

Monitoring and mapping soil functionality in degraded areas of organic European vineyards

S. PRIORI¹, J. TARDAGUILA^{2*}, M.P. DIAGO², A. AQUINO², L. D'AVINO¹, A. LAGOMARSINO¹, S. PELLEGRINI¹, G. VALBOA¹, E.A.C. COSTANTINI¹

¹ Council for Agricultural Research and Economics, CREA-ABP, Firenze, Italy.

²Instituto de Ciencias de la Vid y del Vino (CSIC, UR, Gobierno de La Rioja). Finca La Grajera, Ctra. Burgos, Km6 (26007) Logroño. La Rioja. Spain; *Corresponding author: Javier Tardaguila, +34941299741, Fax: +34941299721, Email: javier.tardaguila@unirioja.es

Aim

Soil malfunctioning, caused by an improper land preparation before vine plantation and/or management, is a common problem in European vineyards. Soil malfunctioning includes: reduced contribution of the soil fauna, poor organic matter content, imbalanced nutritional status, altered pH, water deficiency, soil compaction and/or scarce oxygenation.

To address these issues, ReSolVe, a transnational EU research project was launched in 2015 to test the effects of selected agronomic strategies for restoring optimal soil functionality in degraded areas within organic vineyards.



Figure 1. Example of a degraded area within an organic vineyard in Rioja (Spain)

Materials & Methods

The ReSolVe project involves 8 research groups in 6 different EU countries: Italy, Spain, France, Sweden, Slovenia and Turkey, with experts from several disciplines including soil science, ecology, microbiology, grapevine physiology, viticulture and biometry.

Experimental vineyards are located in Italy (Chianti Hills and Maremma plain, Tuscany), Spain (La Rioja) and Slovenia (Primorska) for winegrapes, and in Turkey (Adana and Mersin) for table grapes.

First activity involved the characterization and mapping of degraded areas within experimental vineyards, using non-invasive technologies (ie. Gamma ray spectroscopy) (Figure 2) and classical soil pits (Figure 3) as well as RGB (Figure 4) and thermal imaging for canopy status.



Figure 2. Characterization of a vineyard's soil with gamma ray.



Figure 3.

(a) Characterization of the soil properties and
(b) root distribution in a Tempranillo Vineyard (Rioja, Spain)



Figure 4. Assessment of grapevine canopy status by RGB image analysis

Three different restoring strategies have been implemented: (i) compost, (ii) Green manure with Winter legumes, and (iii) dry mulching with cover crops (Figure 5). These strategies have been tested according to their efficiency to improve: grapevine and root growth, grape yield and quality, and to optimize the quality of the soil ecosystem services and the terroir effect.



Figure 5.

(a) Compost addition (Turkey) and
(b) cover cropping (Italy).

Expected Results & Impact

The ReSolVe project will provide guidelines for restoring optimal soil functionality in vineyards and other perennial crops, through organic soil management strategies. Likewise, a comprehensive protocol of analysis and measurements for vineyard ecosystemic functioning assessment, adapted to EU vineyards will be prepared. As a long-term impact, EU organic vineyards will be expected to be more homogeneous in terms of grapevine efficiency, health and soil ecosystem.