Change of biological soil quality in organic and conventional farming systems of the DOK trial

Andreas Fliessbach, H.-M. Krause, A. Kuhn, A. Munyangabe,
B. Stehle, M. Sauter, F. Perrochet and P. Mäder

Research Institute of Organic Agriculture (FiBL), Soil Science Department, Switzerland

The DOK trial has started in the 1970ies, when first reports warned us on the consequences of our actions and the limits to growth. Even though farmers and a huge research community know better, we are still not managing our soils in a sustainable way. It seems inevitable that the mainstream agriculture wants to go beyond natural frontiers. Soils have an enormous buffering capacity, but this ends, when ecosystems are collapsing not only at the local, but also at the global level.

If we were to measure sustainable land use and management for the justification of subsidies to farmers from taxpayers' funds, we would certainly look at water quality and biodiversity, supported by ambassadors like sparkling waterfalls, pandas or butterflies to address our feelings. It does not help much towards human stupidity, but soils have no such ambassador, even though earthworms try hard. We are not consuming soils directly and our minds are not confronted with positive images to support the life of soils. However, soils are at stake! Soils harbour a vast diversity of organisms that are carrying out important ecological processes. The decomposition of the organic material produced naturally, but also some of the most complex chemical compounds human minds have developed, can be decomposed if not by one then by the co-metabolism of several organisms.

Soil organic matter and soil organisms are guarantee for maintenance and improvement of the structural stability of the soil and the support of soil functions. Farmers on marginal land in the South are complaining that soils are not responding to fertilizer and they are struggling to improve soil quality since this investment does not pay off after one vegetation phase. Due to the potential of carbon sequestration with co-benefits for food security, climate change adaptation and mitigation, soils are high on the political agenda. Policy measures are about to solicit tax funds, which may motivate farmers and any other soil users to invest in the build-up of SOM. If consistently done, it may not only help the climate.

Organic farmers are setting up their arable systems by organic fertilization strategies that recycle nutrients, but also organic matter at the farm level. Most Swiss farmers produce according to guidelines of label organisations (IP Suisse, Bio Suisse, Demeter) with mixed livestock and arable crop production and use manure as well as multiannual grass-clover leys. This constitutes the typology of the farming systems compared in the DOK-trial.

We will present the chronology of approaches looking for a change in soil quality brought about by land management. We will focus particularly on carbon as the driving element of biological soil processes. In this regard, the differences between the DOK farming systems are due to the amount and quality of the fertilizers and the strategy of plant protection. The soils of the DOK trial represent a perfect platform to evaluate the sensitiveness of soil quality indicators to crop and soil management.