# Impact of conservation tillage on the structure and functional activity of microbial communities

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## Abstract

Soil, as a key natural resource for agriculture, plays a vital role in ecosystem services and biodiversity. Microorganisms are among its most important inhabitants and key drivers of soil functions in ecosystems and agroecosystems. They contribute to soil structure formation, organic matter decomposition, detoxification processes, and the cycling of carbon, nitrogen, phosphorus, and sulfur. In addition, they play an important role in suppressing soil-borne plant diseases, enhancing crop resilience to adverse environmental conditions, and regulating climate-related processes. Given their multiple functions within agroecosystems, it is important to implement appropriate agricultural management practices that promote and support soil microbial communities. In this context, conservation tillage is of particular importance, as it can significantly influence the structure and functioning of microbial communities. Conservation tillage is a sustainable soil management system that protects soil from degradation and environmental stress. It is based on minimal soil disturbance and permanent retention of crop residues on the soil surface. Unlike conventional tillage, whose continuous application disrupts the physical, chemical, and biological components of soil fertility, conservation tillage generally reduces stress on soil microbial communities, positively affects microbial abundance, diversity, and soil biological activity, and increases soil enzymatic activity. However, due to the complex interactions within the soil–plant–microorganism system, the effects of conservation tillage on microbial communities are not always consistent and may sometimes be weak or even absent.

**Key words**: intensive tillage, microorganisms, minimum tillage, soil biology

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