How soil tillage effects the soil organic matter status in soil?

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Summary

Soil organic matter (SOM) content is the key function for preventing soil degradation and rising of soil fertility. Basic benefits of SOM are physical (increases aggregate stability and soil water capacity and decrease soil crusting), chemical (increases cation exchange capacity of soil and availability of essential soil nutrients) and biological (represents habitat and food for numerous live organisms in soil). Furthermore, SOM plays a crucial role in soil carbon sequestration, as a consequence of soil containing the largest terrestrial carbon (C) pool mainly in the form of soil organic matter, which is very sensitive to climate changes, land use and agricultural management practices. The main problem occurs when we change management practice of native land (for example, turning forest and natural pastures in agricultural land) which, due to soil disturbance, causes rapid loss of organic matter. It is estimated that in the period of 50 years 30-50 % of the soil organic matter found under native forest can be lost after the forest was converted to agriculture. The main reason of that rapid loss is excessive tillage (conventional tillage - plowing) and also, inadequate crop rotation or absence of soil cover. Conventional tillage increases the oxygen content of the soil, stimulates soil microbes to decompose soil organic matter which leads to soil structure deterioration, disturbed soil-water relationships and finally the lower soil fertility. When organic material is not applied to the soil through organic fertilizers, crop residues or cover crops (siderate), soil organic-matter levels rapidly decline. In recent years, the promotion of less intensive tillage practices (conservation tillage or reduced tillage) as agricultural management has mange to mitigate some of mentioned negative impacts on SOM. The transition from conventional to conservation tillage can result in C stock increase especially in upper soil layers (0–30 cm) around 4.6 t/ha over ≥ 10 years. Higher SOM concentrations in the upper soil will not only increase soil fertility but also provide resilience to extreme weather conditions which are a consequence of climate change.

Key words: climate change, conservation tillage, soil fertility, soil organic matter

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