horizon. This process is known as

Soil Profile

Soils are described and identified by reference to their profiles. Soil profile is "the sequence and nature of the horizons (layers) superimposed one above the other and exposed in a pit-section dug through the soil mantle". The smallest three-dimensional volume of a soil needed to give full representation of horizontal variability of soil is termed as **Pedon.** A **soil horizon** is defined as "a layer which is approximately parallel to the soil surface and that has properties produced by soil forming processes but that are unlike those of adjoining layers".

Profiles of different types of soil differ markedly in respect of their physico-chemical and biological properties. Figure shows soil profiles with their principal horizons. It is not necessary that all these horizons are always present in each profile. The soil profile consists of the following five main horizons :

1. **O-horizons :** It consists mostly of surface litter and partially decaying organic matter. The O-horizon protects the lower horizons from the compacting effect of rain and the drying effect of wind. In the absence of surface litter, the exposed soil becomes susceptible to erosion.

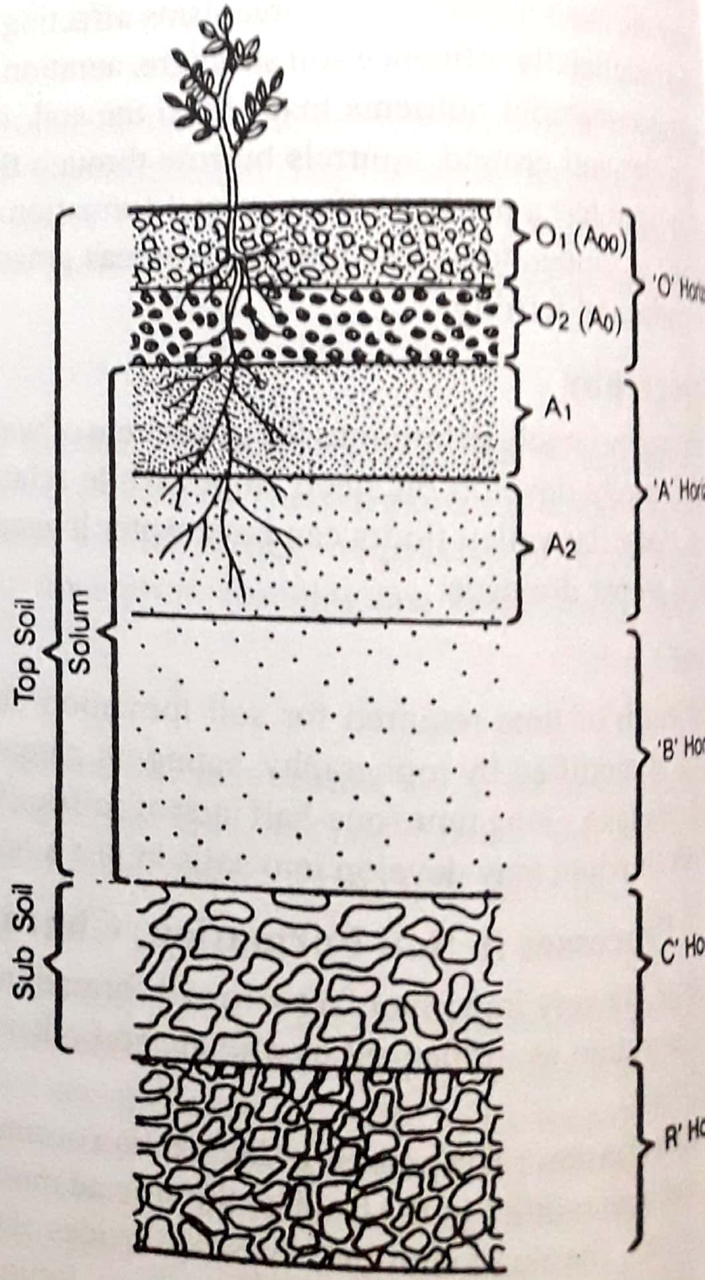

Fig. 8.2 : Generalised soil profile

2. **A-horizons :** It exists below the surface litter. It is commonly called the 'top soil'. It contains the essential organic component humus, living organisms, and some minerals. It is the most fertile part of the soil. Plants with shallow root systems obtain the nutrients directly from the top soil, which usually also retains adequate water and oxygen for their needs.
3. **E-horizons :** It is the zone of leaching, lying between the top soil and the less fertile layers below. Water and soluble minerals pass through this layer. It does not occur in all soils.
4. **B-horizon :** It lies below either A or E horizon. Soluble minerals, such as aluminium and iron, may accumulate here. It is not as fertile as the top soil, but deep rooted plants can withdraw minerals and oxygen that have leached into it. By transporting nutrients out of the B horizon, these plants keep the minerals in circulation in the ecosystem.
5. **C-horizon :** It is the lowest soil layer consisting mostly of parent material. It lies above the impenetrable layer of bedrock, sometimes called the **R-horizon**. It does not contain any organic material.

The R-horizon is absent in loess and alluvial soils where parent materials are transported by wind or water instead of being derived from bedrock.

Soil profiles develop differently in different ecosystems.

The soil profile tells us a great deal about soil history or genesis. From a practical stand point, the soil profile is of great importance, for it can tell the soil scientist whether the soil is suited for agricultural crops, for rangeland, for timber, or for wildlife habitat and recreation. The profile also reveals the suitability of the soil for various urban uses *e.g.* home sites, highways, sewage disposal plants, sanitary landfills, and septic tank fields.

Soil Classification

Processes in Soil Formation, Characteristic to the Climatic Type

Climate is a very important factor in soil formation. The following processes are intimately related with soil formation as influenced by climate and other factors. These are characteristic to a particular type of climate.

1. **Laterization :** The process of laterization occurs in the tropics. Under high temperatures regimes and high rainfall in the tropics, the silicate materials are very unstable and a large loss of silica occurs. The aluminium and iron sesquioxides of the parent minerals are resistant to decomposition and some are synthesised *in situ* from ionic. Al and Fe liberated during alumino-silicate breakdown. This process known as laterization is most common on base-rich patent materials

and it leaves a residue of primary laterite containing iron and aluminium sesquioxides and a few resistant patent minerals.

2. **Melanization :** This process is very common in regions of low humidity where humus formed from the organic matter alongwith water becomes mixed in the 'A' horizon of the soil. Due to melanization, the 'A' horizon becomes dark-coloured.

3. **Podsolization :** In temperate climates, particularly with moderate rain coupled with a nutrient deficient, well drained parent material podsolisation is very common. In such regions, the litter layer of the soil is acidic and the water percolating through such litter dissolves out with it minerals and humus content from 'A' horizon. These leached materials reach the lower horizons, being collected in the form of a hard layer in the 'B' horizon. Due to loss of chemicals, the 'A' horizon turns to a light ash colour. This process is known as podsolization, and soils as podzols.

4. **Gleization :** In humid climates, the retention of surface water in the soil, water logging, *etc.* are quite common. Under such conditions, the due to ferrous compounds the soil colour becomes blue-grey or grey, and the rates of decomposition of organic matter are very slow. As a results there accumulates a sticky, compact layer of blue-grey or grey colour at the bottom of 'B' horizon. This process is known as gleization and the soils as gleys.

thicker while others grow thinner, depending on soil forming

Soil Forming Regimes

Owing to the variations in soil forming factors, the soils differ from place t place. Climate is the most potent factor on which depend the natural vegetation, humu and micro organisms. Accordingly, the following types of soil forming regimes hav been recognized:

1. Podzolization—It is a set of processes associated with cool climates, abunda precipitation and acidic upper soil layers strongly leached of mineral nutrients and t oxides of iron and aluminium. Fungi are the main soil forming organisms. These so are characteristic of northern forests, although they also exist into temperate and su tropical regions.

2. Laterization—It is a set of processes associated with the humid tropics a sub-tropics. High mean temperatures in these regions favour sustained and rapid bacte action, which reduces the accumulation of plant litter and humus. In the absence of organic acids associated with humus, the soils are neutral, rendering the oxides of and aluminium relatively in soluble. These oxides accumulate in the upper horizor hard clays and laterite.

3. Calcification—This process occurs in climates where evapotranspira exceeds precipitation. There is little leaching of the metallic cations and microbial act is slow. Therefore the soils tend to be alkaline and rich in humus. Calcium carbona solution is carried upward by capillary action in the dry season and is concentrat the upper soil horizons in solid form where the water evaporates.