Soil knowledge

Soil composition

The soil consists of a mixture of solid particles, water and air. Solid particles can be inorganic or organic. The inorganic parts are mainly minerals: silicates, oxides and hydroxides of iron, aluminium, manganese, etc. that, according to their dimension, are classified in skeleton and fine earth, which are then divided into sand, slime and clay. These derive from the alteration of rocks into smaller and incoherent material, which accumulates to form superficial deposits. The deposit of incoherent material can occur in the same place as the rock was disintegrated.
The degradation processes of vegetal residues (leaves, fruits, dry branches or whole plants) and dead animals lead to the creation of organic fractions of the soil. Organic compounds can keep unaltered for long periods (non-humic compounds) or be subject to deep and fast changes in their original chemical structure (humic compounds or humus).
Water and air occupy the free spaces between solid particles (pores), and form a thick and extended network that allows water to move in the ground.

Soil structure

When the soil is not removed, the so-called mature soil develops. Paedogenesis is the name of the process that leads to its creation.
A mature soil is characterized by a series of layers, called horizons, which differ according to the soil structure and the composition of organic and inorganic parts.
The layers create the soil profile:

- Horizon A: rich in organic components, but lacks clay particles. Clay particles are transported by the water to the underneath horizons.
- Horizon B: lacks organic material, but is rich in clay particles.
- Horizon C: has particles of real soil and fragments of rock that have not been changed yet. More deeply, unchanged rocks can be found.

A natural resource

The soil is an important part of the landscape and contributes to determine the way in which natural vegetation, crops and human settlements are distributed on the territory. But the importance of the soil is mainly related to its double role as a reserve of nutritional elements and water and mechanical support (how would plants be able to stand upright if they did not have the soil to put their roots in?) for vegetation, leading to the creation of forests and protected areas. A direct observation allows us to see the fundamental importance of the soil: if we go to the mountains or to the countryside, we will see some bare rocks without plants, but next to them there will be wider areas covered by a thick soil. On this land spontaneous vegetation or crops grow. The soil is also very important for men and other living organisms as it affects water composition. In fact, the quality of underground water reserves depends on use of organic and inorganic polluting products, deriving from agricultural and industrial activities or from cities. Various chemical and physical properties of the soil affect the concentration and permanence of polluting compounds in the soil, and the probability that they get in contact with superficial aquifers by polluting them.
The soil can be extremely important for men even if it is not changed and left in its natural conditions. This is the case of protected areas (parks and oasis): the survival of the delicate ecosystems of these areas mainly depends on the fact that the soil keeps in good conditions and does not experience changes. For example, in the past men considered wet areas as unhealthy areas to be reclaimed and used for agriculture. Today wet areas are considered as very important and fragile ecosystems, whose survival can be guaranteed only by preserving the particular conditions of their soil.

An agricultural and food resource

Agriculture causes a major transformation of the soil and represents the main exploitation of renewable resources (water, soil, flora, fauna, and atmosphere) of our planet. Agriculture is the main productive activity (sometimes the only activity) for many countries, in particular for tropical and subtropical regions. Agriculture uses the soil to produce food (fruits, vegetables, roots, and other parts of plants that represent the daily nutrition for more than nine-tenth of men), fibres and other useful goods. Agriculture is practiced almost at all latitudes, although in many different ways: from the most primitive low-income type of agriculture of the poorest parts of the Earth (Africa, Asia, central-southern America), to the modern high-productivity agriculture of mild regions (Europe and North America).

In order to face the world growing need for food (without being able to increase the surface of farmed land, as the land was not-productive or it was already occupied by the cities), agriculture experienced a real revolution. It has become intensive, that is based on high production and specialized. This means that the aim of agriculture today is to farm just a few selected crops in order to be more competitive and reach a better quality. This has all been achieved thanks to agricultural technical and technological progress, the introduction of more efficient irrigation systems and the growing use of chemical fertilizers and phytosanitary products, that are easy to use and economically convenient, although in some cases they pollute.