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Validation of RUSLE model in olive orchard land use by the virtual tool SECO

Victor Marín (1), Encarnacion V. Taguas (1), Maria D. Redel (1), and José A. Gómez (2)

(1) University of Córdoba, Rural Engineering, Cordoba, Spain (victorjamarin@yahoo.es, evtaguas@uco.es, mdredel@uco.es),, (2) Institute for Sustainable Agriculture. CSIC., Dpt. of Agronomy, Cordoba, Spain (joseagomez@ias.csic.es, +34 957499252)

Mediterranean countries concentrate over 95% of the world area of olive orchards (FAOSTAT, 2011). The socio-economic importance of the olive crop in these countries can lead to a challenge to achieve suitable productivity and incomes for rural communities in a context of high rainfall variability and serious risk of soil degradation.

Despite the significant studies of soil loss measurements in olive orchards under a range of environmental conditions and managements (Kosmas et al., 1997; Raglione et al., 1999; Pastor et al., 1999; Gomez et al., 2002, 2004, 2008, 2009; De la Rosa et al., 2005; Francia et al., 2006), a long term analysis is essential in order to take appropriate environmental decisions. The usage of models allows to explore different scenarios once they have been calibrated and validated to the study conditions.
Soil loss is commonly predicted using an empirical model such as the Universal Soil Loss Equation (USLE; Wischmeier and Smith, 1965), because of its simple framework and application. In fact, soil erosion is simply calculated as the product of empirical coefficients, originally derived from field observations on different crops in the USA. These empirical coefficients have rarely been verified against experimental conditions in Spain and particularly in olive orchards. As a consequence, the reliability of their results might be debatable withouth a previous calibration.

This work presents a telematic analysis tool based on the Revised Universal Soil Loss Equation (RUSLE; Renard et al., 1997) to quantify erosion rates in olive grove areas, validating its usage through different soil loss measurements in Andalusia. SECO (Soil Erosion Calculator in Olives), has been programmed with Matlab R2008b from MathWorks Inc. (USA). It consists of six menus with visual material with specific information published on soil losses and soil characteristics in olive orchards in Southern Spain. The managements conventional tillage, non tillage and cover crop on 4 and 5-year-surveys in different plots in Andalusia (Córdoba and Sevilla) were evaluated. The model parameters were determined according to the plot characteristics and the management schedule. Simulations presented a suitable adjustment to the observations on the annual scale as well as considering the average rates. A root mean square error of 4.6 t.ha-1.year-1 and a coefficient of efficiency equal to 0.83 were derived from the annual analysis. Features such as its use simplicity, guidelines included as well as predictive potential justify the application of this tool on erosion risk analyses in olive orchards in Andalusia.

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