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Implementing automatic LiDAR and supervised mapping methodologies to quantify agricultural terraced landforms at landscape scale: the case of Veneto Region

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Traditional agricultural terraced landscapes presently embody an important cultural value to be deeply investigated, both for their role in local heritage and cultural economy and for their potential geo-hydrological hazard due to abandonment and degradation. Moreover, traditional terraced landscapes are usually based on non-intensive agro-systems and may enhance some important ecosystems services such as agro-biodiversity conservation and cultural services.
Due to their unplanned genesis, mapping, quantifying and classifying agricultural terraces at regional scale is often critical as far as they are usually set up on geomorphologically and historically complex landscapes. Hence, traditional mapping methods are generally based on scientific literature and local documentation, historical and cadastral sources, technical cartography and aerial images visual interpretation or, finally, field surveys. By this, limitations and uncertainty in mapping at regional scale are basically related to forest cover and lack in thematic cartography.
The Veneto Region (NE of Italy) presents a wide heterogeneity of agricultural terraced landscapes, mainly distributed within the hilly and Prealps areas. Previous studies performed by traditional mapping method quantified 2,688 ha of terraced areas, showing the higher values within the Prealps of Lessinia (1,013 ha, within the Province of Verona) and in the Brenta Valley (421 ha, within the Province of Vicenza); however, terraced features of these case studies show relevant differences in terms of fragmentation and intensity of terraces, highlighting dissimilar degrees of clusterization: 1.7 ha on one hand (Province of Verona) and 1.2 ha per terraced area (Province of Vicenza) on the other one.
The aim of this paper is to implement and to compare automatic methodologies with traditional survey methodologies to map and assess agricultural terraces in two representative areas of the Veneto Region.
Testing different Remote Sensing analyses such as LiDAR topography survey and visual interpretation from aerial orthophotos (RGB+NIR bands) we performed a territorial analysis in the Lessinia and Brenta Valley case studies.
Preliminary results show that terraced feature extraction by automatic LiDAR survey is more efficient both in identifying geometries (walls and terraced surfaces) and in quantifying features under the forest canopy; however, traditional mapping methodology confirms its strength by matching different methods and different data such as aerial photo, visual interpretation, maps and field surveys. Hence, the two methods here compared represent a cross-validation and let us to better know the complexity of this kind of landscape.