Soil Transformation of European Catchments (SoilTrEC)- Project Fact Sheet (www.soiltec.eu)

Soil formation, land use and biodiversity

Soil Biodiversity

Soil ecosystems are habitat for extreme species rich communities. By far the most important groups of organisms are the microbes (bacteria, fungi, archaea) both in terms of biomass as in (genetic) diversity. In addition, soil communities harbor a range of microbial grazers (protozoa, nematodes, insects, mites), omnivores (enchytraeids, earthworms) and predators (nematodes, insect, mites). Together, these organisms create complex networks of trophic interactions, forming the soil food web (Figure 1).

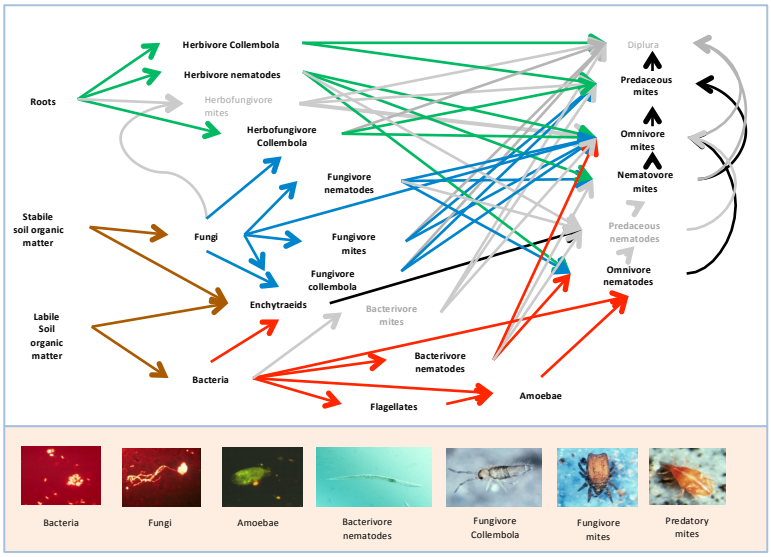

Figure 1. *Food web diagram of the soil community as observed in Austrian farms near Vienna. Boxes represent groups, arrows represent feeding rates. Colours denote the primary energy source, i.e. brown: soil organic matter, red: bacteria, blue: fungi. Black arrows denote more than one energy source. Grey boxes denote groups that were found over all sites but were not present in the Austrian soils.*

The functionality of Soil Biodiversity

The tremendous reservoir of soil biological diversity is pivotal for delivering food, fibre and biofuels, clean air, drinking water and carbon storage. Because of increased intensive land use, it is expected that this soil diversity will be affected with negative impacts on these soil ecosystem services. Considerable efforts by land-owners, policy-makers and scientists are directed towards optimizing land management for maximum functionality in terms of ecosystem services through sustaining the soil food-web governing this functionality.

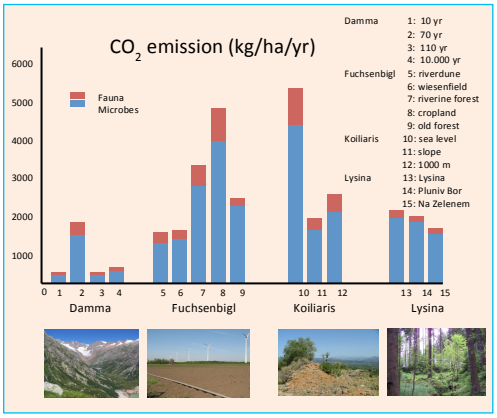

Figure 2. *Soil can store and emit large amounts of carbon. Carbon storage and CO_2 emissions are the direct result of the trophic activity of the soil organisms. In this way, soil biodiversity plays a major role in the global cycling of carbon. Land use that promotes carbon storage can make a significant contribution to climate change mitigation.*

Soil biodiversity along soil formation

To understand the diversity and structure of the soil communities, and how these relate to ecosystem functioning and services, it is important to analyse pathways of development of soil food web structure. SoilTrEC has studied soil food web development along gradients of soil formation created by retracting glaciers in Switzerland and Iceland.

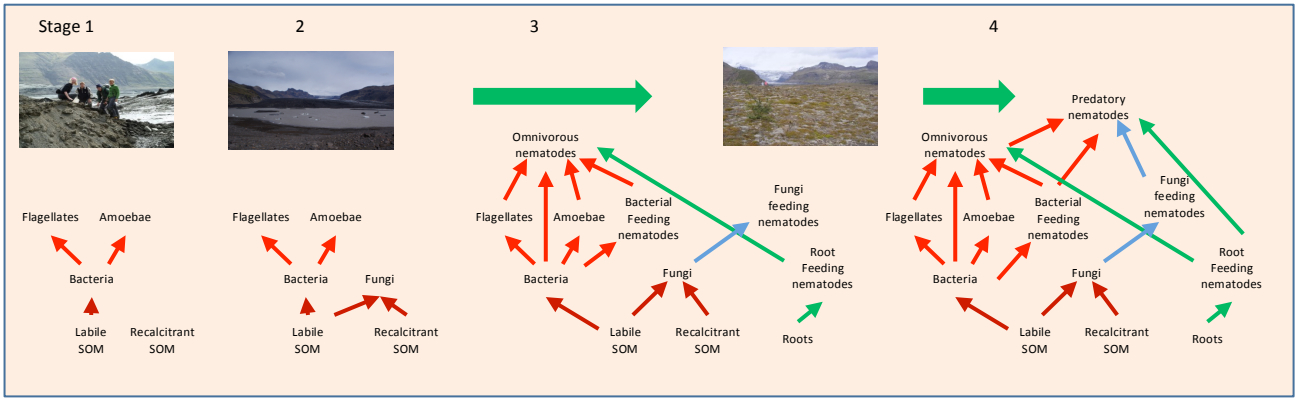

Figure 3. *Retracting glaciers, like that of Skaftafell (Iceland), form excellent chronosequences to study the development of soil ecology during soil formation. This figure shows soil food web development for a period of 120 years.*

The indicative value of soil biodiversity

Because of its high functionality, soil biological properties have been studied for their indicative value for soil quality. Soil quality can refer to agricultural soil fertility, soil habitat suitability for species rich natural vegetation, land degradation and soil pollution.

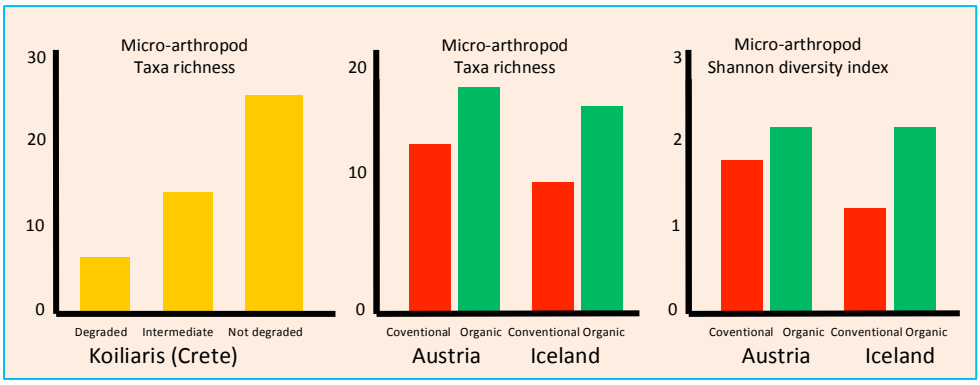

Figure 4. *The SoilTrEC sites with gradients of land degradation and the different agricultural farming confirmed micro-arthropod diversity as soil quality indicator.*

Authors: Jeroen P. van Leeuwen, Daniel Moraetis, Jaap Bloem, Lia Hemerik, Taru Lehtinen, Kristín Vala Ragnarsdóttir, Guðrún Gísladótti, Jeffrey Newton, Georg Lair, Peter C. de Ruiter.

For more information visit SoilTrEC website: www.soiltrec.eu

Contact us: Prof. Steven Banwart, SoilTrEC Project Coordinator, University of Sheffield.
Email: s.a.banwart@sheffield.ac.uk