



Erosion measurements by concentrated flow in olive orchard farms: a study case in a microcatchment under no-tillage with a grass spontaneous cover

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In olive grove land-uses, most studies of soil losses have been conducted to quantify inter-rill erosion at the plot scale or the total sediment load, at the catchment scale. However, work carried out on others land uses in the Mediterranean area have justified that the description of soil losses resulting from concentrated flow is essential since it can jeopardise production and sustainability of commercial farms (e.g. De Santisteban et al., 2006; Castillo, 2012).

In this work, measurements of gullies and rills have been done in an olive orchard microcatchment of 6.1 ha during three years (Jul-2010, Jul-2011 and Jul-2012). No tillage management allowing the development of a grass spontaneous cover was applied in the study period. Moreover, data of rainfall, runoff and sediment load in the catchment outlet were measured. The objectives of this study were: 1) the quantification of the erosion by concentrated flow in the catchment for hydrological years with different features; 2) as well as the description of the morphological changes (width, depth, drainage area and slope) in rills and gullies associated to the annual climate regime and management operations.

Control sections in gullies were established to repeat the measurements of width, depth and shape in each campaign for the evaluation of changes. In the years 2010 and 2011, a sub-metric GPS and a tape were used to locate the sections and to measure gully width and depth. In 2012, a GPS of an accuracy of 2 cm was used to increase the measurement density.

The maximum differences of volume were observed between the years 2011 and 2010, with a value equal to 2.5 t.ha⁻¹. This hydrological period was characterized by the cumulative values of rainfall depth, erosivity, runoff and total sediment load equal to 610 mm, 992 MJ.mm.ha⁻¹.h⁻¹, 60 mm and 7.8 t.ha⁻¹, respectively. Therefore, the contribution of gullies meant 32% of soil losses in the catchment. Main morphological changes were associated to the average width of gullies whereas the average length notably increased in the period 2011-2012 as a result of only one event that provoked 76% of sediment loads in the catchment. In addition to the grass cover, control measures in gullies would improve substantially the sustainability in the farm, particularly because on the event scale, larger runoff coefficient than 50% were observed in the autumn season as a result likely of the lack of cover and the low infiltration rates associated to no-tillage management in the farm.

REFERENCES

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