SOIL CLASSIFICATION

Soils are one of the greatest basic natural resources of any nation. Soils are very much diverse so it is necesary to classify them in a systematic and orderly arrangement. The details and exactness of soil classification depend upon the extent of knowledge about the soils. Thus, soil classification is dynamic in nature and keeps on changing and adjusting as knowlege and understanding of the soil increases.

A. Old Classification

Geological Approach. The earliest was the geographical system according to which the soils were divided into groups depending upon the geological materials or rocks from which the soil was derived. According to this system, soils were divided into two main groups : (1) sedentary and (2) transported. The classification was further improved and soils were grouped into red soils, black soils (regurs), laterite and lateritic soils, delta soils, desert and tarai soils.

B. Modern Classification System

1. Physical Classification. According to this system, soil is divided into a number of groups or classes such as sand, clay, loam etc. It takes into account the mechanical composition of the upper 6 or 7 inch layer of soil only. This system is good enough for agricultural purposes but does not meet the requirements of soil science. As it does not take lowers of soil into consideration it has very limited use.

2. Genetical Classification. The basis of this classification depends on the genesis or origin of the soil and its subsequent development. These classification systems are based upon the study of the soil profile which is the ultimate product and reflection of all the soil-forming factors and processes. The soils are classified into well-defined categories, the higher categories are *order, sub-order, great soil group* and *sub-group*. They give a general understanding of the soils over large areas. The

lower categories are *families, series, types* and *phases*. They are more important in recognising local differences and assessing productive capacities of soil.

At the *order* level, the soils are classified into *zonal, azonal,* and *intrazonal* groups. *Zonal* soils are more or less mature *i.e.*, well-developed horizon differentiation, colour and structure etc. Zonal soils are developed under the influence of climate and vegetation. *Azonal* soils are still immature and have not yet developed their profile characteristics. Such soils are found on steep rocky slope, on fresh alluvial deposits. *Azonal* soils may be found in any climatic region. *Intrazonal* soils have a distinct profile and their characteristics are more influenced by local conditions of relief (topography) or parent material than by the normal effects of climate and vegetation.

The soils are further sub-divided into great soil group (Table 21.1)

Table 21.1 : Scheme for genetic soil classification

Order	Great soil group
ZONAL	1. Desert soil 2. Grey soil 3. Chestnut soils 4. Chernozem (black) soil 5. Laterite soil 6. Podsols 7. Brown earth 8. Tundra soil
INTRAZONAL	1. Saline and alkaline soil 2. Rendzina soil 3. Bog or Marsh soil
AZONAL	1. Lithosols 2. Regosols (dry sands) 3. Alluvium soil

Marbut proposed a modification and divided zonal soils into two main orders : (1) padalfers, and (2) pedocals. Pedalfers are soils developed in humid regions under conditions of free drainage where calcium and other are leached out. Pedocals are soils where calcium carbonate and other bases accumulate at some depth in soil profile due to restricted drainage (Table 21.2).

TABLE 21.2 : Marbut's system of soil classification

Soil order	Sub-order	Soil group
I. ZONAL SOIL	1. Arctic pedalfers	1. Tundra soil
	2. Temperate pealfers	1. Podsol soils
		2. Brown and grey podsolic soils
(*a*) Pedalfers	3. Tropical pedalfers	1. Yellow and red podsolic soils
		2. Laterite soils
(*b*) Pedocals	4. Transition pedalfers	1. Degraded chernozem soils
	1. Temperate pedocals	1. Chernozem soils
		2. Chestnut soil
	2. Tropical pedocals	1. Brown soils
		2. Desert soils
II. INTRAZONAL SOIL	1. Halomorphic	1. Saline and alkaline soils
	2. Hydromorphic	1. Bog or marsh soil
		2. Meadow soils
	3. Calomorphic	1. Rendizine soils
	Or	2. Brown forest soils
III. AZONAL SOIL	Calcimorphic	1. Lithosols
		2. Regosols (dry sands)
		1. Alluvial soils

SOIL CLASSIFICATION-7TH APPROXIMATION

The soil survey staff of the United States Department of Agriculture has proposed a new natural soil classification system called. "Soil classification, A comprehensive system – 7th Approximation, 1960."

The 7th approximation lays more stress on the morphology of soils themselves rather than on the environmental factors. The system classifies the soils into several categories as orders, sub-orders, great groups, sub-groups, families, series and phase (type).

Example of the Classification of a Miami Silt Loam Soil

Order	Alfisol
Sub-order	Udalf
Great group	Hapludalf
Sub-group	Typic Haludalf
Family	Fine loamy, mixed
Series	Miami
Phase	Miami, eroded phase

Characteristics of Soil Classification-7th approximation

1. It is a natural classification of soil.
2. The classification is based on properties of the soils.
3. The properties selected should be observable or measurable. Properties which can be measured quantitatively should be preferred.
4. The properties selected should be those that either affect soil genesis or result from soil genesis.
5. The properties with the greater significance to plant growth should be selected for the higher category.
6. The classification system is flexible.

The various soil orders in which world soils have been divided into are given in Table 21.3.

TABLE 21.3 Revised soil orders of 7th Approximation (Baldwin et.al.)

Order	Soil group
1. Entisols	Azonal soils, *Alluvial soils, Regosols*
2. Vertisols	*Grumosols*(regurs or black cotton soil in India), black earth (Indonesia)
3. Inceptisols	*Andosols*, Brown forest
4. Aridisols	*Desert soils*,,Reddish Desert, Brown and Reddish-Brown soils.
5. Mollisols	Chestnut, Chernozem, Rendzina, some Brown soils.
6. Spodosols	*Podsols*, Brown podsolic soils, ground water podsols.
7. Alfisols	*Grey-Brown podsolic soils, Non-calcic soils,* Grey Wooded soils, Degraded chernozem, some Half-Bog soils.
8. Ultisols	Red yellow podsolic soils. Reddish-Brown Lateritic soils (U.S.A.), some Half-Bog soils.
9. Oxisols	*Latosols* and *Laterite soils*
10. Hisotsols	*Organic soils*,, Bog soils

Note : The soils in italicised letters are the soils found in India.

C. New Classification System – Soil Taxonomy

The comprehensive soil classification, called *Soil Taxonomy* maintains the natural body concept. This system has two important features (*a*) the system is based on *soil properties* that are easily verified, and (*b*) the *unique nomenclature* system.

Categories of the System. There are six categories of classification in *Soil Taxonomy* (*i*) order (*ii*) sub-order (*iii*) great group (*iv*) sub-group (*v*) family, and (*vi*) series. These categories may be compared with those used for the classification of plants.

Comparison of the classification of common cultivated plant, white clover (*Trifolium repens*) and a soil, Miami Series.

Plant classification		Soil classification	
Phylum	Pterophyta	Order	Alfisols
Class	Angiosperme	Sub-order	Udalfs
Suclass	Dicotyledoneae	Great group	Hapludalfs
Order	Rosales	Sub- group	Typical Hapludalfs
Family	Leguminosae	Family	Fine loam, mixed,
Genus	*Trifolium*	Series	Miami
Species	*repens*	Phase*	Miami, eroded phase

*Phase is used in field surveying.

(*i*) **Order.** The order is based on soil forming process. In a given order, soil properties are similar in their genesis. For example, soils that developed under grassland vegetation and are characterised by a thick, dark surface horizon with high metallic cations. Soils with these properties are included in the order, Mollisols. There are following eleven soil orders in soil taxonomy :

Soil Orders and their Major Characteristics

Name	Major characteristics
1. Entisols	Little profile development, Ochric epipedon common.
2. Inceptisols	Embryonic soils with few diagnostic features, Ochric or umbric epipedon; Cambic horizon.
3. Mollisols	Mollic epipedon, high base saturation, dark soils, some with argillic or natric horizons.
4. Alfisols	Argillic or natric horizon; high to medium base saturation.
5. Ultisols	Argillic (clay) horizon, low base saturation.
6. Oxisols	Oxic horizon, no argillic horizon, highly weathered.
7. Vertisols	High in swelling clays, deep cracks when soil dry, dark colour.
8. Aridisols	Dry soil, ochric epipedon, sometimes argillic or natric horizon.

9. Spodosols	Spodic horizon commonly with Fe, Al, and humus accumulation, forest.
10. Histosols	Peat or bog; more than 30% organic matter (organic soil).
11. Andisols*	From volcanic ejects, dominated by allophane or Al-humic complexes.

* Recently added as a soil order.

Sub-order. The sub-orders are sub-divisions of orders. The sub-order indicates genetic homogeneity. Climatic environment, vegetation and wetness help in determining the genetic processes. Forty seven sub-orders have been recognised.

Great group. Diagnostic horizons are the primary bases for differentiating the great group in a given sub-order. Nearly 230 great groups are recognised.

Sub-group. The sub-groups are sub-divisions of the great groups. There are more than 1200 sub-groups.

Family. The family is differentiated on the basis of texture, mineralogy, temperature and soil depth. Some 6600 families are recognised.

Series. The series is a sub-division of the family and is the most specific unit of classification. Differentiating characteristics are primarily based on the kind and arrangement of horizons. About 16,800 soils series are recognised.