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The IN-GEST SOIL Project: results of the introduction of good practices for soil management in piedmont vineyards

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The IN-GEST SOIL Project (*Innovation in viticulture soils management trough the adoption of good practices and tools to support field activities*), funded by the EU and Regione Piemonte within Rural development program 2014-2020 for Operational Groups, aims to reduce soil erosion and enhance soil and vine quality in Piedmont hillside vineyards. This is achieved through the introduction of three key innovations: 1) Improved best soil management practices; 2) Agro-meteorological monitoring for improved water and soil management; 3) ICT tools for the management of monitored data and field observations, to support farmers in vineyard management and water-soil conservation. This study aims to improve the environmental sustainability of the vineyard, a goal that gains significance in the face of the context of the climate change. With forecasts predicting rising temperatures, decreasing rainfall, and an increase in extreme events like droughts and intense rainfall in thein the Mediterranean region, the project's relevance is underscored. In Piedmont, recent rainfall scarcity has led wine growers to reduce the use of permanent grassing, opting instead for temporary or partial cover crops. While beneficial to soil functioning regardless of soil type, these cover crops often compete for water with grapevines, necessitating careful management in water-scarce areas. To explore the impact of different soil management systems and appropriate field operation planning, the IN-GEST project implemented study cases in 2021. These were conducted over two growing seasons in one experimental and five commercial vineyards located in the Alto Monferrato, Gavi and Colli Tortonesi vine-growing areas. In each vineyard, a more conservative soil management practice was compared with current or traditional practices. The effects on soil quality and vineyard production were investigated through monitoring runoff and soil erosion at plot scale, bulk density and soil penetration resistance, soil water content, hydraulic conductivity, ground cover and surface

biomass, and grapevine development and production. Vine-growers and agrotechnicians actively collaborated to the study cases, by collecting runoff data and recording field observations and operations through a specific app, which also provide information for vineyard's management.

The results of the study confirmed the positive effect of permanent spontaneous grass in reducing runoff, erosion and soil compaction, especially in sloping vineyards. Grape production in 2021 and 2022 was higher or stable with the innovative soil management in the case of sown green cover. However, it was lower with permanent grass cover compared to tillage, especially in the younger and flat vineyard. It should be noted that the monitored seasons were exceptionally dry, with the latter characterized by low production across the region. In most of the monitored vineyards, less intensive soil management resulted in increased water infiltration during rainfall events and higher soil moisture in topsoil and, in some cases, at depth of 40 cm. The benefits of grass cover were more evident when a selected grass mixture was sown and used as green manure, resulting in reduced soil bulk density and increased soil moisture, even during very dry seasons.