

Land use change and management effects on soil organic carbon stock and soil quality in Mediterranean areas

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INTRODUCTION

Both land use and management affects to soil properties and soil quality. On the one hand, land use change from natural vegetation to agricultural land often is a key factor that influences to soil. On the other hand, under semiarid climatic conditions, intensive tillage increases soil organic matter losses, reduces soil quality, and contributes to climate change due to increased CO₂ emissions.

MATERIAL AND METHODS

A field study was conducted to determine the land use change [Mediterranean evergreen oak woodland (MEOW-dehesa) to olive grove (OG) and cereal (C), all of them managed under conventional tillage and under conservationist practices] effects on soil organic carbon (SOC) stocks and the soil quality [through Stratification Ratios (SR)] in Los Pedroches valley, southern Spain.

RESULTS

Results for the present study indicate that in MEOW-dehesa management practices had little effect on SOC storage. The stratification ratio was >2 in both management systems, so, soils under MEOW-dehesa had high quality. Nevertheless, in OG and C conservationist practices increased SOC stocks. Therefore, conservationist practices contributed to a better soil quality and to increased carbon sequestration and, consequently, this management is an excellent alternative to conventional tillage.

A change in land use from MEOW-dehesa to OG or C under conservationist practices appeared to increase the SOC. When calculated for the total soil profile these differences were equivalent to 20-25 Mg ha⁻¹ of SOC. This is potentially very important for many agricultural soils in the Mediterranean area which are typically very poor in organic matter. These differences in the SOC stock were not apparent when the change in land use occurred under conventional tillage; even in the land use change from MEOW-dehesa to C the SOC stock was reduced. This suggests that management in addition to change in land use is an important consideration and particularly the degree of soil disturbance which should be minimized.

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