

Impact of soil microbiota and tillage practices on the long-term sustainability of agroecosystems in climate change

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The sustainability of agroecosystems is vital for maintaining their condition, productivity, biodiversity, and integrity over time, especially against the backdrop of increasing consumption of natural resources and climate change. The European Environment Agency and Environment Research Centre prioritize research on improving the water holding capacity of soils, which is increasingly crucial in a drier climate. A long-term field experiment, initiated in 1999 on Planosols, explored the effects of varied tillage intensities and agricultural practices on agroecosystem sustainability. This study utilized both conventional and reduced tillage systems, combined with cover crop treatments. One segment of the study removed straw post-harvest, while another chopped and spread it. The crops rotated were winter oilseed rape, winter wheat, and spring barley.

Over the 21-year period, it was observed that sustainability in agroecosystems is directly related to the stability of their productivity. Analyzing crop productivity from 2000 to 2020, there was minimal variation in long-term measures of different intensities when compared to deep ploughing. A noteworthy finding was that consistently spreading plant residues and using white mustard as green manure positively impacted winter wheat productivity. Interestingly, these measures did not significantly affect spring barley. Microorganisms have also had a very important impact on the sustainability of agroecosystems. The study concludes that reduced soil tillage, combined with the use of plant residues and green manure, ensures stable productivity in agroecosystems, highlighting their potential in promoting sustainable farming amidst environmental challenges.

Keywords: conventional tillage; reduced tillage; no-till; straw, cover crops, soil organic carbon sequestration, microbial biomass carbon; productivity