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Long-term citrus organic farming strategy results in soil organic matter recovery

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ABSTRACT
Soils play a key role in the Earth System (Keesstra et al., 2012; Brevick et al., 2015). Soils are a key resource for the human societies (Mol and Keesstra, 2012) and they are relevant to achieve the sustainability such as the United Nations Goals highlight (Keesstra et al., 2016). Agriculture soils, especially those under conventional tillage, are prone to organic matter mineralization, soil erosion, compaction and increase of greenhouse gases emission (Novara et al., 2011; Bruun et al., 2015; de Moraes et al., 2015; Choudhury et al., 2016; del Mar et al., 2016). The adoption of organic farming and sustainable management practices may provide a sustainable crop productivity, and in the meanwhile mitigate the negative impact of agriculture on ecosystem services benefits (Laudicina et al., 2015; Parras-Alcantara et al., 2015; 2016). The aim of this study was to examine, under field conditions, the long-term changes of soil organic matter under organic farming management in citrus orchards in Mediterranean environment and evaluate the ecosystem service on C sequestration in terms of economic benefits. The research was carried out at the Alcoleja Experimental Station located in the Cànyoles river watershed in the Eastern Spain on 45year old citrus plantation. Soil Organic Matter (SOM) content was monitored for 20 years at 6 different soil depth. The profitability of citrus plantation was estimated under conventional and organic management. Results showed that SOM in the 0-30 cm soil depth was the double after 20 years of organic farming management, ranging from 0.8 g kg-1 in 1995 to 1.5 g kg-1 in 2006. The highest SOM increase was in the top soil layer (368% of SOM increase in comparison to the initial SOM content) and decreased with soil depth.
The effect of organic farming was relevant after 5 years since land management change, indicating that in Mediterranean environment the duration of long term studies should be higher than five years and proper policy should be performed on these results. The ecosystem service evaluated trough the profitability of citrus orchard provided useful information for the assessment of ecosystem service payment which should be based on the real effect on potential SOC sequestration.

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