

Sediment transfer and connectivity analysis in an olive orchard microcatchment in Spain: a study case to evaluate the impact of rainfall variability and management

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Quantification and description of sediment delivery processes at the catchment scale are essential to evaluate the main sources of sediments that contribute to soil degradation, and to design effective management strategies. Erosion derived from concentrated flow might imply a serious degradation risk which is not always apparent as is the case of rills and ephemeral gullies. The objectives of this work were: 1) to characterize the rills and ephemeral gullies measured for periods with different hydrological features in terms of precipitation and erosivity and management; and 2) to evaluate the contribution of concentrated flow to the sediment discharge measured at the catchment outlet.

In this study, rills and ephemeral gullies generated during inter-tillage periods were measured 4 times in a period between April 2009 and March 2014. The measures were carried out in a 6.7 ha olive orchard of with conventional tillage until September 2014, when cover crops were seeded in some lanes following the most approximate direction to contours. Although rainfall, runoff and sediment discharge were monitored at the outlet for the complete study period, there were some very erosive events in which sediment concentration could not be measured. Hence, the SEDD model, previously calibrated (Burguet, 2015), was used to fill these gaps as well as to calculate the sediment delivery ratios in the catchment.

The mean volume of rills and ephemeral gullies for the 4 surveys was equivalent to 8.1 t.ha⁻¹ and 3.3 t.ha⁻¹, respectively whereas the mean total sediment discharge for the same period was of 7.8 t.ha⁻¹. The accumulated erosivity explained the differences of soil losses associated to rills better than accumulated precipitation. The impact of cover crops during 2014 was particularly notable on the reduction of the sediment loads in the events, as well as on the rill discontinuities and sediment trapping as observed in the field. An active sediment dynamics is expected in the catchment derived from a sequence of events with high precipitation (not particularly intense) which improve the connectivity of rills generated in the lanes to the stream. The use of cover crops was very successful for reducing rill connectivity and sediment discharge. However, the farmer decided not to keep them due to the management inconveniences.

REFERENCES:

Burguet Marimón, M. 2015. Procesos distribuidos en la generación y transporte de escorrentía y sedimento en olivar a diferentes escalas . Universidad de Córdoba, Servicio de Publicaciones, Cordoba, Spain.