

# SOIL SURVEY INFORMATION AND LAND USE PLANNING

- **INTRODUCTION**

- Information about soil and site properties is the raw material for land evaluation and land use planning.
- The information is obtained through soil survey exercise.
- The information include but not limited to the following:
  - Soil Texture, Soil Structure, Organic Matter, Stoniness, Soil
  - Depth, Genetic Profile, Soil Pattern, Parent Material, Salinity,
  - Alkalinity, Soil Nutrients and Fertility Status.

- pH and Base status, CEC, Clay Mineralogy, Soil Temperature Regime, Available Water Content, Soil Moisture Regime, Permeability, Infiltration, Drainage, Wetness, Water Table, Flooding, Micro Relief, Soil Colour, Plasticity, Stickiness, Roots, Fauna, Horizon Boundary,
- Erosion, Slope / Relief, Elevation, Rainfall, Evapo-transpiration, Temperature, Growing Season, Wind, Vegetation, etc.

- The intended land use will determine the number of data that will be collected.
- Land use is any kind of permanent or cyclic human intervention with the land to satisfy human needs (Vink, 1975).
- It is therefore the application of human control on natural ecosystems, in a relatively systematic manner, in order to derive benefits from it.
- Vink further went ahead to define land use as the result of a continuous field of tension created between available resources and human needs and acted upon by human efforts.

- FAO defined land-use planning as the systematic assessment of land and water potential, alternatives for land use and economic and social conditions in order to select and adopt the best land-use options.
- Its purpose is to select and put into practice those land uses that will best meet the needs of the people while safeguarding resources for the future.

- All kinds of rural land use are involved: agriculture, pastoralism, forestry, wildlife conservation and tourism.
- Planning also provides guidance in cases of conflict between rural land use and urban or industrial expansion, by indicating which areas of land are most valuable under rural use.
- Planning involves anticipation of the need for change as well as reactions to it.

- **LAND USE PLANNING**
- The major tool for land use planning is **SOIL SURVEY** from which the Soil Information Data are derived. The 3 major agricultural categorizations for land use are: **LAND CAPABILITY CLASSIFICATIONS, THE US Bureau of Reclamation (USBR) LAND CLASSIFICATION FOR IRRIGATION, and LAND SUITABILITY CLASSIFICATIONS(FAO)**
- Other minor one is Baseline Fertility Classification.

- **LAND CAPABILITY CLASSIFICATION**

- This is a category system that groups land into a small number of discrete ranked categories according to the limiting values of a number of soil and site properties.
- Several countries have their own Land Capability Classification systems, but the USDA SYSTEM is the most widely accepted and adopted.

# THE USDA LAND CAPABILITY CLASSIFICATION

This is the grouping of soil mapping units into a 3-level classification viz: **capability classes**, **capability subclasses** and **capability units**. There are 8 classes and the degree of limitation and hazard is used to define them.

- A **CAPABILITY CLASS** is a grouping of capability subclasses that have the same relative degree of limitation or hazard.
- Classes are indicated by Roman numerals, the limitation to type of land use and risks of damage to the environment increasing from class I to class VIII.

- **CLASS I:** Soils with few limitations that restrict their use.
- **CLASS II:** Soils with some limitations that reduce the choice of plants or require moderate conservation practices.
- **CLASS III:** Soils with severe limitations that reduce the choice of plants or require special conservation practice, or both.
- **CLASS IV:** Soils with very severe limitations that reduce the choice of plants, require very careful management or both.

- **CLASS V:** Soils with little or no erosion hazard, but with other limitations impracticable to remove, that limit their use largely to pasture, range, woodland or wildlife. This class could be wet or flooded at times or stony or with climatic limitations.
- **CLASS VI:** Soils with very severe limitation that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife, i.e. steep slope, severe gully erosion, stoniness, shallow rooting zone, saline soils, severe climate, etc.

- **CLASS VII:** Soils with very severe limitations that make them unsuited to cultivation and restrict their use largely to grazing, woodland, or wildlife, i.e. very steep slope, serious gully erosion, stoniness, rock outcrops, salinity, etc.
- **CLASS VIII:** Soils and landforms with limitations that preclude their use for commercial plant production and restrict them to recreation, wildlife, water supply, or aesthetic purposes.

- **A capability subclass** is a grouping of capability units that have the same kinds of limitation or hazard. These kinds are indicated by lower-case subscripts, as follows: Erosion hazard (e), Excess water (w), Soil root-zone limitations (s), and Climatic limitations (c).
- **A capability unit** is a grouping of soil mapping units that have the same potential, limitations and management responses. Units are shown by Arabic numbers, i.e. II-2, III-1, IV-3, etc. All soils within a capability unit can be used for similar crops, require similar management practices, and soil conservation measures and have a comparable production potential.

- **THE US Bureau of Reclamation (USBR)  
LAND CLASSIFICATION FOR  
IRRIGATION**
- Widely used for assessment of land for their suitability for irrigation projects.
- 6 classes are recognized.
- CLASS 1 – Arable: highly suitable, produce profitable crops, deep soils, free from harmful salts, have high payment capacity.

- **CLASS 2-** Arable: moderately suitable, more costly to develop, intermediate payment capacity.
- **CLASS 3** – Arable: marginally suitable, with many limitations like soil, relief or drainage, expensive to develop, adequate payment capacity.
- **CLASS 4** - Limited Arable or special Use: lands with excessive deficiencies resulting in restricted use or special use, deficiencies could be corrective or non-corrective, could be managed for fair payment capacity.

- **CLASS 5 – Non-Arable:** not suitable for irrigation under existing conditions, have a potential value to warrant segregation for special study, or their arability is dependent upon additional project construction.
- **CLASS 6 – Non-Arable:** not suitable, not considered as project land, with no sufficient payment capacity.

- **SUBCLASSES:** The basic subclasses are: s, t, d, st, sd, td and std . The reason for placing areas in a class lower than class 1 will be indicated by appending the letters s, t, or d, to the class number to show whether the deficiency is in soils,s, topography,t, or drainage,d, .

# LAND SUITABILITY CLASSIFICATION (FAO)

- Defined as the fitness of a tract of land for a specified kind of land use (FAO, 1976).
- There are 4 categories: **ORDER, CLASS, SUBCLASS and UNIT.**
- **2 Orders: Suitable(S) and Not Suitable(N) .**
- **Order Suitable (S):** Lands on which sustained use for defined purpose in the defined manner is expected to yield benefit that will justify required recurrent inputs without unacceptable risk to land resources on the site or adjacent area.

- **Order Not Suitable (N):** This refers to lands with characteristics which appear to preclude its sustained use for the defined purpose in defined manner or which would create production, upkeep and/or conservation problems requiring a level of recurrent inputs unacceptable at the time of interpretation (FAO,1976).

- **3 Classes in Order S and 2 Classes in Order N.**
- S 1 – Highly suitable
- S 2 – Moderately suitable
- S 3 – Marginally suitable
- N 1 – Actually unsuitable but potentially suitable
- N 2 – Actually and potentially unsuitable

- **Order Suitable S , SUBCLASSES:** Indicate kinds of limitations, i.e. c – climatic limitation, wetness – w, t – topography limitation, salinity limitation – n , f – fertility limitation and physical soil limitation – s , etc.
- Suitability Units are subdivisions of subclasses differing in detail aspects of their production, characteristics or management requirements. They are numbered successively, i.e.  $S2w_1$ ,  $S2w_2$ .





