Geophysical Research Abstracts
Vol. 14, EGU2012-10976, 2012
EGU General Assembly 2012

Quantification of gully erosion in a cultivated area in Southern Spain under high rainfall conditions

C. Castillo (1), R. Pérez (1), J. Mora (2), and J.A. Gómez (3)

(1) University of Córdoba, Rural Engineering Department, Spain (ccastillo@uco.es), (2) Ayuntamiento de Córdoba, (3) Institute for Sustainable Agriculture. CSIC. Apartado 4084. 14080 Cordoba Spain

Gully erosion is a major process contributing to soil degradation on cultivated areas, specially when is triggered by extreme rainfall conditions (e.g. Øygarden, 2003). This study evaluates the gully erosion rates in a Mediterran agricultural area over a five years, 2010-2011, period. This period includes the maximum annual record of the last 50 years. A qualitative field survey (June 2006, to register present gullies and those refilled by tillage) and two field measurement surveys (June 2010 and 2011) were conducted in a set of cultivated catchments located in Cordoba (Spain) within the area named as "Campiña Media del Guadalquivir". The area of these landscapes ranged from 10 to 100 ha, and they were covered by field crops (mostly bean, sunflower and wheat) on vertic soils. The main gully defining properties (widths and depths) were measured after the rainy season, and before tillage operations covered them again, using global position system (GPS), pole and measurement tape. Soil erosion was estimated calculating the gully volume difference between two periods, by assuming simple geometric forms such as a triangle, triangle or trapezium for gully cross sections. Comparing 2006 and 2010 survey results, a mean erosion rate of 10 t ha-1 yr-1 was calculated, under the hyphotesis of only one removing (gully filling) operation. For the 2010-2011 period, a great enlargement of the gully network was observed, including headward migration, cross sectional widening and sidewall sloughing. In most cross sections the widths increase ratio (width in 2011 compared to that in 2010) exceeded 2, reaching in some cases to 3 o 4 times the original dimensions. Gully erosion estimates at the different catchments ranges from 37 to 250 t ha-1 yr-1, exceeding by far the tolerable soil erosion rates. The lack of vegetation, removed during years of continued tillage at valley bottoms, the elimination of natural features such as reach sinuosity by management practices, in combination with steep slopes increase largely flow shear stresses and lead to extreme gully development when large amounts of runoff are available.

References

Øygarden, L. 2003. Rill and gully development during an extreme winter runoff event in Norway. Catena 50: 217–242.