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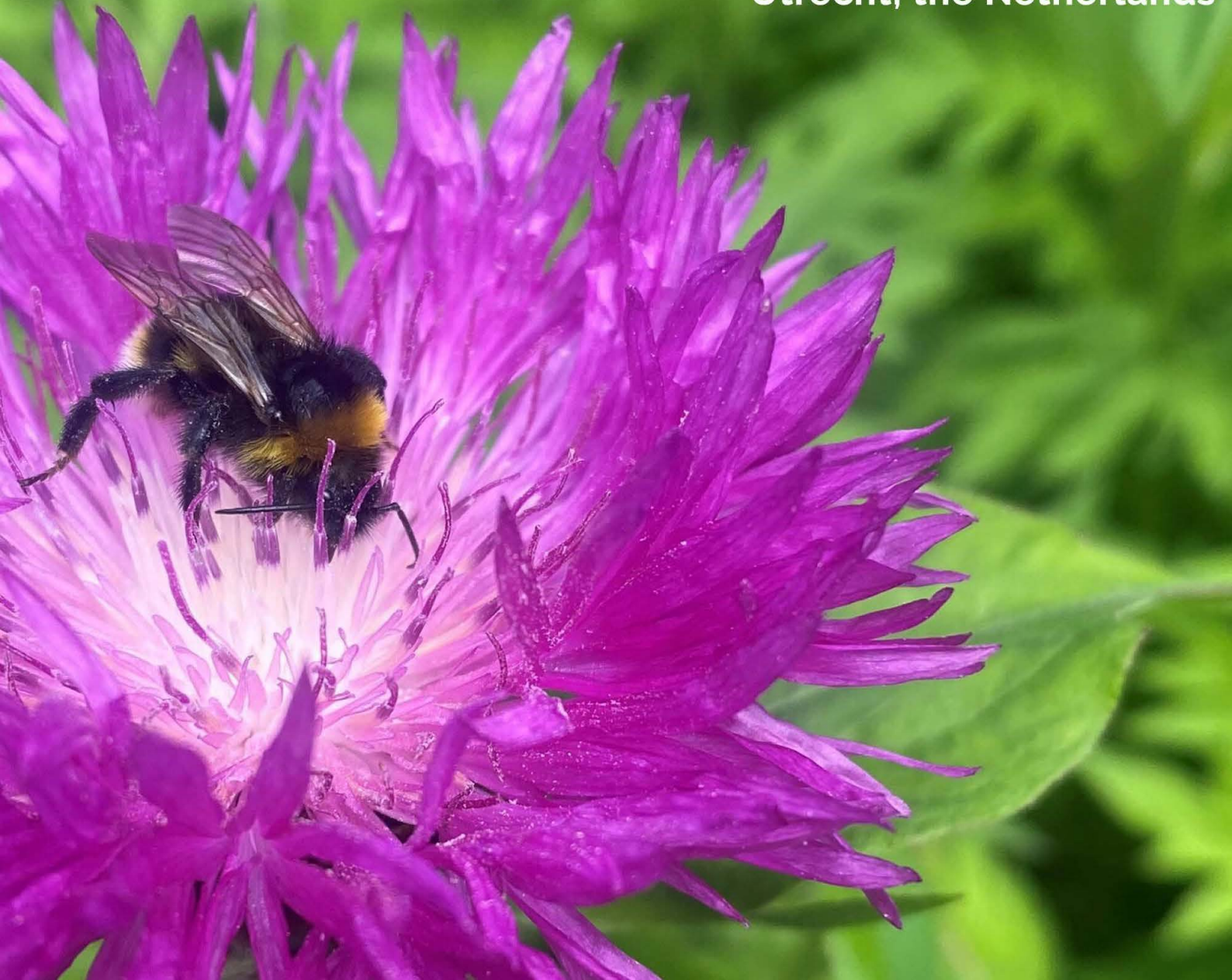
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WAGENINGEN
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**Nature-based Solutions to Facilitate
the Transition for Living within
the Planetary Boundaries**

27 June - 1 July 2022
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TerraEnVision 2022

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

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

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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 H₂O 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 CO₂ soil emission (Palese et al., 2015). Promoting cost-effective sustainable land use strategies aimed at 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.

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