FAO/UNESCO CLASSIFICATION SYSTEM

The FAO/UNESCO system was developed by a panel set up by UNESCO for providing the basic unit for the soil map of the world. This classification was compiled from diverse systems in term of category and nomenclature. The FAO system has two categories, a higher and a lower one. These categories have not been given name. From their definition, the higher category is equivalent to the great group of the USDA taxonomy while the lower category cannot be fitted into any category of the USDA.

The criteria for classification are similar to those of great group and sub group in the USDA taxonomy. The definition of diagnostic horizons in the FAO system is different from that of the USDA system, although there are many equivalent definitions. For example, argillic horizon in the USDA is the same as argic horizon in the FAO, while Albic, calcic, cambic, duric, histic, melanic, gypsic and nitric horizons has definition similar to those horizons bearing the same nomenclature in the USDA system.

There are 32 reference groups in the FAO (WRB, 2006) system:- Acrisols, Albeluvisols, Alisols, Andosols, Anthrosols, Arenosols, Calcisols, Cambisols, Chernozems, Cryosols, Durisols, Ferralsols, Fluvisols, Gleysols, Cypsisols, Histosols, Kastanozems, Leptosols, Lixisols, Luvisols, Nitosols, Phaeozems, Planosols, Plinthosols, Podzols, Regosols, Solonckak, Solonetz, Stagnosols, Technosols, Umbrisols and Vertisols.

Common group in Nigeria soils are Plinthosols, Ferralsols, Stagnosols (mangrove soils), Alisols (ultisols), Acrisols (ultisols), Luvisols, Lixisols (alfisols), Arenosols, Cambisols and Regosols.

The names of soils are indicated by adding prefix and suffix adjectives from the qualifier lists to the reference group, for example Gleyic Luvisol oxyaquic.

Acrisols : Acrisols are soils that have a higher clay content in the subsoil than in the top soil as a result of pedogenic processes (especially clay migration) leading to an argic (argillic) subsoil horizon. Acrisols have in certain depths a low base saturation and low activity clays. Acrisols correlates with Ultisols with low activity clays (USDA).

Alisols: Alisols are soils that have a higher clay content in the subsoil than in the top soil as a result of pedogenic processes (especially clay migration) leading to an argic (argillic) subsoil horizon. Alisols have in certain depths a low base saturation and high activity clays throughout the argic horizon. They occur predominantly in humid tropical, humid subtropical and warm temperate regions. Alisols correlates with Ultisols with high activity clays (USDA).

Arenosols: Arenosols comprise sandy soils, including both soils developed on residual sand after in situ weathering of usually quartz-rich sediments or rocks, and soils developed in recent deposited sands such as dunes in deserts and beach lands.

Cambisols: Cambisols combine soils with at least an incipient subsurface soil formation. Transformation of parent material is evident from structure formation and mostly brownish discoloration, increase clay percentage, and /or carbonate removal. US taxonomy classifies most of these soils as Inceptisols.

Gleysols: Gleysols are wetland soils that, unless drained, are saturated with ground water for long enough periods to develop a characteristic gleyic colour pattern. This pattern is essentially made up of reddish, brownish or yellowish colours at ped surfaces and/or in the upper soil layer or layers, in combination with grayish/bluish colours inside the peds and/or deeper in the soil.

Many of the WRB Gleysols correlate with the aquic suborder in the USDA taxonomy (Aqualfs, Aquents, Aquepts, aquolls etc).

Lixisols: Lixisols comprise of soils that have a higher clay content in the subsoil than in the topsoil as a result of pedogenic processes (especially clay migration) leading to an argic (argillic) subsoil horizon. Lixisols have a high base saturation and low activity clays at certain depths. Lixisols correlates with Alfisols with low activity clays (USDA).

Luvisols: Luvisols comprise of soils that have a higher clay content in the subsoil than in the topsoil as a result of pedogenic processes (especially clay migration) leading to an argic (argillic) subsoil horizon. Luvisols have high activity clays throughout the argic horizon and a high base saturation at certain depths. Luvisols correlates with Alfisols with low activity clays (USDA).

Local soil classification Systems

A number of soil classification systems exist within the country that is native of the country. These includes:-

- Smith and Montgomery (1962); Moss (1957); Jungerius (1964) ; Klinkenberg and Higgins (1968)

However, non of these classification can be said to be national, i.e. they are not nationally acceptable and cannot be apply to the nation because each of the system was either developed for the soils of a given locality or of a given parent material.

Soil Classification by Smith and Montgomery

All the soils classified by Smith and Montgomery are within the central southern part of Nigeria. These soils are formed from igneous and metamorphic rocks.

The schematic diagram below depicts the classification pattern adopted by Smith and Montgomery.

Soil survey

Soil survey is a branch of soil science which involves the identification of the different types of soil in a given landscape and the location of their distribution to scale on a map. In addition, soil survey provides information on the quality of the land in terms of their response to management and manipulation.

Mapping Unit

A mapping unit is a geographical unit and it is an area of land within which the greater proportion is occupied by the taxonomic class after which it is named.

Purity of Mapping

The degree of uniformity or heterogeneity in term of kinds of soils within a mapping unit is a measure of its purity. Purity is the proportion of the mapping unit occupied by the profile class after which it is named. Different soil survey organizations have different acceptable purity standards ranging from70 - 85%.

Kind of mapping units

Mapping units have been distinguished based on the amount of inclusion or impurity they contain. Five kind of mapping units have thus been distinguished and these are consociation, association, complex, undifferentiated and miscellaneous/unvisited.

Consociation

A consociation is a mapping unit with very little inclusion or impurity. It is assumed to contain the profile class after which it is named but in practice the purity of such class may range from 70% to 85%.

Association

An association is a mapping unit that contain two or more taxonomic class that are nearly equally represented and in which it is very easy to separate one profile class from the other.

Complex

Complex is a mapping unit where more than two taxonomic classes are equally represented and the components are intricately interwoven so that separation, even at large scale is difficult.

Undifferentiated

This is a mapping unit consisting of a number of taxonomic units that are so intricately interwoven that separation into different units are impossible at any reasonable mapping scale.

Miscellaneous/unvisited

This is a loosely used term by some survey organization. It refers mainly to areas that cannot be mapped because of rock outcrops, thick forests or other impediments.

Principles of soil survey

The principles of survey can be discussed under five points

- A soil survey must have an objective.
- A soil survey is not the only basis for decision on land use and management, it is only an aid
- Land resources do not consist of soils alone
- A soil map must show soils.
- Soil map and report are complementary..

Type of Survey

Soil survey can be classified using the following criteria

Purpose of survey

Regularity of observation

Based on scale of mapping

Classification by purpose of survey

Based on the purpose of survey, there are two types of survey. These are general purpose and special purpose survey.

A general purpose soil survey is one that is done mainly to add to the already existing inventory of soil information.

A special purpose soil survey is done for specific purpose in mind, e.g. survey for irrigation or survey for citrus plantation.

Based on regularity of observation, three kinds of surveys have been distinguished: - free survey, rigid grid and flexible grid.

In **free survey**, there is no rigid pattern of observation.

In **rigid grid survey**, examinations of the soil are done at regular and pre-determined interval.

Flexible grid survey method is a compromise between the free and rigid grid methods of survey. In this system of survey, the number of observation is fixed but the location of the observation points are not pre-determined and can be fixed at will.

Based on the scale of mapping, there are seven kinds of surveys:- compilation, integrated survey, exploratory survey, reconnaissance survey, semi-detailed survey, detailed survey and intensive survey.

Compilation: These are soil maps produced by abstraction from other soil surveys. And where they exist they are filled by inferences. The scale is usually at 1: 100,000 or smaller.

Integrated survey: This is also known as land system survey. It is based on mapping the total physical environment and the scale is 1: 250,000 or smaller.

Exploratory survey: They are usually rapid road traverse made to provide modicum of information about the area that are otherwise unknown. Scale of exploratory survey varies from 1: 2,000,000 to 1,500,000.

Reconnaissance survey: They are the smallest scale of survey where the whole area is still covered using remote sensed imageries and the scale is usually 1:250,000

Semi-Detailed survey: In a semi-detailed mapping units are usually soil association and the scale of mapping varies from 150,000 to 100, 000.

Detailed survey: Detailed surveys are executed using rigid grid method and are usually employed for small area. Scale of observation varies between 1: 10,000 and 1: 25,000. Mapping unit are usually soil series.

Intensive survey uses rigid grid approach and mapping units are soil series and phase of soil series. Scale of mapping varies from 1: 1,000 to 1: 10,000.

Producing soil survey report

Soil survey reports take different forms because of the variation in the purpose of the survey and the interest of the client. However, some basic items are common to all soil survey reports. These are:

(a) The physical environment

(b) Methodology of the survey

(c) Description of the soils in terms of mapping unit and classification

(d) Land evaluation

The physical environment

In the physical environment, the aspects usually discussed are the location and extent, the climate, regional and local relief and topography, geology of the parent materials, vegetation and land use pattern (including mining and agriculture).

Location: The location is given in longitude and latitude or the Eastings and Northings (when using GPS). The site is also indicated by small area on a large map where the area of the project is shaded. The approximate area of the land is also given in hectares.

Climate: Full information is given on the climatic condition of the area. Data on Rainfall, temperature, relative humidity, wind speed and direction are collected and presented either as tables or as graphs.

Relief and topography: Because of the influence of relief on soil formation, the information on it is very vital.

Geology or parent material: Knowledge of the parent rock from which the soil is formed is necessary. The difference between geology and parent material become important where the transported material and the geology are different from each other.

Vegetation

Experience has shown that there is a close association between vegetation and kind of soils. Therefore, information on the vegetation of the project area is important. It is therefore necessary to mention the type, subtype and identification of vegetation.

Land Use

The kind and pattern of land use in the project area must be fully discussed. This include the type of crop cultivated, irrigation practices, area covered, mining activities, constructions if any, and some peculiar characteristics of farming systems e.g. land conservation practices.

Social Economic activities

The social economic environment of the project area also needs to be mentioned. The presence or absence of market and the marketing potentials of the available markets should be described.

Methodology of the survey

Here the method used in carrying out the soil survey is spelt out

The soils

This is the main part of the report. In it a full account of the soils, their properties and distribution over the landscape studied are given. Specifically, the aspect of the soils to be mentioned includes:-

(1) Soil classification: The soil classification systems used are discussed and the criteria of classification are well spelt out. In addition, the categorical level at which the classification was stopped should be mentioned.

(2) Description of the mapping units: The mapping units are described fully in terms of their extent and major soil properties. Also for each mapping unit, the representative profile class is given and the extent of coverage (purity).

Soil Survey interpretation and land evaluation

Land evaluation is the main point most land users are interested in. This is the stage where the potentials of the soils in that area is accessed and their response to management are accessed. The soils can be grouped into:

1. Capability classes (Land capability classification)
2. Land suitability evaluation classes (FAO framework)
3. Irrigation capability classification (US Bureau of land reclamation)
4. Fertility capability classification

Text figures

Here the legend of the soil map and land evaluation map are presented. Each map must have its own legend and this must correlate with the map.

Appendix

Various information from which the report has been summarized but which are too voluminous to be included in the main report are presented here. The data presented here include data on profile description and analyzed data.