



Fire and land use history effects on soil fertility in eastern Spain

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The number of large fires increased significantly in the 1970s in the Valencia region (eastern Spain), as well as in most northern Mediterranean countries, due to the increasing fuel accumulation that affected large areas as a consequence of an intensive land abandonment and undergrazing.

Although medium- or long-term depletions in nutrients in the soil as a result of fire or after repeated burning have been reported, the long-term effects of fire on nutrient cycling need to be further investigated. Consideration of site history (past site management, disturbances, etc.) is crucial for these studies as it determines the vegetation and soil properties and, thus, the potential effect of new fires on soil nutrient concentrations.

With these matters in mind, we worked in the Vall de Gallinera municipality (Alicante province) and aimed (1) to characterise the soils in relation to land use and fire history, and (2) to analyse the effects of land use history and fire frequency and their interaction on soil fertility 9 years after fire.

In a previous study, we created a map of land use and fire histories for the study area using photo-interpretation. On this map, we randomly selected a set of plots (at least 3) for each of the most frequent combinations of land use and fire history. We found three different fire histories among the soil sampling plots (none, one and two fires) and three different land use histories: uncropped areas (NC hereafter), early abandoned areas (EA hereafter) and recently abandoned areas (RA hereafter). The latter were abandoned 7-10 years before soil sampling. On each plot we sampled the upper 5 cm of mineral soil at four randomly selected points. A composite sample, made from

the four samples of fine earth, was used for determination of soil organic carbon (C), carbonates, total nitrogen (N), total phosphorus (P) and available P contents. Data were analysed by two-way analysis of variance (ANOVA) with fire frequency and land use history as main factors.

With respect to the fire frequency, we observed a significant decrease in soil organic matter (24.9%), total N (25%) and total P (33%) between the one-fire and the two-fire plots. The magnitude of this effect appears to be related to the type of ecosystem burned, with larger losses of soil organic C among the uncropped plots, that is in the less-disturbed ecosystems, which probably had larger fuel loads at the moment of fire and, thus, were burned with greater intensities.

As for long-term cultivation, it caused medium-term significant decreases in organic C, total N and C/N ratio and increases in total P and available P, which were probably due to the application of phosphorus fertilisers on former crops. The effects of cultivation were still detected in the contents of organic C and total N between 20 and 40 years after abandonment, whereas the other variables had recovered to values similar to those found in the uncropped soils.

Our results also suggested that both long-term cultivation and fire would tend to separate C and P cycles.