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Rates of erosion and sediment yield in an agroforestry catchment in Galicia, Spain

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Analysis of sediment discharge information is considered as one of the most objective methods of evaluating the intensity of erosion. As a part of a project on water quality, a survey of suspended sediments yield and erosion rates was carried out at a small agro-forestry catchment near to La Coruña in the temperate humid area of Spain. Rates of erosion and sediment yield were assessed yield during a six year period, from 1999 to 2004, at the 36.3 km^2Valiñas River catchment. Soils are mainly sandy-loam textured. Soil use was 45% forest and 55% agricultural, mainly grassland (20%) and arable (35%), maize in rotation with winter cereal. Water samples were obtained during base and storm flow conditions. Yearly rainfall oscillated between 786.1 and 1451.5 mm.

Mean suspended solid concentrations over the six year study period were 30.25 mg/l and the yearly figures oscillated between 13.67 and 91.12 mg/l. Taken into account individual samples, a maximum of 1044 mg/l of suspended solids were recorded during stormflow, whereas base flow figures were even below 1 mg/l. Solid sediment concentrations were over 100 mg/l for a limited number of samples, namely three in 1999, nine in 2000, zero in 2001, twelve in 2002, nine in 2003 and four in 2004. Patterns of suspended sediment transport at the catchment outlet presented similarities with previous studies in temperate humid regions: (i) a few events of intense rainfall are responsible for the transport of suspended sediment and (ii) peaks suspended solids occur at the beginning of each event and decrease before the maximum of water discharge. Mean annual values of specific sediment yield at the catchment outlet were between 0.066 and 0.574 t/ha/year, indicating a limited availability of sediments for erosion. Yearly figures of erosion rate for the entire catchment were: 0.303 t/ha, 0.173

t/ha, 0.187 t/ha, 0.574 t/ha, 0.323 t/ha y 0.066 t/ha in 1999, 2000, 2001, 2002, 2003 and 2004 respectively. Small erosion rates during 2004 were due to extreme dryness of this year. The largest cause of between year sediment yields was total discharge.

Spatial variability of sediment yield was also assessed. Suspended solids concentration in the forest was 4 to 5 times lower in the forest than in the agricultural area. The main sources of sediments were agricultural land and river banks. At the field scale erosion rates of cultivated fields. However, the sediment discharge of a river is not a precise measure of all erosion occurring within the drainage basin. Erosion rates within the arable land were as high as 2 to 5 t ha^{-1} $year^{-1}$, but the situation is considered as sustainable from the viewpoint of soil conservation. On the other hand, overland flow is an important source of phosphorus reaching surface waters and contributes both to dissolved and particulate P. Thus sediment contributions due to concentrated erosion of agricultural land and bank erosion during periods of high flow suppose an important contribution to eutrophization risks.

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