

Nourish and preserve the habitat of the soil food web: the principles of a regenerative production system

The soil food web is the set of organisms that live in the soil. **The nutrition of the food web and the preservation of a favourable habitat for the life of these organisms are the basis of a sustainable production system.** A system managed following these criteria results in high soil fertility and health and, therefore, **high plant productivity.**

A healthy soil harbours a complex **trophic network** (Figure 1), ranging from **microorganisms** (bacteria, fungi, protozoa, nematodes), to the soil **macrofauna** (worms, insects, reptiles and mammals). Under natural conditions, **efficient plant feeding** occurs as a result of the biological activity of this trophic network. The functioning of this biological activity requires two basic conditions: 1) the supply of **food for the soil trophic network** and 2) the maintaining of suitable **habitat conditions** for the different organisms. Compliance with these conditions defines the **bases of a sustainable production system.**

■ Relations between the soil food web and plants

Maintaining the **relationships established between the organisms of the soil food web and plants** is the basis of a sustainable production system. These relationships occur in both directions:

• Plants feed the soil food web.

Under natural conditions, all the carbohydrates produced in photosynthesis, which have not been consumed by plant respiration, end up being incorporated as organic materials to feed the food web of the soil. An important part of this

incorporation is performed by the **roots** (Figure 2). Through them, the plant directly feeds ecto and endomycorrhizal fungi and releases exudates to favour the presence and activity of beneficial microorganisms in its environment (rhizosphere). **Dead roots are an important contribution of organic material** for feeding the trophic web of the soil. When a plant dies, **the plant tissues of the aerial part are also incorporated as organic materials** that nourish the trophic network of the soil, either directly or through herbivore excrements.

• **The food web of the soil feeds the plants.** The activity of the soil trophic network generates complex processes that make it possible to make the nutrients available to the plant in the most appropriate place and time. **Soil ecto and endomycorrhizal fungi help the plant to more efficiently prospect for nutrients and water from the soil.**

The biological activity that favours the plant in the root environment generates biochemical changes that release cations retained in the soil and make them available to it. The activity of **nitrogen-fixing bacteria** is also favoured. In addition, the roots can also directly absorb amino acids and proteins from **organic materials incorporated into the soil** and partially decomposed by the activity of the soil's food web.

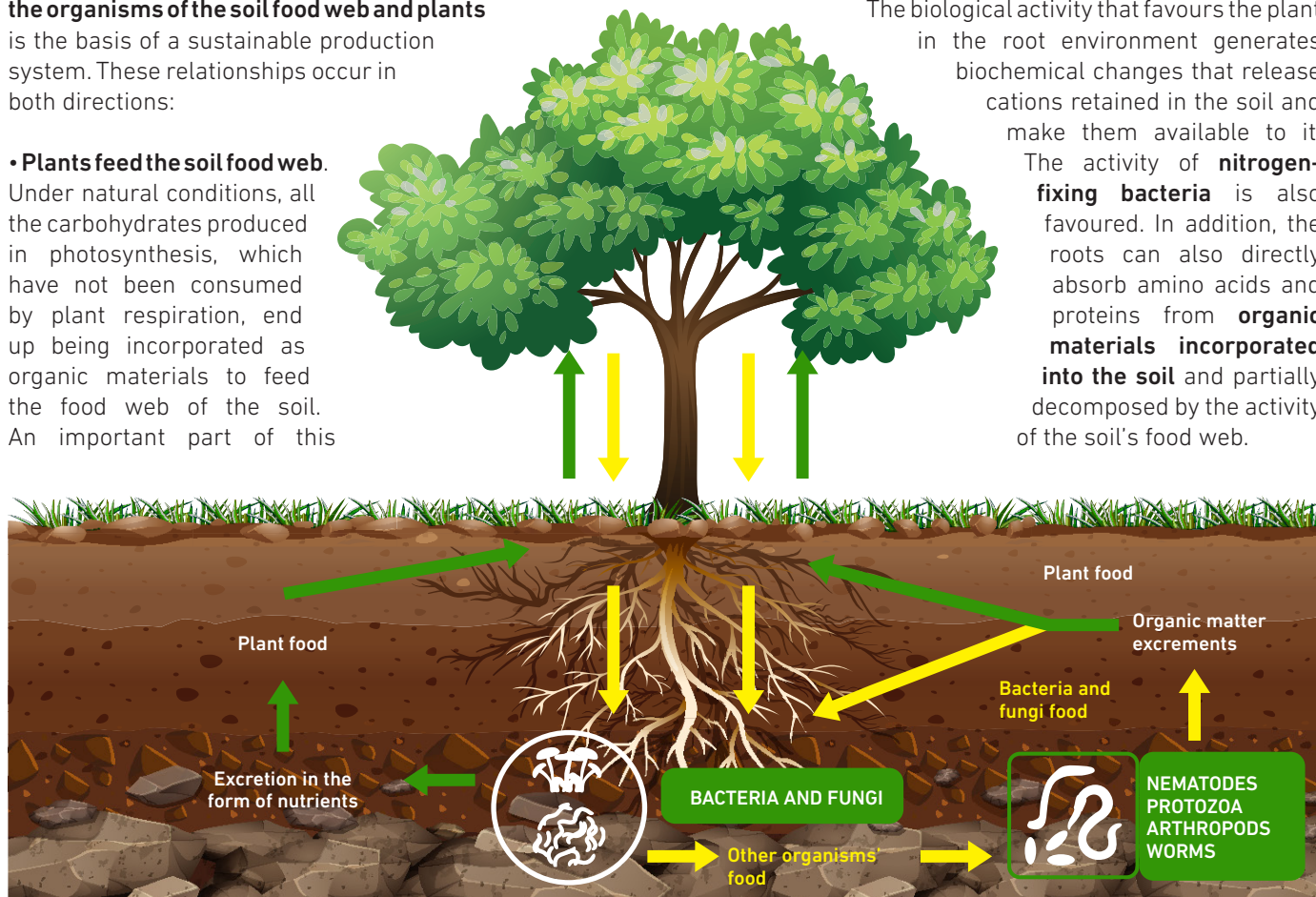


Figure 1. Chain of relationships between soil and plants. Yellow arrows: the plants feeding the soil, green arrows, the soil feeding the plants.



Figure 2. Roots play a fundamental role in feeding the soil food web. Photo: Pxfuel. Creative Commons Zero - CC0.



Figure 3. Earthworms play a fundamental role in soil aeration.

■ Habitat conditions necessary for the life of the soil

The functioning of the biological processes of the soil requires habitat conditions (**micro and macro pores**) that allow the **movement of air in the soil, the movement and retention of water**, and the necessary conditions for the movement and shelter of the different components of the food web. The main thing responsible for maintaining these habitat conditions is **Soil Organic Matter (SOM)**. An important component of this SOM is **humus**, which is a stable phase of the degradation process of organic material incorporated into the soil by the trophic web. Another important component of SOM is **organic chains**, which are produced by fungi and are responsible for creating stable agglomerates of mineral particles. The **activity of the soil macrofauna**, such as worms or ants, **creates tunnels** that improve the conditions necessary for the functioning of the entire trophic network (**Figure 3**).

The regenerative production model is based on the natural feeding of the plant

The regenerative production model is based on knowing the factors that **naturally nourish a plant** and only uses the soil's resources to **feed it**. **This model is based on feeding the soil food web** and maintaining the habitat conditions necessary for its functioning, specifically regarding SOM and soil structure. As a result, the regenerative production system, well managed, obtains a large production of food with high nutritional quality and in a sustainable way.

The conventional agricultural system, on the contrary, does not consider the importance of the biological processes of the soil trophic network, and the plant is mainly fed by soluble nutrients provided by **external fertilisers**. In this type of agriculture, the habitat conditions necessary for root growth (penetrability, aeration and infiltration), are achieved by **working the land** with increasingly powerful machinery. In this way, a **system dependent on the increasing consumption of external energy** (machinery, fertilisers, herbicides and insecticides) is created. Without this important input of external energy, the system collapses and stops producing.