H2020 MAGIC PROJECT

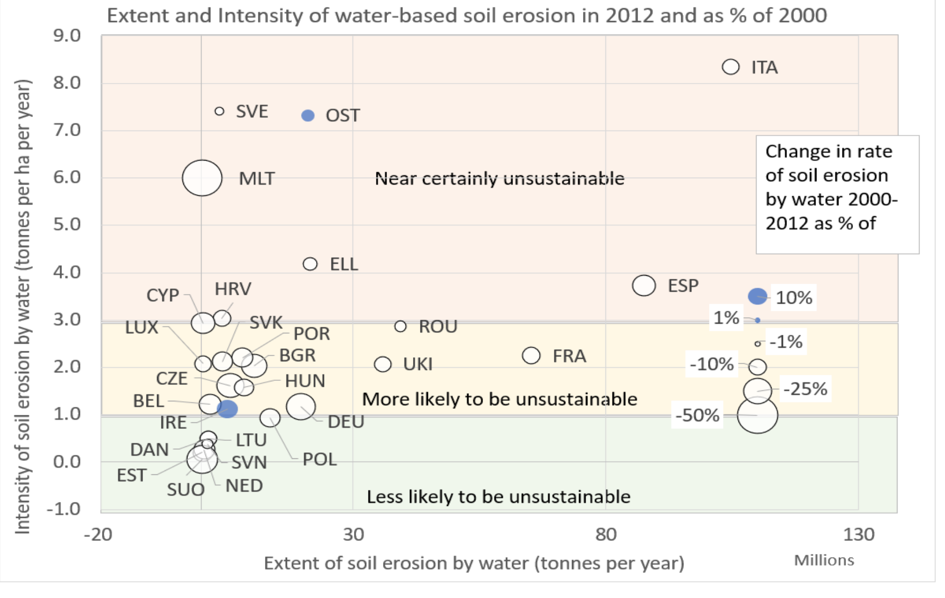
POLICY BRIEF / MAY 2020

Soil as the 'missing link' for the Water-Energy-Food-Environment Nexus

Soil illustrates multiple facets of the WEFE nexus from across the MAGIC project

Overview

Our Magic project has considered the sustainability of the EU agro-food system and its impacts on the environment. Our research has illustrated that despite soil health being considered as part of the Good Agricultural and Environmental Conditions under the Common Agricultural Policy, soil loss continues at what many consider an unsustainable rate[1].



Soil and multiple dimensions of the WEFE nexus

Magic proposes three dimensions to the WEFE nexus: biophysical, policy and knowledge framing.

Soil as part of the biosphere: Soil health has impacts on water quality, biodiversity and carbon sequestration processes[2,3] with implications for SDG6 (water), 13 (climate) and 15 (biodiversity). Agricultural management can be positive (no tillage, organic mulching, crop rotation) or negative (synthetic mulching, fertilizer use) for soil health[4]. Every centimetre of soil takes a long time to form, making it essential that we protect this fund underpinning our socio-ecological system.

The importance of soils for WEFE nexus

Hatfield et al (2017) identify soil as the forgotten piece of the Water, Food, Energy Nexus and urges policy to recognise its importance.

Hatfield JL et al. (2017), *Advances in Agronomy*, 143, 1-46.

The importance of soils for UN Sustainable Development Goals

Soil science has an under-recognised role to play in supporting the delivery of SDGs associated with food, water, climate change, biodiversity and health

Keesstra SD et al. (2016), *Soil* 2, 111-128.

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Soil as a challenge for policy coherence: The link between some aspects of water, agriculture and environmental policies is quite well understood. For example, soil sediment can affect aquatic ecological status and whether designated sites are classed as being in favourable condition. To reduce erosion (the source of the sediments) relies on farmers following and perhaps even going beyond cross-compliance rules under the Common Agricultural Policy. However, explicit links with energy policy while significant, are not yet well articulated – for example EU food production is reliant on artificial inputs of synthetic fertilizers, with high energy requirements. Increased demand for energy from biomass (as part of a decarbonization strategy) may trigger the conversion of marginal land with conservation benefits into production of energy crops. Demand for biomass can lead to the removal of crop residues that otherwise would remain to improve soil organic matter[5].

Soil as a boundary object for knowledge exchange: Degradation of soil is visible to farmers (unlike diffuse pollution to air or water), illustrated by the knowledge controversies where experts claim water re-use and desalination is good to rebalance natural assets, but farmers dispute this through local knowledge of how their soils are slowly changing[3]. This provides an opportunity to encourage users to better understand, and value, this resource. But at the same time, we need to also consider pressure on soils beyond the EU through the externalization (via imports) of our food production and consumption systems[6]. In this case soil degradation is taking place elsewhere and may be invisible to farmers and consumers in Europe.

Photo courtesy of Chris York

Conclusion

Current mismanagement of soil is an example of a serious pressure on the biosphere, with impacts on the viability and desirability of our socio-ecological systems. Within the EU, there should be more attention to soil within WEFE nexus policy making and delivery of the UN Sustainable Development Goals.

Key sources for further information

1. Matthews K et al. (2018) Report on the Quality Check of the Robustness of the Narrative behind the Common Agricultural Policy (CAP). MAGIC (H2020–GA 689669) Project Deliverable 5.5, 29/11/2018.
2. Kok A (2019) Environmental Protection, MAGIC Innovation Case https://magic-nexus.eu/case_study/innovation-environmental-protection
3. Cabello-Villarejo V et al. (2020), Solving water problems vs. creating new ones: the use of alternative water resources for irrigation. MAGIC (H2020–GA 689669) Project Deliverable 6.7, 27/02/ 2020.
4. Vargas A, Hogeboom R & Schyns J (2019) Saving Water in Irrigation, MAGIC Innovation Case https://magic-nexus.eu/case_study/saving-water-irrigation
5. Holmatov B, Hoekstra A & Krol M (2019) 'Land, water and carbon footprints of circular bioenergy production systems', Renewable and Sustainable Energy Reviews, vol. 111, pp. 224–235. DOI: 10.1016/j.rser.2019.04.085
6. Waylen K, Blackstock K, Matthews K & Juarez-Bourke A (2019) Europe's contribution to the SDGs via Sustainable Agriculture: The need to better account for 'spillover' effects in other countries, MAGIC Policy Brief https://magic-nexus.eu/documents/europe's-contribution-sdgs-sustainable-agriculture

For more information, see https://magic-nexus.eu/knowledge-hub or contact Mario Giampietro (mario.giampietro@uab.cat)

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