



Conservation tillage versus conventional tillage on carbon stock in a Mediterranean dehesa (southern Spain)

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INTRODUCTION

Understanding soil dynamics is essential for making appropriate land management decisions, as soils can affect the carbon content from the atmosphere, emitting large quantities of CO₂ or storing carbon. This property is essential for climate change mitigation strategies as agriculture and forestry soil management can affect the carbon cycle. The dehesa is a Mediterranean silvopastoral system formed by grasslands with scattered oaks (*Quercus ilex* or *Q. suber*). The dehesa is a pasture where the herbaceous layer is comprised of either cultivated cereals such as oat, barley and wheat or native vegetation dominated by annual species, which are used as grazing resources. In addition, the dehesa is a practice dedicated to the combined production of Iberian swine, sheep, fuel wood, coal and cork, as well as hunting. The dehesa is characterized by the preservation of forest oaks. In this work, we compared two management practices such as organic farming (OF) and conventional tillage (CT) on soil organic carbon stocks (SOC-S) in Cambisols (CM) and Leptosols (LP), and we analyzed the quality of these soils based on stratification ratio (SR) in a Mediterranean dehesa.

MATERIAL AND METHODS

An analysis of 85 soil profiles was performed in 2009 in Los Pedroches Valley (Cordoba, southern Spain). Two soil management practices were selected: OF (isolated trees of variable densities —15-25— trees ha⁻¹, mostly holm and cork oaks, and patches of shrubs — cistaceae, fabaceae and lamiaceae— with a herbaceous pasture layer mostly composed of therophytic species and livestock are introduced to provide organic fertilizer to the soil, without ploughing and animal manure from the farms may be incorporated) for 20 years and CT (similar to OF, with ploughing —annual passes with a disc harrow and/or cultivator— is aimed at growing grain for livestock or at clearing the encroaching shrubs) in CM and LP. The dehesas studied were silvopastoral systems without cropping. Soil properties determined were: soil particle size, bulk density, SOC, TN, C:N ratio, stocks and SR. The statistical significance of the differences in the variables between management practices was tested using the Anderson-Darling test at each horizon or a combination of horizons for each soil type.

RESULTS

The SOC-S was greater in CM (75.64 Mg ha⁻¹) than in LP (44.01 Mg ha⁻¹). SOC-S was very similar in OF and CT (CM [74.90 Mg ha⁻¹-CT; 76.39 Mg ha⁻¹-OF] and LP [44.77 Mg ha⁻¹-CT; 43.25 Mg ha⁻¹-OF]). Data analysis showed that management practices had little effect on SOC storage. Significant differences between soil types and management practices were found in SOC content for different horizons. The SR index was >2 in both soils types (CM and LP) and management systems (OF and CT). These results indicate that the soil is of high quality and that management practices have little influence on SOC-S (Parras-Alcántara et al., 2014) and do not affect SOC storage.

REFERENCES

Parras-Alcántara, L., Díaz-Jaimes, L., Lozano-García, B., Fernández Rebollo, P., Moreno Elcure, F., Carbonero Muñoz, M.D. 2014. Organic farming has little effect on carbon stock in a Mediterranean dehesa (southern Spain). *Catena*, 113: 9-17.