

Introduction :-

Examination of the upper 1 – 2 meters part of the regolith shows that it differs from the material below in many aspects. This upper biochemically weathered and synthesized portion of regolith having more or less horizontal layering constitutes the soil. A vertical section of a soil from surface through all of its horizontal layers up to parent material is called Soil profile. The individual layers within the profile which are more or less parallel to the surface are called horizons. The horizons above the parent material are collectively referred to as the **Solum** derived from the Latin word meaning soil or part of land.

Soils from the different climate regions and physiographic units are significantly very in their profile characteristics. In judging a soil intelligently and to communicate this information, one must study its profile. A hypothetical soil profile is shown in figure 1.1 which gives designation and meaning of each horizon.

Significance :-

- Every well developed, undistributed soil has distinct profile characteristics and hence used to differentiate one soil from another.
- It is pre-requisite for classification and mapping of soils.
- The study of profile characteristics helps in assessing the agricultural value of land.
- It also helps in delineating the areas affected by different problems such as salinity, sodicity, water logging, presence of hardpans, etc.

Materials required :-

- Digging tools (spade, pick-axe, shovel, auger etc.).
- Cutting knife with a strong wooden handle.
- Measuring tape.
- GPS.
- Munsell colour chart.
- Dilute HCl (10%).
- Wash bottle.
- Magnifying lens.
- Sampling cloth/polythene bags.
- Profile description proforma

Selection of profile site :- The profile site should be selected in such a way that :

- It represents the normal conditions prevailing in the area.
- It is away from a tree, an irrigation channel/ditch/river, roads, human inhabitation etc.
- If possible, virgin area should be preferred.

Digging of soil profile :-

- Soil profile is exposed by digging a pit of the dimensions of about 1.80 meter (180 cm) long, 1.20 meters (120 cm) wide and 1.50 or 1.80 meters (150 or 180 cm) deep.
- The depth of the pit may be increased or decreased depending upon the thickness of the solum.
- The pit should be dug in such a way that the one of its vertical walls faces towards the sun so that a reader may describe the in natural sunlight.

Description of soil profile :-

- A soil profile characteristics succession of horizons and the description of all of these horizons furnish a picture of the whole profile.
- Each horizon in a profile is differentiated from its adjoining horizons based on certain observable / measurable properties.
- Following characteristics are used to describe each horizon separately.
 1. Horizon symbol
 2. Depth of each horizon/layer (cm)
 3. Soil colour (weather wet/moist/dry)
 4. Soil texture and structure
 5. Soil consistence when (a) dry, (b) moist, (c) wet
 6. Content of carbonates, soluble salts etc
 7. Hard pans
 8. Features of biological origin

Definition of soil profile :

The vertical section of the soil showing the various layers from the surface to the unaffected parent material is known as a soil profile. Soil profile is the key for the soil classification and also forms the basis for the practical utility of soils.

Horizons : The various horizontal layers observed in the soil profile are known as horizons. A soil profile contains main horizons symbols are O, A, B, C and R.

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Recently W is also added in horizons, which means unfrozen water layer. These horizons may again be divided into sub horizons like A₁, A₂, A₃ etc.

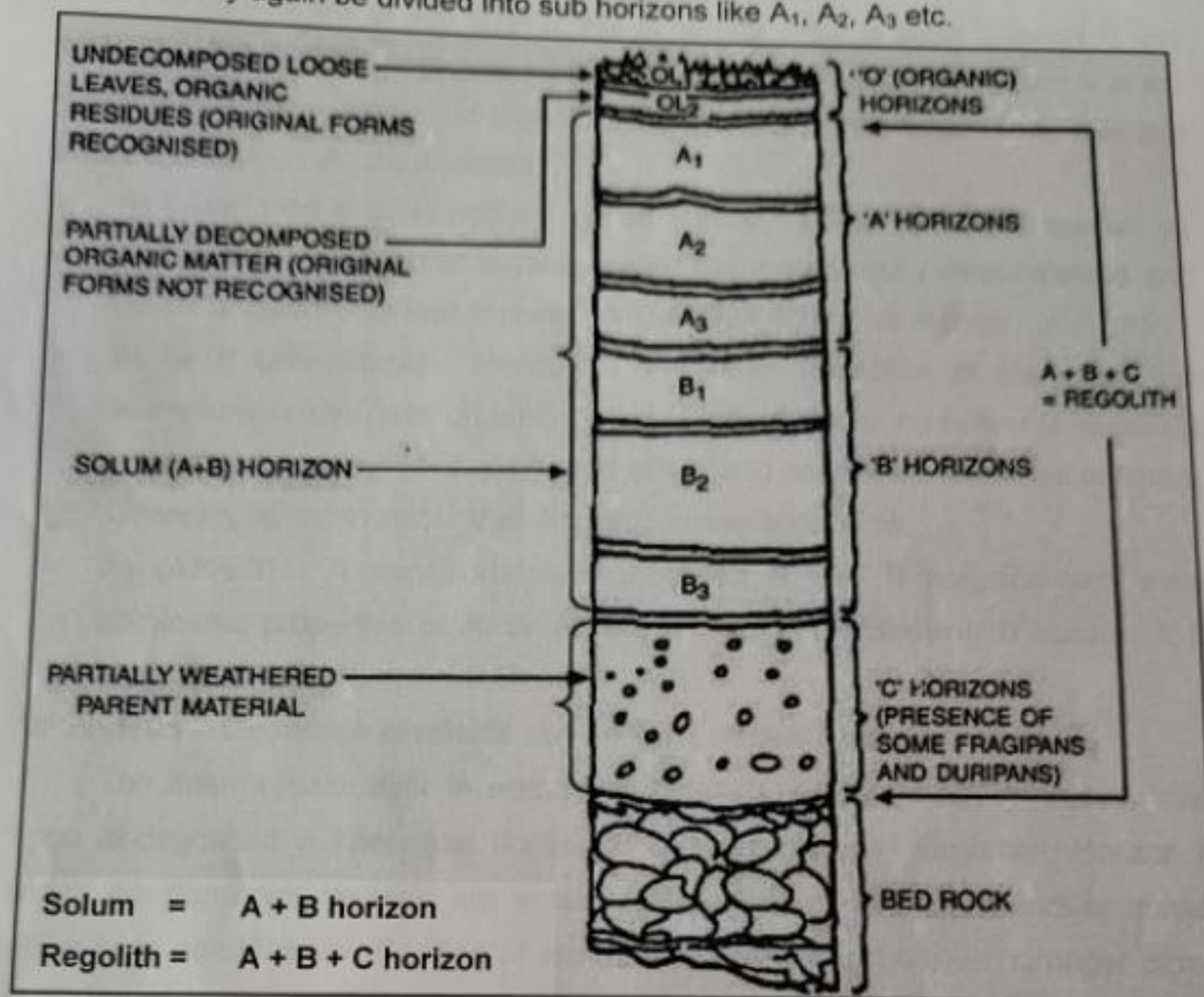


Figure 1.1 : Hypothetical diagram of soil profile

'O' horizon – Dominated by organic matter on the surface of mineral soil

It is called as organic horizon. It is formed in the upper part of the mineral soil, dominated by fresh or partly decomposed organic materials. The organic horizons are commonly seen in forest areas and generally absent in grassland, cultivated soils.

- **O₁ or O_i (only slightly decomposition)** : Organic horizon in which the original forms of the plant and animal residues are can be recognized through naked eye.
- **O₂ or O_e (intermediately decomposition)** : Organic horizon in which the original plant or animal matter cannot be recognized through naked eye.
- **O₃ or O_a (highly decomposition)** : Organic horizon in which the plant or animal residues are highly decomposition.

'A' horizon – Accumulation of humified organic matter closely mixed with mineral fractions

The surface soil or that layer of soil at the top which is liable to leaching and from which some soil constituents have been removed is known as horizon A or the horizon of eluviation. Horizon of organic matter accumulation adjacent to surface and that has lost clay, iron and aluminium.

- **A₁** : Top most mineral horizon formed adjacent to the surface. There will be accumulation of humified organic matter associated with mineral fraction and darker in colour than that of lower horizons due to organic matter
- **A₂ or E (Eluviation)** : Horizon of maximum Eluviation of clay, iron and aluminium oxides and organic matter. Loss of these constituents generally results in accumulation of quartz and other sand and silt size resistant minerals. Generally lighter in colour than horizons above and below.
- **A₃ (AB/EB)** : A transitional layer between A and B horizons with more dominated properties of A₁ or A₂ above than the underlying B horizon. It is sometimes absent.

'B' horizon – Deposition of silicate clays, Fe, Al, humus carbonate

The intermediate layer in which the materials leached from horizon A have been re-deposited is known as horizon B or the horizon of illuviation. Horizon in which the dominant features are accumulation of clay, iron, aluminium or humus alone or in combination. Coating of sesquioxides will impart darker, stronger of red Colour than overlying or underlying horizons.

- **B₁** : A transitional layer between A and B. More like A than B
- **B₂ (Illuviation)** : Zone of maximum accumulation of clay, Fe and Al oxide that may have moved down from upper horizons or may have formed in situ. The organic matter content is generally higher and Colour darker than that of A₂ horizon above
- **B₃** : Transitional horizon between B and C and with properties more similar to that of overlying B₂ than underlying C

'C' horizon - Mineral layered lattice affected by pedogenic process

The parent material from which the soil is formed is known as horizon C. It is the horizon below the solum (A + B), relatively less affected by soil forming processes. It is outside the zone of major biological activity. It may contain accumulation of carbonates or sulphates, calcium and magnesium.

- C_r : Weathered or soft bed rock
- C_w : Change in structure or colour
- C_n : Strong cementation of various materials (sodium)
- C_y : Accumulation of gypsum

'R' (Consolidated bed rock) - Underlying consolidated bed rock and it may or may not be like the parent rock from which the solum is formed.

'W' (Water layer) - Unfrozen water

Field tests :-

1. Calcium carbonate test - Apply very little quantity of dilute HCl (10%) from wash bottle on the soil to be tested. If the effervescence comes, the carbonate must be present.

$$\text{CaCO}_3 + 2 \text{HCl} = \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$$
2. Firmness of the soil - Take the moist soil between thumb and fingers and press. Note the adherence of fingers and classify to non-sticky, slightly sticky, sticky and very sticky.
3. Soil texture - Sand, loam sand, loam, sandy loam, silt loam, clay loam, sandy clay, clay and silty clay.
4. Soil structure - Granular, blocky, prismatic, platy and single grain.
5. Permeability - Slow, moderate and rapid.
6. Colour - Black, gray, brown, red and yellow.
7. Mottling - Present or absent.
8. Free lime - Present or absent.