Treatment of steep and clayey soils with olive pruning residues for conservation purposes: hydrological monitoring and modelling approaches

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**Abstract.** When olive groves are cultivated on clayey soils with steep slopes, as in many Mediterranean areas, reducing runoff and soil erosion by adopting effective soil management practices (SMPs) is imperative. A soil cover by pruning residues may result in a viable alternative to the commonly-adopted mechanical tillage. However, while the literature about the soil protection with a crop cover is abundant, the studies about the SMPs using pruning residues are much less. To fill this gap, this study evaluates and simulates the hydrological response of a steep and clayey olive grove of Southern Italy under three SMPs (mechanical tillage, MT, mulching with 3500 kg ha-1 of pruning residues, M, and standard protection of soil, assumed as a control, C). Under these scenarios, the infiltration rates under simulated rainfall, and the surface runoff and soil loss after natural rainfalls have been evaluated at the plot scale throughout two years. Moreover, the accuracy of the SCS-CN and two USLE-family models (MUSLE and USLE-M) in predicting runoff volume and soil loss has been evaluated using those hydrological observations. The MT led to the lowest water infiltration rates (on average +63%, compared to the control), and the highest runoff (+8%) and soil loss (+57%). The M practice increased the soil infiltration rates by over 20%. For this practice, noticeable reductions in runoff (on average -22%) and soil loss (-48%) were detected. The SCS-CN model was accurate in predicting runoff volumes (mean difference of 7% compared to the corresponding observations) for all SMPs. The MUSLE model showed better performances in soils subjected to MT and SP (differences between predictions and observations lower than 10%), while the USLE-M was more reliable in simulating the soil loss in M plots (differences of 8%). Overall, the results of this study are promising in view of a broader diffusion of SMPs in croplands with adverse conditions under Mediterranean semi-arid conditions. Moreover, the Curve Numbers and C-factors coming from calibration are useful for future models applications in orchards with steep and clayey soils.