Geophysical Research Abstracts
Vol. 18, EGU2016-5776, 2016
EGU General Assembly 2016

Overland flow connectivity in olive orchard plots with cover crops and conventional tillage, and under different rainfall scenarios

Manuel López-Vicente (1), Roberto García-Ruiz (2), Gema Guzmán (3), José Luis Vicente-Vicente (2), and José Alfonso Gómez (3)

(1) Department of Soil and Water, Experimental Station of Aula Dei, EEAD-CSIC. Avda. Montañana 1005, 50059 - Zaragoza, Spain, (2) Area of Ecology, University of Jaen. Campus Las Lagunillas s/n, 23009 - Jaen, Spain, (3) Agronomy Department, Institute of Sustainable Agriculture, IAS-CSIC. Alameda del Obispo s/n, 14080 - Cordoba, Spain

The study of overland flow connectivity (QC) allows understanding the redistribution dynamics of runoff and soil components as an emergent property of the spatio-temporal interactions of hydrological and geomorphic processes. However, very few studies have dealt with runoff connectivity in olive orchards. In this study we simulated QC in four olive orchard plots, located on the Santa Marta farm (37° 20′ 33.6" N, 6° 13′ 44" W), in Seville province (Andalusia) in SW Spain. The olive plantation was established in 1985 with trees planted at 8 m x 6 m. Each bounded plot is 8 m wide (between 2 tree lines) and 60 m long (total area of 480 m2), laid out with the longest dimension parallel to the maximum slope and to the tree lines. The slope is uniform, with an average steepness of 11%. Two plots (P2 and P4) were devoted to conventional tillage (CT) consisting of regular chisel plow passes depending on weed growth. Another set of two plots had two types of cover crops (CC) in the inter tree rows (the area outside the vertical olive canopy projection): uniform CC of Lolium multiflorum (P3) and a mixture of L. rigidum and L. multiflorum together with other species (P5). The tree rows were treated with herbicide to keep bare soil. We selected the Index of runoff and sediment Connectivity (IC) of Borselli et al. (2008) to simulate three rainfall scenarios: i) low rainfall intensity (Sc-LowInt) and using the MD flow accumulation algorithm; ii) moderate rainfall intensity (Sc-ModInt) and using MD8; and iii) high rainfall intensity (Sc-HighInt) and using D8. After analysing the values of rainfall intensity during two hydrological years (Oct'09-Sep'10 and Oct'10-Sep'11) we associated the three scenarios with the followings months: Sc-LowInt during the period Jan-Mar, that summarizes 42% of all annual rainfall events; Sc-ModInt during Oct-Nov and Apr-May (32% of all events); and Sc-HighInt during the period Jun-Sep and in December (26% of all events). Instead of using the C-RUSLE factor as it is indicated in the original version of the IC model, we chosen the product between the C (cover-management) and P (support-practices) factors. Previous studies in olive orchards (Gómez et al., 2003) demonstrated that this product is advisable in soil erosion studies. We distinguished four areas within the plots: inter-row-CC, inter-row-CT, olive trees and bare soil under the tree line. Values of the C-RUSLE factor were obtained from previous studies (e.g. Moreira-Madueño, 1991 in Andalusia; Panagos et al., 2015 in Europe). The minimum, mean and maximum values of connectivity in the two plots with CC were lower (-8% on average) than the corresponding values in the two plots under CT. This trend remained by using any of the three algorithms. CC efficiently reduced overland flow connectivity. Areas with low connectivity (deposition-prone areas) appeared more frequently in inter-row-CC in comparison with CT. The assessment of the C-RUSLE factor for each month according to the phenology of the CC and the sowing practices will be explored in further research.