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Effect of land use changes on carbon losses induced by erosion in a Mediterranean catchment of Southeast Spain.

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Catchments can behave globally as sources or sinks of soil carbon depending on the magnitude and type of land use changes within their drainage area, on the intensity of erosion processes and, on the destiny of eroded sediments. The effect of changing land uses on the organic soil carbon stock and the soil carbon transported by water erosion and buried in depositional wedges behind check-dams were estimated in a Mediterranean catchment in SE Spain. The change in the land use pattern of the catchment between 1956 and 1997 (decrease of 56 % of agricultural areas and increase by 1.5-fold of the total forest cover) induced an accumulation rate of Total Organic Carbon (TOC) in the soil of 10.73 g m-2 yr-1. The Mineral Associated Organic Carbon (MOC) was the main soil C pool (70 %). The Particulate Organic Carbon (POC) was the highest in the shrubland soils (32.74 %). The average enrichment ratio sediments/soil at the subcatchment scale (8-125 ha) was 0.77 $\pm$0.39 g kg-1. The eroded soil carbon accounts for between 1.76 % to 77.51 % of the soil carbon stock in the first 5 cm of the soil in the subcatchments. The carbon erosion rates oscillates between 0.008 and 0.2 t ha-1 yr-1. Changes in land use involving the increase of forest reduce the percentage of eroded carbon, although sediments coming from non-agricultural sources are richer in organic carbon. At the catchment scale from the 4.2 % of the soil C stock mobilized by water erosion, 78.5 % is buried in the sediment wedges behind check-dams and the replacement due to an increase of the vegetation cover increased by a 36.78 % the original soil organic carbon stock. All together represent an erosion-induced sink of soil organic carbon of 40 % compared to the original levels 27 years before. This promoted the behaviour of the catchment as a soil carbon sink within the soil erosion subsystem from the 1950's till present day.