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Spatial distribution of agricultural terraces according to physical and anthropic characterization in a Mountainous Mediterranean catchment

Josep Fortesa[1,2], Julián García-Comendador[1,2], Jaume Company[1,2], Maurici Ruiz[1,2], and Joan Estrany[1,2]

[1]University of the Balearic Islands, Geography, Palma, Spain (josep.fortesa@uib.cat)
[2]Institute of Agro-Environmental and Water Economy Research –INAGEA

Terracing is one of the most ancient agricultural practices in mountain landscapes to develop agricultural activity and it has been spread worldwide. Furthermore, a large diversity of terraces type (i.e. check-dam terraces, braided terraces, step terraces, pocket terraces) have been constructed depending on geomorphic features and their relative position to the drainage system. These structures are reshaping the geomorphology due to the slope gradient modification, creating a different geomorphic signature than natural landscapes. Moreover, anthropogenic signatures change the geomorphological organization of the landscape with direct consequences on geomorphic processes related to water and sediment fluxes connectivity. It is clear that a different slope intervention –constructing different terraces types– is necessary depending on the background conditions. Once built, terraces promote decoupling effects according to their degree of hydrological and sediment (dis)connectivity. Hence, slope length and connectivity vary according to terraces type, size, shape, slope and inter-terrace distance, being key characteristics for an effective terraces parameterization into hydrological models to assess runoff and sediment yields at catchment scale.

The aim of this study is to analyse the spatial distribution of soil conservation structures types according to geomorphic (i.e. elevation, slope, connectivity index) and anthropic (i.e. terraces parameters) characteristics in a representative Mediterranean basin (Búger River basin; 67.4 km^2; Mallorca, Spain).

The physical characterisation of the different terraces type evidenced statistically significant higher values of mean elevation, slope and connectivity index in braided terraces than check dam and terraced fields. In addition, an analysis of the mean elevation and mean slope of the terraces according to their conservation state (i.e., active or abandoned terraces) illustrated that the mean elevation of active areas and the mean slope of abandoned areas significantly decreased from 1956 to 2018, as a result of forest transition. The anthropic characteristics depicted significant differences between the terraces types, where the mean length wall was longer in terraced fields (40 m) than check dam (26 m) and braided (24 m) terraces. Furthermore, the mean distance between walls was significantly larger in check dam terraces (25 m) than terraced fields (18 m) and braided terraces (15 m). Finally, braided terraces had significantly lower dry stone wall density (360 m/ha) than check dam terraces (404 m/ha) and terraced fields (443 m/ha). The interactions between physical and anthropic characteristics were assessed through a Spearman correlation matrix, which results showed how total dry-stone had strong positive correlation with mean elevation, slope and

connectivity index. However, the mean length wall decreased as values of mean elevation, slope and connectivity index increased due to its depicted a significant negative correlation. The dry-stone density negatively correlated with mean distance wall and positively correlated with mean slope. Finally, the mean distance between walls negatively correlated with mean slope.

This research may allow to parametrize the heterogeneity of terraces types in order to provide a better understanding of terracing, which can be useful for a terrace parameterization into hydrological models to assess runoff and sediment yields at catchment scale under different land uses change scenarios.