



Relationships between soil erosion risk, soil use and soil properties in Mediterranean areas. A comparative study of three typical sceneries

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INTRODUCTION

Generally, literature shows that the high variability of rainfall-induced soil erosion is related to climatic differences, relief, soil properties and land use. Very different runoff rates and soil loss values have been reported in Mediterranean cropped soils depending on soil management practices, but also in soils under natural vegetation types.

OBJECTIVES

The aim of this research is to study the relationships between soil erosion risk, soil use and soil properties in three typical Mediterranean areas from southern Spain: olive groves under conventional tillage, minimum tillage and no-till practices, and soils under natural vegetation.

METHODS

Rainfall simulation experiments have been carried out in order to assess the relationship between soil erosion risk, land use, soil management and soil properties in olive-cropped soils under different types of management and soils under natural vegetation type from Mediterranean areas in southern Spain

RESULTS

Results show that mean runoff rates decrease from 35% in olive grove soils under conventional tillage to 25% in olive (*Olea europaea*) grove soils with minimum tillage or no-till practices, and slightly over 22% in soils under natural vegetation.

Moreover, considering the different vegetation types, runoff rates vary in a wide range, although runoff rates from soils under holm oak (*Quercus rotundifolia*), 25.70%, and marginal olive groves, 25.31%, are not significantly different. Results from soils under natural vegetation show that the properties and nature of the organic residues play a role in runoff characteristics, as runoff rates above 50% were observed in less than 10% of the rainfall simulations performed on soils with a organic layer. In contrast, more than half of runoff rates from bare soils reached or surpassed 50%.

Quantitatively, average values for runoff water losses increase up to 2.5 times in unprotected soils. This is a key issue in the study area, where mean annual rainfall is above 600 mm.

Regarding soil properties, the analysis shows that organic matter from soils under minimum tillage or no-till is strongly related with runoff, the amount of sediments in runoff and soil loss. In soils from olive groves, the amount of sediments in runoff was significantly related to soil pH. Moreover, for olive-cropped soils under conventional tillage, soil loss is strongly related with clayey texture, which is characteristic of these soils.

Concerning this, the relationship between soil loss and coarse sand contents is highly significant, and shows that medium-sized soil particles are most prone to detachment and transport by runoff. Thus, the average content of these fractions in soils under conventional management is more than two times that from olive groves under minimal or no tillage, which are more coarsely textured. In fine-textured soils, hydraulic conductivity is reduced, thus increasing soil erosion risk. In addition, in sandy and silty soils with low clay content, infiltration rates are high even when soil sealing is observed. At the scale of this experiment, runoff generation and soil erosion risk decrease significantly in areas under natural vegetation, with lower clay contents