Factors determining distribution and temporal changes in soil carbon in Iberian Dehesa

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The largest terrestrial pool of carbon is found in soils. Moreover, soil organic carbon (SOC) is the major determinant of soil quality, and it is greatly influences global carbon cycling and climate change. Understanding how soil C responds to drivers of change (climate, land use and management) and how these responses are modified by inherent soil properties is crucial if we want to manage soils more sustainably in the future.

We studied the distribution and temporal changes of soil organic C (SOC) of Iberian dehesa (Mediterranean agro-silvo-pastoral system). A mixed model approach was used to model soil C concentration (g C kg-1) and stocks (t C ha-1) and their temporal changes for the average periods of 20 years across the Iberian Dehesa. We use a variety of explanatory variables as soil properties (pH, soils texture fractions, CEC, K, Mg, Ca); climate variables (annual average temperatures, maximun and minimun temperatures, annual precipitation); vegetation system (tree cover, shrub cover, grass cover, legume cover); management practices (grazing, periodical cropping); indicators of sustainability (tree health, tree regeneration, soil erosion signs, soil fauna activity, dung decomposition).

We found temporal changes in soil C concentration from -0,055 to 0,199% by year, with a SOC stock change average of 1,01 Tn·ha-1·year-1. That amount represents an annual growth rate of soil C stock around the 11‰ greatly above the proposed '4 per mille Soils for Food Security and Climate' of the Lima-Paris Action Agenda.