

Reduced tillage in two long-term experiments of FiBL, Switzerland

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Abstract:

Reduced tillage has proven positive effects on topsoil carbon storage (Krauss et al. 2022) and consequently for topsoil structure compared to conventional ploughing. However, in organic farming, many farmers use the plough because it is considered as a reliable method of reducing weeds and stimulating mineralization in spring (Peigne et al. 2015). A field trial was set up 2002 on the biodynamic FiBL Farm Linde, Frick AG, and 2010 on the organic farm Schlatthof, Aesch BL, both Switzerland, for the further development of organic arable farming in the area of reduced tillage. The experiments are still ongoing. The tillage treatments are conventional tillage (annual ploughing, approx. 20 cm deep, CT) versus reduced tillage (chisel ploughing with occasional use of a skim plough for ley termination, approx. 10 cm deep, RT). Further factors are fertilization (Aesch and Frick) and biodynamic preparations (Frick; FiBL 2019 and 2022). Among other parameters, crop yields, soil organic carbon (SOC), and soil microbial biomass were measured in three-year intervals in 0-10 cm and 10-20 cm depth. The mean yield reduction with RT compared to CT was approx. 4% in both experiments over all years. For SOC, there was an increase of 25% in the clay loam in Frick, and 14% in the silty loam in Aesch under RT in the 0-10 cm layer, and no significant differences were measured in the layer 10-20 cm on both sites. 2021 soil microbial biomass was significantly higher in 0-10 cm and 10-20 cm in RT compared to CT in Frick and in 0-10 cm layer in Aesch. Weed pressure was higher in RT compared to CT on both sites. In conclusion, RT enhanced SOC and microbial biomass on both sites and acceptable yield were achieved, but weeds should be monitored further to avoid future problems. For improved weed control, hoeing will be introduced as a new factor in Aesch and the efficiency of hoeing intensity on N-mineralisation, C-depletion and contribution margin will be assessed.

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