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Assessing recently landuse change as driver of variations in vegetation cover and soil properties in Mediterranean agroecosystems.

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Changes in land use due to human activities on soils and vegetation are a widespread problem that often leads to land degradation and are of considerable concern worldwide in the context of environmental degradation and global climate change. Over last centuries, the conversion of rangelands into croplands had increased the surfaces prone to erosion and thereby land degradation. Human activities have been the main drivers of ecosystem changes by transforming natural landscapes into agricultural lands. However, in the southern Pre-Pyrenees the process was reversed during the middle of the twentieth century, allowing the vegetation regrowth.

This work aims to assess in what manner land use changes after generalised land abandonment affect some main soil properties linked to soil quality, paralleling variations in the vegetation cover. For this purpose, 98 replicate bulk soil samples were collected in a 23 km^2 catchment that was mostly cultivated at the beginning of the last century. After land abandonment, 16.5% of the catchment remained as croplands but as much as 83.5% of its surface was occupied by natural revegetation and afforestation. Soil samples were distributed for representing the actual land uses and land covers in the catchment, namely agricultural land, natural forest, pine afforestation and scrubland.

Soil organic carbon (SOC), total nitrogen (TN), stoniness, grain size, pH, carbonates, electrical conductivity, water retention capacity, magnetic properties (low frequency magnetic susceptibility (LF) and frequency dependence (FD)) were analysed in the soil samples. Physiographic properties (altitude, slope and solar radiation) were determined at the sampling points. Furthermore, a multitemporal analysis of the Normalised Difference Vegetation Index of Landsat images was performed between 1972 and 2017 in order to assess the vegetation dynamics. Thus, we compare the NDVI with the distribution of soil nutrients to assess the impact of vegetation recovery in the different land uses.

The SOC, TN, pH and $CaCO_3$valuesindicate that the remnant agricultural land has the less fertile soils. Soil organic carbon stocks and total nitrogen have significantly increased due to afforestation and natural revegetation of the previous croplands, supporting the key role of agricultural management in soil organic carbon and nitrogen dynamics.

From the images used to calculate the NDVI, the increase in the value of the index from the 1970s indicates an increase in the vegetation cover and density. For most of the catchment this was produced by the gradual abandonment of the agricultural land and its progressive transition to natural revegetated cover, in parallel with afforestation. The results extracted from the soil nutrient quantification and the correlation with remote sensing analysis, suggest that in the short term, afforestation produces a faster increase in SOC than natural cover, although such increase is not observed for TN. Soil quality was similar under naturally revegetated and afforested covers. These results outline the impact on soil and vegetation cover produced by land use changes in fragile Mediterranean mountain agroecosystems.