roots; few pores; diffuse wavy boundary.
Bt ₃	120 - 175	Red (2.5YR 4/8) sandy clay loam; moderate fine subangular blocky; firm; very few roots; few pores.

SOIL MAPPING UNIT NO.

SOIL CLASSIFICATION:

SOIL PROFILE PIT NO.

LOCATION:

GEOLOGY/PARENT MATERIAL:

TOPOGRAPHY/SLOPE:

VEGETATION/LAND USE:

DRAINAGE:

DEPTH TO WATER TABLE:

DATE DESCRIBED:

DESCRIBED BY:

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A1	0 - 20	Dark brown (7.5YR 4/4) loamy sand; weak medium to coarse subangular blocky; hard; many fine and medium roots; many pores; clear smooth boundary.
BA	20 - 40	Strong brown (7.5YR 4/6) loamy sand; moderate medium to coarse subangular blocky; hard; many fine medium and large roots; many pores; gradual smooth boundary.
Bt ₁	40 - 60	Yellowish red (5YR 5/6) gravelly sandy loam; moderate fine to medium subangular blocky; slightly hard; many fine to medium roots; many pores; gradual wavy boundary.
Bt ₂	60 - 105	Yellowish red (5YR 4/6) gravelly sandy clay loam; moderate fine to medium subangular blocky; firm; common roots; common pores; gradual wavy boundary.
Bt ₃	105 - 140	Yellowish red (5YR 5/6) gravelly sandy clay; moderate to strong; fine to medium subangular blocky; firm; common roots; common pores.

19a

Oxic Haplustult (USDA)

Orthic Acrisol (FAO)

BN 19a - 09

Ofugo, 14km off Ofugo on Ofugo - Bopo Road

Indurated sandstone

Gently undulating plains, 0 - 2%

Fallow Guinea Savanna

Well drained

Below profile depth

07/11/83

FDALR Staff

SOIL MAPPING UNIT NO. 19a
 SOIL CLASSIFICATION: Oxic Haplustalf (USDA)
 Chromic Luvisol (FAO)
 SOIL PROFILE PIT NO. BN 19a - 10
 LOCATION: Ugbokolo
 GEOLOGY/PARENT MATERIAL: Sandstones
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 12/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 21	Dark brown (7.5YR 3/4) very fine sandy loam; weak crumb; very friable; many fine roots; many fine and medium pores; clear smooth boundary.
Bt ₁	21 - 56	Dark reddish brown (2.5YR 3/4) very fine sandy clay loam; weak fine subangular blocky; very friable; many fine roots; many fine and medium pores; gradual wavy boundary.
Bt ₂	56 - 100	Dark red (10YR 3/6) sandy clay; moderate medium to coarse subangular blocky; friable; common roots; many pores; diffuse wavy boundary.
Bt ₃	100 - 145	Red (10YR 4/8) sandy clay; moderate medium to coarse subangular blocky; friable; few roots; common pores; diffuse wavy boundary.
BC	145 - 180	Red (10YR 4/8) sandy clay; moderate medium to coarse subangular blocky; friable; few fine roots; few fine pores.

SOIL MAPPING UNIT NO. 19b
 SOIL CLASSIFICATION: Typic Paleustult (U.S.D.A.)
 Dystric Nitosol (F.A.O.)
 SOIL PROFILE PIT NO: AN 19b - O1
 LOCATION: Ezzamgbo
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Undulating, 4 - 6%
 VEGETATION/LAND USE: Secondary bush, Eupatorium Odoratum, Panicum
 and Penisetum spp.
 DRAINAGE: Imperfectly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 15/10/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 4	Dark brown (7.5YR 4/3) loam; weak medium subangular blocky; friable; many fine and medium irregular pores; abrupt wavy boundary.
Bt ₁	4 - 14	Dark reddish brown (5YR 3/4) sandy clay; weak medium subangular blocky; friable; many fine and medium roots; many fine and medium irregular pores; clear smooth boundary.
Bt ₂	14 - 34	Yellowish red (5YR 4/6) clay; moderate medium subangular blocky; firm; many fine and medium fine and medium irregular pores; clear smooth boundary.
Bt ₃	34 - 73	Yellowish red (YR 5/8) clay; moderate medium subangular blocky; firm; many fine and medium roots; many fine and medium irregular pores; clear smooth boundary.

Bt₄

73 - 130

Yellowish brown (10YR 5/6) clay; common medium and distinct yellow (10YR 7/8) mottles; weak medium subangular blocky; slightly firm; few fine roots; many fine irregular pores; clear smooth boundary.

Bc

130 - 163

Brown (10YR 5/3) clay; weak medium subangular blocky; plastic and sticky; few fine roots; many fine irregular pores; common distinct yellow (10YR 7/8) mottles.

SOIL MAPPING UNIT NO. 19b
 SOIL CLASSIFICATION: Ustoxic Dystropepts (U.S.D.A.)
 Dystric Cambisol (F.A.O.)
 SOIL PROFILE PIT NO. AN 19b - 02
 LOCATION: 73km Abakaliki - Enugu road
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Gently undulating plain,
 2 - 4%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 14/11/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 15	Dark reddish brown (5YR 3/4) clay loam; crumb structure; loose; many fine roots; many pores; clear wavy boundary.
A	15 - 30	Yellowish red (5YR 4/6) clay; weak fine subangular blocky; very friable; many fine roots; many pores; abrupt smooth boundary.
BA	30 - 78	Yellowish red (5YR 4/6) clay; common distinct coarse dark red (2.5YR 3/6) mottles and rounded iron concretions; moderate medium subangular blocky; firm; few roots; few pores; diffuse wavy boundary.
B	78 - 101	Yellowish red (5YR 4/5) clay; common distinct coarse dark red (2.5YR 3/6) mottles and rounded iron concretions; moderate medium subangular blocky; firm; few roots; few pores; diffuse wavy boundary.

Bc	101 - 140	Yellowish red (5YR 4/6) sandy clay loam: moderate coarse subangular blocky; slightly firm; few roots; few pores; very few iron concretions; diffuse wavy boundary.
C	140 - 173	Strong brown (7.YR 5/6) sandy loam; few iron concretions with distinct coarse yellowish red (5YR 5/8) mottles; moderate coarse subangular blocky; firm; few roots; few pores.

SOIL MAPPING UNIT NO.

19b

SOIL CLASSIFICATION:

Typic Haplustalf (USDA)

Orthic Luvisol (FAO)

SOIL PROFILE PIT NO.

BN 19b - 02

LOCATION:

Naka, 54km along Taraku - Naka road

GEOLOGY/PARENT MATERIAL:

Shale

TOPOGRAPHY/SLOPE:

Nearly level plains, 0 - 2%

VEGETATION/LAND USE:

Fallow grassland

DRAINAGE:

Moderately well drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIBED:

20/6/83

DESCRIBED BY:

FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 22	Dark brown (7.5YR 3/2) sandy loam; weak coarse subangular blocky; friable; many fine roots; many pores; clear wavy boundary.
Bt ₁	22 - 58	Brown (7.5YR 5/2) sandy clay loam; moderate coarse subangular blocky; firm; many fine roots; many pores; clear smooth boundary.
Bt ₂	58 - 83	Greyish brown (10YR 5/2) sandy clay loam; moderate fine to medium subangular blocky; firm; few medium and many fine roots; many medium and fine pores; diffuse wavy boundary.
Bt ₃	83 - 135	Light brownish grey (10YR 6/2) sandy clay; moderate medium subangular blocky; firm; common pores.

SOIL MAPPING UNIT NO. 19b
 SOIL CLASSIFICATION: Oxic Haplustalf (USDA)
 Chromic Luvisol (FAO)
 SOIL PROFILE PIT NO.: BN 19b - 11
 LOCATION: Oturkpo, 119km on Enugu - Makurdi road
 (i.e. 48km to Oturkpo)

GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Undulating plains, 4 - 6%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 28/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 5	Dark greyish brown (10YR 4/2) silty loam; moderate medium subangular blocky; firm; many fine roots; many fine and medium pores; diffuse smooth boundary.
AB	5 - 30	Dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky; firm; many roots; many pores; clear wavy boundary.
Bt ₁	30 - 55	Strong brown (7.5YR 4/6) clay loam; moderate coarse subangular blocky; firm; many medium and large roots; many medium pores; clear wavy boundary.
Bt ₂	55 - 78	Strong brown (7.5YR 5/6) clay loam; moderate coarse subangular blocky; common fine and large roots; many fine pores; clear wavy boundary.
Bt ₃	78 - 120	Yellowish brown (10YR 5/6) clay loam; moderate coarse subangular blocky; common fine and medium roots; common medium pores; clear wavy boundary.
Bt ₄	120 - 180	Yellowish brown (10YR 5/8) clay loam; moderate fine to subangular blocky; firm; few fine roots; few fine pores.

SOIL MAPPING UNIT NO. 19b
 SOIL CLASSIFICATION: Oxic Haplustalf (USDA)
 Chromic Luvisol (FAO)
 SOIL PROFILE PIT NO. BN 19b - 12
 LOCATION: Ikobi, 40km from Adoka
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/! AND USE: Guinea Savanna
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 27/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 20	Very dark grey (10YR 3/1) fine sandy loam; weak coarse subangular blocky; firm; many fine roots; many pores; clear smooth boundary.
Bt ₁	20 - 37	Dark brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky; firm; many fine and medium roots; many pores; abrupt smooth boundary.
Bt ₂	37 - 56	Strong brown (7.5YR 4/6) sandy clay loam; moderate medium to coarse subangular blocky; firm; common roots; many pores; clear smooth boundary.
Bt ₃	56 - 105	Strong brown (7.5YR 5/6) clay; common distinct fine to medium yellowish red (5YR 5/8) mottles; moderate medium subangular blocky; very firm; few roots; few pores; abrupt wavy boundary.
BC	105 - 180	Yellowish brown (10YR 5/4) gravelly clay; many distinct fine to medium yellowish red (5YR 5/8) mottles; moderate fine to medium subangular blocky; very fine roots; few pores.

SOIL MAPPING UNIT NO. 19c
 SOIL CLASSIFICATION: Oxic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO. AN 19c - 01
 LOCATION: Obiagu, 4km East of Agbani
 GEOLOGY/PARENT MATERIAL: Weakly consolidated sand
 TOPOGRAPHY/SLOPE: Undulating, 6 - 13%
 VEGETATION/LAND USE: Oil Palm bush
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 10/3/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 18	Yellowish brown (10YR 4/4) sand; single grained; loose; many roots; many pores; clear wavy boundary.
AB	18 - 63 ●	Yellowish red (5YR 5/6) sandy clay loam; weak fine to medium subangular blocky; friable; common roots; common fine pores; diffuse wavy boundary.
B	63 - 115	Yellowish red (5YR 5/6) sandy clay loam; weak medium to coarse subangular blocky; very friable; few roots; few pores; diffuse wavy boundary.
BC	115 - 180	Yellowish red (5YR 5/8) sandy loam to sandy clay loam; weak moderate subangular blocky; very few roots; few pores.

SOIL MAPPING UNIT NO. 19c
 SOIL CLASSIFICATION: "Arenic" Paleustult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO. AN 19c - 02
 LOCATION: Agbani Village
 GEOLOGY/PARENT MATERIAL: Weakly consolidated sand
 TOPOGRAPHY/SLOPE: Gently undulating, 2 - 4%
 VEGETATION/LAND USE: Eupatorium, spear grass
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 16/3/82
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 38	Pale brown (10YR 6/3) sand; single grained; loose; common roots; common pores; diffuse wavy boundary.
A	38 - 74	Dark brown (7.5YR 4/4) sand; single grained; loose; common roots; common pores; clear wavy boundary.
Bt ₁	74 - 104	Strong brown (7.5YR 4/6) sandy loam; weak coarse angular blocky; firm; few pores; clear smooth boundary.
Bt ₂	104 - 152	Yellowish red (5YR 4/6) loam; weak coarse angular blocky; very firm; very few roots; very few pores; common faint dark brown mottles; clear smooth boundary.
Bt ₃	152 - 180	Dark yellowish brown (10YR 4/4) loam; many prominent medium yellowish red (5YR 4/6) mottles; moderate coarse angular blocky; very firm; very few roots; very few pores.

SOIL MAPPING UNIT NO. 20b
 SOIL CLASSIFICATION: Arenic Haplustalf (USDA)
 Orthic Luvisol (FAO)
 SOIL PROFILE PIT NO. BN 20b - 01
 LOCATION: Katsina-Ala, behind Government College,
 on Katsina-Ala - Zaki-Biam road
 GEOLOGY/PARENT MATERIAL: Basement Complex
 TOPOGRAPHY/SLOPE: Gently undulating plain
 VEGETATION/LAND USE: Cultivated - Cassava, Yam, Sorghum
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 16/11/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 25	Dark brown (7.5YR 3/2) coarse sand; weak fine to medium crumb; friable; many fibrous roots; many fine and medium pores; gradual smooth boundary.
A	25 - 50	Dark yellowish (10YR 4/4) coarse sand; weak medium subangular blocky; friable; many fibrous roots; many fine and medium pores; gradual smooth boundary.
AB	50 - 70	Strong brown (7.5YR 5/6) sandy loam; moderate medium subangular blocky; friable; common roots; many fine and medium pores; clear wavy boundary.
2Bt ₁	70 - 93	Yellowish red (5YR 4/6) sandy clay loam; moderate medium to coarse subangular blocky; very firm; few roots; few pores; gradual smooth boundary.

2Bt ₂	93 - 135	Red (2.5YR 4/6) sandy clay; moderate coarse angular blocky; very firm; very rare roots; few pores; clear wavy boundary.
2BC	135 - 184	Brownish yellow (10YR 6/8) sandy clay, common distinct medium red (2.5YR 4/6) mottles; moderate coarse angular blocky; slightly firm; very few roots; few pores.

MAPPING UNIT NO. 20b
 SOIL CLASSIFICATION: Oxic Haplustult (USDA)
 Ferric Acrisol (FAO)
 SOIL PROFILE PIT NO. BN 20b - 05
 LOCATION: 15KM ON Takum Bete road
 GEOLOGY/PARENT MATERIAL: Basement Complex
 TOPOGRAPHY/SLOPE: Gently undulating plains surrounded by hills, 1 - 5%
 VEGETATION/LAND USE: Millet, Sorghum, Yam, Maize, Groundnuts.
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 20/10/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 18	Dark brown (10YR 4/3) loamy sand; weak fine granular; loose; many fine and medium roots ; gradual wavy boundary.
BA	18 - 61	Brown (10YR 5/3) sandy clay loam; weak fine subangular blocky; friable; many fine and medium pores; many fine and medium roots; gradual wavy boundary.
Bt ₁	61 - 103	Brownish yellow (10YR 6/6) sandy clay loam; weak angular blocky; friable; many fine and medium pores; many fine and few large roots; gradual smooth boundary.
Bt ₂	103 - 146	Yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky; friable; many fine and medium pores; many fine and few large roots; clear wavy boundary.
BC	146 - 195	Brownish yellow (10YR 6/60) sandy clay loam; moderate medium subangular blocky; friable; many fine and medium pores; many fine and few large roots.

SOIL MAPPING UNIT NO. 20b
 SOIL CLASSIFICATION: Oxic Haplustalf (USDA)
 Ferric Luvisol (FAO)
 SOIL PROFILE PIT NO. BN 20b - 06
 LOCATION: 30Km Takum - Bete Rd
 GEOLOGY/PARENT MATERIAL: Basement Complex
 TOPOGRAPHY/SLOPE: Gently undulating plains surrounded by hills 0 - 2%
 VEGETATION/LAND USE: Millet, Sorghum, Yam.
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 25/10/1983
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 10	Very dark greyish brown (10YR 3/2) sandy loam; fine moderate crumb; friable; many fine medium pores; many fine and medium roots; clear wavy boundary.
AB	10 - 24	Dark brown (10YR 4/3) sandy loam; moderate medium subangular blocky; slightly hard; many fine medium pores; many roots; wavy boundary.
Bt ₁	24 - 47	Strong brown (7.5YR 5/6) sandy clay; moderate medium subangular blocky; slightly hard, many fine and medium pores; few fine roots; gradual smooth boundary.
Bt ₂	47 - 86	Reddish yellow (7.5YR 6/6) clay; moderate medium coarse blocky; firm; few fine and medium pores; few fine roots; gradual smooth boundary.
Bt ₃	86 - 170	Brownish yellow (10YR 6/6) clay; moderate medium coarse subangular blocky; firm; few fine and medium pores; few fine roots.

SOIL MAPPING UNIT NO. 21a
 SOIL CLASSIFICATION: Oxic Haplustalf (USDA)
 Orthic Luvisol (FAO)
 SOIL PROFILE PIT NO. AN 21a - 01
 LOCATION: Isu (Ehamufu Area)
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Undulating, 2 - 6%
 VEGETATION/LAND USE: Cassava and Oil Palm
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Moist 0 - 25, wet rest of profile depth
 DATE DESCRIBED: 19/10/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 6	Very dark grayish brown (10YR 3/1) gravelly clay loam; weak moderate subangular blocky; friable; common fine roots; common medium pores; medium irregular iron concretions; clear wavy boundary.
AB	6 - 15	Dark brown (10YR 3/3) gravelly clay loam; weak moderate subangular blocky; friable; common medium roots; common medium pores; medium irregular iron concretions; gradual wavy boundary.
Bt ₁	15 - 25	Dark brown (10YR 4/3) gravelly clay; weak moderate subangular blocky; friable; common fine roots; many fine pores; fine iron concretions; clear smooth boundary.
Bt ₂	25 - 54	Dark yellowish brown (10YR 4/4) gravelly clay; weak moderate subangular blocky; common fine roots; many fine pores; fine iron concretions;

SOIL MAPPING UNIT NO. 21a
 SOIL CLASSIFICATION: Ustoxic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO. AN 21a - 02
 LOCATION: Agunede (Near Ehamufu)
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Undulating, 4 - 6%
 VEGETATION/ AND USE: Secondary bush, E. Odorum, Panicum spp.
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 19/10/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 4	Dark reddish brown (5YR 3/2) sandy loam; weak medium subangular blocky; friable; many fine to medium roots; many fine to medium irregular pores; many fine to medium irregular iron concretions; gradual wavy boundary.
A	4 - 15	Dark reddish brown (5YR 3/2) sandy loam; weak medium subangular blocky; friable; many fine to medium roots; many fine to medium irregular pores; many fine to medium irregular iron concretions; clear smooth boundary.
AB	15 - 29	Dark red (2.5YR 3/6) clay; moderate medium subangular blocky; friable to firm; many fine and medium roots; many fine irregular pores; many fine to medium irregular iron concretions; clear smooth boundary.
B	29 - 80	Red (2.5YR 4/6) clay; moderate medium subangular blocky; firm; many fine roots; many

fine irregular pores; many medium irregular iron concretions; clear smooth boundary.

BC 80 - 109

Red (2.5YR 4/6) clay; weak medium subangular blocky; firm; many fine roots; many fine irregular pores; many medium irregular iron concretions; gradual wavy boundary.

C 109 - 185

Light grey (10YR 8/6) clay; weak medium subangular blocky; firm; many fine roots; many irregular pores; medium irregular soft iron concretions.

SOIL MAPPING UNIT No.: 21a
 SOIL CLASSIFICATION: Typic Paleustult (USDA)
 Dystric Nitosol (FAO)
 SOIL PROFILE PIT NO.: CR 21a - 01
 LOCATION: 4km from Yahe, along Yahe-Ezekwe Road, Cross
 River State.
 GEOLOGY/PARENT MATERIAL: Shale / Sandstone
 TOPOGRAPHY/SLOPE: Undulating plains, 6%
 VEGETATION/LAND USE: Fallow
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below Profile Depth
 DATE DESCRIBED: 8/8/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 10	Dark brown (10YR 3/4) sandy clay loam; crumb; very friable; many fine to medium roots; many pores; many ferruginised Fe concretions; clear wavy boundary.
Bt ₁	10 - 25	Strong brown 7.5YR 5/6) clay; moderate medium subangular blocky; slightly firm; common fine medium roots; common pores; Fe concretion and indurated shale; clear irregular boundary.
Bt ₂	25 - 43	Brownish yellow (10YR 6/8) clay; moderate medium subangular blocky; firm; common fine to medium roots; few pores; Fe concretion and indurated shales; diffuse irregular boundary.
Bt ₃	43 - 74	Red (10YR 4/8) sandy clay; moderate medium subangular blocky; very firm; few pores; few roots; clear wavy boundary.

Bt ₄	74 - 120	Dark red (2.5YR 3/6) sandy loam; common distinct brownish yellow (10YR 5/6) mottles with weathering sandstones; moderate medium subangular blocky; very firm; few pores; few roots.
BC	120 - 180	Dark red (2.5YR 3/6) sandy clay; moderate coarse angular blocky; very firm; many pores; few roots; prominent coarse brownish yellow mottles with pieces of coarse weathering sand stone.

SOIL MAPPING UNIT No.:

21a

SOIL CLASSIFICATION:

Typic Haplustult (USDA)

Orthic Luvisol (FAO)

SOIL PROFILE PIT NO.:

CR 21a - 02

LOCATION:

6km Abakaliki-Ogoja Road after Abakaliki.

GEOLOGY/PARENT MATERIAL:

Shale

TOPOGRAPHY/SLOPE;

Gently undulating, 0 - 2%

VEGETATION/LAND USE:

Secondary bush

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below Profile Depth

DATE DESCRIBED:

14/9/81

DESCRIBED BY:

FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 12	Dark reddish brown (5YR 3/2) sandy clay loam; moderate fine to medium subangular blocky; friable; many fine roots; many pores; many fine ferruginised iron concretions; diffuse wavy boundary.
Bt ₁	12 - 36	Dark brown (7.5YR 4/2) clay loam; moderate medium to coarse subangular blocky; firm; many fine to medium roots; many pores; many fine ferruginised iron concretions; clear wavy boundary.
Bt ₂	36 - 65	Yellowish red (5YR 5/8) clay; moderate to strong subangular blocky; firm; many fine to medium roots; many pores; common fine to medium ferruginised iron concretions; clear wavy boundary.
Bt ₃	65 - 80	Yellowish red (5YR 5/8) clay; moderate coarse subangular blocky; firm; rare roots; few pores; common coarse pieces of weathering shale; clear wavy boundary.
C	80 - 120	Essentially dominated by stratification of black; grey and olive grey shales; weakly cemented with less than 10% clayey matrix.

SOIL MAPPING UNIT No.: 21a
 SOIL CLASSIFICATION: Typic Haplustult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO.: CR 21a - 03
 LOCATION: Yahe, Cross River State
 GEOLOGY/PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 1%
 VEGETATION/LAND USE: Guinea Savanna
 DRAINAGE: Moderately well drained
 DEPTH TO WATER TABLE: Below Profile Depth
 DATE DESCRIBED: 1/9/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth(cm)</u>	<u>Description</u>
Ap	0 - 25	Dark greyish brown (10YR 4/2) loamy sand; weak crumb; very friable; many pores; many roots; diffuse wavy boundary.
AB	25 - 45	Reddish yellow (5YR 6/6) loamy sand; very friable; many pores; many roots; clear wavy boundary.
Bt ₁	45 - 95	Red (2.5YR 5/8) sandy clay; moderate subangular blocky; slightly firm, slightly sticky; many pores; few roots; clear smooth boundary.
Bt ₂	95 - 132	Dark red (2.5YR 3/6) sandy clay; strong medium subangular blocky; firm, sticky and plastic; many pores; many fine concretions of shale origin; clear smooth boundary.
BC	132 - 180	Red (2.5YR 4/8) sandy clay; strong medium subangular blocky; firm, sticky and plastic; many pores; few gravels.

SOIL MAPPING UNIT NO. 21b
 SOIL CLASSIFICATION: Oxic Haplustults (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO. AN 21b - 01
 LOCATION: Nsukka
 GEOLOGY/PARENT MATERIAL: Sandstone
 TOPOGRAPHY/SLOPE: Undulating, 4 - 6%
 VEGETATION/LAND USE: Savanna
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below Profile depth
 DATE DESCRIBED: 19/2/81
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 6	Dark reddish brown (5YR 3/3) sandy loam; weak crumb; friable; many fine roots; many pores; clear smooth boundary.
Bt ₁	6 - 29	Dark reddish brown (2.5YR 3/4) sandy clay loam; moderate fine to medium subangular blocky; friable; many fine roots; many pores; abrupt smooth boundary.
Bt ₂	29 - 58	Dark red (2.5YR 3/4) sandy clay loam; moderate to strong subangular blocky; friable; common fine roots; many pores; clear smooth boundary.
Bt ₃	58 - 68	Dark red (2.5YR 3/6) sandy clay loam; moderate strong subangular blocky; slightly firm; few fine roots; common pores; clear smooth boundary.
Bt ₄	68 - 114	Dark red (2.5YR 3/6) sandy clay; moderate to strong medium subangular blocky; slightly firm; few fine roots; common pores; clear smooth boundary.
BC	114 - 180	Dark red (2.5YR 3/6) sandy clay; moderate to strong medium subangular blocky; firm; few roots; common pores.

SOIL MAPPING UNIT NO. 21b
 SOIL CLASSIFICATION: Aquic Haplustalf (USDA)
 Orthic Luvisol (FAO)
 SOIL PROFILE PIT NO. BN 21b - 01
 LOCATION: 2km east of Utonkon
 GEOLOGY PARENT MATERIAL: Shale
 TOPOGRAPHY/SLOPE: Nearly level plains, 0 - 2%
 VEGETATION/LAND USE: Grassland dominated by Pennisetum spp
 DRAINAGE: Imperfect to poorly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED:
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 10	Dark brown (7.5YR 4/2) sandy loam; weak subangular blocky; friable; abundant fine and medium roots; many fine to medium pores; clear smooth boundary.
AB	10 - 28	Dark brown (7.5YR 4/4) sandy loam; weak subangular blocky; friable; many fine and medium roots; many fine and medium pores; clear smooth boundary.
Bt ₁	28 - 58	Strong brown (7.5YR 5/6) sandy loam to loam; strong medium subangular blocky; firm; many fine and medium roots; many fine to medium pores; clear wavy boundary.
Bt _{2g}	58 - 109	Light brownish grey (10YR 6/2) sandy loam; strong medium subangular blocky; firm; few roots; common pores; clear wavy boundary.
BCg	109 - 160	Greyish brown (10YR 5/2) sandy clay; strong medium subangular blocky; very few roots; few medium pores

SOIL MAPPING UNIT NO.

21b

SOIL CLASSIFICATION:

Typic Paleustalf (USDA)

Orthic Luvisol (FAO)

SOIL PROFILE PIT NO.

BN 21b - 02

LOCATION:

Egga, 4km from Egga, Egga - Oturkpo road

GEOLOGY/PARENT MATERIAL:

Sandstone over shale

TOPOGRAPHY/SLOPE:

Nearly level plains, 0 - 2%

VEGETATION/LAND USE:

Secondary bush

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIBED:

13/10/83

DESCRIBED BY:

FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 23	Dark brown (7.5YR 4/4) sand; weak crumb; very friable; many medium to coarse roots; many fine pores; clear smooth boundary.
Bt ₁	23 - 44	Yellowish brown (5YR 4/6) sandy clay loam; moderate medium to coarse subangular blocky; firm; many medium and fine roots; many fine pores; clear smooth boundary.
Bt ₂	44 - 90	Yellowish red (5YR 5/8) clay loam; moderate fine medium to coarse subangular blocky; firm; many fine and medium roots; many fine and medium pores; gradual smooth boundary.
Bt ₃	90 - 128	Red (2.5YR 5/8) sandy clay; moderate medium to coarse subangular blocky; firm; common fine roots; common medium and large pores; diffuse smooth boundary.
Bt ₄	128 - 166	Yellowish red (5YR 5/8) sandy clay; moderate fine medium coarse subangular blocky; firm;

BC

166 - 190

common fine and medium roots; common medium and coarse pores; abrupt smooth boundary.

Reddish yellow (5YR 6/8) sandy clay, common distinct fine to medium light yellowish brown (10YR 6/4) mottles; moderate fine to medium angular blocky; firm; many fine roots; many fine pores.

SOIL MAPPING UNIT NO.

21b

SOIL CLASSIFICATION:

Typic Ustipsamment (USDA)

Eutric Regosol (FAO)

SOIL PROFILE PIT NO.

BN 21b - 03

LOCATION:

Dekina, 3km off the town, eastwards

GEOLOGY/PARENT MATERIAL:

Sandstones/shale

TOPOGRAPHY/SLOPE:

Undulating plains, 2 - 6%

VEGETATION/LAND USE:

Guinea Savanna

DRAINAGE:

Well drained

DEPTH TO WATER TABLE:

Below profile depth

DATE DESCRIBED:

24/6/83

DESCRIBED BY:

FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 22	Dark reddish brown (5YR 3/2) loamy sand; fine to medium single grained; loose; many fine medium and coarse roots; many pores; clear smooth boundary.
AC1	22 - 55	Dark reddish brown (2.5YR 3/4) loamy sand; fine to medium single grained; loose; many roots; many pores; clear smooth boundary.
AC2	55 - 87	Dark red (2.5YR 3/6) loamy sand; medium to coarse single grained; loose; common roots; many pores; clear smooth boundary.
C1	87 - 130	Red (10YR 4/8) loamy sand; medium to coarse single grained; loose; common roots; many pores; clear smooth boundary.
C2	130 - 170	Red (10YR 4/8) loamy sand; coarse single grained; loose; few roots; few pores; gradual smooth boundary.
C3	170 - 180	Red (10YR 4/8) loamy sand; coarse single grained; loose; few roots; few pores.

SOIL MAPPING UNIT NO. 21b
 SOIL CLASSIFICATION: Lithic Ustorthent (USDA)
 Lithosol (FAO)
 SOIL PROFILE PIT NO. BN 21b - 04
 LOCATION: Dekina
 GEOLOGY/PARENT MATERIAL: Sandstones/shale
 TOPOGRAPHY/SLOPE: Undulating plains, 2 - 6%
 VEGETATION/LAND USE: Guinea Savanna
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 24/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
A	0 - 15	Dark brown (7.5YR 3/2) fine sandy loam; weak crumb; very friable; many fine roots; many pores; clear smooth boundary.
AC	15 - 32	Dark brown (7.5YR 3/4) fine sandy loam; weak fine to medium subangular blocky; friable; many fine roots; many fine and medium pores; abrupt smooth boundary.
R	32 +	Paralitic contact - coarse ironstone and sandstone boulders with less than 5% sandy clay loamy material.

SOIL MAPPING UNIT NO. 21b
 SOIL CLASSIFICATION: Typic Paleustult (USDA)
 Orthic Acrisol (FAO)
 SOIL PROFILE PIT NO. BN 21b - 05
 LOCATION: Odugbo, 1km off the village
 GEOLOGY/PARENT MATERIAL: Sandstones/shale
 TOPOGRAPHY/SLOPE: Undulating plains, 2 - 6%
 VEGETATION/LAND USE: Fallow
 DRAINAGE: Well drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 23/6/83
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 29	Dark reddish brown (5YR 3/3) sandy loam weak crumb; friable; many fine and medium roots; many fine to medium pores; clear wavy boundary.
AB	29 - 62	Reddish brown (5YR 4/6) fine sandy loam; weak crumb; friable common fine to medium pores; gradual wavy boundary.
Bt ₁	62 - 82	Yellowish red (5YR 4/6) clay loam; weak moderate subangular blocky; firm common roots; many pores; gradual wavy boundary.
Bt ₂	82 - 117	Yellowish red (2.5YR 3/6) sandy clay loam; weak medium subangular blocky; firm; few roots; common pores; diffuse wavy boundary.
Bt ₃	117 - 160	Yellowish red (2.5YR 3/6) sandy clay loam; moderate fine to medium subangular blocky; firm; very few roots; common pores.

SOIL MAPPING UNIT NO. 24a
 SOIL CLASSIFICATION: Oxic Dystropept (USDA)
 Dystric Cambisol (FAO)
 SOIL PROFILE PIT NO. AN 24a - 01
 LOCATION: Maku
 GEOLOGY/PARENT MATERIAL: Shale and sandstone
 TOPOGRAPHY/SLOPE: Hilly, 13 - 15%
 VEGETATION/LAND USE: Secondary bush
 DRAINAGE: Imperfectly drained
 DEPTH TO WATER TABLE: Below profile depth
 DATE DESCRIBED: 17/3/82
 DESCRIBED BY: FDALR Staff

(All colours are for moist soils unless otherwise stated)

<u>Horizon</u>	<u>Depth (cm)</u>	<u>Description</u>
Ap	0 - 15	Yellowish red (5YR 5/6) sandy clay loam; weak fine subangular blocky; friable; common fine roots; common pores; clear wavy boundary.
B	15 - 47	Very gravelly clayey layers; dominated by medium to coarse indurated shale and ferruginised iron concretions and few iron stones; abundant indurated and weathering pieces of shale.
BC	47 - 143	Light brownish grey (2.5YR 6/2) clay; weak coarse angular blocky; firm; few ferruginised iron concretions; rare roots; common pores; diffuse wavy boundary.
C	143 - 180	Grey brown (2.5YR 5/2) clay; massive and firm; rare roots; rare pores.

APPENDIX 2.

SOIL PHYSICAL AND CHEMICAL DATA

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

2a
AN 2a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0-15	53	23	24	SCL
Bt1	15-43	45	25	30	CL
Bt2	43-85	34	28	38	CL
Bw1	85-113	72	12	16	SL
Bw2	113-136	77	11	12	SL
Bw3	136-180	88	4	8	LS

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.3	3.9	2.3	0.05	9.6
5.1	3.8	0.4	0.05	2.4
5.6	3.7	0.2	0.04	2.4
5.5	4.2	0.2	0.01	6.0
5.4	4.0	0.1	0.03	10.8
5.9	4.8	0.0	0.02	9.0

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
5.8	1.5	0.42	0.27	22.6	35
8.8	0.66	0.19	0.33	20.2	50
7.9	2.0	0.19	0.32	26.6	39
6.8	2.2	0.14	0.05	17.6	92
2.8	2.4	0.80	0.09	8	82
-	-	0.08	0.14	-	-

SOIL MAPPING UNIT NO: 9a
 SOIL PROFILE PIT NO: AN 9a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0-12	72	6	22	SCL
Bt1	12-50	64	77	29	SCL
Bt2	50-79	65	7	28	SCL
Bt3	79-103	65	4	31	SCL
BC	-	65	4	31	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.8	9.9	1.1	0.05	15.05
5.0	3.9	0.6	0.04	6.13
5.3	4.0	0.5	0.02	1.75
5.2	3.9	0.3	0.03	2.28
5.4	4.0	0.2	0.02	-

Exchangeable Cations			CEC	BS
Meq/100g Soil			Meq/100g Soil	%
Ca + Mg	K	Na		
1.23	.06	.08	3.15	44
0.32	.13	.07	3.05	17
0.48	.14	.09	4.30	17
0.56	.12	.07	2.98	25
0.88	.15	.06	2.07	53

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

9a
AN 9a - 02

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
A	0 - 11	34	7	59	C	
AB	11 - 32	22	21	57	C	
BA	32 - 53	21	12	67	C	
B	53 - 78	25	6	69	SC	
BC	78 - 115	25	7	68	SC	
C1	115 - 160	46	18	36		
C2	160 - 200	80	4	16		

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.1	3.8	0.2	.02	-
5.0	3.9	0.4	.04	0.88
4.9	3.8	0.5	.04	-
4.8	3.7	0.7	.07	2.80
4.8	3.7	0.8	.07	-
5.0	3.9	1.1	.08	0.88
5.3	4.0	0.6	.01	4.2

Exchangeable	Cations			CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca + Mg	K	Na			
0.82	0.13	.05	2.5	40	
0.93	0.20	.80	2.4	60	
2.64	0.38	.17	3.8	82	
2.32	0.34	.33	10.9	28	
2.36	0.33	.31	4.1	78	
4.40	0.32	0.3	8.99	56	
0.04	1.18	0.3	11.03	7	

SOIL MAPPING UNIT NO: 15d
 SOIL PROFILE PIT NO: AN 15d - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 14	25	45	30	CL
Bt1	14 - 40	13	33	54	C
Bt2	40 - 70	24	22	54	C
Bt3	70 - 105	42	16	42	C
Bt4	105 - 137	45	11	44	C
BC	137 - 182	10	12	78	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2	3.9	.81	.03	1.23
4.9	3.8	1.04	.04	-
4.8	3.8	.74	.02	-
5.5	3.7	.27	.02	.35
5	3	0.15	.01	-
4.9	X	.11	.01	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.05	1.95	.08	.02	4.17	50
.06	1.36	.09	.02	4.92	31
.03	1.07	.31	.06	7.67	19
.04	1.46	.22	.43	2.17	99
.06	1.74	.12	.16	2.75	76
.05	1.75	.26	.25	10.09	23

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

17a
AN 17a - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0-32	65	23	12	SL
Bt1	32-58.	58	30	15	SL
Bt2	58-102	57	28	15	SL
Bt3	102-150	55	27	18	SL
BC	150-200	53	26	21	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.5	4.3	.9	.04	-
5.7	4.4	.2	.01	1.75
5.8	4.0	.2	.02	-
4.7	3.8	.5	.03	-
5.0	3.7	.5	.02	6.65

Exchangeable	Cations		CEC	BS
Meq/100g Soil			Meq/100g Soil	%
Ca + Mg	K	Na		
0.79	.15	.05	2.14	46
0.79	.08	.04	1.65	55
0.79	.13	.10	1.26	80
0.64	.18	.07	1.72	52
1.08	.14	.06	2.52	51

SOIL MAPPING UNIT NO: 19a
 SOIL PROFILE PIT NO: AN 19a - 01

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 13	52	30	18	SL	
Bt1	13 - 29	21	25	54	C	
Bt2	29 - 65	15	18	62	C	
Bt3	65 - 97	25	10	66	C	
Bt4	97 - 125	19	16	65	C	
Btg1	125 - 161	17	19	64	C	
Btg2	161 - 182	15	22	63	C	

pH		OC	Total N	Available P
H ₂ O	KCl			
		%	%	ppm
5.5	4.1	2.9	.11	3.50
5.6	4.1	1.6	.05	1.05
5.3	4.1	.9	.02	.53
5.1	4.1	.6	.02	1.23
5.2	4.1	.5	.02	-
5.4	4	.35	.01	-
5.3	3.9	.38	-	1.23

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
1.29	2.75	.22	0.14	8.51	52
.17	1.75	.15	.06	5.59	38
.06	.94	.22	.06	5.00	26
.12	1.68	.11	.18	4.50	46
.05	.55	.29	.29	3.59	33
.06	.54	.11	.10	3.75	21
.04	.56	.26	.14	4.92	20

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

19a
AN 19a - 03

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 10	85	3	12		SL
Bt1	10 - 25	83	-	17		SL
Bt2	25 - 51	69	1	30		SCL
Bt3	51 - 97	57	12	31		SCL
Bt4	97 - 132	63	-	37		SC

pH		OC	Total N	Available P
H ₂ O	KCl			
5	4.2	1.4	.03	5.43
5.2	4.4	.7	.01	2.28
5.7	4.5	.7	.02	1.75
4.9	4.3	.4	.02	.88
4.7	3.7	.6	.01	1.93

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
.14	1.76	.10	.09	2.67	78
.09	1.72	.21	.12	2.92	72
.16	2.24	.23	.09	3.75	73
.14	2.40	.23	.11	3.91	74
.16	.5	.15	.01	2.09	39

SOIL MAPPING UNIT NO: 19b
 SOIL PROFILE PIT NO: AN 19b - 01

Horizon	Depth (cm)	Particle Size			Texture
		Sand	Silt	Clay	
Ap	0 - 4	51	29	20	L
Bt1	4 - 14	47	5	48	SC
Bt2	14 - 34	41	13	46	C
Bt3	34 - 73	38	14	48	C
Bt4	73 - 130	29	19	52	C
Bt5	130 - 160	23	19	58	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2	4.3	.6	.15	2.10
5.5	4.1	.1	.1	2.63
5.0	4.1	.6	.04	3.50
5.0	3.9	.4	.23	2.63
5.8	3.9	.1	.02	1.75
5.3	3.8	.1	.06	1.40

Exchangeable	Cations				CEC	BS
	Meq/100g Soil				Meq/100g Soil	%
<u>Ca</u>	<u>Mg</u>	<u>K</u>	<u>Na</u>			
2.7	2.0	.31	.07	8.0	46	
.20	1.82	.20	.03	11.80	19	
1.40	1.48	.36	.12	14.20	24	
.40	1.36	.37	.11	14.80	15	
.30	1.86	.33	.09	16.00	16	
1.20	2.24	.35	.10	17.40	22	

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

19b
AN 19b - 02

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 15	40	18	39		CL
A	15 - 30	38	19	43		C
BA	30 - 78	43	16	44		C
B	78 - 101	41	14	45		C
BC	101 - 140	61	17	21		SCL
C	140 - 173	59	22	29		SL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.40	3.90	0.3	.09	0.35
5.30	3.75	0.1	.15	Trace
5.20	3.90	0.4	.19	Trace
5.55	3.95	0.4	.16	0.70
5.60	4.00	0.5	.20	0.70
5.40	4.10	0.5	.17	Trace

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.20	0.68	0.17	0.10	8.60	13
0.20	0.68	0.19	1.17	8.60	25
0.20	0.52	0.29	0.22	8.00	14
0.50	0.54	0.29	1.17	8.60	31
0.20	0.60	0.23	0.24	7.40	17
0.20	1.08	0.27	0.26	3.40	55

SOIL MAPPING UNIT NO: 19c
 SOIL PROFILE PIT NO: AN 19c - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 18	88	6	6	S
AB	18 - 63	60	17	23	SCL
B	63 - 115	58	18	24	SCL
BC	115 - 180	60	20	20	SL-SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.4	5.6	0.7	0.04	3
4.4	3.9	0.3	0.04	2.4
4.7	3.9	0.2	0.03	3
4.95	3.95	0.1	0.03	2.4

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.43	0.88	0.28	0.78	3.6	66
1.75	2.8	0.20	0.22	49.3	10
1.23	1.23	0.25	0.10	28.6	9.8
1.10	2.10	0.25	0.26	17.9	100

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

19c
AN 19c - 02

Horizon	Depth (cm)	Particle	Size Analysis			Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 38	19	4	5	S	
A	38 - 74	87	7	6	S	
Bt1	74 - 104	71	13	16	SL	
Bt2	140 - 150	48	24	28	SCL	
Bt3	150 - 180	53	20	28	SCL	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.6	4.94	0.6	0.05	8
5.4	4.4	0.0	0.02	3
5.3	4.1	0.0	0.03	2
5.2	4.0	0.3	0.03	2
5.0	4.2	0.3	0.04	2

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.17	0.23	0.19	0.24	3.8	22
1.93	0.18	0.26	0.28	4.6	57
1.58	1.40	0.38	0.22	9.7	37
2.3	1.8	0.24	0.10	46.3	10
3.0	0.7	0.23	0.30	42.	10

SOIL MAPPING UNIT NO: 21a
 SOIL PROFILE PIT NO: AN 21a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 6	43	28	29	CL
AB	6 - 15	43	22	35	CL
Bt1	15 - 25	27	26	47	C
Bt2	25 - 54	19	22	59	C
Bt3	54 - 102	29	16	55	C
Btg1	102 - 130	31	14	55	C
BCg	130 - 160	14	15	71	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2	4.1	2.4	.08	1.23
5.4	3.8	2.4	.08	1.23
5.2	3.8	2.1	-	.88
5.2	3.8	1.3	.08	1.23
5.2	3.7	.3	.02	.88
4.9	3.7	.15	.06	.00
5.1	3.4	.34	.02	.88

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.17	3.90	.16	.13	7.20	61
.13	2.87	.37	.18	6.59	53
.14	2.8	.43	.11	6.55	53
.14	1.06	.35	.17	6.51	26
.16	2.82	.32	.22	9.5	37
.60	1.00	.09	.21	7.92	24
.60	7.30	.10	.20	40.51	22

SOIL MAPPING UNIT NO: 21a
 SOIL PROFILE PIT NO: AN 21a - 02

Horizon	Depth (cm)	Particle	Analysis			Texture
			%			
		Sand	Silt	Clay		
Ap	0-4	66	19	15	SL	
A	4-15	65	18	18	SL	
Bt1	15-29	34	16	50	C	
Bt2	29-50	32	13	50	C	
Bt3	50-80	26	17	57	C	
Bt4	80-109	33	15	52	C	
Btg1	109-165	18	11	71	C	
Btg2	165-185	42	9	49	C	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2	4.3	2.0	.09	1.58
5.5	4.3	1.7	.06	1.05
5.3	4.0	1.5	.06	0.70
5.1	3.9	0.8	.04	0.35
5.3	3.9	0.3	.03	Trace
5.2	3.7	0.5	.02	Trace
5.2	3.7	0.4	.20	Trace
5.2	3.7	0.1	.02	C

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
3.69	3.50	0.56	.23	10.60	76
3.29	2.59	0.46	.25	92.80	52
1.30	1.75	0.36	.27	32.40	13
0.70	0.81	0.36	.37	25.20	9
0.40	0.68	0.31	.26	66.00	3
0.20	0.61	0.26	.21	40.00	3
0.20	0.61	0.26	.21	40.00	3
0.90	0.81	0.36	.06	52.00	4

SOIL MAPPING UNIT NO: 21b
 SOIL PROFILE PIT NO: AN 21b-01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0-6	82	2	16	SL
Bt1	6-29	77	1	22	SCL
Bt1	29-58	77	1	22	SCL
Bt2	58-68	63	3	34	SCL
Bt3	68-90	57	1	42	SC
Bt4	90-114	59	3	38	SC
BC	114-180	49	1	50	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.0	4.1	1.9	.15	3.50
5	4.2	1.4	.12	2.80
5	4.2	1.2	.09	2.50
5.1	4.3	0.8	.06	1.93
5.1	4.3	0.3	.05	1.93
5.2	4.6	0.4	.04	1.05
5.1	4.5	0.3	.04	0.70

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.10	.20	.26	.07	7.55	8
.16	.40	.23	.09	8.60	10
.40	.20	.26	.07	5.61	10
.08	.40	.07	.06	6.84	9
.07	.25	.06	.08	8.93	5
.16	.40	.07	.10	7.60	10
.04	1.06	.07	.34	3.40	44

SOIL MAPPING UNIT NO: 24a
 SOIL PROFILE PIT NO: AN 24a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 -15	45	28	28	SCL
B	15-47	24	28	48	C
BC	47-143	30	28	42	C
C	14-180	25	29	44	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.0	4.2	2.7	.21	66
5.6	4.9	.8	.10	Nil
5.1	4.3	.3	.04	Nil
5.1	4.0	.3	.03	24

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.48	5.25	0.92	2.8	24	48
8.23	5.43	1.51	0.54	34	46
7.0	4.7	0.43	0.07	18	68
7.2	7.3	0.47	0.35	35	44

SOIL MAPPING UNIT NO: 2a
 SOIL PROFILE PIT NO: BN 2a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0-12	30	59	11	SiL
A	12-24	25	59	16	SiL
AC	24-35	27	57	16	SiL
C13	35-65	40	28	32	CL
C24	65-90	32	338	35	CL
C35	90-121	63	15	22	SCL

pH	OC	Total N	Available P
H ₂ O	%	%	ppm
5.3	0.87	0.07	6.3
5.7	0.79	0.05	2.6
5.2	0.40	0.05	1.0
6.0	0.40	0.03	1.3
5.9	0.40	0.02	1.1
5.9	0.34	0.02	1.1

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
4.70	3.65	2.15	1.87	12.77	97
4.90	4.10	0.46	1.29	11.15	96
8.00	6.68	0.77	1.26	17.31	97
8.50	6.12	0.25	1.04	16.51	96
9.50	6.50	0.22	1.48	10.1	96
9.50	6.84	0.23	1.65	18.62	98

OIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

2a
BN 2a - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0-27	49	41	10	L
AB	27-55	58	28	14	SL
B	55-72	71	15	14	SL
BC	72-81	77	11	12	SL
C	81-109	54	35	11	SL

pH	OC	Total N	Available P
H ₂ O	%	%	ppm
5.5	1.15	0.10	11.6
5.3	0.67	0.05	10.0
5.1	0.20	0.03	9.7
5.4	0.28	0.02	9.7
5.7	0.20	0.02	9.7

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
8.00	3.03	0.46	0.16	12.85	91
4.40	2.61	0.25	0.18	8.24	90
4.30	1.45	0.72	0.78	7.65	95
3.00	1.78	0.25	0.28	5.51	96
3.60	2.80	0.23	0.22	7.25	95

SOIL MAPPING UNIT NO: 15d
 SOIL PROFILE PIT NO: BN 15d - 01

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
Ap	0-21	60	16	24		SCL
Bt ₁	21-55	56	4	40		SC
Bt ₂	55-79	56	4	40		SC
BC	79-130	66	8	26		SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.0	5.3	2.33	0.10	2.0
5.3	4.0	1.45	0.05	-
5.1	4.0	0.67	0.03	-
5.1	4.2	0.36	0.03	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
4.7	2.1	0.36	0.28	11.5	65
0.7	1.1	0.33	0.13	7.5	30
1.4	1.0	0.47	0.31	8.0	40
1.1	1.5	0.52	0.22	8.5	39

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

15d
BN 15d - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0-10	53	25	22	SCL
AB	10-30	29	21	50	C
B	30-65	35	11	54	C
BC	65-120	62	8	30	SCL
C	120-180	72	9	19	SL

pH	OC	Total N	Available P
H ₂ O	%	%	ppm
5.9	3.18	0.17	3.2
5.1	1.81	0.13	1.2
5.1	1.17	0.09	0.6
4.8	0.90	0.07	1.9
4.9	0.8	0.05	1.41

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
12.00	7.10	0.97	0.14	20.61	98
2.05	3.75	1.13	0.27	11.00	66
1.50	2.13	0.92	0.32	11.07	44
1.25	1.16	1.20	1.09	8.10	58
1.05	1.25	2.02	1.26	8.78	64

SOIL MAPPING UNIT NO: 15d
 SOIL PROFILE PIT NO: BN 15d - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0-13	80	12	8	SL
AB	13-25	78	12	10	SL
BA	25-43	52	12	14	SL
2B	43-65	52	8	40	SC
2BC	65-115	52	8	40	SC
2BC	115-160	52	8	40	SC
2C	160-180	32	10	58	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.7	6.1	2.33	0.17	9.0
6.8	6.0	0.57	0.04	2.0
6.5	5.7	0.57	0.04	2.0
5.6	4.6	0.72	0.06	2.0
5.3	4.3	0.47	0.05	2.0
5.1	4.2	0.26	0.04	2.0
4.9	3.7	-	-	2.5

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
8.4	2.6	0.52	0.18	12.5	94
3.5	1.0	0.33	0.14	5.0	99
3.4	1.4	0.47	0.18	6.0	91
4.0	3.6	0.54	0.17	12.5	66
3.3	2.4	0.54	0.20	13.0	50
4.4	2.6	0.53	0.27	13.5	58
5.2	5.2	0.56	0.42	28.5	40

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

15d
BN 15d - 04

Horizon	Depth (cm)	Particle	Size Analysis			Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 16	75	1	24	SCL	
AB	16 - 65	66	7	27	SCL	
B	55 - 82	58	5	37	SC	
BC	82 - 108	51	3	46	SC	

pH	OC	Total N	Available P
H ₂ O	%	%	ppm
5.6	1.14	0.07	2.9
5.1	0.64	0.04	2.4
4.7	0.60	0.03	1.8
5.0	0.24	0.03	1.3

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.30	0.50	0.41	0.36	2.37	66
0.20	0.10	0.19	0.06	1.75	31
0.50	0.34	0.84	0.24	2.72	71
0.20	0.11	0.22	0.07	1.42	43

SOIL MAPPING UNIT NO: 15d
 SOIL PROFILE PIT NO: BN 15d - 05

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 33	66	27	7	SL
Bt ₁	33 - 50	66	17	17	SL
Bt ₂	50 - 120	40	19	41	C
Bt ₃	120 - 180	51	15	34	SCL

pH	OC	Total N	Available P
H ₂ O	%	%	ppm
5.7	0.71	0.05	2.8
5.8	0.67	0.06	2.6
5.3	0.67	0.06	0.5
6.0	0.31	0.03	0.4

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.90	1.02	0.72	0.16	5.20	92
2.60	2.78	0.54	0.14	6.41	94
1.25	0.88	0.54	0.14	5.94	53
1.80	15.2	0.82	0.14	5.28	81

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

15d
BN 15d - 06

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0-20	92	3	5	S
AB	20-58	90	3	7	S
BA	5-102	89	7	4	S
B	102-140	74	7	19	SL
BC	140-180	79	5	16	SL

pH	OC	Total N	Available P
	%	%	ppm
6.2	0.96	0.05	21.1
5.1	0.47	0.03	19.3
5.8	0.23	0.02	16.7
5.0	0.81	0.03	25.1
4.0	0.81	0.07	24.4

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
1.35	0.53	0.20	0.06	2.54	84
1.00	0.54	0.41	0.18	2.43	92
0.50	0.33	0.19	0.26	1.88	61
1.20	0.08	0.87	0.22	3.97	85
1.20	0.67	0.77	0.31	3.55	83

SOIL MAPPING UNIT NO: 15d
 SOIL PROFILE PIT NO: BN 15d - 08

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0-10	50	41	9	L
AB	10-29	37	57	6	SiL
Bt ₁	29-50	53	31	16	SL
Bt ₂	50-121	45	15	40	SC
Bt ₃	121-180	58	10	32	SCL

pH	OC	Total N	Available P
	%	%	ppm
6.2	1.16	0.09	9.0
5.8	0.62	0.05	4.8
5.7	0.29	0.04	3.7
6.1	0.27	0.04	3.6
5.4	0.25	0.03	1.9

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
4.5	1.29	0.61	0.10	6.55	94
3.90	1.84	0.49	0.18	7.21	89
2.40	0.98	0.66	0.27	4.71	92
3.00	1.51	0.43	0.34	6.48	82
1.95	2.00	0.66	0.26	5.27	92

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

15d
BN 15d - 09

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
Ap	0-15	80	10	10		LS-SL
2B ₁	15-35	34	6	60		C
2B ₂	35-54	28	10	62		C
2BC ₁	54-107	28	10	62		C
2BC ₂	107-138	28	10	62		C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
7.0	6.3	1.66	0.07	2.0
5.8	4.9	1.29	0.06	2.0
5.3	4.6	0.72	0.06	2.0
5.8	4.6	0.47	0.05	2.0
5.7	4.3	0.31	0.03	2.0

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
3.9	2.1	0.52	0.33	7.5	91
3.7	2.7	0.55	0.31	11.0	66
3.6	2.1	0.52	0.21	13.0	49
2.5	1.5	0.54	0.41	11.0	45
2.0	1.4	0.53	0.36	11.0	39

SOIL MAPPING UNIT NO: 15d
 SOIL PROFILE PIT NO: BN 15d - 11

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0-15	34	42	14	L
AB	15-30	36	29	35	CL
2B	30-55	48	17	35	SCL
2B ₂	55-102	54	15	31	SCL
2C	102-180	54	15	37	SCL

pH		OC	Total N	Available P
H ₂ O		%	%	ppm
5.9		3.18	0.02	2.9
6.0		1.95	0.26	1.61
5.2		1.80	0.21	0.3
5.4		0.87	0.20	0.2
5.5		0.48	0.12	0.2

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
12.00	7.00	1.30	0.27	20.97	98
9.00	5.21	0.66	0.14	15.81	95
2.00	2.16	1.18	0.28	11.42	49
1.40	2.29	0.69	0.13	11.11	41
1.60	3.63	0.64	0.16	9.83	61

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

15d
BN 15d -13

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0-19	90	6	4	S
AB	19-30	88	8	4	S
BA	30-60	88	6	6	LS
2B ₁	60-115	52	2	46	SC
2B ₂	115-150	48	6	46	SC
2BC	150-180	48	6	46	SC
2C	180-200	48	6	46	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.4	5.7	0.66	1.14	10.0
6.8	6.0	0.30	0.52	5.0
6.2	5.4	0.24	0.41	5.0
5.0	4.0	0.18	0.31	17.0
5.0	4.1	0.18	0.31	14.0
5.5	4.5	0.18	0.31	7.0
5.8	5.1	0.31	0.03	3.5

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
3.2	1.3	0.26	0.05	6.0	80
1.9	0.6	0.54	0.31	5.0	61
1.3	0.7	0.26	0.10	4.0	59
3.8	1.6	0.26	0.11	11.0	53
4.1	1.6	0.33	0.23	9.0	70
3.8	1.4	0.34	0.23	7.5	77
3.9	1.3	0.52	0.30	7.5	80

SOIL MAPPING UNIT NO: 15d
 SOIL PROFILE PIT NO: BN 15d - 15

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 25	80	16	4	LS
A	25 - 45	80	14	6	LS
Bt ₁	45 - 69	64	18	18	SL
Bt ₂	69 - 112	58	4	38	SC
Bt ₃	112 - 151	52	4	44	SC
BC	151 - 189	52	4	44	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.2	5.4	0.04	0.04	2.5
6.2	5.5	0.47	0.03	2.0
5.8	5.1	0.31	0.03	2.0
5.7	5.0	0.47	0.05	2.0
6.1	5.3	0.41	0.04	2.5
6.1	5.4	0.31	0.03	2.0

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.3	0.7	0.26	0.15	4.0	85
1.9	0.3	0.35	0.17	3.0	91
2.8	0.4	0.26	0.18	4.0	91
3.5	2.4	0.28	0.20	7.5	85
4.3	1.9	0.36	0.19	9.0	75
3.5	2.0	0.35	0.18	6.0	80

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

15d
BN 15d - 17

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0-15	56	16	28	SCL
Bt ₁	15-36	40	16	44	C
Bt ₂	36-90	38	14	48	C
Bt ₃	90-131	32	16	52	C
Bt ₄	131-152	32	16	52	C
BC	152-180	32	16	52	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.4	4.5	6.41	0.28	7.0
5.0	4.0	1.60	0.08	-
5.0	4.0	0.83	0.06	-
5.3	4.1	0.57	0.04	-
5.3	4.0	0.36	0.04	-
4.9	3.8	0.31	0.04	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
6.0	3.0	0.53	0.39	23.5	42
0.9	0.7	0.51	0.40	11.0	22
1.2	1.0	0.55	0.33	9.0	34
2.1	1.2	0.55	0.38	10.0	42
2.8	1.8	0.54	0.38	13.5	41
1.1	3.3	0.52	0.30	14.0	37

SOIL MAPPING UNIT NO: 17a
 SOIL PROFILE PIT NO: BN 17a - 04

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0-10	51	21	28	SCL SCL C SC SCL
BA	10-27	54	19	27	
B	27-54	36	14	50	
BC	54-80	50	8	42	
R	-- 80+	60	13	27	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.1		3.69	0.28	10.1
5.7		1.52	0.15	1.6
5.2		1.29	0.31	0.9
5.0		0.79	0.07	0.6
5.6		0.64	0.04	0.3

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
10.50	6.57	1.23	0.25	20.55	90
4.25	3.40	0.79	0.11	8.95	96
3.25	2.14	0.61	0.10	6.50	94
1.90	1.03	0.56	0.34	4.43	87
0.90	0.60	0.51	0.08	3.29	64

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

17a
BN 17a - 06

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A1	0-11	54	29	17	SL
AB	11-45	158	18	24	SCL
BA	45-77	80	3	17	SL
B	77-112	50	14	36	SCL
BC	112-180	34	19	47	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.3		2.08	0.16	8.4
5.4		1.11	0.09	1.4
5.8		0.87	0.08	0.6
5.5		0.70	0.06	0.13
5.7		0.48	0.05	0.2

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
1.60	1.41	1.25	0.15	5.01	88
0.50	0.73	0.46	0.19	2.98	63
0.40	0.15	0.54	0.11	2.20	55
0.50	0.46	0.07	0.17	3.00	40
0.70	0.23	1.02	0.17	2.72	78

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

17a
BN 17a - 08

Horizon	Depth (cm)	Particle Size	Analysis	Texture	
		%			
		Sand	Silt	Clay	
A1	0-20	54	30	16	SCL
B _{Ag}	20-30	52	28	20	SL
B _g	30-51	56	28	28	CL
BC _g	51-83	36	24	40	CL
C _{1g}	83-133	34	18	48	C
C _{2g}	133-180	34	18	48	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.6	4.8	2.07	0.19	-
5.5	4.4	1.03	0.09	-
5.3	4.3	0.78	0.06	-
5.4	4.4	0.62	0.05	-
5.7	4.7	0.36	0.04	-
5.6	4.8	0.26	0.03	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
5.8	1.3	0.40	0.27	9.0	86
4.5	0.8	0.26	0.23	6.0	97
5.3	1.5	0.24	0.22	10.5	69
7.6	2.0	0.21	0.23	11.5	87
8.0	4.5	0.30	0.26	16.0	82
6.5	1.5	0.31	0.30	20.0	43

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

17a
BN 17a - 09

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0 - 16	80	14	6	LS
AC	16 - 25	80	14	6	LS
C	25 - 47	72	10	18	SL
R	47 +	60	16	24	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.4	5.8	1.34	0.06	-
5.8	4.9	0.67	0.04	-
5.5	4.5	0.72	0.05	-
5.1	4.1	0.62	0.05	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
3.2	1.4	0.47	0.20	6.5	81
1.4	0.7	0.34	0.29	3.0	91
1.6	1.2	0.54	0.42	5.5	68
2.0	1.4	0.55	0.32	7.0	61

SOIL MAPPING UNIT NO: 17a
 SOIL PROFILE PIT NO: BN 17a - 11

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
Ap	0-25	82	6	12	LS	
2Bt ₁	25-46	68	4	28	SCL	
2Bt ₂	46-70	56	6	38	SC	
2Bt ₃	70-105	56	6	38	SC	
2Bt ₄	105-145	54	6	40	SC	
2BC	145-182	50	8	42	SC	

pH		OC	Total N	Available P
H ₂ O	KCl			
		%	%	ppm
6.7	5.8	0.98	0.05	3.5
5.3	4.4	0.88	0.06	2.0
5.3	4.4	0.67	0.05	2.0
5.6	5.0	0.52	0.05	2.0
5.5	4.9	0.41	0.03	2.0
6.0	5.0	0.26	0.03	2.0

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
2.5	1.7	0.51	0.30	6.5	76
3.0	2.5	0.31	0.18	9.0	67
4.0	2.7	0.26	0.19	10.5	68
3.6	2.6	0.50	0.39	10.5	68
3.3	3.6	0.46	0.26	10.0	76
4.5	5.7	0.52	0.41	14.5	77

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

17a
BN 17a - 12

Horizon	Depth (cm)	Particle	Size Analysis			Texture
			%			
		Sand	Silt	Clay		
A	0 - 17	76	14	10	SL	
AB	17 - 28	56	26	28	SL	
Bt ₁	28 - 43	52	18	30	SCL	
Bt ₂	43 - 65	46	14	40	SC	
Bt ₃	65 - 90	46	14	40	SC	
BC	90 - 170	46	14	40	SC	

pH		OC	Total N	Available P
H ₂ O	KCl			
6.6	5.9	0.98	0.06	-
6.2	5.3	0.93	0.06	-
5.5	4.3	0.88	0.05	-
5.0	3.8	0.52	0.06	-
5.3	4.0	0.36	0.05	-
5.6	3.8	0.21	0.04	-

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
4.1	6.1	0.51	0.17	11.0	99
0.8	1.6	0.42	0.19	4.5	67
3.3	1.6	0.51	0.17	8.0	70
2.0	1.9	0.51	0.19	8.5	54
2.5	1.7	0.47	0.18	9.0	54
3.6	2.2	0.54	0.35	9.0	74
8.6	7.6	0.50	0.41	21.0	81

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

17a
BN 17a - 13

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
A ₁	0 - 19	72	28	10	SL	
B	19 - 31	54	16	30	SCL	
BC	31 - 182	48	12	40	SC	
pH		OC	Total N	Available P		
H ₂ O	KCl	%	%	ppm		
6.1	5.4	1.24	0.06	-		
5.5	4.0	1.03	0.06	-		
5.6	4.0	0.98	0.06	-		
Exchangeable		Cations		CEC	BS	
Meq/100g Soil				Meq/100g Soil	%	
Ca	Mg	K	Na			
3.6	1.5	0.52	0.26	9.0	65	
2.5	2.8	0.54	0.36	8.5	73	
1.5	1.8	0.55	0.45	12.0	37	

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

17a
BN 17a - 14

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 26	68	16	16	SL	
Bt ₁	26 - 40	58	10	32	SCL	
Bt ₂	40 - 70	38	12	50	C	
Bt ₃	70 - 110	36	12	32	C	
Bt ₄	110 - 151	56	12	32	SCL	
BC	151 - 180	36	12	52	C	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.2	5.7	2.17	0.09	-
5.5	4.7	1.14	0.06	2.0
4.8	4.0	0.76	0.06	2.0
4.7	3.9	0.57	0.05	2.0
4.6	3.8	0.41	0.05	2.0
4.6	3.8	0.36	0.04	2.0

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
6.9	2.1	0.52	0.20	12.5	78
3.7	2.2	0.44	0.26	7.5	88
2.8	2.2	0.37	0.18	15.5	36
1.2	1.7	0.47	0.26	12.5	29
1.5	1.2	0.52	0.34	15.0	24
1.0	3.2	0.36	0.16	14.0	34

SOIL MAPPING UNIT NO: 17b
 SOIL PROFILE PIT NO: BN 17b - 01

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
A	0 - 15	91	5	4		S
AB	15 - 75	87	3	10		LS
B	75 - 128	78	5	17		SL
BC	128 - 200	74	3	23		SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.7	-	1.51	0.07	9.0
4.3	-	1.47	0.05	3.9
6.0	-	0.72	0.05	3.9
5.6	-	0.35	0.05	3.9

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.85	1.14	0.51	0.09	3.06	94
0.07	0.58	0.56	0.16	3.20	63
0.20	0.08	0.56	0.14	1.17	84
0.50	0.45	0.15	0.12	2.58	47

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

17b
BN 17b - 03

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
A	0 - 22	86	10	4	LS	
AB	22 - 40	80	8	12	SL	
Bt ₁	40 - 70	74	10	26	SCL	
Bt ₂	70 - 103	52	8	40	SC	
Bt ₃	103 - 137	50	8	42	SC	
Bt ₄	137 - 165	50	8	42	SC	

pH		OC	Total N	Available P
H ₂ O	KCl			
6.5	6.1	1.09	0.05	14.0
6.3	5.6	0.41	0.03	5.0
6.1	5.1	0.41	0.03	3.5
6.0	5.2	0.26	0.03	2.5
6.1	5.6	0.26	0.05	-
6.2	5.6	0.26	0.03	-

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
2.3	2.1	0.46	0.15	6.0	83
2.7	0.6	0.42	0.16	4.5	87
2.5	2.2	0.43	0.07	7.0	74
4.3	1.7	0.40	0.18	12.0	55
3.5	1.9	0.52	0.42	10.0	63
3.4	1.9	0.19	0.44	7.5	79

SOIL MAPPING UNIT NO: 17b
 SOIL PROFILE PIT NO: BN 17b - 05

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
A1	0 - 15	90	5	5		S
AB	15 - 46	88	2	10		LS
BA	46 - 95	82	7	11		LS
B	95 - 155	75	1	24		SCL
BC	155 - 180	67	7	27		SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.5	-	4.7	0.25	13.2
5.4	-	1.03	0.13	6.0
4.5	-	0.92	0.11	4.5
4.3	-	0.51	0.04	3.2
4.4	-	0.40	0.04	3.2

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
3.05	1.92	1.33	0.17	7.67	84
0.95	0.79	0.41	3.10	3.10	74
1.10	0.52	0.66	0.40	3.48	77
0.70	0.40	1.07	0.04	3.81	58
0.70	0.19	1.28	1.04	3.81	81

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

17b
BN 17b - 07

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A1	0 - 17	86	12	2	LS
BA _g	17 - 41	76	12	12	SL
B _g	41 - 80	40	16	44	C
BC	80 - 126	40	14	46	C
C _g	126 - 180	40	12	48	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.5	6.1	0.78	0.04	1.0
5.7	5.2	0.67	0.04	-
5.0	4.3	0.47	0.04	-
5.2	4.5	0.31	0.03	-
5.2	4.2	0.21	0.02	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
3.1	0.7	0.19	0.19	5.0	80
2.3	0.8	0.22	0.19	4.0	88
4.6	1.6	0.25	0.21	11.0	61
5.9	2.5	0.27	0.22	12.0	74
7.9	3.3	0.27	0.26	14.5	81

SOIL MAPPING UNIT NO: 17b
 SOIL PROFILE PIT NO: BN 17b - 10

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 25	64	22	14	SCL
Bt ₁	25 - 70	50	10	40	SC
Bt ₂	70 - 90	40	14	46	C
Bt ₃	90 - 127	36	16	48	C
Bt ₄	127 - 170	36	16	48	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.7	5.0	1.34	0.06	2.0
4.9	4.0	0.88	0.06	-
4.8	3.8	0.67	0.06	-
4.8	2.8	0.52	0.05	-
4.5	3.7	0.36	0.04	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
3.0	1.7	0.30	0.08	7.0	73
1.7	1.0	0.43	0.33	11.5	30
2.0	1.1	0.45	0.30	15.5	25
2.6	0.5	0.36	0.13	15.0	24
2.2	1.6	0.54	0.21	17.5	26

SOIL MAPPING UNIT NO: 17b
 SOIL PROFILE PIT NO: BN 17b - 16

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 20	90	8	2		S
AB	20 - 44	88	8	4		S
BA	44 - 66	90	8	2		S
IIB	66 - 109	56	6	36		SC
IIBC	109 - 147	52	4	44		SC
IIC	147 - 184	50	6	44		SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.3	5.8	0.62	0.03	-
6.0	5.6	0.36	0.02	-
5.6	5.2	0.21	0.02	-
5.4	4.5	0.47	0.05	-
5.2	4.1	0.36	0.04	-
5.2	4.2	0.21	0.03	-

Exchangeable				Cations	CEC	BS
Meq/100g Soil					Meq/100g Soil	%
Ca	Mg	K	Na			
2.3	0.7	0.19	0.17		4.5	75
1.3	0.4	0.10	0.17		4.0	49
0.9	0.2	0.12	0.17		3.0	46
3.4	1.6	0.27	0.19		8.5	64
3.1	2.0	0.37	0.21		10.5	54
3.3	1.6	0.39	0.20		9.5	58

SOIL MAPPING UNIT NO: 18d
 SOIL PROFILE PIT NO: BN 18d - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A1	0 - 18	80	10	10	LS
AC	10 - 30	86	8	6	LS
pH		OC	Total N	Available P	
H ₂ O		%	%	ppm	
5.9		0.62	0.04	-	
6.3		1.66	0.07	3.5	
Exchangeable Cations		CEC		BS	
Meq/100g Soil		Meq/100g Soil		%	
Ca	Mg	K	Na		
0.9	0.9	0.19	0.20		88
3.5	0.4	0.32	0.22		81

SOIL MAPPING UNIT NO: 18d
 SOIL PROFILE PIT NO: BN 18d - 02

Horizon	Depth (cm)	Particle Size	Analysis	Texture	
		%			
		Sand	Silt	Clay	
Ap	0 - 11	84	10	6	LS
Bt ₁	11 - 37	74	6	20	SL
Bt ₂	37 - 71	60	10	30	SCL
Bt ₃	71 - 118	52	10	38	SC
BC	118 - 144	56	12	32	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.2	5.7	0.898	0.04	
5.4	4.4	0.72	0.04	
5.2	4.4	0.52	0.04	
4.9	4.2	0.41	0.03	
4.9	4.3	0.31	0.03	

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.0	1.0	0.21	0.23	4.5	76
1.4	0.9	0.24	0.17	3.5	77
1.7	0.0	0.19	0.19	4.5	46
0.9	1.5	0.22	0.17	4.0	69
1.4	1.0	0.21	0.21	5.0	56

SOIL MAPPING UNIT NO: 18d
 SOIL PROFILE PIT NO: BN 18d - 03

Horizon	Depth (cm)	Particle Size	Analysis	Texture	
		%			
		Sand	Silt	Clay	
A1	0 - 12	74	10	16	SL
B	12 - 28	56	4	40	SC
BC	28 - 180	40	8	52	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.2	5.6	2.07	0.09	2.0
5.2	4.5	1.46	0.04	-
6.1	5.5	0.52	0.04	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.0	3.2	0.22	0.24	5.5	81
1.7	1.5	0.27	0.29	6.5	58
3.1	0.4	0.45	0.28	7.0	60

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

19a
BN 19a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 30	92	4	4	S
AB	30 - 67	86	4	20	LS
Bt ₁	67 - 100	66	8	26	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
7.0	6.5	1.14	0.06	3.5
5.3	3.9	0.41	0.03	-
5.5	4.0	0.26	0.03	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
5.4	1.1	0.48	0.18	7.5	95
2.5	1.0	0.18	0.16	4.5	85
9.6	3.5	0.30	0.30	14.5	94

N.N Bt₂ and Bt₃ present on the soil description sheet are missing on this sheet

SOIL MAPPING UNIT NO: 19a
 SOIL PROFILE PIT NO: BN 19a - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A1	0 - 13	55	33	12	SL
Bt1	13 - 38	44	25	31	SCL-CL
Bt2	38 - 79	46	15	39	SC
Bt3	79 - 120	54	20	26	CL
BC	120 - 153	42	27	31	CL
C	153 - 180	48	21	21	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.6		2.22	0.09	12.9
5.4		0.67	0.07	1.8
5.4		0.55	0.05	0.6
5.6		0.39	0.04	0.6
5.5		0.32	0.04	0.2
5.7		0.27	0.02	0.13

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
5.00	5.99	1.02	0.27	12.48	98
1.70	3.33	1.07	0.34	6.84	94
2.50	2.87	1.02	0.12	6.91	94
2.30	4.32	0.82	0.17	8.10	95
2.75	6.03	0.84	0.28	10.10	98
2.25	6.10	0.56	0.15	9.26	98

SOIL MAPPING UNIT NO: 19a
 SOIL PROFILE PIT NO: BN 19a - 04

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A1	0 - 11	60	15	27	SL
AB	15 - 43	80	9	11	SL
BA	43 - 83	76	9	15	SL
B	83 - 115	81	4	15	SL
BC	115 - 148	80	5	15	SL
IIC	148 - 195	84	2	14	LS

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.1		1.65	0.08	10.5
4.8		0.64	0.03	4.0
4.4		0.24	0.04	3.8
5.4		0.16	0.03	3.1
4.6		0.16	0.03	3.2
5.6		0.16	0.02	1.3

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.50	0.26	0.77	3.27	3.27	51
0.40	0.09	0.09	0.54	0.20	61
6.00	0.09	1.64	0.36	10.5	77
0.60	0.09	0.12	0.04	1.45	59
0.60	0.57	1.33	1.13	4.23	86
0.10	0.38	0.77	0.04	2.04	63

SOIL MAPPING UNIT NO: 19a
 SOIL PROFILE PIT NO: BN 19a - 05

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A1	0 - 15	90	3	7	S
BA	15 - 41	85	1	14	LS
Bt ₁	41 - 82	64	9	27	SCL
Bt ₂	82 - 103	55	5	40	SC
Bt ₃	103 - 150	58	5	37	SL
IIBC	150 - 180	67	13	20	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.3		2.52	0.17	7.7
5.1		0.84	0.06	3.2
5.5		0.79	0.05	0.64
4.6		0.48	0.04	1.50
4.2		0.21	0.02	1.0
				0.3

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.60	1.32	0.51	0.07	4.90	92
0.40	0.29	0.24	0.05	1.49	66
0.25	0.21	0.20	0.10	1.76	43
0.80	0.14	0.43	0.17	2.54	61
0.40	0.09	0.18	0.07	1.74	43
1.40	0.75	6.35	2.35	11.2	96

SOIL MAPPING UNIT NO: 19a
 SOIL PROFILE PIT NO: BN 19a - 06

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A1	0 - 13	80	8	12	SL
BA	13 - 30	68	10	22	SCL
Bt ₁	30 - 45	54	6	40	SC
Bt ₂	45 - 65	46	10	44	SC
Bt ₃	65 - 85	40	10	50	C
BC	85 - 145	40	10	50	C
C	145 - 180	32	8	60	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.9	5.0	2.12	0.08	
5.4	4.6	1.40	0.08	
5.2	4.2	1.40	0.11	
5.2	4.2	1.09	0.09	
5.1	4.1	0.93	0.07	
4.7	3.8	0.41	0.05	
4.7	3.7	0.26	0.04	

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
5.2	2.8	0.55	0.24	12.0	73
4.3	3.9	0.53	0.22	13.0	69
16.0	8.0	0.54	0.24	29.0	85
4.3	6.8	0.55	0.42	24.6	49
5.1	7.9	0.56	0.39	26.0	54
7.0	15.6	0.50	0.29	34.5	68
13.4	12.4	0.52	0.35	36.0	74

SOIL MAPPING UNIT NO: 19a
 SOIL PROFILE PIT NO: BN 19a - 07

Horizon	Depth (cm)	Particle	Size		Analysis
			%		
		Sand	Silt	Clay	
Ap	0 - 25	79	19	2	
AB	25 - 36	49	39	12	
Bt ₁	36 - 78	41	13	56	
Bt ₂	78 - 106	48	19	43	
Bt ₃	106 - 155	39	33	28	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.9	-	0.89	0.06	7.1
5.4	-	0.47	0.04	2.6
5.2	-	0.45	0.04	2.1
5.1	-	0.43	0.02	2.1
5.1	-	0.19	0.01	0.9

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.95	2.03	0.95	0.78	7.31	92
1.15	0.73	0.26	0.16	3.50	66
2.70	1.25	0.30	0.30	5.21	85
1.25	0.96	0.46	0.34	3.77	79
1.45	1.35	0.46	0.06	4.40	75

SOIL MAPPING UNIT NO: 19a
 SOIL PROFILE PIT NO: BN 19a - 08

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 15	69	25	7	SL	
AB	15 - 34	82	11	7	LS	
Bt ₁	34 - 67	71	15	14	SL	
Bt ₂	67 - 120	51	17	32	SCL	
Bt ₃	120 - 175	66	15	29	SCL	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.8	-	0.74	0.04	21.9
6.0	-	0.60	0.04	2.7
6.4	-	0.47	0.03	1.7
5.8	-	0.48	0.03	0.6
5.1	-	0.37	0.3	0.6

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
10.50	2.76	1.00	0.21	14.67	99
1.15	1.18	0.77	0.06	3.79	84
1.75	0.91	0.74	0.22	3.82	95
2.80	1.92	0.41	0.14	5.67	93
0.35	0.58	0.61	0.17	2.11	81

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

19a
BN 19a - 09

Horizon	Depth (cm)	Particle Size	Analysis		Texture
			Sand	Silt	
A	0 - 20	80	12	8	LS
BA	20 - 40	76	4	20	LS
Bt ₁	40 - 60	62	14	24	SCL
Bt ₂	60 - 105	62	10	28	SCL
Bt ₃	105 - 140	58	6	36	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.2	5.3	1.24	0.06	2.5
6.0	5.0	0.93	0.05	1.0
5.8	5.0	0.88	0.06	1.0
5.7	5.0	0.72	0.06	2.0
5.4	4.8	0.47	0.04	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.9	1.0	0.32	0.05	5.0	85
2.0	1.0	0.41	0.15	5.5	65
1.8	0.8	0.53	0.43	6.0	60
1.9	0.7	0.56	0.43	7.5	48
2.8	1.1	0.54	0.21	9.0	52

SOIL MAPPING UNIT NO: 19a
 SOIL PROFILE PIT NO: BN 19a - 10

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 21	80	8	12	SL
Bt ₁	21 - 56	74	8	22	SCL
Bt ₂	56 - 100	56	4	40	SC
Bt ₃	100 - 145	56	4	40	SC
BC	145 - 180	56	4	40	40

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.0	5.5	1.66	0.07	2.0
5.5	4.6	0.72	0.04	-
5.7	4.8	0.57	0.04	-
5.6	4.7	0.36	0.02	-
5.6	4.9	0.31	0.02	-

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
3.7	1.9	0.36	0.11	8.5	71
1.2	1.4	0.36	0.26	7.5	43
2.0	1.5	0.55	0.45	5.0	90
1.9	1.5	0.29	0.11	5.0	76
1.8	1.6	0.36	0.15	4.5	87

SOIL MAPPING UNIT NO: 19b
 SOIL PROFILE PIT NO: BN 19b - 02

Horizon	Depth (cm)	Particle Size Analysis	Texture
		%	
		Sand Silt Clay	
Ap	0 - 22	62 29 9	SL
Bt ₁	22 - 58	46 27 27	SCL
Bt ₂	58 - 83	56 9 35	SCL
Bt ₃	83 - 135	44 17 38	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.0	-	0.95	0.07	14.8
5.9	-	0.56	0.07	5.5
6.3	-	0.24	0.07	2.6
6.2	-	0.21	0.04	1.3

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
4.10	1.56	0.66	0.29	7.21	92
4.35	1.29	0.26	0.08	6.38	94
7.50	2.43	0.72	0.14	10.99	98
5.00	2.99	1.66	0.10	10.15	96

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

19b
BN 19b - 11

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 5	36	53	11	Sil
AB	5 - 30	50	26	24	SCL
Bt ₁	30 - 55	26	42	32	CL
Bt ₂	55 - 78	29	30	38	CL
Bt ₃	78 - 120	24	45	31	CL
BC	120 - 180	36	26	38	CL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.2	-	1.68	0.15	3.3
6.0	-	1.07	0.13	2.6
5.2	-	0.75	0.06	0.8
5.1	-	0.59	0.06	0.4
5.7	-	0.52	0.06	1.7
5.4	-	0.39	0.02	0.3
				0.0

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
4.70	3.83	1.18	0.17	10.08	98
2.70	2.36	1.28	0.15	9.89	66
1.10	1.75	1.20	0.10	5.55	75
0.90	0.63	0.92	0.11	4.36	59
0.90	0.10	0.64	0.07	4.82	35
1.40	2.41	0.66	0.10	4.97	92
2.00	2.87	0.92	0.10	6.49	91

SOIL MAPPING UNIT NO: 19b
 SOIL PROFILE PIT NO: BN 19b - 12

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A1	0 - 20	74	16	10	SL
Bt ₁	20 - 37	75	9	15	SL
Bt ₂	37 - 56	64	3	33	SCL
Bt ₃	56 - 105	43	11	46	C
BC	105 - 180	35	15	50	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.2	-	1.04	0.09	23.3
5.6	-	0.71	0.06	2.1
5.8	-	0.67	0.05	1.60
5.8	-	0.45	0.04	1.40
5.7	-	0.43	0.04	0.13

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
4.50	1.89	0.97	0.15	7.91	89
2.30	0.50	0.43	0.08	3.71	97
4.60	2.33	0.51	0.08	7.72	98
4.30	3.08	0.66	0.21	8.45	95
8.00	2.84	0.82	0.11	12.17	97

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

20b
BN 20b - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 25	94	4	2	S
A	25 - 50	94	2	4	S
AB	50 - 70	94	2	4	S
IIBt ₁	70 - 95	60	6	34	SCL
IIBt ₂	95 - 135	56	2	42	SC
IIBC	135 - 184	56	2	42	SC

pH		OC %	Total N %	Available P ppm
H ₂ O	KCl			
6.1	5.6	0.57	0.03	3.5
6.1	5.6	0.36	0.02	3.5
5.9	5.4	0.72	0.04	2.5
5.2	4.8	0.47	0.03	2.5
5.2	4.8	0.41	0.03	2.5
5.0	4.6	0.36	0.03	2.0

Exchangeable Cations				CEC Meq/100g Soil	BS %
Ca	Mg	K	Na		
1.5	0.8	0.13	0.23	3.1	89
0.7	0.6	0.12	0.17	2.5	64
0.6	0.5	0.12	0.16	2.0	69
2.4	1.1	0.22	0.22	6.5	61
5.0	2.6	0.17	11.0	11.0	73
3.0	0.9	0.22	0.27	5.5	80

SOIL MAPPING UNIT NO: 20b
 SOIL PROFILE PIT NO: BN 20b - 05

Horizon	Depth (cm)	Particle Size Analysis				Texture
		Sand	Silt	Clay		
Ap	0 - 18	45	38	8	9	LS
B ₁	18 - 61	41	28	9	22	SCL
Bt ₂	61 - 103	35	22	8	35	SCL
B2 ₂	103 - 146	42	20	8	30	SCL
B ₃	146 - 195	36	22	10	32	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.0	4.8	0.31	0.02	
5.3	4.5			
5.3	4.7			
5.4	4.7			
5.4	4.6			

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.7	0.3	0.1	-	0.8	10
0.7	0.3	0.1	-	2.6	42
0.7	0.3	0.1	-	4.2	26
0.7	0.4	0.1	-	3.2	36
0.8	0.3	0.1	-	3.8	32

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

20b
BN 20b - 06

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
AP	0 - 10	40	37	13	SL
A12	10 - 24	38	35	11	SL
B1	24 - 47	27	22	10	SC
B21	47 - 86	20	18	11	C
B22	86 - 170	14	18	8	C

pH		OC %	Total N %	Available P ppm
H ₂ O	KCl			
6.4	4.9	0.74	0.06	
5.5	4.3			
5.2	4.2			
5.0	4.1			
5.1	4.1			

Exchangeable Cations				CEC Meq/100g Soil	BS %
Ca	Mg	K	Na		
2.7	0.6	0.2	0.1	2.7	10
1.0	0.3	0.1	-	1.8	78
1.1	0.4	0.2	-	3.7	46
0.8	0.2	0.1	-	4.4	25
0.9	0.2	0.1	-	4.7	26

SOIL MAPPING UNIT NO: 21b
 SOIL PROFILE PIT NO: BN 21b - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 10	74	21	5	SL
AB	10 - 28	75	18	8	SL
Bt ₁	28 - 58	51	21	28	SCL-L
BBt _{2g}	58 - 109	62	19	19	SL
BCg	109 - 160	49	17	34	SC

pH		OC %	Total N %	Available P ppm
H2O	KCl			
5.4	0	0.93	0.06	5.1
5.3	-	0.66	0.04	2.3
4.3	-	0.57	0.04	2.7
4.7	-	0.48	0.04	3.0
5.3	-	0.27	0.03	3.0

Exchangeable Cations				CEC Meq/100g Soil	BS %
Ca	Mg	K	Na		
2.70	2.04	0.61	0.17	6.92	80
2.30	1.79	0.56	0.17	5.42	89
2.20	1.42	0.61	0.27	9.50	47
2.30	1.63	0.46	0.13	10.02	46
4.30	2.84	0.46	0.13	12.53	62

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

21b
BN 21b - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A ₁	0 - 23	90	6	4	S
Bt	23 - 44	66	8	26	SCL
Bt ₂	44 - 90	58	4	38	SC
Bt ₃	90 - 128	56	4	40	SC
Bt ₄	128 - 160	56	4	40	SC
BC	160 - 190	54	6	40	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.2	5.5	0.93	0.05	-
4.7	4.1	0.52	0.04	2.0
4.9	3.8	0.47	0.05	1.0
4.9	3.8	0.31	0.04	1.0
4.5	3.8	0.31	0.03	1.0
5.0	4.0	0.31	0.03	2.0

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.0	1.5	0.33	0.13	5.5	72
1.3	1.3	0.45	0.32	7.0	48
1.3	1.4	1.4	0.31	8.5	36
1.4	1.4	0.54	0.43	8.0	47
1.3	1.0	0.33	0.24	8.0	36
1.1	1.3	0.28	0.11	8.0	35

SOIL MAPPING UNIT NO: 21b
 SOIL PROFILE PIT NO: BN 21b - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A ₁	0 - 22	84	7	9	LS
AC ₁	22 - 55	88	4	8	LS
AC ₂	55 - 87	87	3	10	LS
C ₁	87 - 130	89	1	10	LS
C ₂	130 - 170	84	5	11	LS
C ₃	170 - 180	86	3	11	LS

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.4		1.73	0.08	9.0
5.2		0.95	0.04	4.3
5.0		0.32	0.03	3.9
5.4		0.31	0.03	2.1
5.7		0.23	0.03	1.9
5.7		0.16	0.04	1.0

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.75	0.47	0.56	0.16	2.74	71
0.20	0.11	0.25	0.18	1.54	48
0.35	0.09	0.46	0.19	1.69	65
0.20	0.05	0.19	0.06	0.80	63
0.20	0.28	0.21	0.05	1.34	55
1.10	0.36	0.66	0.39	2.91	86

SOIL MAPPING UNIT NO: 21b
 SOIL PROFILE PIT NO: BN 21b - 04

Horizon	Depth (cm)	Particle	Size Analysis			Texture
			%			
		Sand	Silt	Clay		
A ₁	0 - n15	66	25	9	SL	
AC	15 - 32	62	27	11	SL	
R	32+-	53	19	29	SCL	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.8		1.12	0.09	A1
5.8		1.06	0.07	AC
5.4		1.03	0.04	R

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
8.2	2.80	1.90	0.56	5.56	96
4.8	2.00	1.53	0.11	4.60	91
3.1	0.90	0.16	1.22	3.00	76

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

21b
BN 21b - 05

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 29	67	25	8	SL
AB	29 - 62	43	33	14	SL
Bt ₁	62 - 82	43	29	28	CL
Bt ₂	82 - 117	53	21	26	SCL
Bt ₃	117 - 160	50	16	34	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.9		0.79	0.05	21.9
5.2		0.39	0.03	1.9
5.2		0.35	0.03	0.3
5.2		0.30	0.03	0.3
5.2		0.03	0.03	0.3

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.90	0.86	0.72	0.72	4.79	96
1.30	0.62	0.46	0.14	2.92	86
1.75	0.63	0.64	0.15	3.77	84
1.65	0.71	0.23	0.08	3.27	82
2.90	1.02	0.5	0.12	4.95	92

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

2a
CR 2a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 4	91.0	7.0	3.0	S
A	4 - 17	86.0	6.0	8.0	LS
AB	17 - 34	86.0	5.0	9.0	LS
BA	34 - 74	78.0	9.0	13.0	SL
B	74 - 116	79.0	5.0	16.0	SL
BC	116 - 143	78.0	5.0	16.0	SL
C	143 - 170	77.0	5.0	18.0	AL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.4		6.85	0.14	22.8
6.1		2.16	0.15	7.3
5.8		1.36	0.11	5.5
5.8		1.16	0.10	4.5
5.6		0.70	0.05	4.9
5.3		0.51	0.02	3.2
5.4		0.39	0.01	2.5

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
11.0	01.88	0.72	1.22	15.22	97
3.0	01.83	0.56	0.13	5.92	93
2.35	0.80	0.25	0.17	3.97	90
1.50	0.64	0.49	0.31	3.54	83
0.40	0.68	0.43	0.12	3.03	54
0.20	0.16	0.46	0.12	2.54	37
0.20	0.05		0.05	2.08	73

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

2a
CR 2a - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 4	70	8	22	SCL
A	4 - 26	77	1	22	SCL
AB	26 - 58	70	-	30	SCL
Bt ₁	58 - 114	59	1	40	SC
Bt ₂	114 +	50	1	49	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.1	4.1	2.75	.12	11.03
5	4	2.09	.16	33.15
4.9	3.95	1.38	.11	3.05
4.5	3.9	.80	.23	Trace
4.8	3.9	.39	.24	Trace

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.6	.68	.21	.04	3.7	41
.2	.44	.13	.07	2.0	42
.2	.28	.15	.03	17.7	4
.2	.28	.15	.01	30.2	23
.2	.68	.12	.01	4.2	24

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
CR 6a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 16	86	7	7	S
Bt ₁	16 - 42	84	5	11	LS
Bt ₂	42 - 64	82	5	12	LS
Bt ₃	64 - 112	80	7	13	LS
Bt ₄	112 - 152	76	7	17	SL
Bt ₅	152 - 184	76	7	17	SL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.8		3.01	0.17	225.1
5.0		1.06	0.15	225.1
5.4		1.20	0.10	241.1
5.7		0.62	0.05	273.3
5.5		0.43	0.03	321.5
5.6		0.44	0.03	273.3

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.25	0.24	0.19	0.20	2.26	47
0.40	0.50	0.20	0.19	3.27	39
0.20	0.28	0.26	0.06	2.80	29
0.10	0.28	0.17	0.22	2.37	33
0.15	0.26	0.20	0.11	2.52	29
0.15	0.08	0.22	0.08	1.93	28

SOIL MAPPING UNIT NO: 6a
 SOIL PROFILE PIT NO: CR 6a - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 30	76	3	21	-
A	30 - 64	76	3	21	SCL
AB	64 - 95	73	5	22	SCL
Bt ₁	95 - 154	72	3	25	SCL
Bt ₂	154 - 180	74	1	25	SCL

pH		OC %	Total N %	Available P ppm
H ₂ O	KCl			
5.1	-	3.36	0.20	80.4
5.1	-	1.24	0.10	78.6
5.2	-	1.29	0.06	70.7
5.5	-	1.20	0.06	209.0
5.6	-	0.72	0.06	209.0

Exchangeable Cations				CEC Meq/100g Soil	BS %
Ca	Mg	K	Na		
0.50	0.50	0.82	0.26	4.08	51
0.50	0.35	0.20	0.32	3.17	43
0.00	0.50	0.33	0.22	3.23	51
0.30	0.33	0.56	0.15	2.54	53
0.15	0.15	0.17	0.07	2.34	23

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
CR 6a - 06

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 22	79	5	16	SL
Bt ₁	22 - 50	74	5	21	SCL
Bt ₂	50 - 80	71	3	26	SCL
Bt ₃	80 - 136	71	3	26	SCL
BC	136 - 190	70	6	24	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2	-	2.66	0.15	22.5
5.5	-	0.98	0.08	209.0
5.6	-	0.90	0.07	209.0
5.3	-	0.50	0.04	209.0
5.9	-	0.31	0.01	200.0

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.90	0.75	1.38	0.15	3.98	80
0.20	0.17	0.24	0.10	2.71	20
0.35	0.32	0.46	0.33	3.26	45
0.35	0.42	0.66	0.12	3.55	44
0.30	1.03	0.54	0.09	3.56	55

SOIL MAPPING UNIT NO: 6a
 SOIL PROFILE PIT NO: CR 6a - 11

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
A	0 - 12	87.0	5.0	8.0	S	
AB	12 - 30	79.0	9.0	12.0	SL	
Bt ₁	30 - 65	66.0	5.0	29.0	SCL	
Bt ₂	65 - 108	66.0	5.0	29.0	SCL	
BC	108 - 150	67.0	4.0	29.0	SCL	
C	150 - 180	62.0	7.0	31.0	SCL	

pH		OC	Total N	Available P
H ₂ O	KCl			
		%	%	ppm
5.6	-	3.31	0.19	80.4
4.9	-	1.63	0.10	73.9
5.0	-	0.86	0.08	128.6
5.3	-	0.76	0.07	168.8
5.2	-	0.27	0.04	69.5
5.6	-	0.27	0.04	73.9

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
1.80	1.17	0.56	0.27	4.40	86
0.70	0.95	0.61	0.33	3.79	68
0.30	0.46	0.49	0.16	4.09	35
0.30	0.19	0.51	0.12	2.92	39
0.25	0.50	0.56	0.20	3.31	46
0.30	0.22	0.26	0.04	4.20	76

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
CR 6a - 13

Horizon	Depth (cm)	Particle	Analysis			Texture
			Size %			
		Sand	Silt	Clay		
Ap	0 - 23	87.0	7.0	6.0	S	
Bt ₁	23 - 70	75.0	3.0	22.0	SL	
Bt ₂	70 - 105	76.0	7.0	17.0	SL	
Bt ₃	105 - 140	78.0	3.0	19.0	SL	
Bt ₄	140 - 188	72.0	7.0	21.0	SCL	

pH		OC %	Total N %	Available P ppm
H ₂ O	KCl			
5.9	-	3.00	0.15	202.9
5.5	-	1.55	0.10	321.5
5.4	-	11.52	0.10	321.5
5.5	-	0.62	0.06	241.1
5.3	-	0.55	0.05	

Exchangeable Cations				CEC Meq/100g Soil	BS %
Meq/100g Soil					
Ca	Mg	K	Na		
0.65	0.17	0.24	0.12	2.78	42
0.26	0.28	0.26	0.10	3.00	33
0.30	0.42	0.36	0.10	2.58	46
0.25	0.44	0.43	0.13	2.45	57

SOIL MAPPING UNIT NO: 6B
 SOIL PROFILE PIT NO: CR 6b - 01

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
AP	0 - 15	42	85	33		CL
AB	15 - 42	30	19	51		C
B	42 - 63	22	17	61		C
BC	63 - 115	32	25	43		C
C	115 - 200	18	12	70		C

pH		OC	Total N	Available P
H ₂ O	KCl			
		%	%	ppm
5.2	3.9	1.19	0.11	3.50
5.4	1.8	1.02	0.15	0.70
5.3	3.8	0.65	0.09	1.58
5.4	3.8	0.15	0.04	0.70
4.9	3.7	1.35	0.11	Trace

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
0.7	0.8	0.7	0.43	14.4	18
0.3	0.9	0.4	0.08	24.2	4
0.1	0.6	0.4	0.66	22.0	5
0.7	0.9	0.5	0.28	18.2	13
0.3	0.7	0.5	0.16	23.4	7

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

10a
CR 10a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0 - 19	72	4	24	SCL
AB	19 - 35	68	6	26	SCL
B	35 - 118	70	-	30	SCL
BC	118 +	69	1	30	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.5	4.2	1.59	.28	1.58
5.3	4.1	0.56	.20	.88
5.4	4.4	0.55	.07	.33
5.0	4.2	0.19	.16	.53

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.20	.29	.20	.17	3.20	47
.20	.12	.18	.18	2.20	31
.10	.38	.22	.19	2.40	37
.20	.20	.41	.26	3.00	36

SOIL MAPPING UNIT NO: 10a
 SOIL PROFILE PIT NO: CR 10a - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 4	72	9	19	SL
A	4 - 11	71	9	20	SL
AB	11 - 17	76	2	22	SCL
Bt ₁	17 - 62	68	4	28	SCL
Bt ₂	62 - 87	62	4	34	SCL
Bt ₃	87 - 112	62	2	36	SC
BC	112 - 180	56	6	38	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2	4.2	2.73	.32	17.15
5.0	4.1	1.70	.17	8.75
5.1	4.1	.62	.16	1.58
5.0	4.1	.41	.23	1.75
5.1	4.1	.21	.12	.04
4.7	4.1	.47	.18	.04
5.3	4.2	.18	.16	Trace

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.20	.92	.28	.10	8.1	43
.30	.74	.21	.11	1.9	72
.30	.74	.13	.05	3.7	33
.20	.28	.15	.02	3.6	18
.20	.76	.16	.17	4.3	30
.30	.34	.21	.11	6.0	16
.30	.58	.18	.07	4.0	28

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

10a
CR 10a - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
AP	0 - 19	49	3	48	SC
AB	19 - 47	59	1	40	SC
BA	47 - 70	57	3	40	SC
B	70 - 120	63	3	34	SCL
BC	120 - +	68	2	30	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.9	4.0	0.28	0.23	0.35
6.3	4.1	0.50	0.19	0.53
4.8	4.0	0.83	0.25	0.53
5.2	4.0	1.07	0.40	1.40
5.1	4.1	2.42	0.35	80.5

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.20	.76	.29	.07	11	12
0.2	.20	.34	.14	4	22
0.20	.60	.32	.12	10	12
0.2	.44	.34	.08	5	23
1.30	.66	.45	.12	5	71

SOIL MAPPING UNIT NO: 10a
 SOIL PROFILE PIT NO: CR 10a - 05

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 3	80	6	14	SL
AB	3 - 10	78	4	18	SL
Bt ₁	10 - 21	72	4	24	SCL
Bt ₂	21 - 58	55	1	44	SC
Bt ₃	58 - 108	36	32	32	CL
Bt ₄	108 - 142	49	11	40	SC
BC	142 - 170	40	4	46	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.3	4.3	2.71	.32	7.18
5.4	4.25	1.55	.25	5.6
5.35	4.20	1.11	.21	4.9
5.2	4.3	0.29	.15	5.15
5.1	4.2	0.62	.16	4.9
4.8	4.4	0.32	.13	2.8
5.1	4.4	0.32	.09	3.85

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.5	0.54	14	.04	4.3	28
0.3	1.14	14	.02	3.10	52
0.3	0.34	20	.02	3.9	22
0.3	0.58	29	.14	12.3	11
0.3	0.58	23	.09	3.6	33
0.3	0.26	28	.19	1.4	74
0.2	0.52	21	.05	3.3	31

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

10a
CR 10a - 06

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
AP	0 - 15	68	10	22	SCL
AB	15 - 38	54	8	38	SC
Bt ₁	38 - 73	40	8	52	C
Bt ₂	73 - 104	44	10	46	SC
Bt ₃	104 - 160	50	12	38	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.9	5.1	2.42	.55	5.6
5.2	4	.65	.16	2.45
4.5	3.9	.53	.24	2.98
4.9	3.9	.88	.11	2.8
5	4	.20	.08	2.45

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
4.99	1.97	.29	.07	9	81
.20	6.6	.25	.09	15.6	46
.80	.40	.43	.37	8.6	23
.20	1.08	.29	.04	7.2	22
.20	.44	.26	.04	8.1	12

SOIL MAPPING UNIT NO: 10a
 SOIL PROFILE PIT NO: CR 10a - 08

Horizon	Depth (cm)	Particle Size	Analysis	Texture	
		%			
		Sand	Silt	Clay	
AP	0 - 8	35	6	59	C
AB	8 - 14	70	9	21	SCL
Bt ₁	14 - 44	60	10	30	SCL
Bt ₂	44 - 71	43	4	53	C
Bt ₃	71 - 107	45	2	53	C
Bt ₄	107 - 170	34	1	65	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.5	4.1	.59	.12	0.7
5.4	4.5	3.02	.65	8.05
4.8	4.2	.96	.35	4.2
4.7	3.9	.72	.27	1.75
4.5	4.0	.63	.20	1.58
4.9	3.9	.62	.23	1.05

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.3	0.5	.24	.04	8.5	13
2.79	1.53	.36	.11	7.3	66
1.2	0.80	.36	.22	5.1	51
0.6	0.84	.32	.14	6.5	29
0.1	0.28	.41	.26	7.5	26
0.3	0.68	.32	.09	7.8	18

SOIL MAPPING UNIT NO: 12a
 SOIL PROFILE PIT NO: CR 12a - 01

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
A	0 - 7	78	-	22	SCL	
AB	7 - 21	70	-	30	SCL	
Bt ₁	21 - 38	62	-	38	SCL	
Bt ₂	38 - 73	52	2	46	SC	
Bt ₃	73 - 105	44	2	54	C	
Bt ₄	105 +	44	2	54	C	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.4	3.65	2.75	.11	6.83
4.5	3.8	2.75	.17	2.98
5	4	.84	.25	1.58
4.4	4	.09	.12	.88
4.5	4	.9	.19	1.05
4.6	3.95	.66	.12	1.05

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.2	.2	.14	.11	5.5	12
.3	.42	.24	.15	11.3	10
.2	.36	.2	.11	5.6	56
.4	.24	.29	.18	6.2	18
.3	.50	.24	.07	9.2	12
.3	.34	.23	.04	7.9	12

SOIL MAPPING UNIT NO: 12a
 SOIL PROFILE PIT NO: CR 12a - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
AP	0 - 5	56	14	28	SCL
AB	5 - 15	36	8	56	C
BA	15 - 32	34	8	58	C
B	32 - 68	34	10	56	C
BC	68 - 105	42	12	46	C
C	105 - 180	40	14	46	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
7.5	7.1	2.72	.13	37.1
5.2	3.8	1.01	.19	.04
-	-	.78	.31	Trace
4.5	3.7	.66	.04	Trace
-	-	.54	.08	0.04
4.8	4.1	1.94	.07	0.53

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.79	9.37	.51	.33	13.7	95
2.0	.24	.41	.16	14.9	19
1.9	.34	.56	.19	19.1	16
1.0	.12	.44	.09	15.7	11
1.9	1.62	.27	.03	14.9	26
3.19	.33	.28	.16	12.3	32

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

12a
CR 12a - 04

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
AP	0 - 4	60	14	26		SCL
A	4 - 10	52	22	26		SCL
AB	10 - 38	37	19	44		C
BA	38 - 73	26	16	58		C
B	73 - 99	19	19	62		C
BC _B	99 - 131	21	23	56		C
C _B	131 - 155	23	25	52		C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.5	4.4	2.46	.53	7.88
5	3.9	.74	.29	2.45
4.6	3.8	.86	.16	1.05
4.7	3.7	.66	.19	Trace
5	3.8	.57	.12	Trace
5.3	4	.54	.08	2.10
5.5	4.4	.27	.19	22.05

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
4.89	.15	.42	.09	11.0	50
1.7	.54	.21	.07	10.1	25
.6	.2	.37	.18	11.8	11
1.2	.48	.28	.07	17.5	12
8.28	.06	.32	.19	21.1	42
1.1	9.22	.31	.17	19.6	55
11.8	80.12	.23	.09	13.5	19

SOIL MAPPING UNIT NO: 12a
 SOIL PROFILE PIT NO: CR 12a - 05

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 10	53	17	30	SCL
Bt1	10 - 50	-	-	-	Sc
Bt2	50 - 80	46	17	37	Sc
Bt3	80 - 135	62	9	29	SCL
Bc	135 - 180	74	7	19	-

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.3		2.2	.14	5.80
-		-	-	-
5.3		.6	.07	3.20
5.5		.5	.04	.61
5.3		.3	.03	.60

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.40	.19	.46	.09	2.5	38
-	-	-	-	-	-
.40	1.78	.43	.09	5.3	51
.20	.12	.14	.08	2.0	40
.25	.08	.22	.07	1.4	44

SOIL MAPPING UNIT NO: 21a
 SOIL PROFILE PIT NO: CR 21a-01

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
Ap	0-10	62	6	22	SCL	
Bt1	10-25	28	12	60	C	
Bt2	25-43	20	14	65	C	
Bt3	43-74	17	19	64	C	
Bc	74-180	33	9	58	C	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.3	4.3	0.35	0.15	1.75
5.4	4.0	1.35	0.09	1.05
5.7	3.9	0.60	0.11	Trace
5.3	3.9	0.15	0.14	1.05
5.3	3.9	0.18	0.05	0.35

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.2	2.4	0.5	0.21	11.8	45
0.5	0.3	1.5	0.23	17.6	14
0.1	0.5	0.5	0.21	19.4	6
0.3	1.5	0.6	0.44	22.8	12
1.2	4.7	0.7	0.53	23.6	30

SOIL MAPPING UNIT NO: 21a
 SOIL PROFILE PIT NO: CR. 21a-02

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 12	61	21	18	SL	
Bt1	12 - 36	41	20	39	CL	
Bt2	36 - 65	15	15	70	C	
Bt3	65 - 80	14	16	70	C	
C	80 - 120	18	18	64	C	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.4	4.4	1.3	0.23	0.7
5.4	4.2	-	-	0.53
5.2	4.0	0.7	0.28	Trace
5.4	4.3	0.4	0.20	0.35
5.5	4.3	0.3	0.27	Trace

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.28	0.5	0.3	0.12	8.7	13
0.20	2.7	0.1	0.06	9.8	31
0.37	6.0	0.4	0.23	8.5	85
0.64	10.4	0.4	0.17	15.7	74
0.67	10.2	0.1	0.12	14.5	77

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

21a
CR,21a - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 25	87	5	8	Ls
Bt1	25 - 45	84	3	12	Ls
IIBt2	45 - 95	56	8	36	Sc
IIBt3	95 - 132	49	3	48	Sc
Bc	132 - 180	67	15	18	Sc

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.6	4.6	60	0.08	1.05
5.8	4.6	18	0.04	0.70
5.8	4.0	.32	0.09	Trace
5.9	4.0	15	0.08	Trace
5.7	4.0	.42	0.12	1.40

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.04	1.5	0.1	0.09	8.4	21
0.01	1.5	0.1	0.02	5.1	32
0.1	1.5	0.3	0.04	14.1	14
0.02	1.1	0.2	0.04	13.7	10
0.16	2.3	0.2	0.04	10.3	26

SOIL MAPPING UNIT NO: 2b
 SOIL PROFILE PIT NO: IM 2b-01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0 - 19	83	2	15	SL
Bt1	19 - 60	67	4	15	SCL
Bt2	60 - 110	82	6	17	SL
Bt3	110 - 209	76	5	19	SL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.4	3.8	4.36	.06	
4.0	.87	.05	.05	
5.0	4.3	.80	.03	
5.0	4.2	.45	.02	

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.14	.11	.34	.06	5.3	10
4.8	.70	.23	.13	-	-
3.6	1.06	.31	.14	-	-
.08	.98	.01	.14	-	-

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

2b
IM 2b - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 15	88	6	6	S
AB	15 - 30	79	8	13	SL
Bt	30 - 73	77	8	15	SL
Bt	73 - 125	60	6	34	SCL-SC
BC	125 - 180	58	2	40	SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.3	5.5	7.9	.21	1.04
5.8	5.4	1.6	.06	9.60
6.7	5.5	.7	.02	1.80
5.4	4.6	.02	.05	9.80
5.2	4.4	.01	.03	9.60

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.95	1.13	.15	.04	5.2	83
2.10	.80	.17	.04	-	-
3.43	1.21	.18	.04	-	-
1.85	.51	.19	.04	12.2	21
1.93	.47	.19	.04	11.9	22

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
IM 6a - 02

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
A	0 - 17	75	2	23		SCL
Bt1	17 - 31	59	4	37		SC
Bt2	31 - 52	53	2	45		SC
Bt3	52 - 82	55	4	41		SCL
Bt4	82 - 125	49	6	45		SC
BC	125 - 183	45	2	53		SC

pH		OC	Total N	Available P
H ₂ O	KCl			
		%	%	ppm
5.3	4.4	4.7	.21	1.8
5.4	4.2	3.2	.11	.16
5.2	4.1	2.0	.08	6.0
5.3	4.3	1.9	.07	1.1
5.0	4.3	1.1	.16	.06
5.1	3.4	3.7	.05	1.2

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na	Meq/100g Soil	%
.76	.26	.27	.09	4.6	30
.81	.21	.31	.08	12.5	11
.89	.15	.25	.0	14.8	9
1.16	.07	.24	.07	15.9	11
.94	.08	.24	.06	14.6	9
.92	.11	.30	.06	15.5	9

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
IM 6a - 02

Horizon	Depth (cm)	Particle	Size Analysis			Texture
			%			
		Sand	Silt	Clay		
AP	0 - 12	84	8	8	LS	
A	12 - 43	82	10	8	LS	
BA	43 - 58	80	10	10	LS	
AB	58 - 87	77	12	11	SL	
Bt1	87 - 124	71	13	16	SL	
Bt2	124 - 158	66	16	18	SL	
BC	158 - 185	67	12	21	SCL	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.2	4.1	2.3	.23	46
6.1	4.8	1.6	.05	39
5.6	4.7	.6	.02	62
5.6	4.4	.5	.03	61
5.9	4.2	.5	.03	62
5.5	4.3	.6	.14	30
4.7	4.0	.05	.10	15.6

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.5	0.91	.21	2.30	5.5	71
1.4	0.60	.25	.46	4.4	84
1.9	0.90	.16	.12	3.4	91
1.6	1.10	.18	.48	2.0	-
1.1	1.40	.19	.31	1.8	-
1.6	.90	.28	.36	2.9	-
2.8	Tr	.21	.25	1.5	-

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
IM 6a - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
AP	0 - 13	80	2	18	SL
AB	13 - 34	57	6	37	SC
Bt1	34 - 75	56	2	42	SC
Bt2	75 - 130	45	2	53	SC-C
Bt3	130 - 190	55	1	44	SC

pH		OC %	Total N %	Available P ppm
H ₂ O	KCl			
5.0	4.1	5.3	.22	.14
4.8	4.2	4.5	.26	1.4
5.1	4.2	1.5	.06	-
5.1	4.2	1.2	.04	-
5.4	4.4	.9	.04	-

Exchangeable Cations				CEC Meq/100g Soil	BS %
Ca	Mg	K	Na		
.9	4	.67	.1	19.5	11
.4	.1	.12	.04	-	-
.61	.23	.8	.04	-	-
.8	.4	.18	.06	-	-
.1	.4	.17	.06	-	-

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
IM 6a - 04

Horizon	Depth (cm)	Particle	Analysis			Texture
			%			
		Sand	Silt	Clay		
A	0 - 16	77	5	18	SL	
AB	16 - 36	74	7	19	SL	
Bt1	36 - 82	54	4	42	SC	
Bt2	82 - 137	60	6	34	SCL	
BC	137 - 180	37	6	57	C	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.8	5.0	2.2	.07	
5.6	4.8	1.0	.04	
5.1	4.1	.8	.06	
5.3	4.3	.5	.09	
5.2	4.1	.4	.07	

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
1.0	.34	.23	.12	4.3	39
.02	.34	.26	.13	2.6	29
1.40	.10	.08	.04	18.8	9
.40	1.08	.06	.04	16.5	10
	1.20	.17	.12	18.6	13

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
IM 6a - 05

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 13	65	8	27	SCL
Bt ₁	13 - 38	53	4	43	SC
Bt ₂	38 - 78	32	2	66	C
Bt ₃	78 - 127	44	2	54	C
BC	127 - 190	58	2	40	SC

pH		OC %	Total N %	Available P ppm
H ₂ O	KCl			
5.0	4.1	4.1	.08	
5.0	4.2	3.0	.13	
5.0	4.2	1.5	.06	
5.2	4.3	1.3	0.3	
5.4	4.3	.8	.04	

Exchangeable Cations				CEC Meq/100g Soil	BS %
Ca	Mg	K	Na		
.90	.04	.41	.10	4.9	30
1.40	.11	.32	.12	8.5	23
1.40	.15	.45	.13	10.4	20
1.30	.10	.35	.13	7.6	25
1.45	.17	.29	.10	9.4	21

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

9a
IM 9a - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0 - 10	54	20	26	SCL
BA	10 - 35	63	7	30	SCL
AB	35 - 60	66	8	28	SCL
Bt ₁	60 - 95	54	16	30	SCL
Bt ₂	95 - 160	46	17	37	SC
BC	160 - 180	42	14	44	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.7		2.5	.15	5.1
4.8		1.5	.14	3.4
4.7		1.1	.10	3.2
4.7		.8	.10	3.2
5.2		.6	.05	.6
4.4		.3	.01	Tr.

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
1.10	1.71	.49	.16	9.3	37
.25	.62	.26	.12	11.7	11
.40	.95	.51	.20	13.1	16
.30	.82	.41	.09	14.6	11
.40	1.30	.36	.14	12.1	17
.40	1.59	.46	.15	17.0	15

SOIL MAPPING UNIT NO: 12a
 SOIL PROFILE PIT NO: IM 12a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
AP	0 - 13	81	7	12	LS
BA	13 - 41	81	7	12	LS
AB	41 - 65	81	4	15	SL
Bt ₁	65 - 94	66	9	25	SCL
Bt ₂	94 - 135	66	4	30	SCL
BC	135 - 180	68	3	21	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.8		2.6	.14	9.20
6.0		1.3	.08	2.10
5.3		1.1	.10	2.00
5.1		.7	.07	.80
4.9		.5	.02	.30
5.3		.5	.02	.50

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.65	.31	.41	.10	2.5	60
.20	.38	.25	.07	2.5	36
.30	.49	.34	.07	2.6	46
.35	.16	.38	.12	2.6	39
.20	.47	.24	.10	3.3	31
.20	.34	.43	.22	2.8	43

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

12a
IM 12a - 01

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
AP	0 - 13	41	14	45		C
AB	13 - 36	6	18	76		C
BA1	36 - 66	23	7	17		C
Bg	66 - 103	97	4	27		C
BC	103 - 131	67	12	27		C
C	131 - 180	42	9	49		C

pH		OC	Total N	Available P
H ₂ O	KCl			
6.6	5.8	5.8	.40	50.4
6.4	5.5	1.5	.18	47.4
6.4	5.9	1.7	.12	18.0
6.4	4.4	.9	.05	-
6.4	5.4	.4	.04	19.2
6.9	5.9	1.0	.03	

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
3.43	1.20	.80	.45	-	-
3.83	3.60	1.35	.29	-	-
14.1	7.61	.45	.29	-	-
7.81	3.41	.45	.41	-	-
6.85	3.20	.51	.41	-	-

SOIL MAPPING UNIT NO: 12a
 SOIL PROFILE PIT NO: IN 12a - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
AP	0 - 14	88	6	6	S
AB	14 - 31	84	5	11	LS
Bt1	31 - 73	84	1	15	SL
Bt2	73 - 120	68	2	30	SCL
Bt3	120 - 180	70	5	25	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.5		2.4	.20	9.70
5.9		1.5	.13	5.00
5.4		.6	.04	3.70
5.2		.5	.04	3.10
5.2		.2	.03	3.00

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
1.00	.45	.29	.26	2.5	80
.30	.10	.24	.07	2.1	34
.25	.18	.22	.06	1.5	47
.30	.13	.46	.06	2.4	40
.30	.14	.14	.24	2.0	38

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

12a
IN 12a - 03

Horizon	Depth (cm)	Particle	Size Analysis			Texture
			%			
		SAND	SILT	CLAY		
A	0 - 16	80	5	7	LS	
Bt ₁	16 - 57	76	4	20	SL-SCL	
Bt ₂	25 - 116	75	4	21	SCL	
Bt ₃	116 - 167	75	5	20	SCL-SC	
BC	167 - 180	74	2	24	SCL	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2		4.4	.41	13.50
5.2		11.1	.09	2.90
5.5		.9	.05	2.30
5.2		.5	.04	2.10
5.1		.5	.04	1.29

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.30	.53	.46	.06	2.9	47
.40	.33	.24	.05	2.0	50
.20	.21	.23	.10	1.7	43
.20	.06	.21	.06	1.3	40
.30	.07	.87	.13	2.4	58

SOIL MAPPING UNIT NO: 12a

SOIL PROFILE PIT NO: IM 12a - 04

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			SAND	% SILT		
Ap	0 - 17	74	15	11	SI	
AB	17 - 37	66	4	30	SCL	
Bt ₁	37 - 79	55	9	36	SC	
Bt ₂	79 - 111	46	7	47	SC-C	
BC	111- 171	55	16	29	SC-C	
C	171+	-	-	-	-	

pH		OC	Total N	Available P ^a
H ₂ O	KCl			
5.0		2.3	.20	7.10
5.0		1.3	.67	1.20
4.9		.8	.06	.30
5.4		.5	.05	.30
5.7		.5	.03	.13
-		-	-	-

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
.40	.21	.82	.24	4.5	48
.35	.25	.59	.08	3.1	41
.30	.13	.46	.08	2.5	31
.25	.28	.24	.08	2.7	32
.20	.30	.33	.05	1.4	63
-	-	-	-	-	-

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

12a
IM 12a - 06

Horizon	Depth (cm)	Particle	Analysis			Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 13	89	3	8	S	
AB	13 - 37	89	1	10	LS	
B ₁	37 - 70	83	1	16	SL	
B ₂	70 - 123	80	3	17	SL	
B ₃	123 - 180	74	9	17	SL	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.5		2.2	.13	6.30
5.5		2.2	.10	3.20
5.5		.9	.06	1.30
5.6		.4	.04	1.30
5.4		.4	.03	1.30

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.25	.35	.15	.06	2.0	40
.10	.04	.12	.05	1.3	24
.10	.04	.16	.05	1.8	20
.15	.07	.16	.05	1.9	23
.20	.08	.19	.08	1.6	36

SOIL MAPPING UNIT NO: 12a
 SOIL PROFILE PIT NO: IM 12a - 08

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt %	Clay	
Ap	0 - 16	76	8	16	SL
BA	16 - 44	83	8	9	LS
2Bt ₁	44 - 79	66	7	27	SCL
2Bt ₂	79 - 135	50	26	24	SCL
2BC	135 - 180	71	3	26	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.3		1.7	.10	3.70
5.1		.9	.07	1.30
5.0		.6	.06	1.30
5.1		.5	.04	1.30
5.5		.5	.03	1.00

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.20	.25	.19	.05	2.3	
.20	.33	.15	.07	2.0	38
.25	.06	.15	.08	1.8	31
.25	.07	.11	.20	1.6	39
.10	.04	.14	.10	1.6	24

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

12a
IM 12a - 11

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 11	28	33	39	CL
A	11 - 35	51	15	34	SC
AB	35 - 70	50	16	34	SC
B	70 - 100	52	21	37	SCL
BC	100 - 144	42	21	37	CL
C	144 - 180	42	40	18	L

pH		OC %	Total N %	Available P ppm
H ₂ O	KCl			
5.1		2.7	.21	9.00
5.2		1.2	.15	.30
3.3		0.7	.05	.30
4.7		.5	.05	.20
5.4		.5	.04	.13
5.5		.2	.03	Trace

Exchangeable Cations				CEC Meq/100g Soil	BS %
Ca	Mg	K	Na		
4.70	7.48	.66	.13	15.2	85
2.80	3.93	.61	.21	23.4	32
1.60	3.37	.59	.13	24.9	23
3.00	5.18	.66	.13	33.0	27
8.00	21.08	.46	.18	46.5	64
11.50	34.75	.41	.17	52.0	90

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

12a
IM 15d - 01

Horizon	Depth (cm)	Particle Size	Analysis		Texture
			Sand	Silt	
AP	0 - 14	69	15	16	SL
AB	14 - 40	60	11	29	SCL
Bt ₁	40 - 60	54	8	38	SC
Bt ₂	60 - 120	54	4	42	SC
Bt ₃	120 - 180	54	8	38	SC

pH		OC	Total N	Available P
H ₂ O	KCl			
4.8		2.4	.17	6.2
4.9		1.7	.10	1.1
5.2		1.5	.08	.8
5.4		1.1	.07	.8
5.6		.6	.04	.3

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
.85	.17	.51	.14	3.47	48
.30	.13	.21	.19	4.23	20
.30	.85	.25	.10	5.30	28
.30	.35	.54	.12	4.71	28
.30	.23	.38	.07	3.38	29

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

15d
IM 15d - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 12	75	19	6	SL
AB	12 - 31	70	23	7	SL
Bt ₁	31 - 68	54	27	19	SL
Bt ₂	68 - 90	55	18	27	SCL
Bt ₃	90 - 123	56	19	29	SCL
Bt ₄	123 - 180	54	14	32	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.8		.9	.05	5.5
5.1		.6	.04	4.6
4.6		.5	.04	4.0
4.8		.5	.05	3.9
5.3		.5	.05	.6
5.7		.4	.03	.5

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
.90	.58	.41	.25	2.3	91
.40	.21	.21	.10	2.1	43
.40	.28	.17	.08	4.9	19
.35	.32	.16	.08	5.9	15
1.15	.19	.20	.10	7.2	23
3.75	1.00	.45	.20	8.4	64

SOIL MAPPING UNIT NO: 15d
 SOIL PROFILE PIT NO: IM 15d - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 15	29	44	27	L-CL
Bt ₁	15 - 36	44	18	38	CL
Bt ₂	15 - 36	44	18	38	CL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2		1.8	.15	3.1
5.3		.9	.08	1.9
5.2		.6	.08	Tr

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
1.00	1.57	.41	.26	5.7	5.7
.35	1.29	.26	.14	10.6	19
.40	1.56	.51	.15	11.28	22

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

15d
IM 15d - 04

Horizon	Depth (cm)	Particle	Analysis			Texture
			Size			
			%			
		Sand	Silt	Clay		
Ap	0 - 10	84	9	7		LS
Bt ₁	10 - 37	39	11	49		C
Bt ₂	37 - 56	50	6	44		SC
Bt ₃	56 - 87	41	13	46		C
BC	87 - 124	52	24	24		SCL
C	124 - 180	47	7	46		SC

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.1		2.9	.20	8.0
5.8		.8	.05	2.3
5.2		.7	.05	.8
5.5		.7	.06	.13
5.0		.5	.05	Tr.
5.3		.3	.05	

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
10.50	3.15	.61	.15	15.0	96
1.60	.83	.17	.07	3.1	87
1.45	.90	.24	.01	5.9	46
1.10	.50	.43	.11	6.5	33
1.00	.18	.22	.11	5.7	26
.85	.58	.59	.15	8.2	27

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

15d
IM 15d - 05

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 15	55	29	16	
AB	15 - 25	57	11	32	
Bt ₁	25 - 60				
Bt ₂	60 - 100	34	13	53	
Bt ₃	100 - 125	29	11	60	
BC	125 - 180	30	23	47	

H ₂ O	pH		OC	Total N	Available P
	KCl				
SCL	4.6		5.8	.31	7.70
SCL	5.1		1.01	.11	1.29
C	5.0		.6	.07	1.00
C	5.2		.4	.06	.77
C	4.9		.3	.03	.50

Exchangeable	Cations				CEC	BS
	Meq/100g Soil					
Ca	Mg	K	Na			
1.60	2.01	1.15	.20	9.8	51	
.20	1.18	.24	.08	10.9	15	
.35	.40	.38	.15			
.25	.15	.54	.17	10.5	12	
.25	.25	.46	.09	13.7	8	
				15.5	7	

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

1a
RV 1a - 01

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
Ap	0 - 8	17	15	68	C	
A	8 - 35	7	38	55	C	
C ₁	35 - 87	4	32	64	C	
C ₂	87 - 145	6	49	45	C	
C ₃	145 - 160	18	46	36	SiCL	

pH		OC	Total N	Available P
H ₂ O	KCl			
		%	%	ppm
5.2	4.0	1.4	0.15	31
5.4	3.9	0.7	0.10	16
5.5	4.0	0.08	0.07	11
6.2	4.3	-	-	8
6.6	4.7	-	-	6
				3

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
5.09	1.69	0.44	0.03	12	59
5.81	3.00	0.56	0.04	16	59
7.58	4.98	0.78	0.10	27	59
7.84	7.15	0.38	0.13	17	91
7.81	7.12	0.17	0.03	16	98
4.05	2.75	0.09	0.03	7	97

SOIL MAPPING UNIT NO: 1a
 SOIL PROFILE PIT NO: RV 1a - 02

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
A	0 - 17	1	58	41	S/C	
C ₁	17 - 85	0	28	72	C	
C ₂	85 - 140	1	29	70	C	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.8	3.6	1.20	0.17	21
5.1	3.7	0.65	0.09	11
4.6	3.6	-	-	7

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.99	1.34	0.44	0.03	24	20
5.4	3.02	0.44	0.10	25	38
6.61	4.53	0.34	0.10	27	44

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

1c
RV 1c - 01

Horizon	Depth (cm)		Particle	Size		Analysis	Texture
				%			
			Sand	Silt	Clay		
A	0	- 35	95	1	4	S	
C1g	35	- 105	96	0	4	S	
C2	105	- 180	93	1	6	S	
C3g	180	- 230	93	1	6	S	

pH		OC	Total N	Available P
H ₂ O	KCl			
		%	%	ppm
4.8	4.1	0.40	0.04	Tr
5.1	4.1	0.20	0.02	tr
5.0	4.5	0.70	0.05	10
5.2	4.7	0.50	0.64	tr

Exchangeable Cations				CEC	BS
Meq/100g Soil					
Ca	Mg	K	Na		
tr	0.02	0.03	tr	2	22.0
tr	tr	0.05	0.02	2	14.0
0.71	0.12	0.06	0.02	5	17.0
tr	tr	tr	tr	-	-

SOIL MAPPING UNIT NO: 1c
 SOIL PROFILE PIT NO: RV 1c - 02

Horizon	Depth (cm)	Particle	Size			Texture
			%			
		Sand	Silt	Clay		
A	0 - 30	97	0	3	S	
C ₁	30 - 95	98	0	2	S	
C ₂	95 - 180	94	0	6	S	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.4	4.2	0.40	0.04	tr
5.6	4.6	0.30	0.02	tr
5.4	4.7	0.30	0.03	10

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.03	tr.	0.01	tr.	0.70	44
0.40	tr.	0.01	tr.	0.87	47
0.20	tr.	0.01	tr.	0.79	27

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

1c
RV 1c - 03

Horizon	Depth (cm)	Particle	Analysis			Texture
			%			
		Sand	Silt	Clay		
Ag	0 - 44	97	2	1	S	
C1g	44 - 110	97	1	2	S	
C2	110 - 180	96	0	4	S	

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.9	3.4	0.60	0.05	tr.
5.5	4.0	0.10	0.02	tr.
5.0	4.3	1.00	0.05	tr.

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.10	0.08	0.04	0.02	3	9
0.10	0.15	0.04	0.02	1	32
tr.	0.15	0.04	tr.	8	2

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

2c
RV 2c - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0 - 7	26	61	13	SiL
C ₁	7 - 64	25	60	15	SiL
C ₂	64 - 135	41	46	13	L

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
6.0	4.5	1.25	0.12	6
5.6	4.0	0.36	0.07	2
5.9	4.3	0.21	0.40	2

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
2.10	1.95	0.51	0.11	20	23
4.73	1.51	0.21	0.03	11	55
4.79	1.95	0.13	0.07	13	53

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

2c
RV 2c - 02

Horizon	Depth (cm)	Particle	Size	Analysis	Texture
			%		
		Sand	Silt	Clay	
A	0 - 20	2	89	9	Si
C ₁	20 - 96	2	55	43	SiC
C ₂	96 - 135	21	50	29	Cl

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.8	4.0	1.79	0.16	3
5.0	3.7	0.27	0.05	9
5.2	5.2	0.15	0.03	15

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
3.68	3.40	0.21	0.04	15	49
4.24	1.95	0.22	0.03	22	29
1.83	1.71	0.14	0.02	18	21

SOIL MAPPING UNIT NO: 5a
 SOIL PROFILE PIT NO: RV 5a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 15	67	13	20	SL
AB	15 - 53	63	13	24	SCL
Bt ₁	53 - 92	59	13	28	SCL
Bt ₂	92 - 140	57	11	32	SCL
Bt ₃	140 - 167	55	11	34	SCL
C	167 - 195	55	27	18	SL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.5	3.6	1.60	0.15	6.3*
4.6	4.0	0.71	0.11	0.4
4.8	3.8	0.28	0.12	tr.
4.7	3.7	0.18	0.10	tr.
4.9	3.7	0.20	0.08	tr
4.9	3.9	0.18	0.10	tr.

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.10	0.46	0.24	0.05	19	5
0.20	0.36	0.24	0.04	13	7
0.40	0.40	0.61	0.10	11	14
0.10	0.54	0.18	0.03	16	6
0.10	0.46	0.16	0.01	16	5
0.10	0.62	0.14	0.03	18	5

SOIL MAPPING UNIT NO: 5d
 SOIL PROFILE PIT NO: RV 5d - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 15	67	13	20	SL
AB	15 - 45	63	13	24	SCL
Bt ₁	45 - 91	59	13	28	SCL
Bt ₂	91 - 140	57	11	32	SCL
Bt ₃	140 - 174	55	11	34	SCL
C	174 - 200	55	27	18	AL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.5	3.6	1.6	0.15	6.3
4.6	4.0	0.71	0.11	0.4
4.8	3.8	0.28	0.12	tr
4.7	3.7	0.18	0.10	tr
4.8	3.7	0.20	0.08	tr
4.9	3.9	0.10	0.10	tr

Available P Exchangeable Cations
 ppm Me/100g Soil

Ca	Mg	K	Na		
0.10	0.46	0.24	0.05	19	5
0.20	0.36	0.24	0.04	13	7
0.40	0.40	0.61	0.10	11	13
0.10	0.54	0.18	0.03	16	6
0.10	0.46	0.16	0.01	16	5
0.10	0.62	0.14	0.03	18	5

SOIL MAPPING UNIT NO: 5d
 SOIL PROFILE PIT NO: RV 5d - 02

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 10	81	2	17	SL
A	10 - 45	75	4	21	SCL
AB	45 - 87	77	3	20	SCL
BA	87 - 125	77	2	21	SCL
B	125 - 159	77	2	21	SCL
BC	159 - 200	77	2	21	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2	4.0	1.79	0.12	1.8
4.9	4.0	0.63	0.11	tr.
4.9	4.0	0.44	0.01	tr.
4.9	4.0	0.28	0.05	tr.
5.1	4.0	0.21	0.05	0.7
4.9	4.0	0.24	0.04	tr.

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.20	1.32	0.12	0.07	7	20
0.20	0.36	0.11	0.03	8	9
0.10	0.54	0.08	0.03	6	12
0.10	0.70	0.07	0.03	6	16
0.10	0.62	0.08	0.03	6	15
0.10	0.60	0.10	0.04	4	22

SOIL MAPPING UNIT NO: 5d
 SOIL PROFILE PIT NO: RV 5d - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 8	55	27	18	SL
Bt ₁	8 - 47	51	23	26	SCL
Bt ₂	47 - 86	43	22	35	L
Bt ₃	86 - 115	45	18	37	SC
Btg	115 - 141	47	16	43	CL
Cg	141 - 155	37	18	45	C

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.9	3.9	0.92	0.19	2.1
4.5	3.7	0.39	0.14	tr.
4.6	3.7	0.23	0.14	tr.
4.6	3.7	0.23	0.14	tr.
4.2	3.6	0.11	0.04	tr.
4.7	3.7	0.15	0.04	tr.

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.30	1.46	0.30	0.03	11	18
0.10	0.70	0.22	0.09	11	9
0.20	0.60	0.36	0.07	11	11
0.10	0.54	0.05	0.04	17	4
0.20	0.52	0.15	0.04	18	5
0.10	0.78	0.14	0.05	24	4

SOIL MAPPING UNIT NO: 6a
 SOIL PROFILE PIT NO: RV 6a - 01

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 16	69	15	16	SL
AB	16 - 35	43	23	29	SCL
Bt ₁	35 - 72	37	25	38	CL
Bt ₂	72 - 112	44	14	42	SC
Bt ₃	112 - 150	38	26	36	CL
BC	150 - 185	44	22	34	CL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.2	4.0	2.4	0.21	96
5.1	4.8	1.0	0.10	65
5.0	4.0	0.1	0.05	84
5.2	3.9	0.5	0.07	77
5.2	4.2	0.2	0.04	48
5.2	4.2	0.2	0.04	27

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.29	0.28	0.10	0.19	7	12.0
1.29	0.12	0.10	0.14	6	26.0
3.33	0.09	0.13	0.24	6	55.0
1.40	0.03	0.12	0.05	6	27.0
0.53	0.81	0.11	0.13	6	29.0
0.31	0.02	0.09	0.17	3	23.0

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
RV 6a - 03

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
Ap	0 - 18	74	17	9	SL
AB	18 - 55	77	8	15	SL
A	55 - 130	57	7	18	SL
BC	130 - 183	73	8	19	SL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
4.5	3.8	1.80	0.16	46
4.8	4.1	0.60	0.06	35
5.0	4.2	0.20	0.03	42
4.9	4.0	0.17	0.03	39

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.10	0.63	0.03	tr.	11	7
0.01	0.10	0.03	tr.	4	29
0.10	0.08	0.06	tr.	4	6
0.10	0.02	0.07	tr.	3	19

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
RV 6a - 04

Horizon	Depth (cm)	Particle Size Analysis			Texture
		Sand	Silt	Clay	
A	0 - 16	90	5	5	S
AB	16 - 52	87	7	8	LS
Bt ₁	52 - 115	75	5	20	SL
Bt ₂	115 - 190	71	2	27	SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.0	4.1	0.83	0.08	80
4.6	4.0	0.37	0.03	115
4.7	3.9	0.29	0.03	97
4.9	3.9	0.25	0.03	75

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.15	1.55	0.07	0.02	6	27
0.08	0.85	0.05	0.02	4	9
0.15	0.40	0.05	tr.	5	8
0.08	0.44	0.05	tr.	5	8

SOIL MAPPING UNIT NO:
SOIL PROFILE PIT NO:

6a
CR 6a - 10

Horizon	Depth (cm)	Particle	Size		Analysis	Texture
			%			
		Sand	Silt	Clay		
AP	0 - 18	88	4	8		LS
AB	18 - 60	82	4	14		LS
Bt ₁	60 - 107	69	5	26		SCL
Bt ₂	107 - 148	70	6	24		SCL
BC	148 - 180	72	7	21		SCL

pH		OC	Total N	Available P
H ₂ O	KCl	%	%	ppm
5.3	-	2.59	0.18	23.1
5.2	-	1.88	0.11	22.5
5.6	-	0.70	0.06	10.3
5.2	-	0.69	0.05	10.0
5.6	-	0.69	0.04	10.0

Exchangeable Cations				CEC	BS
Meq/100g Soil				Meq/100g Soil	%
Ca	Mg	K	Na		
0.25	0.44	0.23	0.10	2.81	36
0.20	0.11	0.38	0.07	2.36	32
0.20	0.18	0.23	0.31	2.52	37
0.20	0.12	0.25	0.24	2.01	40
0.40	0.50	0.66	0.14	2.09	59

APPENDIX 3
RATING FOR SOIL DATA INTERPRETATION

1. Soil Depth 30cm
 Very shallow 30 - 50cm
 Moderately deep 50 - 1m
 Deep 1m +

2. Soil reaction
 Extreamly acidic 4.5
 very strongly acid 4.5 - 5.0
 strongly acid 5.1 - 5.1
 Moderately acid 5.6 - 6.0
 Slightly acid 6.1 - 6.5
 Neutral 6.6 - 7.3
 Slightly alkaline 7.4 - 7.8
 moderately alkaline 7.9 - 8.4
 Strongly alkaline 8.5 - 9.0
 Very strongly alkaline 9.0

3. Organic matter
 very low 0.4% carbon
 Low 0.4% - 1.0% carbon
 Moderate 1.0% - 1.5% carbon
 High 1.5% - 2.0% carbon
 Very High 2.0% carbon

4. Exchangeable cations

Range :meq

	Exch. ca	Exch. Mg	Exch. k	Exch. Na
Very high	20	8	1.0 - 2	2
High	10 - 20	3 - 8	0.6 - 1.2	0.7 - 2
Moderate	5 - 10	1 - 3	0.3 - 0.6	0.3 - 0.7
Low	2 - 5	0.3 - 1	0.2 - 0.3	0.1 - 0.3
Very low	2	0.3	0.2	0.1

5. Cation Exchange Capacity:
 Very low 6 meq per 100g soil
 Low 6 - 12 meq per 100g soil
 Moderate 12 - 25 meq per 100g soil
 High 25 - 40 meq per 100g soil
 Very high 40 meq per 200g soil

6.	Drainage Classes	Soil Depth to Gleyic Horizon (cm)	
	Very poorly drained	0 - 10	
	Poorly drained	10 - 50	
	Imperfectly drained	50 - 150	-or matrix having gleyicchroma +1 within 50cm or 10 per cent or more gleyic mottles and streaks within 50cm, - or 20 per cent or more gleyicmottles and streaks between 30 and 100cm.
	Well drained	150	Lacking the previous characteristics

7.	<u>Percentage base concentration</u>	%
	Very low	0 - 20
	Low	20 - 40
	Moderate	40 - 60
	High	60 - 80
	Very high	80 - 100

(Afterwood, Hutcheon and Hackham,1974)

8.	<u>Total N</u>	%
	Very low	0.050 N
	Low	0.050 - 0.100 N
	Moderate	0.101 - 0.150 N
	Medium	0.151 - 0.200 N
	Moderater high	0.201 - 0.250 N
	High	0.251 - 0.300 N
	Very high	0.300 N

9.	<u>Available P</u> (Bray)	
	Very low	3 ppm P
	Low	3 - 7 ppm P
	Moderate	7 - 20 ppm P
	High	20 ppm P

(In C.A.Black. Methods of soil analysis).

10 Drainage Classification

The gleyic horizon which indicates wetness inthe soil is identified by:

1. Colours on the munsell grey colour page, and/or.
2. For hues of 10YR and redder, by moist chroma's of 2 or less unless due to orgainc matter;
3. For hues yellower than 10YR, by moist chroma's of 3 or less due to organic matter.

SOIL MAP OF NIGERIA PROJECT:- LIST OF PARTICIPANTS

- 1) Mr. E.O.U. Okoye, - National Project Co-ordinator/Correlator 1980-1986, then 1989 to date.
Assistant Director,
Soil Survey and Land
Evaluation
- 2) Mr. H.D. Huckle U.S.D.A. Project Leader and Counterpart
National Project Co-ordinator, (1982-84)
- 3) Late Mr. T.E. Joshua National Co-ordinator/
Assistant Director, Correlator 1986-1989.
Soil Survey and Land
Evaluation.
- 4) Mr. H.M. Ucheagwu - Assistant to the National
(S.L.R.O.) Cor-ordinator, November, 1986 to

NORTH WEST ZONAL FIELD TEAM COMPOSITION

- 1) Dr. G. Lekwa - Pedologist and Zonal P
Leader/Correlator/Team Leader
1983.,
- 2) Mr. E.O.U. Okoye - National/Zonal Project
Leader/Correlator 1983-1985
- 3) Dr. E.A. Amba - Team Leader/Correlator
1985-1986.
- 4) Mr. S.O. Kalejaiye - P.L.R.O.
- 5) Mr. A.O. Popoola - P.L.R.O.
- 6) Mr. T.O. Ugwu - P.L.R.O.
- 7) Dr. G.I. Nwaka - S.L.R.O.
- 8) Mr. C.O. Nwune - S.L.R.O.
- 9) Mr. P.S. Oseji - L.R.O.I.
- 10) Mr. A.O. Alabi - S.A.S.
- 11) Mr. E.I.E. Chikwendu - S.A.S.
- 12) Mr. O. Nwaubani - H.A.S.
- 13) Mr. O. Obia - H.A.S.
- 14) Mr. G. Oleka - H.A.S.
- 15) Mr. A. Okoye - H.A.S.

NORTH EAST ZONAL FIELD TEAM COMPOSITION

- 1) Dr. S.M.C. Oparaugo - Pedologist and Zonal Project Leader/Correlator

TEAM A

- 2) Mr. G.A. Uzoigwe - P.L.R.O. Team Leader
- 3) Mr. O.A. Akinwa - S.L.R.O.
- 4) Mr. A.C. Ogoamaka - Soil Survey Assistant
- 5) Mr. John Choji - Soil Survey Attendant

TEAM B

- 6) Mr. E.O. Olagbaju - L.R.O. I - Team Leader
- 7) Mr. B.O. Adewoye - H.A.S.
- 8) Mr. L. Odika - Soil Survey Assistant
- 9) Mr. M. Sale - Soil Survey Attendant

TEAM C

- 10) Dr. S.M.C. Oparaugo - Team Leader
- 11) Mr. N.A. Opara - H.A.S.
- 12) Mr. Pam Chwang - Soil Survey Attendant

SOUTH WEST ZONAL FIELD TEAM COMPOSITION

- 1) Dr. F.A. Fapohunda - Zonal Project Leader/ Correlator.
- 2) Mr. D. White - U.S.D.A., Zonal Project Counterpart (1982-1984).

TEAM A

- 3) Dr. A.O. Ogunsola - P.L.R.O. - Team Leader
- 4) Mr. H.M. Ucheagwu - S.L.R.O.
- 5) Mr. Owolabi Bello - Field Assistant

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- 6) Dr. J.K. Olaniyi - P.L.R.O. - Team Leader
- 7) Mr. M.O. Sule - L.R.O. I
- 8) Mr. A.O. Alabi - H.A.S.
- 9) Mr. Niyi Akutu - Field Assistant

SOUTH EAST ZONAL FIELD TEAM COMPOSITION

- 1) Dr. G. Lekwa - Pedologist & Zonal Project Leader/Correlator/Team leader
- 2) Mr. Campbell - U.S.D.A., Zonal Project Counterpart (1982-84)

- | | | | |
|-----|-------------------------------|---|-------------------------------|
| 3) | Mr. T.O. Ugwu | - | Team Leader (1985-1989) |
| 4) | Mr. R.R.A. Abangwu | - | Team Leader (1980-1983) |
| 5) | Mr. L.I. Bosah | - | Team Leader (1980-1983) |
| 6) | Mr. I. Chikezie | - | S.L.R.O. |
| 7) | Mr. E. Otisi | - | L.R.O. I |
| 8) | Mr. U.O.U. Ukpung | - | H.A.S. |
| 9) | Mr. C.U. Ahumibe | - | H.A.S. |
| 10) | Mr. P. Ogboso | - | A.A.S. |
| 11) | Mr. E.C. Ukaegbu | - | A.A.S. |
| 12) | Mr. J.I. Amadi | - | H.A.S. |
| 13) | Mr. E. Ebukanson | - | H.A.S. |
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