

Soil formation

Paedogenesis

Soil formation is the result of long processes (paedogenesis) that are generally based on the alteration (that is change) of inorganic (minerals and rocks) and organic compounds (plants and dead animals or substances produced by them, like leaves and faeces) that are present in the area, their deposit and the subsequent formation of new minerals and organic molecules.

The final composition and structure of a soil depend on the following factors:

- the parent rock (or lithologic matrix), i.e. the original material (rocks, clays, limestones, etc) of the soil. You will find more information on rocks in the section dedicated to subsoil resources
- the climate, which is considered as the main responsible for the formation and definition of soil characteristics and properties
- water and temperature, which influence the majority of physical, chemical and biochemical processes that are important for the development of mature soil
sun exposure
- the activity of biotic entities (vegetation, micro and macro fauna e flora)
- the height, defined by land altitude and inclination
- the length of time, as the different products of change and the definition of soil characteristics occur in different length of time.
- human activity.

The action of the organisms

Organisms can contribute to the disintegration of the parent rock:

- plant roots enter the rock cracks and can produce acid substances that facilitate disintegration
- some sea molluscs produce acid substances that dig holes in the rock and use them as a shelter
- lichens manage to penetrate into the rock granules with their microscopic layers
- some bacteria produce carbon dioxide, ammonia, nitric acid, sulphurous acid. All these substances react with minerals and favour their alteration
- dead organisms are subject to decay, a process that produces substances like humic acids, carbon dioxide and ammonia.

Those organisms that move in the soil can contribute to further crumble soil particles. Those organisms can be worms and coleopters, which transport bits of plants and animals from the surface to the lower layers.

How long does it take to form?

The time needed to form a soil depends on the latitude:

- in environments characterized by a mild climate, it takes 200-400 years to form 1 cm of soil
- in wet tropical areas soil formation is faster, as it takes 200 years

- in order to accumulate enough substances to make a soil fertile it takes 3000 years.

For these reasons the soil is considered as a non-renewable resource: once it has been destroyed, it is lost forever.