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Source: Air, Soil and Water Research, 14(1)

Published By: SAGE Publishing

URL: https://doi.org/10.1177/1178622120985817

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Vineyards Assessed Under a Biophysical Approach: Findings From the Biohydrology and TERRAenVISION Meetings

Air, Soil and Water Research
Volume 14: 1–3
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DOI: 10.1177/1178622120985817

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ABSTRACT: During the Biohydrology 2019 (24-27 July 2019, Valencia, Spain) and TERRAenVISION 2019 (2-7 September 2019, Barcelona, Spain) meetings, the scientific sessions joined reputed scientists around the world. Innovative debates during these scientific sessions about vineyards focused on the use of new technologies to assess soil erosion and nutrient losses, benefits or damages generated by tillage, the use of cover crops, and the introduction of organic farming. Among all the high-quality posters and oral presentations in these 2 abovementioned conferences, 3 groups from different countries with an extended list of publications decided to publish their new findings on the special issue: Vineyards Assessed Under a Biophysical Approach.

KEYWORDS: Vineyards, sustainability, soils, human impacts, biophysial approach

RECEIVED: October 30, 2020. **ACCEPTED:** December 8, 2020.

TYPE: Vineyards Assessed Under a Biophysical Approach: Findings from the Biohydrology and TerraEnvision Meetings – Editorial

FUNDING: The author(s) received no financial support for the research, authorship, and/or publication of this article.

DECLARATION OF CONFLICTING INTERESTS: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Recent research is demonstrating new advances to reduce land degradation processes in agricultural fields. In vineyards, this is necessary considering the exacerbated issues related to soil erosion,[1] loss of nutrients,[2,3] and decrease in fertility.[4-6] Soils are key to understand human and natural ecosystems.[7] During the last 2 decades, the research conducted on vineyards is becoming more and more exhaustive. Biophysical approaches are playing a significant role to decipher the magnitude of human impacts affecting soil quality, especially.[8-10]

During the Biohydrology 2019 (24-27 July 2019, Valencia, Spain) and TERRAenVISION 2019 (2-7 September 2019, Barcelona, Spain) meetings, the scientific sessions joined reputed scientists around the world. Innovative debates during these scientific sessions about vineyards focused on the use of new technologies to assess soil erosion and nutrient losses, benefits or damages generated by tillage, the use of cover crops, and the introduction of organic farming. Among all the high-quality posters and oral presentations in these 2 abovementioned conferences, 3 groups from different countries with an extended list of publications decided to publish their new findings on the special issue: Vineyards Assessed Under a Biophysical Approach.

The first paper was published by Bogunovic et al[11] assessing soil erosion in a Croatian vine plantation, where the loss of fertile soils due to compaction, tillage, and bare surfaces is significant.[12,13] The main novelty of this research was to compare the impacts of croplands and vineyards under conventional management on some key soil properties and its hydrological response. The research was conducted in Eastern Croatia (Figure 1A and B). Rainfall simulations were used as the main method combined with soil analysis. They concluded that overall, non-invertive tillage practices in vineyards were able to maintain soil structure, allowing better soil quality and decreasing soil degradation.

In Portugal, Ferreira et al[14] provided a study case in the Bairrada viticultural region, located in north-central Portugal (Figure 1C and D). These vineyards are characterized by intense and frequent tillage with the application of chemicals.[15] As we mentioned, fortunately, this soil management is being substituted by integrated production and, to a lesser degree, no-tillage, and biodynamic approach. These authors assessed the differences in soil quality of 4 vineyards for 6 years using soil analysis collected along the rows and inter-rows. Also, forest soils were sampled as a control plot to compare with prior land-uses. They concluded that conventional management can diminish soil quality, considering the lower contents of organic matter and nutrients (total nitrogen, phosphorus), and exchangeable cations, as well as its higher concentration of trace elements.

The last study was carried out in Madrid (Spain; Figure 1D and E), where the effects of alternative soil managements to tillage were considered in summer and autumn as critical seasons for soil degradation because of the high-intensity and short-duration rainfall events.[16] They examined the differences between runoff and soil moisture patterns at different soil depths focused on 2 different treatments: traditional tillage and permanent cover crop using the herbaceous species *Brachypodium distachyon (L) P Beauv.* Rainfall simulation experiments on closed plots of 2 m^2 were used and wine parameters were also tested. The main conclusions obtained

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Figure 1. Panoramic overviews of all the study areas: (A and B) Vineyards in Eastern Croatia. (C and D) Vineyards in north-central Portugal. (E and F) Vineyards in Central Spain.

were the necessity to develop proper site-specific management plans to avoid water shortages and that cover crops can be recommended for soil protection in semi-arid environments. These results complete previous results obtained in other pioneer investigations conducted by this group in this region[17,18] or when compared with other European vineyards.[19]

Acknowledgements

We want to thank all of the contributors to the special issue for their willingness to participate, and for the time invested, as well as the reviewers, associate editors, and editorial manager. All of them have actively contributed to the success of this special issue. All the guest editors are very happy with the organization of both meetings. Thanks a lot to all the local organizers of Biohydrology and TERRAenVISION Meetings.

Author Contributions

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