Interventions that block the functioning of soil biological processes

Some management practices destroy biodiversity and therefore do not favour the food web of the soil. These include: (i) **tillage**: it breaks down the suitable habitat for the soil food web; (ii) **the increase of bare soil**: it allows the direct impact of the sun and rain on the soil surface; (iii) **soil compaction**: it destroys the habitat by altering the porosity of the soil; (iv) **the use of chemical fertilisers**: they directly feed the plants without feeding the trophic web of the soil; (v) the **use of insecticides, fungicides and herbicides**: they reduce the soil's biological activity.

Figure 1. Turned soil after tillage. Photo: N. Anglada

All agricultural practices that negatively affect the soil food web or that destroy the habitat, cause the blocking of biological processes and, as a result, the natural fertility of the soil is lost. In this situation, farms depend on external factors such as the use of tillage (oil) and agrochemicals (more oil) to continue producing. The following **interventions have the greatest impact on the loss of soil fertility**:

• **Tillage**. Tilling the soil (**Figure 1**) **breaks the hyphal systems of the fungi** that help the roots to increase the prospecting of the soil, **breaks the agglomerates** that participate in the creation of the suitable habitat for the soil food web and facilitates the mineralisation of the organic substances that are responsible for maintaining these conglomerates. At the same time, tillage **increases the temperature and aeration of the soil, favouring the activity of opportunistic bacteria** and the mineralisation rate of soil organic matter. This means that tilling the soil has an initial effect of increasing fertility (mineralisation), but the final effect is a **decrease in the total content of organic matter in the soil**, and its consequences are the worsening of the habitat conditions for the soil food web and the nutrient and water retention capacity.

• **Increase in bare soil**. The increase in bare soil is an important effect of tillage or overgrazing (**Figure 2**). The bare ground **causes a direct impact of sunlight, with a direct effect on the life of the first few centimetres of the ground**. At the same time, it allows the impact of rain and wind on the soil surface, which causes **erosion and loss of superficial organic matter, compaction and a decrease in the infiltration rate**.

• **Soil compaction**. Compaction is usually the **result of the use of heavy machinery or poor grazing management** (overgrazing) (**Figure 3**). It is usually linked to bare ground. This compaction **breaks the micro- and macro-porosity of the soil**, destroying the habitat of the soil trophic network and preventing the infiltration of rainwater. This does not mean that machinery cannot be used. For extensive productions it is necessary to use a tractor for the direct sowing and harvesting of products. But you should **always use the lightest possible machinery** and avoid times when damage to the ground can be more significant, such as when the ground is very wet.

• **Use of chemical fertilisers**. Chemical fertilisers directly feed the plants, which, having soluble nutrients available, do not invest in feeding the soil food web. In addition, the **increase in nitrogen in the soil causes bacteria to consume more carbon**, which they obtain from the soil organic matter (SOM). This increases the mineralisation rate and causes

Figure 2. Tilled field with the soil exposed.

the disappearance of SOM and the loss of habitat for the soil food web, so that the natural diet of plants stops working and it becomes increasingly dependent on external inputs. **When the biological activity of the soil is lost, feedback is generated with a negative effect**: the plants become increasingly malnourished. This makes them more easily attacked by pests, which requires the use of multiple products (such as insecticides, fungicides or herbicides) to protect them; in turn, these biocides further reduce the biological activity of the soil.

• **Use of insecticides, fungicides and herbicides**. All these products directly affect the life of organisms and, therefore, all the biological activity and functioning of the soil. These products are closely related to chemical fertilisers, since they make plant nutrition increasingly dependent on the soluble nutrients provided. In this way, and as we have said, **a circle of growing dependence between chemical fertilisers and insecticides is generated.**

The regenerative production model: production is put in the farmer's hands

The conventional production model depends on the big companies that manufacture the machinery and agrochemicals necessary for the system to function. The costs of this machinery and these agrochemicals are the highest production costs and continuously increase. To maintain profitability, the farmer must produce more and more, entering a **circle of dependence on large industry to produce and sell**. The small farmer usually cannot afford these costs and must close down.

A model that considers the natural feeding of the plant is based on knowledge, which is accessible to everyone, and does not depend on oil. With this model, production costs related to external inputs are reduced or disappear (there are no agrochemicals, there is no soil work).

There is also an economy of scale: as it does not require external inputs, it is a model applicable to smaller scales. The difference in costs when working at reduced scales is manageable and can be compensated by local sales strategies. **This creates the opportunity for quality food in the hands of farmers and consumers**.

Figure 3. Uncovered soil compacted by overgrazing. Photo: MJ Broncano