TERRA

ENVISION

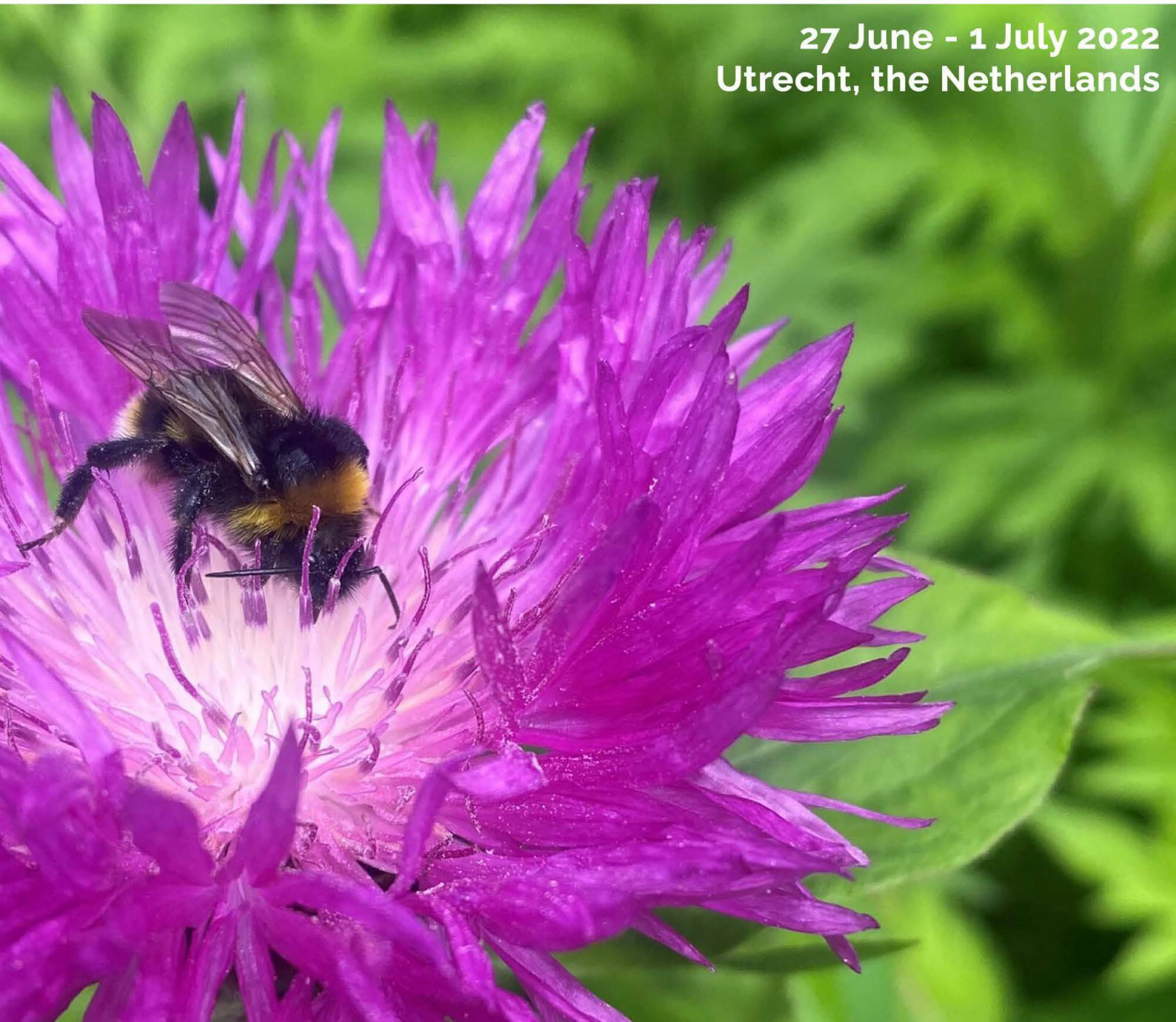
Utrecht University

Rijkswaterstaat

WAGENINGEN
UNIVERSITY & RESEARCH

Nature-based Solutions to Facilitate the Transition for Living within the Planetary Boundaries

27 June - 1 July 2022
Utrecht, the Netherlands



TerraEnVision 2022

Nature-based Solutions to Facilitate the Transitions for living within the Planetary Boundaries

Utrecht, the Netherlands, June 27 - July 1, 2022

Editors

Saskia Keesstra, Wageningen Environmental Research, Netherlands / University of Newcastle, Australia

Artemi Cerdà, Department of Geography, University of Valencia, Spain

Wouter Gevaerts, Director Environmental restoration EMU Region at Arcadis, the Netherlands

Gerben Mol, Senior Researcher, AMS, and Wageningen Environmental Research, the Netherlands

Margon De Cleen, Senior Advisor, Soil and Water Ministry of Infrastructure and Water Management, tThe Netherlands

Carla Sofia Ferreira, Researcher, Stockholm University, Sweden

Ioannis Daliakopoulos, Department of Agriculture, Hellenic Mediterranean University, Greece

Publication

Hellenic Mediterranean University, Estavromenos, 71 410 Heraklion, Greece

First published on Month Day, 2022, in Heraklion, Greece by Hellenic Mediterranean University, School of Agriculture, Department of Agriculture.

ISBN:

Table of Contents

TERRAENVISION Abstracts
Vol. 3 TNV2022-AG-3124
Utrecht, the Netherlands, 27 June - 1 July, 2022

Agroecosystem diversification and sustainable management lead to increased biodiversity, crop production and socio-economic advantages: the case of Mediterranean olive orchards

[1]Adriano Sofo and [2]Assunta Maria Palese

[1]*University of Basilicata*
[2]*Ages s.r.l.s. – Academic spin-off*

Abstract

Climate change, in terms of increased temperature and extreme precipitation regimes, will have agricultural consequences because of the interrelations between climate, land and water use, soil degradation and landscape changes. Sustainable agriculture offers new chances to mitigate these deleterious effects. Sustainable management practices can increase soil carbon (C) inputs, reduce greenhouse gases emissions from the soil and, at the same time, increase agroecosystem biodiversity. This study shows the benefits of sustainable management on biodiversity, crop production and socio-economic aspects in a Mediterranean olive orchard. In 2000, the field was divided in two plots: *a)* sustainable (S_{mng}) with no-tillage, prunings and spontaneous vegetation used as mulch, irrigation with treated wastewater, correct pruning; *b)* conventional (C_{mng}) with soil tillage, mineral fertilizers, burning of prunings, empirical irrigation and pruning. Results show that a 21-year period of S_{mng} caused increases in soil organic carbon levels (6.74 vs 11.84 t ha^{-1} in the 0-30 cm soil layer), soil water retention (up to 40% more) and soil permeability (from 13 to 160 mm H_2O day^{-1}), so allowing farmers to save irrigation water and improve soil structure (Sofo and Palese, 2021). The adoption of a correct irrigation management had a key role in the potential role of orchards in C sequestration and on vegetational, and on soil faunal and microbiological diversity (Sofo et al., 2019). Compared to dry areas, wetted soils had a higher microbial respiration and SOC mineralization, and a faster bacterial C and N turnover. Finally, the S_{mng} brought benefits on plant yield, that was improved (8.4 vs 6.3 t ha^{-1} yr^{-1}) (Pascazio et al., 2018). The endogenous C additions had positive effects on the reserves of soil water and nutrients (N, P, K, Ca, Mg) and on CO_2 soil emission (Palese et al., 2015). Promoting cost-effective sustainable land use strategies aimed and increasing agroecosystem biodiversity can avoid soil erosion, compaction and contamination, that are important ecosystem services. The S_{mng} was more effective in terms of productivity and profitability. The economic analysis showed that the gross profits of the S_{mng} were considerably higher (6276 vs 1517 € ha^{-1}), likely because of the higher yield and its superior quality (Pergola et al., 2013). Given the importance of the olive growing and the area covered by this crop, the study could be adapted for scaling up for the whole Mediterranean area (9,800,000 ha covered by olive), and adapted for other crops.

Keywords: Agroecosystem biodiversity, ecosystem services, soil carbon storage, socio-economic benefits, sustainable agricultural practices.

References

Palese AM, Ringersma J, Baartman JEM, Peters P, Xiloyannis C (2015) Runoff and sediment yield of tilled and spontaneous grass-covered olive groves grown on sloping land. Soil Res. 53(5): 542–552. doi: 10.1071/SR14350; Pascazio S, Crecchio C, Scagliola M, Mininni AN, Dichio B, Xiloyannis C, Sofo A (2018) Microbial-based soil quality indicators in irrigated and rainfed soil portions of Mediterranean olive and peach orchards under sustainable management. Agric. Water Manage. 195: 172–179. doi: 10.1016/j.agwat.2017.10.014; Pergola M, Favia M, Palese AM, Perretti B, Xiloyannis C, Celano G (2013) Alternative management for olive orchards grown in semi-arid environments: An energy, economic and environmental analysis. Sci. Hortic. 162: 380-386. doi: 10.1016/j.scienta.2013.08.031; Sofo A, Palese AM (2021) Mediterranean olive orchard subjected to sustainable management in Matera, Basilicata, Italy. In: FAO, ITPS, "Recarbonizing Global Soils – A Technical Manual of Recommended Sustainable Soil Management. Volume 4: Cropland, Grassland, Integrated Systems and Farming Approaches – Case Studies". FAO, Rome, Italy. Pp. 177-186. ISBN: 978-92-5-134897-0. doi: 10.4060/cb6598en

Acknowledgments: This work was partly supported by an OECD Co-operative Research Programme grant: Biological Resource Management for Sustainable Agricultural Systems. Directorate: T AD/ CRP; Contract: JA00091460.