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CHARACTERIZING AGRICULTURAL TERRACES - NEW QUANTITATIVE GEOMORPHOMETRIC APPROACHES TO ESTIMATE SOIL VOLUMES STORED

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Agricultural terraces are the most extensive and common landforms that humans have ever produced. Geomorphometric information can be exploited to study and ultimately assist in the future preservation of such landforms in a world increasingly affected by anthropogenic activities. High-resolution topographic (HRT) techniques allow the mapping and characterization of geomorphological features with wide-ranging perspectives at multiple scales through high-resolution Digital Terrain Models (DTMs). By using riser bases as well as terrace edges (riser tops) and through the computation of geomorphometric parameters as the minimum curvature, it is possible to obtain environmentally useful information on these agricultural systems such as terrace soil thickness and volumes. This work aims to realize and test an innovative and rapid methodological workflow to estimate the minimum anthropogenic reworked and moved soil of terrace systems in three different terrace sites in central Europe (Italy and Belgium). We start with remote terrace mapping at a large scale and then utilize more detailed HRT surveys to extract geomorphological features, from which the original theoretical slope-surface of terrace systems were derived. The utilization of ground-truthing through field excavation and sampling has confirmed the reliability of the methodology used. Differences between actual and theoretical terraces from DTM and excavation evidence have been used to estimate the minimum soil volumes and masses used to remould slopes. Moreover, geomorphometric analysis through indices such as sediment connectivity permitted also to quantify the volume of sediment transported downstream, with the associated and mobilized C, after a collapsed terrace. The quantification of terrace volumes can provide extremely useful standards for further multi-disciplinary analysis on the terrace sediments themselves, new benchmarks for soil erosion models, new perspectives for land and stakeholders for terrace management in terms of natural hazard and offer a measure of the effect of these agricultural systems on soil organic carbon (SOC) sequestration.

Keywords

volume computation, agricultural terrace systems, high-resolution topography, geomorphological features

Note/comment