Changes in hydrological connectivity due to farmland abandonment in terraced fields

N. Lana-Renault¹, M. López-Vicente², J.A. Llorente¹, P. Ruiz-Flaño¹, J. Arnáez¹, I. Galilea¹

¹Area of Physical Geography, University of La Rioja, 26006-Logroño, Spain. ²Dept. of Soil and Water, Experimental Station of Aula Dei, EEAD-CSIC. Avda. Montañana 1005, Zaragoza, Spain

Terrace fields are unique landscapes in many countries of the world, with important environmental, cultural, aesthetic and productive functions. Terraces provide a larger surface for cultivation, improve water availability and reduce soil erosion, as they increase infiltration and reduce runoff. In many Mediterranean countries, farmland abandonment has resulted in a lack of maintenance of the terraces, causing failures in the terrace risers, often followed by small mass movements and gullying. Little is known about the effect of such failures on the hydrological system. The aim of this study is to contributing to fill in this gap by exploring the effect of terrace failure on hydrological connectivity. For this purpose, we applied two modified versions of the index of runoff and sediment connectivity of Borselli et al. (2008) in a small catchment (192 ha) in northern Spain mostly occupied by abandoned terraced fields. The modified index includes (i) the improvement proposed by Cavalli et al. (2013) related to very steep slopes and (ii) an infiltration component to account for the high infiltration rates observed in the terraced fields. Firstly, we carried out an assessment of the modified and original indices using discharge and sediment data collected at the outlet of the catchment, as well as analysing the simulated values of connectivity throughout the hillslopes, the stream and at the outlet. Secondly, we run several scenarios to evaluate different land management strategies on hydrological connectivity: land abandonment in the coming future (with many terrace failures distributed randomly); conservation and restoration of all terraces (no failures, similar to the past scenario); and conservation of selected terraces (e.g., at different positions on the hillslope). The results of this study will be of interest to promote best management practices (BMPs) in abandoned mountainous agricultural landscapes.
