

Organic reduced tillage – evidence from 15 years of research in the Frick trial

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In Europe, the plough is commonly used for soil tillage. Its history is dating back to the early days of agriculture and hence its use is deeply rooted in European culture. With ongoing heavier machines, larger fields and less landscape diversity, ploughing contributed to large-scale soil degradation. Long-term sustainability of the current ploughing practice is therefore questioned. In organic farming, ploughing is seen as an important tool for weed control, ley termination and incorporation of organic material. In the light of climate change and increasing pressure on food security, also organic farming practices need to be improved. The aim of reduced tillage in organic systems is therefore to replace ploughing by less intensive tillage but still to be able for mechanical weed control.

The long-term trial in Frick was established in autumn 2002 on a heavy clay soil (stagnic eutric Cambisol) with the aim to compare continuous reduced tillage with traditional ploughing (18-20 cm) under organic farming conditions in the long run. In this trial, reduced tillage is determined as regular soil tillage to maximum 10 cm by chisel tillage with wide sweeps. Occasional aeration to max. 20 cm with a chisel at a maximum of once per rotation period and ley termination by shallow inversion (5 cm) with a special plough ("Stoppelhobel") allow for system optimisation.

After three rotation periods and 15 years, soil quality improved substantially by conversion to reduced tillage. Topsoil organic carbon content increased by 25 % and microbial biomass and activity by 32-34 % compared to ploughing. Organic carbon was stabilised by clay in the lower soil layers. Earthworms profited from reduced tillage with a higher reproduction. Belowground biodiversity also increased and shifted to more fungal based communities. Yield performance was similar to ploughing across all years but less stable with both higher and lower yields in single years. Crop performance under reduced tillage was more dependent on the current weather situation, especially N supply in early spring that is largely provided by soil and farmyard manure mineralisation in organic farming. Weed infestation under reduced tillage also increased and was seen to lower yields when N supply was sufficient. Perennial grasses and Convolvulus species were the most problematic weeds at this site.

At this stage, it can be concluded that continuous reduced tillage is possible in organic farming. Soil conservation aims are fully met. Yet, management is more difficult and needs to be combined with other strategies like green manures, strategic soil aeration and a more sophisticated weed control. At the conference, a compilation of results from 15 years of research in the FiBL long-term trial will be presented