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Influence of different agricultural managements on soil organic matter distribution and stability in topsoil and subsoil.

Chiara POESIO[1], Mauro De Feudis[2], Giacomo Tosti[1], Francesco Tei[1], Livia Vittori Antisari[2], Alberto Agnelli[1,3]

[1]Department of Agricultural, Food and Environmental Sciences, University of Perugia, Italy
[2]Department of Agricultural and Food Sciences, University of Bologna, Italy
[3]Research Institute on Terrestrial Ecosystems (IRET), National Research Council (CNR), Sesto Fiorentino, Firenze, Italy

Soil plays a crucial role as a global reservoir of carbon (C) for ecosystem functioning. Soil organic C sequestration can have multiple benefits, including restoring soil functions, offsetting anthropogenic C emissions and mitigating climate change, improving soil resilience, increasing agricultural productivity and sustainability, and enhancing food security. Because of the potential benefits, many studies have focused on determining which practices should be favoured for increasing soil organic carbon (SOC) in the agroecosystem. To increase stabilization and storage of SOC, conservative soil management strategies such as improved crop rotation, organic fertilization, increased buried crop residues, minimum or no tillage and permanent grass cover, are considered the most effective. Besides management practices, SOC accumulation is highly dependent on climate and soil properties, according to the climatic region and soil type, respectively. Soil properties and C dynamics also change depending on the considered soil depth. SOC content is normally larger in the upper horizons, where microbial activity, aeration, and soil disturbance are higher. Therefore, subsoil could be more suited to long-term C sequestration than topsoil.
The aim of our study was to investigate how different agricultural management systems influenced the functional pools of soil organic matter in topsoil and subsoil of a Cambisol located in Umbria plain, central Italy. The research was conducted in a mid-term (10 years) wheat-maize rotation field where three different cropping systems were applied: 1) integrated conventional management with no cover crop and conventional tillage, 2) organic management with cover crop and conventional tillage, 3) conservative integrated management with cover crop and no tillage. Within each plot, soil profiles were dug reaching 60/70 cm of depth and A (Ap1, Ap2) and B (Bw1, Bw2) horizons were sampled. The soil samples were characterised (texture, pH, organic C and total N contents) and subjected to a combined physical and chemical fractionation which allow us to obtain the following organic matter (OM) pools: active (water-extractable and particulate OM), intermediate (OM associated with stable sand-size aggregates and silt- and clay-size aggregates) and passive (OM resistant to oxidation).
The comparison among the distributions of the different organic pools will provide a preliminary indication of the potential for organic C stabilization of the three tested agricultural managements systems.

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