Soil Biodiversity
– the factory of life

In this UN International Year of Biodiversity, 2010, one large section of global biodiversity has been ignored for too long: soil biodiversity. An enormous variety of life forms exists within the soil, helping to keep our soils healthy and fertile, mitigate climate change, store and purify water, provide antibiotics and prevent erosion. But their habitat is under threat as never before.

Janez Potočnik
European Commissioner for the Environment

Beneath our feet is a fascinating world: the soil, a factory of life. This bustling workplace is home to thousands of species – soil biodiversity – which toil each day to create the conditions that enable plants to grow, animals to feed, and human society to source essential raw materials.

Scientists estimate that over one-quarter of all living species on planet Earth live in the soil. Yet while we can name most species that live above the ground, we hardly know the shadowy creatures that dwell beneath, out of sight and out of mind. And we neglect this vast community of life forms at our peril.

soil

EUROPEAN COMMISSION

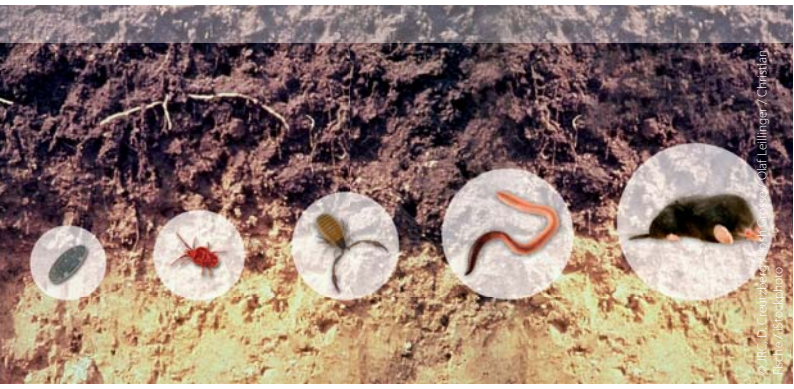
environment

The most productive factory on Earth

Soil organisms – ranging from microscopic single-celled organisms to small mammals burrowing into the ground – work together to carry out vital tasks that help the earth to function:

- They create and refresh soil, decomposing organic matter to maintain the soil's productivity.
- They enable the soil to store and release carbon, helping to regulate the climate.
- They purify water as it enters the soil, stripping out contaminants and pollutants. They provide the structures required to retain and store water within the soil and in underground reservoirs.
- They control pest outbreaks: the richer the soil biodiversity, the greater the number of predators, reducing the chance that one species will gain dominance.
- They provide the means to tackle infectious diseases: the antibiotic penicillin is derived from a soil fungus identified by Alexander Fleming in 1928. Like a medicine cabinet for the future, the rapid evolution of soil micro-organisms makes the soil a rich source of new life-saving pharmaceuticals.

While the monetary value of these services is difficult to calculate, it has been estimated to be billions of euros per year. Whatever the true cost, no amount of human activity could replace this work.



The invisible heroes

Smallest but most important of the soil-dwellers are the micro-organisms: bacteria, fungi and algae. These "chemical engineers" regenerate the soil by processing waste organic matter into its chemical constituents, delivering nutrients that plants and other animals need.

A broader group of slightly larger creatures – the "biological regulators" – keep the micro-organisms in check, controlling their abundance and activity.

Earthworms, ants, termites, woodlice and mammals such as moles fall into a third group of soil workers, the "ecosystem engineers". They mix and move soil particles, creating habitats for smaller species and allowing air and water to penetrate the ground. Larger animals that live only part of their lives in soil, such as voles, rabbits and badgers, help with this service.

A factory under threat

The problem today is that soil is under threat as never before. The way that we use and manage land, as well as climate change, have far-reaching impacts. And soil is a highly sensitive resource, which is practically non-renewable: it can take decades, even centuries to form.

The soil factory is subject to attack on various fronts, undermining soil biodiversity and impairing its ability to deliver vital services:

- Erosion is a threat to soil across Europe, the result of harsh farming practices and land-use change, such as deforestation. It occurs when the surface of the soil is scraped off by wind and water.
- A decline in levels of organic matter starves soil organisms of the raw materials that are essential for their survival. This can be caused by an over-dependence on chemicals in agriculture, and too sparing a use of organic rather than mineral fertilisers.
- Salinisation can result from inappropriate irrigation or the poor management of water resources. It can lay waste to the soil, killing soil organisms, vegetation and leading eventually to desertification.
- Crushing soils through the use of heavy machinery results in compaction, which squeezes air out of the soil factory and damages the open structure it needs for soil organisms to thrive.
- Laying asphalt and concrete in urban areas has the effect of sealing soils, suffocating soil biodiversity and causing water run-off, which worsens erosion and flooding.

Climate change is expected to add to these threats to soil, altering levels of moisture and temperature and disrupting the delicate balance of this ecosystem. It may also trigger a negative feedback effect that results in more stored carbon being released. Greater erosion, drought and wildfires will only compound the problem.

KH-78-095-71-EN-D

Farmers can help insure against this bleak future and be part of the solution. Rotating crops, preserving hedges and field margins, and using more mulches and organic residues can encourage biodiversity and make soils resilient to other pressures. As the global population heads towards 9 billion by mid-century, healthy soils will be critical to our future food supply – which is all the more reason to act now before it is too late.

Saving the soil factory

The European Commission is addressing the threats to soil on several fronts: supporting research to assess and monitor soil quality and raising awareness about the precious resource bank beneath our feet. It has also proposed legislation to address the problem, the Soil Framework Directive, as an integral part of its Soil Thematic Strategy.

The Directive aims to establish a common approach for the protection and sustainable use of soils. By addressing the main causes of soil degradation, it should play a decisive role in protecting all soil biodiversity. But European governments have yet to achieve the agreement that would ensure that, like water and air, soil gains the protection it needs. Let us delay no longer and move to put soil biodiversity at the heart of our combined efforts to safeguard our environment for the future.

A full report on soil biodiversity is available at http://ec.europa.eu/environment/soil/biodiversity.htm (English only).

A brochure summarising the content of the report, available in English, French, German, Spanish, Italian and Polish, can be downloaded from http://ec.europa.eu/environment/soil/publications_en.htm

European Atlas of Soil Biodiversity
http://eusoils.jrc.ec.europa.eu/library/maps/biodiversity_atlas

European Commission Directorate-General for Environment
http://ec.europa.eu/environment/soil/index_en.htm

Publications Office