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A landscape archaeological approach to estimate the cover-management and conservation practice factors for RUSLE models.

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Developing more sustainable agricultural systems represents a challenge and urgent global venture. A sustained collaboration among researchers from diverse fields, policymakers, and the public at large is necessary to deal with this complex global emergency. Landscape archaeology can actively contribute to this movement by exploring the interactions of social and environmental systems over long periods of time and generating insights for potential future applications. Environmental sustainability and historic landscape conservation are typically treated as two separate fields. Still, this research proposes a new way to embrace cultural and natural values as components of the same landscape management plans.

Over the long term, rural activities have given rise to a wide variety of historic landscapes. Historic Landscape Characterisation (HLC) uses a qualitative but formalised method to map historic landscapes' chronological and spatial complexity. Each HLC study uses GIS to map 'historic landscape character types' (HLC types) based on distinctive characteristics which result from known historical processes. Meanwhile, in environmental studies, the diachronic land-use-land cover (LULC) analysis has helped illustrate how different anthropogenic activities have altered the soil erosion rate in specific areas. Modelling can provide a quantitative and consistent approach to estimating soil erosion under a wide range of conditions. GIS integration with the RUSLE (Revised Universal Soil Loss Equation) model has been applied to estimate soil loss at a regional scale. It has resulted in implementing soil management and conservation practices to reduce soil erosion in fragile ecosystems. In previous HLC studies, LULC has been evaluated from the perspective of cultural heritage. In contrast, RUSLE modellers have used it as a proxy for the LULC of an area (i.e. absence or presence of tree canopy) and its effect on soil erosion.

This study proposes an innovative methodology that combines both the historical/cultural and the environmental values of LULC to inform the development of a model to evaluate the increasing/decreasing soil erosion rate. From a cultural heritage point of view, the diachronic analysis of historical features (mapped as HLC types) informs understanding of the LULC, which characterised a landscape. At the same time, these features had an impact on local soil erosion rates. In this study, the HLC types have been employed to define the C and P factors, the two most challenging factors to be determined in the RUSLE equation. In literature, the C factor is usually derived from automatic satellite detection (e.g. CORINE), resulting in a low detailed characterisation of the LULC types, especially in the case of local agricultural activities. Conversely, the P factor is often taken equal to 1 because of the lack of geospatial data about the conservative practices adopted regionally (e.g. occurrence of terraced systems, hedgerows or contour ploughing).

The methodology proposed has been tested in the Tuscan - Emilian Apennines historical landscape (Vetto - Italy) with the aims to assess: i) how the changes in the LULC in the past 70 years impacted the soil erosion rate, and ii) which HLC types perform better in term of soil erosion mitigation.

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