



Impact of vegetation types on soil organic carbon stocks SOC-S in Mediterranean natural areas

Luis Parras-Alcántara, Beatriz Lozano-García, and Marta Cantudo-Pérez

Cordoba, Faculty of Science, Agrifood Campus of International Excellence - ceiA3, Agricultural Chemistry and Soil Science, Cordoba, Spain (qe1paall@uco.es)

* Corresponding author: Luis Parras-Alcántara, Tel.: +34957211092; fax: +34957212146; E-mail: luis.parras@uco.es; qe1paall@uco.es

Abstract

Soils play a key role in the carbon geochemical cycle because they can either emit large quantities of CO₂ or on the contrary they can act as a store for carbon. Agriculture and forestry are the only activities that can achieve this effect through photosynthesis and the carbon incorporation into carbohydrates (Parras-Alcántara et al., 2013). The Mediterranean evergreen oak Woodland (MEOW – dehesa) is a type of pasture with scattered evergreen and deciduous oak stands in which cereals are often grown under the tree cover. It is a system dedicated to the combined production of Iberian swine, sheep, fuel wood, coal and cork as well as to hunting. These semi-natural areas still preserve some of the primitive vegetation of the Mediterranean oak forests. 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. These Iberian open woodland rangelands (dehesas) have been studied from different points of view: hydrologically, with respect to soil organic matter content, as well as in relation to gully erosion, topographical thresholds, soil erosion and runoff production, soil degradation and management practices... etc, among others.

The soil organic carbon stock capacity depends not only on abiotic factors such as the mineralogical composition and the climate, but also on soil use and management (Parras et al., 2014 and 2015). In Spanish soils, climate, use and management strongly affect the carbon variability, mainly in soils in dry Mediterranean climates characterized by low organic carbon content, weak structure and readily degradable soils. Hontoria et al. (2004) emphasized that the climate and soil use are two factors that greatly influence carbon content in the Mediterranean climate.

This research sought to analyze the SOC stock (SOCS) variability in MEOW – dehesa with cereals, olive grove and Mediterranean oak forest with different vegetation types (*Quercus suber*, *Quercus ilex*, *Quercus faginea*, *Pinus pinaster* and *Pinus pinea*) in The Cardeña-Montoro Natural Park, a nature reserve that consists of a 38,449 ha forested area in southern Spain.

Sixty-eight sampling points were selected in the study zone. Each sampling point was analyzed as soil control section with different depth increments (0-25, 25-50, 50-75 and 75-100 cm). The studied soils were classified as Cambisols and the major goal of this research was to study the SOCS variability at regional scale.

The total SOCS in The Cardeña-Montoro Natural Park was higher in MEOW with olive grove (111,69 Mg ha⁻¹) and lower in MEOW with *Quercus faginea* (93,57 Mg ha⁻¹). However, when the top soil (superficial section control) was analyzed, the SOCS was the highest in MEOW with olive grove (70,12 Mg⁻¹) and the lowest in MEOW with *Pinus* (47,82 Mg ha⁻¹). This research is a preliminary assessment for modeling SOCS at the regional level in Mediterranean natural areas.

References

Hontoria, C., Rodríguez-Murillo, J., and Saa, A.: Contenido de carbono orgánico en el suelo y factores de control en la España Peninsular, *Edafología*, 11, 149–155, 2004.

Parras-Alcántara, L., Díaz-Jaimes, L., and Lozano-García, B: Organic farming affects C and N in soils under olive groves in Mediterranean areas, *Land Degrad. Develop.*, in press, available online: in Wiley Online Library (wileyonlinelibrary.com), <http://dx.doi.org/10.1002/lde.2231>, 2013.

Parras-Alcántara, L., Díaz-Jaimes, L., Lozano-García, B., Fernández Rebollo, P., Moreno Elcure, F., Carbonero Muñoz, M.D.: Organic farming has little effect on carbon stock in a Mediterranean dehesa (southern Spain). *Catena* 113 (2014) 9-17. <http://dx.doi.org/10.1016/j.catena.2013.09.002>

Parras-Alcántara, L., Díaz-Jaimes, L., and Lozano-García, B.: Management effects on soil organic carbon stock in Mediterranean open rangelands—treeless grasslands, *Land Degrad. Develop.*, in press, available online: in Wiley Online Library (wileyonlinelibrary.com), <http://dx.doi.org/10.1002/ldr.2269>, 2015.