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Patterns of soil carbon and nitrogen in relation to soil movement under different land uses in mountain farmland fields (South Central Pyrenees)

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Cultivation on mountain landscapes has been identified as a main factor triggering soil erosion. The loss of soil particles and its redistribution across the landscape is associated to that of soil nutrients. Patterns of soil erosion and of the transport and redistribution of soil particles appear to be closely linked to that of carbon in soils. In this work the redistribution of total organic carbon and nitrogen and that of soil particles is analysed in different geomorphic parts of mountain farmland fields. A southern orientated hillslope in the Central Spanish Pyrenees was selected as representative of main land uses. In the region, farmland abandonment during the last decades affects 74 % of its surface and therefore patterns of soil and nutrient losses in the fields are affected by land abandonments and tillage. A set of cultivated and abandoned fields with different ages of land abandonment, slope gradients and length were selected to conduct this study. In each of the fields, sampling was carried out in different parts of the slope to assess the pattern of particle size distribution and of total organic carbon (TOC) and total nitrogen (TN). Other general soil properties analysed: pH, EC and carbonate contents provided supplementary information for better understanding soil and nutrient redistribution patterns. In addition, information provided by a previous research using fallout caesium 137 was used to document soil movement in these fields. At the bottom slope of the fields significant increases in the sand percentage occurs whereas the clay contents decrease slightly. This could be due to the export of the finest fractions with high runoff in spite that fields are surrounded with stone walls as well as to some clay leaching in the soil profile, as suggested by the lowest values of EC at the bottom of the slope. The results indicate that in general TOC increases from the crest to the bottom slope of the fields. Percentages of TOC increases range from 5 to 35 %. In spite that some soil carbon could have been exported with the clay fraction, also carbon mineralization may have occurred. Although TOC decreases are less common they also occurred when there is no evidence of soil deposition at the bottom of the slope therefore, TOC loss is associated to lost of soil particles. In parallel with TOC increases significant increases of TN are also registered in most fields. Therefore, soil deposition at the bottom slope as indicated by the ^{137}Cs inventories is generally paralleled with increases in TOC and TN contents.