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The occurrence of undergrazed areas within large farms with problems of overgrazing and their effects on soil functions

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In the last decade, concepts such as soil biodiversity, soil functions and ecosystem services are becoming more and more usual topics on earth sciences disciplines. As well as, land use changes and land management are often under consideration on the recent bibliography because of the new climatic scenarios. Though, studies focusing on their effects on soil functions are well documented, there are still many gaps of knowledge describing soil functions at local scale under different land managements. Spatial distribution of vegetation and soil properties such as texture, bulk density, organic matter and even soil moisture are many times, well defined at catchment scale. Some of these variables can be determined, for instance, by remote sensing, photo interpretation and spatial analysis. However, the lack of information about soil living communities because of soil survey and monitoring problems are common for researchers studying the ecology of soil communities.

This is one of the main reasons because of soil ecologists need to use specific taxonomic or functional groups that are easily sampled and quantified, in other words, a biological indicator. It is widely accepted that soil fauna is an important factor providing soil functions. In these terms, microarthropods such as centipedes, millipedes, collembolans, mites, coleopterans and so on have demonstrated to be a good soil health indicator because of their sensitivity to changes in soil environment (see Menta et al., 2018).

We hypothesized that soil biodiversity and its distribution across a topographic gradient are sensitive to farmland management and grazing pressure. To highlight this, we used soil moisture, several pedological variables and soil microarthropods community as indicator of soil quality and soil functions (creation of pores, soil organic matter mechanic degradation and humification). We realized two samplings of microarthropods community in the last year (spring and autumn) in a 20-year monitored catchment. It is an agrosilvopastoral system with scattered trees and annual herbaceous grassland known as “Dehesa” in south western Spain. To achieve our aims, we tried (i) to complete the existing physical-chemical database with data regarding to soil microarthropod biodiversity; and (ii) to obtain the spatial distribution maps of both, biological and pedological, types of variables.

A previous photo interpretation analysis was developed to identify and classify the grazing areas. As well as, multivariate statistical analyses were used to determine the influence of each component. And finally, geostatistical approaches were used to implement the spatial distribution of the variables.

Results showed a precise convergence of the whole variables. All of them seemed to follow the spatial distribution of the trees and undergrazed areas. Trees role appeared to be a “soil biodiversity island”, which coincides with the bibliography. Trampled areas were correlated to higher values of bulk density and, subsequently, they showed lower microarthropod abundance. Apparently, microarthropod taxa does not follow the same spatial pattern. In future, further researches will need to clarify these results.

Menta, C. et al. (2018) ‘Soil Biological Quality index (QBS-ar): 15 years of application at global scale’, Ecological Indicators. Elsevier, 85(November 2017), pp. 773–780. doi: 10.1016/j.ecolind.2017.11.030.