



About some current controversies on mechanisms controlling carbon storage in soils

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Abstract :

Increasing organic matter (OM) storage in soils has a positive effect on climate change by alleviating the amount of C transferred from the soil to the atmosphere as CO₂ or CH₄, and should therefore be favored when making decision about soil management practices. It can result either from additional OM inputs, or from preservation mechanisms reducing C loss from soil. However, there is still a lack of consensus in the scientific community on the mechanisms controlling C storage.

We discuss here some of the current antagonistic views on several mechanisms driving C storage in soils: chemical recalcitrance, microbial transformations leading to C persistence in soil and the contribution of particulate organic matter to additional C storage. We propose that the different conflicting theories can often be reconciled by considering ecosystem properties. We also recall that while our community focuses on how biomass-derived soil OM can contribute to climate change mitigation, we should keep in mind the alternative fate of plant biomass. Harvested biomass of course contributes to food security but also to climate mitigation through the production of bioenergy and biomaterials as a substitute for fossil resources. The trade-off between exporting biomass or maintaining it in the ecosystem for soil organic matter accrual must take into account these global challenges of food security, climate change mitigation and soil sustainability, together with socio-economical constraints.

Reference: Derrien et al. ASD 2023