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Soil Organic Carbon Storage in Moroccan Agroforestry Olive Orchards

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Abstract: Soil supports numerous ecosystem services and contributes to climate change mitigation. Several publications have appeared in recent years considering soil as a persistent carbon sink and reported that agroforestry systems have a potential for soil organic carbon storage. However, there is still little knowledge about the soil organic carbon storage in olive orchards and its role in climate change mitigation. Therefore, soil samples collected from topsoil (0-30 cm) and subsoil (30-60 cm) in 57 different olive orchards provide an excellent opportunity to investigate, for the first time, the role of several factors (tree ages, planting density, farming system type and soil depth) in driving soil organic carbon storage variability in agroforestry olive orchards compared to olive trees in monoculture system across the Saiss region (Morocco). The difference was significant between the two types of plantation systems studied (agroforestry and monoculture) and between the two soil layers studied (topsoil and subsoil). Agroforestry olive orchard systems stored approximately 1.2 times the organic carbon in the soil compared to monoculture systems. In addition, topsoil stores 1.5 times compared to subsoil. The correlation results showed that the organic carbon stock of the subsoil increases with the increase of the topsoil. These results can provide a better understanding of the effect of agroforestry on deep soil organic carbon stock in Moroccan olive orchards. Furthermore, it can provide a valuable reference for future research on the soil organic carbon storage variability in Morocco and from an international perspective.

Keywords: Soil Organic Carbon Stock, Climate Change Mitigation, Topsoil, Subsoil, Agroforestry, Olive groves, Morocco.