TERRA

ENVISION

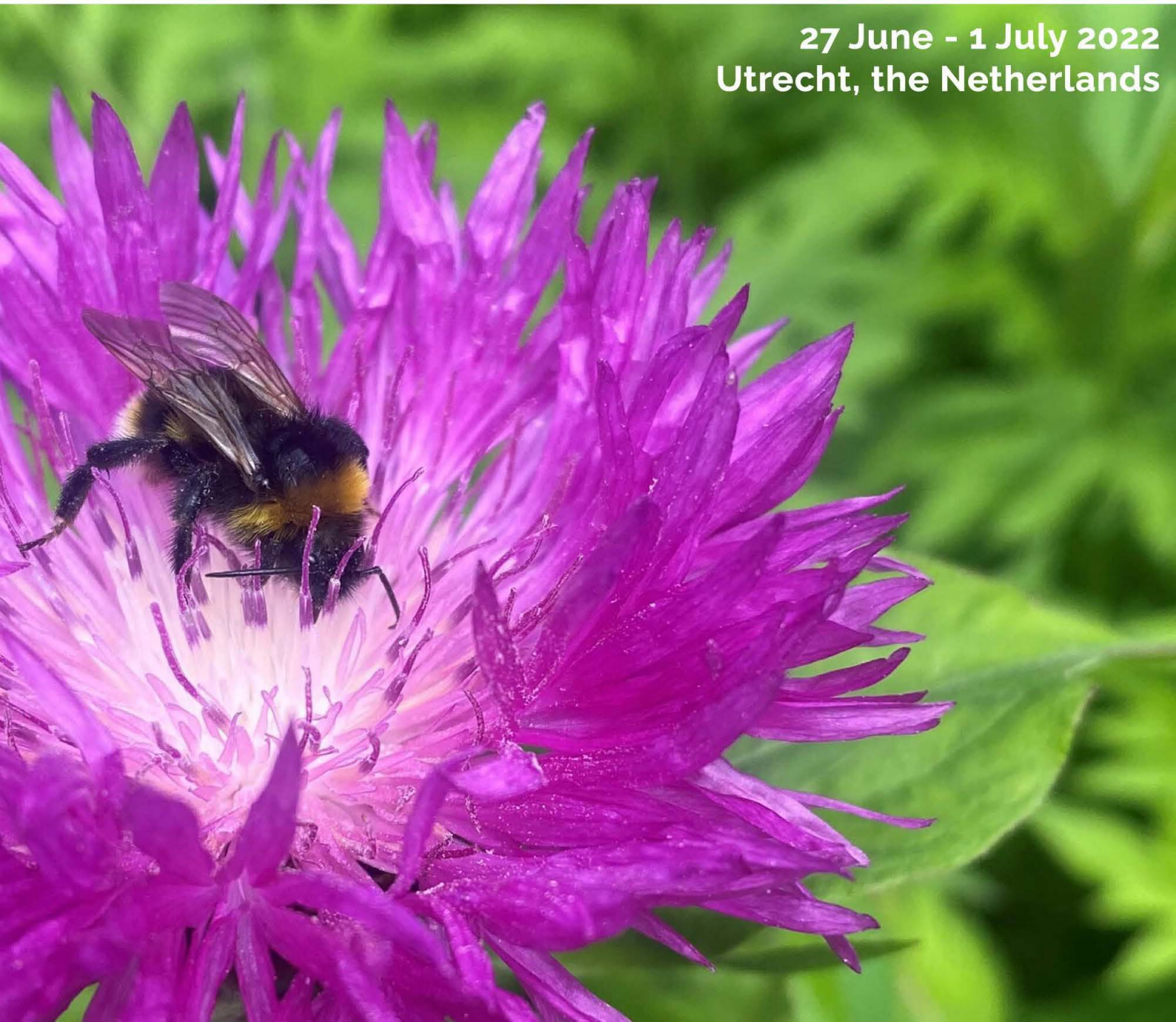
Utrecht University

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

The Mission of TerraEnVision 2022 1
Keynote speakers 3
Conference Program 13
Keynotes 15
Keynote by Annette Schneegans, title pending 16
How to make system change practical at landscape level? Experiences, lessons and needs 17
Rewilding nature to combat societal challenges 18
The climate challenge in water management 19
Keynote by Lilian van den Aarsen, title pending 20
EU Climate policies in the land sector 21
Urban floods and private land-challenges of implementing nature-based solutions 22
Wanted: biodiversity in the City; do we realize what it entails? - from decoration to ecology 23
AG: Transforming agriculture – Nature based Solutions between the poles of tradition and innovation to tackle land degradation 24
Agroecosystem diversification and sustainable management lead to increased biodiversity, crop production and socio-economic advantages: the case of Mediterranean olive orchards 25
Breaking monoculture: crop rotation scenarios with maize 27
Crop diversification in low input viticulture on steep slopes 29
Soil nutrients washing in dehesa farms of Extremadura, SW Spain 30
How does different crop type classifications affect biodiversity indicators in arable regions in Germany: towards (geo)data fitness for use quality metrics 32
Establishment of thyme-based living mulch and its effects on carob drought stress under rainfed conditions 34
Developing the first national database of soil erosion in vineyards to promote the protection of fertile soil 36
Seasonal changes in the effectiveness of a seeded cover crop to reduce the loss of soil nutrients in a rainfed vineyard 38
Determination of dry matter production by spectroscopy techniques in rangelands of SW Spain 40
Mathematic programming and model simulation for cover crops in Northwest China by assessing ecological and economic values 41
EC: Erosion - Connectivity 42
Assessing and managing soil erosion and lateral sediment connectivity in agricultural catchment systems: an Austrian example 43
Measuring the size of pendant water drop generated by hypodermic needles for construction of rainfall simulator for soil erosion research 45
Socio-ecosystemic analysis of the 2018 drought in Wallonia (Belgium) and possible recommendations for a transversal and sustainable risk management 47
The feasibility of applying nature-based solutions for flood mitigation in Israel: Marrying hydro-morphological analysis with land property rights 49
Four perspectives on agri-forest configurations for natural flood management 51
Estimation of shallow landslides susceptibility by the hydrogeological

characterization of vineyard steep slopes, through a multidisciplinary survey. 52
Impact of Nature-Based solutions on flow connectivity and flood hazard mitigation within a Mediterranean peri-urban catchment 53
The role of extreme rainfall events on soil erosion on bare and plant covered plots: A 7-year assessment under Mediterranean climatic conditions 55
The role of plant species on runoff and soil erosion in a Mediterranean shrubland 57
Treatment of landfill leachate using an innovative test facility. A significant step towards a more sustainable and biodeverse water treatments 59
On the use of the Resilience Performance Assessment framework for evaluating NbS-induced hydro-geomorphic connectivity 61
Developing Watershed Resilience with Indigenous Traditional Ecological Knowledge (ITEK) and Nature-based Solutions (NBS) 62
Inclusive Outscaling of Agro-ecosystem REstoration ACTions for the MEDiterranean - Pilot Area Bethlehem of Galilee, Israel 63
Analysis of land use changes and erosion process for a Degraded Rural Landscape using DEMs, Historical Images, LEM and USPED Models 64
Modelling the effects of vegetated landscape elements on the rainfall-runoff behaviour in a small agricultural watershed. 65
Modeling Soil Texture Parameters for Irrigation Optimization: a case study from Crete (Greece) 67
Historical evolution and future storylines of biophysical and socioeconomic drivers of ecosystem changes in the Mediterranean 69
How much have the nature-based solutions incorporated in the studies of Iranian paired watersheds? 70
The effect of different urban land use on the deposition of particle matter by plants in southwestern Iran 72
ME: Methodologies 74
Adoption of nature-based solutions and orchard sustainable management to face kiwifruit vine decline syndrome (KVDS) 75
Impact of Plant Protection Products Application on Pesticide Residues in Golf Course Soil 77
Long-term effects of afforestation on hydrological ecosystem services on the Loess Plateau 78
How can different decision-making criteria shape mulching techniques in burnt areas? 79
To seal or not to seal – what kind of soil is lost in Germany? 81
Nature-based solutions as building blocks for the transition towards climate resilient and circular food systems 82
Effects of vegetation restoration on soil physicochemical properties are achieved by the coupling contributions of biological synusium on the Loess Plateau 83
Hydrological monitoring on different managements vineyards to access shallow slope failures susceptibility and water stress phenomena 84
Are nature-based solutions a sustainable and efficient treatment option for olive oil mill wastewater? 85
Using Black Soldier Fly technology to turn livestock waste into profitable products 87
Remote sensing monitoring of beach cliff vegetation and shallow landslides in Catterline Beach, Scotland 89
Monitoring gully erosion in a coastal slope with Nature-based Solutions using terrestrial laser scanning 91
European Joint Program Agricultural Soils under Climate Change 92

Assessment of the performance of implemented NBS in the IJssel delta, The Netherlands – land cover and biodiversity 94
What triggers a socio-ecological transition? Lessons from the Early Middle Ages. 96
FI: Paradigm shifts in wildfire management 97
Approach for Selection of Fire Risk Assessment, Reduction and Adaptation Products for Demonstration Within FirEUrisk Project 99
Mapping canopy base height using GEDI relative height metrics for wildfire simulation models 100
Land management strategies to reduce wildfire risk across Europe 102
Nature-based Soil Bioengineering Solutions for Post-fire Response and First Erosion Control 103
Greenhouse gas emissions risk management in forest fires (Interreg Sudoe REMAS) 105
Native soil microalgae and cyanobacteria consortium as a nature-based solution for the immediate protection of burnt soils 107
Total Carbon content assessed by UAS near-infrared imagery as a new fire severity metric 109
Modeling forest fire risk in southern Corsica and development of a decision support tool for local authorities and land protectors 111
The use of weather types to foresee future runoff and soil loss activation in Mediterranean burned Shrublands 113
Adapting wildfire management to climate and global changes: A paradigm shift for the European Union 115
CO: Environmental Resilience and Nature Based Solutions: Communication, Science, Policies 117
SB4: Open Session for Science Brokers 118
Describing the potential of nature based solutions for urban groundwater remediation in the Griftpark by the use of storytelling 119
Is the resilience frame of wildfires gaining momentum in mainstream media? Exploring narratives in Spain 121
Revisiting wildfire resilience from a territorial perspective: Insights from Mediterranean Spain 123
Toward a nature-based future: A vison for a nature-based future for The Netherlands 125
Nature Based Solutions for climate adaptation in the Netherlands 126
UR: Nature based solutions for urban and industrial areas (land and water management and spatial planning) 127
Stormwater control benefits of urban tree canopy via rainfall interception and intensity reduction 128
Floodplain land uptake: Cental-European perspective 130
Potentials of circular and engineered soils for advancing and re-establishing nature-based retentive functional surfaces 131
Implementation aspects of NBS in the subsoil 133
How to sustainably implement and operate community gardens: Understanding the motivation of community garden coordinators 134
Soil and Water Bioengineering in urban fluvial rehabilitation and in flooding prevention: The Estepona RiVER 136
Integrated modelling for urban runoff 138
LIFE CO2SAND Using clay to make farmland climate proof 139
Infrastructure vulnerability assessment and NbS recommendations 141
A methodology leveraging satellite data to support urban resilience planning

through nature-based solutions: Application to the city of Ouagadougou in Burkina Faso 142
Past, Present and Future Predictions – Understanding the behaviour of contamination at a complex former manufactured gas plant 143
Retention of microplastics by green urban spaces vegetation 145
Increase of sustainability of urban forests by prevention of land degradation 147
Land Stewardship at industrial sites; a chance to enhance societal ánd natural value 149
Can the EU Taxonomy help upscaling investments into urban nature-based solutions? 150
Phytoremediation: a nature-based remediation solution and a means for improving underground and above ground biodiversity 151
Evaluation of selected factors affecting the water capacity of small-leaved linden (T. cordata Mill.) 153
Bringing the Wood and Scrub to the Mediterranean Urban Park 154
CC: Circular Economy and Carbon Farming 156
Orchid City 158
What does the circular and climate neutral household of the future look like? 160
Enabling carbon farming: presentation of a robust, affordable and scalable method 161
Leveraging legacy data to lower implementation thresholds for carbon farming 162
Climate Knowledge Agenda: Synergies and trade-offs of Wageningen Climate Solution 163
LIFE CO2SAND Using clay to make farmland climate proof 164
ORCaSa project 165
Workshops 166
Nature-Based Solutions (NBS) by applying Nature-based design 167
Support to the EU Mission "A Soil Deal for Europe": How to engage actors, close R&I gaps and set up Living Labs and Lighthouses 169
Challenges and opportunities for the upscaling of successful climate buffers 170
Scaling Nature-based Solutions for climate resilient food systems: What works and what not? 171
Interaction between society, problem owner and regulator on brownfield redevelopment 172
Index 175

TERRAENVISION Abstracts
Vol. 3 TNV2022-ME-3123
Utrecht, the Netherlands, 27 June - 1 July, 2022

Adoption of nature-based solutions and orchard sustainable management to face kiwifruit vine decline syndrome (KVDS)

[1]Adriano Sofo, [1]Alba Mininni, [1]Maria Calabritto, [2]Evangelos Xylogiannis, [2]Marco Mastroleo, [1]Roberto Di Biase and [1]Bartolomeo Dichio

[1]*University of Basilicata*
[2]*Zespri Fresh Produce Italy*

Abstract

Italy, the third largest producers of kiwifruit in the world, lost 10% of its production in recent years because of the spread of the kiwifruit vine decline syndrome (KVDS) (Bardi, 2020). Although the etiology of KVDS is still not clear, it is often associated with water excess and stagnation. We hypothesize that soil compaction and hypoxia could have a priming effect in the emergence of KVDS. To investigate the causal factors and potential solutions to counter KVDS, a multi-disciplinary experimental trial was undertaken in a kiwifruit orchard (*Actinidia chinensis* var. chinensis 'Zesy002') affected by KVDS in Latina (Italy). Soils from two areas were sampled: *a)* vines showing severe symptoms of KVDS, and *b)* healthy vines as control (CTRL). Soils showed different levels of compaction, clay/silt content and water content, with higher values in KVDS field, compared to CTRL. The topsoil (0-30 cm) redox potential was significantly lower in KVDS field than in the CTRL (256 vs 327 mV), so indicating low soil oxygen content. Higher soil CO_2 and CH_4, two greenhouse gases that also are indicators of hypoxic conditions, were found in KVDS field (Sofo et al., 2022). The analysis of topsoil (0-30 cm) thin sections showed KVDS soils had fewer macropores than CTRL (8.5 vs 11.5%, v/v). Macroscopically, the roots affected by KVDS were rotting, showing a loss of rhizodermis and cortical parenchyma. Microscope analysis revealed damage to the root system, with tissue breakdown and decomposition (D'Ippolito et al., 2022). Genomic analysis identified some abundant fungal species in KVDS roots (*Ilyonectria vredenhoekensis, Fusarium oxysporum and Paraphaeosphaeria michotii*), but further investigation is required to determine the eventual role of these fungi in KVDS emergence. A metagenomic/metatranscriptomic analysis of rhizosphere-associated microorganisms was carried out for detecting *a)* eventual beneficial microorganisms and biocontrol microbial agents for KVDS control isolated from healthy plants, and *b)* the hypothetical role of pathogenic microorganisms detected in KVDS plants, able to compromise roots functionality. Nature-based solutions were applied, such as planting decompacting crops (*e.g.*, *Rafanus* spp.) for increasing water permeability and agroecosystem diversification, the application of compost and bio-fertilizers containing plant-growth-promoting microorganisms and mycorrhiza (*Saccharomyces cerevisiae, Bacillus megaterium, Bacillus pumilus, Pseudomonas striata, Azospirillum brasilense, Candida tropicalis, Glomus intraradices,* and *Trichoderma harzianum*), the amelioration of water drainage into the soil, and root pruning for improving root regeneration. Implementing novel

management strategies can improve kiwifruit growth and vine productivity, also reducing KVDS symptoms in impacted vineyards, contributing to the socio-economic sustainability of farms, and increasing the ecosystem services, according to a sustainable, modern and multifactorial concept of agriculture.

Keywords: Kiwifruit, KVDS, nature-based solutions, socio-economic benefits, sustainable agricultural management.

References

Bardi L (2020) Early kiwifruit decline: a soil-borne disease syndrome or a climate change effect on plant–soil relations? Front. Agron. 2: 3. doi: 10.3389/fagro.2020.00003; D\'Ippolito I, Camele I, Elshafie H, Mang S, Scillitani G, Mastrodonato M, Sofo A, Mininni AN, Xylogiannis E (2022) Morpho-anatomical and microbiological analysis of kiwifruit roots with KVDS symptoms. Acta Hort. 1332: 131-136. doi: 10.17660/ActaHortic.2022.1332.18; Sofo A, Mininni AN, Dichio B, Mastroleo M, Xylogiannis E (2022) Physical structure and chemical quality of waterlogged soils in a kiwifruit orchard. Acta Hort. 1332: 185-202. doi: 10.17660/ActaHortic.2022.1332.26

Acknowledgments: With the support of the Zespri Innovation project “G3 water and soil management in Italy” GI21020.