



Effects of land management after cropland abandonment on soil organic carbon stocks and soil quality in a sub-Mediterranean mountain area: the role of passive and active (shrub clearing and afforestation) practices

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During the 20th century, especially in the 1960s and 1980s, Mediterranean mountain areas were affected by rapid and extensive depopulation and abandonment of cultivated fields, being the dominant form of land use and land cover (LULC) changes in the Mediterranean mountains. Land abandonment and land management after the abandonment is at present the main problem in mountain areas damaging water resources management, soil erosion, land restoration and a series of ecosystem services such as carbon sequestration. These abandoned areas can be left to undergo secondary succession (passive restoration) or be subjected to active restoration that mostly consists of tree and shrub planting or, in some cases, shrub clearing for enhancing landscape diversity and extensive livestock. This study will assess the effects of land abandonment and post-land abandonment management on soil organic carbon (SOC) dynamics and soil quality in the Leza Valley (Iberian System, Spain). We hypothesized that land abandonment and post-land management strategies in Mediterranean mountain areas produce significant changes in soil properties, SOC dynamics, and the magnitude of these impacts depend on land management. For this purpose, we analyzed 72 soil samples, from 6 land uses (control pasture, *Cistus laurifolius*, *Juniperus communis*, *Quercus faginea*, afforested areas with *Pinus sylvestris* and shrub clearing areas) and 4 depths (0-10, 10-20, 20-30 and > 30 cm).

The results related to SOC dynamics show that: (i) the highest SOC values were recorded in the first 10 cm, and in all cases values decrease in depth; (ii) managed afforestation areas present the highest SOC stocks; (iii) first stages of secondary succession covers (rockrose and junipers) and shrub clearing show lower values related to SOC concentration and stocks, increasing SOC values in the semi-deciduous oak communities (*Quercus faginea*); (iv) the highest nitrogen concentration were recorded in the afforested areas and control pastures; and (v) the lowest Corg/N ratios were recorded in the control pasture areas and the highest were recorded in the managed afforested areas.

An in-depth analysis of soil quality will be evaluated and future studies will determine the quantification of erosion-induced changes on soil carbon storage across the different land uses and land management.

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