Indicators of Sustainable Vineyard Soil Management: Metrics for Assessing Environmental Impacts

Abstract

The vital role of soils in supporting life on our planet cannot be overstated. Soils provide numerous ecosystem services and functions, including biomass production, carbon sequestration, physical support, biological habitat, and genetic reserve, among others. Understanding the characteristics and sensitivity of soils in a specific terroir, along with effective soil management practices, is crucial for the sustainable management of natural resources.

To address this issue, we aimed to develop a concise set of indicators to assess soil quality in vineyards. By creating a protocol or guide for winemakers, we can enable them to conduct a basic evaluation of their soil's quality.

To do so, we have mined the literature, from over 600.000 articles on the subject of "soil health" we selected the 100 most relevant and recent documents. Then, we have identified a set of 12 descriptors belonging to 4 categories that can be easily determined by the farmers to assess the quality of their soils using protocols that will be soon available online. The first category includes descriptors of the status of the soils and the 3 remaining categories contain descriptors related to physical, chemical, and biological quality. To have a more precise description of the soil quality, we have identified a set of 6 additional descriptors requiring more complex equipment and aimed at the scientific community. Amongst these indicators, certain microbes play crucial roles in enhancing plant adaptability to various abiotic and biotic stresses and can serve as valuable indicators of soil health. The microbial community of a field with different plowing practices has been assessed through metagenomic techniques in a maize rotation involving cover crops and this approach will be implemented, over the course of this project, in vineyards of varying age, soil management (till versus no-till) and grape color.

Acknowledgements: Plan Complementario de I+D+i de Agroalimentación AGROALNEXT dentro del Plan de Recuperación, Transformación y Resiliencia financiado por la Unión Europea – Next Generation EU.

> DOI:
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> Publication date: October 3, 2023

Issue: ICGWS 2023

Type: Article

Authors

Emily Silva Araujo[1], Jérôme Grimplet[2,3*], Vicente González-García[1,3], Inés Zugasti López[1] , Pedro Marco-Montori[2,3], María José Rubio-Cabetas[2,3], Sergio Sánchez[2,3], Sergi García- Barreda [2,3], Ramón Isla[1], Farida Dechmi[1,3] and José Manuel Mirás-Avalos[1]

[1] *Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA), Departamento de Ciencia Vegetal, Gobierno de Aragón, Avda. Montañana 930, 50059 Zaragoza, Spain*
[2] *Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA), Departamento de Sistemas Agrícolas, Forestales y Medio Ambiente, Gobierno de Aragón, Avda. Montañana 930, 50059 Zaragoza, Spain*
[3] *Instituto Agroalimentario de Aragón—IA2 (CITA-Universidad de Zaragoza), Calle Miguel Servet 177, 50013 Zaragoza, Spain*

Contact the author*

jgrimplet@cita-aragones

Keywords

sustainable management, soil quality indicators, microbiome

Tags

2ICGWS | ICGWS | ICGWS 2023 | IVES Conference Series

Citation

Avalos (2023). Indicators of Sustainable Vineyard Soil Management: Metrics for Assessing Environmental Impacts. *IVES Conference Series, ICGWS 2023*.

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