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SOiLUTION SYSTEM: innovative solutions for soil erosion risk mitigation and better management of vineyards in hills and mountain landscapes

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Cultivating in high-steep slope hilly and mountainous landscapes, requires a great effort in terms of economic and human resources, especially if the territory is particularly complex from a geomorphological point of view and historically affected by landslides such as the Italian peninsula. This fragility is also combined with two other factors. The first is linked to agricultural mechanization, which causes soil compaction and a consequent alteration of its draining capacity. The second is related to climate change, responsible for an increase of extreme rainfall events characterized by intense, shorter and localized precipitations. The combination of these elements makes agricultural terraced landscapes at risk and prestigious vineyards, particularly important for historical, cultural, landscaping and economic reasons, increasingly sensitive to soil erosion processes.

In response to these problems, the project SOiLUTION SYSTEM is proposed (www.soilutionsystem.com), aiming to identify an integrated system of environmentally and economically sustainable interventions able to reduce the risk of erosion and improve soil management in the terraced area of Soave (Veneto region), one of the two Italian GIAHS-FAO site. Indeed, in such terraced areas, the hydrogeological risk is high due to the steep-slope where heroic vineyards are cultivated. The project is also focused on multidisciplinary, capable of combining expertise from the academic world, farmers and other stakeholders, in order to promote a sustainable production approach to ensure greater soil resilience, as well as to protect biodiversity.

In the first phase, several terraced study areas historically threatened by erosion have been selected. Within them were organized topographic surveys using a low-cost commercial drone in combination with an RTK-GPS for the 3D reconstruction of the terrain using the Structure-From-Motion photogrammetric technique. The point cloud obtained was subsequently processed, filtered and interpolated in order to create high-resolution digital terrain models (DTM) with cells of resolution less than 50cm. Based on the obtained data, some geomorphological indicators were calculated to identify areas potentially susceptible to erosion. In order then to understand the processes that take place at a larger scale than the single areas detected by drone,

geomorphological analyses were also performed on a 1m DTM elaborated from airborne LIDAR data, granted by the Italian Ministry for Environment, Land and Sea (MATTM).

The goals of the project are 1) to provide innovative survey techniques using low-cost commercial drone to better understand erosion processes in vineyards; 2) to install innovative tools for the monitoring of surface runoff in the field; 3) to test new mechanization prototypes with low impact on the soil and able to work on steep slopes; 4) to provide an innovative technique for the consolidation of dry stone walls; 5) to introduce the “conservative agriculture” for improving soil management; 6) to analyze the role of native herbaceous species as grass cover in erosion reduction; 7) to evaluate the efficiency of the proposed management model in considering biodiversity conservation purposes.

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