SOIL

What is it?

The very top layer of the earth's crust that forms an almost complete, incredibly thin, skin over the earth, broken only by oceans and other water bodies and by mountains that have yet to develop soil cover. Most soil is no more than 3m deep.

It is a natural resource like air and water and is vital for life. Most of our food depends on soil and it has been cultivated for thousands of years.

It performs four main functions:

- enables plant growth;
- is a means of water storage, supply and purification;
- it is a modifier of the atmosphere;
- and it is a habitat for organisms.

What is soil made of?

Composition of soil typical to British agricultural

Mineral particles: *parent* rocks that have been *weathered* (ground down) to small particles by the wind, water and temperature.
Organic matter: rotting remains from dead and living plants and animals, the bulk of which is *humus (*humus is the biochemical substance that makes the upper layers of the soil become dark. It is difficult to see in isolation because it binds with larger mineral and organic particles.).

Within the UK there are over 700 different kinds of soils. Worldwide there are many thousands of different soils.

Soil Degradation

Because of our reliance on soil for life and that it takes so long for soil to be replaced, it is incredibly precious. Many of our soils are becoming damaged and are at risk. In the last 50 years there has been increasing evidence of mismanagement of our soils.

Soil **erosion** and **desertification** (f ertile lands becoming desert) is widespread and affecting millions of hectares of land. Desertification and **salinisation** (becoming impregnated with salt) are causing major problems in the drier parts of the world. Pollution either directly to the soil or by way of **acid rain** (rain made acidic by chemicals released into the atmosphere from the industrial burning of fossil fuels) is a problem in some areas, not only affecting the soil but leaving the soil to cause pollution to water bodies and loss of aquatic life. Intensive farming, while producing increasing crop yields to feed the growing population, has put increasing pressure on the soil and this has led to soil degradation.

Africa

Africa's soils, like so many of its people, are hungry; it's low soil fertility will not sustain food production.

Traditionally, African farmers cleared land, grew a few crops and then moved on to clear more land. This practice left the soil fallow, allowing it to regain its fertility. But constant population growth now forces farmers to continually plant crops on the same land, "*mining*" the soil while giving no nutrients back. **Nutrient mining** affects more than 75% of the continent's farmland, which loses soil nutrients worth an estimated $4 billion every year.

The highest rates of nutrient depletion are in Guinea, the Democratic Republic of the Congo, Angola, Rwanda, Burundi and Uganda. Those are among the world's poorest countries and comprise 40% of the region's farmland.

Crop yields in Africa will decline by as much as 30% by 2020 if soil erosion and nutrient loss continue at their current rate.

Horizons

Soil is built up of layers called *horizons*. The composition of these layers is called the soil's *profile*. Each soil can be described and identified by looking at its profile.

O horizon → organic debris on soil surface
A horizon → topsoil - leaching, water movement down, organic and mineral material transported downward
B horizon → subsoil - accumulation of dissolved material and fine clays
C horizon → partially altered parent rock material
Bedrock → unweathered parent material

There are six main contributors that interact to produce soils:

1. **parent rocks and sediments** (residual or transported material),
2. **climate** (affects rate at which organic matter decomposes and parent rock to erode down),
3. **landscape/relief** (elevation, orientation, and slope of terrain),
4. **vegetation and living creatures** (biotic activities - organisms),
5. **time,**
6. **the effect of man**.

Residual soil – Remains in place, has not been transported
Transported soil – Transported by wind (aeolian) or water (alluvial) and deposited, such as, on a flood plain.

Around the world the influence of these soil forming factors will be different from one country to another and this is why there are many different soils in the world.

Most soils are formed from hard rock or sediments, many of which date back millions of years. The main exception to this is the peat soils which are derived mainly from buried plant remains.

IT TAKES ABOUT 500 YEARS FOR 1CM OF TOPSOIL TO FORM

Texture

There is a very wide variety of rocks in the world, some acidic, some alkaline, some coarse-textured like sands, and some fine-textured and clayey. It is from the rocks and sediments that soils inherit their particular texture.

Texture influences soil's capacity to retain moisture, air and nutrients. The particles are normally grouped into three main classes: sand, silt, and clay.

A loam soil with a small amount of organic material is considered the ideal for food production and gardening. The mineral constituents of a loam soil might be 40% sand, 40% silt and the balance 20% clay by weight.

Soil texture affects soil behaviour, in particular its retention capacity for nutrients and water.

Clay soils are heavy, high in nutrients, wet and cold in winter and baked dry in summer
Sandy soils are light, dry, warm, low in nutrients and often acidic
Silt soils are fertile, light but moisture-retentive, and easily compacted
Loams are mixtures of clay, sand and silt that avoid the extremes of each type
Peat soils are very high in organic matter and moisture
Chalky soils are very alkaline and may be light or heavy