

#CAP4NATURE.

# Soil Biodiversity

## Aboveground-belowground linkages

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# 1. Status

- **Soil biodiversity control nutrient cycling and structure in soil**
  - Bardgett RD, van der Putten WH. 2014 Belowground biodiversity and ecosystem functioning. *Nature* **515**, 505-511.
- **Intensive land use reduces soil biodiversity**
  - Curry et al. (2002). Intensive cultivation can drastically reduce earthworm populations in arable land. *European Journal of Soil Biology*, *38*(2), 127-130.
  - Spaans F et al (2019). Trees in trimmed hedgerows but not tree health increase diversity of oribatid mite communities in intensively managed agricultural land. *Soil Biology and Biochemistry*, *138*, 107568.
  - Morriën, E. et al (2017). Soil networks become more connected and take up more carbon as nature restoration progresses. *Nature Communications*, *8*, 14349.
- **Current research is investigating how land use controls the response of ecosystems to climate extremes (extreme drought, flood, etc.)**
  - De Vries F. et al (2012). Land use alters the resistance and resilience of soil food webs to drought. *Nature climate change*, *2*(4), 276
  - de Vries FT & Wallenstein MD (2017). Below-ground connections underlying above-ground food production: a framework for optimising ecological connections in the rhizosphere. *Journal of Ecology*, *105*(4), 913-920.

# 2. Trends

- **Climate extremes are increasingly more frequent and unpredictable with negative effects on soil nutrient cycling**
  - Easterling DR et al 2000 Climate extremes: observations, modeling, and impacts. *Science* **289**, 2068–2074.
  - Schimel JP (2018) Life in dry soils: effects of drought on soil microbial communities and processes. *Annual Review in Ecology, Evolution, and Systematics*. **49**, 409-432.
  - Bellprat O et al 2019 Towards reliable extreme weather and climate event attribution. *Nature communications* **10**, 1732.
  - Noone S et al. (2017). A 250-year drought catalogue for the island of Ireland (1765–2015). *International Journal of Climatology*, *37*, 239-254.
- **Soil quality and biodiversity are declining at dramatic rates due to increased intensification of land use**
  - Bardgett RD, van der Putten WH. 2014 Belowground biodiversity and ecosystem functioning. *Nature* **515**, 505-511
  - De Vries F. et al (2012). Land use alters the resistance and resilience of soil food webs to drought. *Nature climate change*, *2*(4), 276
- **Despite increase in urban areas, slight increases in forested land in Ireland have had important positive effects on soil carbon. Hedgerows in intensively managed Irish land are important reservoirs of soil biodiversity**
  - Eaton, J. M., McGoff, N. M., Byrne, K. A., Leahy, P., & Kiely, G. (2008). Land cover change and soil organic carbon stocks in the Republic of Ireland 1851–2000. *Climatic change*, *91*(3-4), 317-334.
  - Spaans F et al (2019). Trees in trimmed hedgerows but not tree health increase diversity of oribatid mite communities in intensively managed agricultural land. *Soil Biology and Biochemistry*, *138*, 107568.

# 3. Drivers/Pressures

- **Grasslands in Ireland are under pressure for tensions between lifting of milk quotas and Brexit (the UK is a major export market). This can lead to land use changes with impacts on national climate and biodiversity targets.**
  - Donnellan T et al. (2018). Future Scenarios for Irish Agriculture: Implications for Greenhouse Gas and Ammonia Emissions. *Teagasc, Athenry. June 2018.*
  - Adenuga A et al (2018). Estimation and determinants of phosphorus balance and use efficiency of dairy farms in Northern Ireland: A within and between farm random effects analysis. *Agricultural Systems, 164*, 11-19.
- **Protection of hedgerows, peatlands and forested land must secure carbon stocks and soil biodiversity reservoirs to compensate for the pressures Irish agricultural land will have to face in the nearest future.**
  - Holden J et al. (2019). The role of hedgerows in soil functioning within agricultural landscapes. *Agriculture, ecosystems & environment, 273*, 1-12.
  - Spaans F et al (2019). Trees in trimmed hedgerows but not tree health increase diversity of oribatid mite communities in intensively managed agricultural land. *Soil Biology and Biochemistry, 138*, 107568.