

Organic matter dynamics and carbon sequestration in relation to fertilizer use in temperate regions

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Soil Organic Matter (SOM) dynamics are fundamental soil biological processes, which govern the retention and supply of plant nutrients and lead to improve soil quality and in consequence plant growth. SOM consists of both active and passive pools, while most changes occur in the *active* pool. Therefore assessment of both quantity and quality of SOM as affected by land use change, fertilizer use, and crop and soil management under short and long terms conditions is very important for the overall quality and productivity of soils. Land use changes can result in rapid carbon losses, whereas carbon gains accumulate more slowly. The potential of soil organic carbon (SOC) in agro-ecosystems depends on soil management practices (e.g. conservation tillage, reduced soil erosion) coupled with improved cultivation practices (e.g. judicious fertilizer use, crop rotation, cover crops). Among several improved farming practices, the retention of crop residues, manure application strongly contributed to the restoration of SOC, but the synergistic effect between N fertilization rate and crop yield on increase in SOC was variable. The long-term quantitative and qualitative effects on SOM suggest that adopting no-till system and including grass in crop rotation and manure in fertilizer application may contribute to preserve soil fertility and mitigate climate change. Experimental evidences and case studies will be utilized to illustrate the importance of SOM dynamics and SOC sequestration in agro-ecosystems and strategies to enhance SOC will be suggested.