November 4, 2024

Biodiversa+ Policy Brief Information Sheet: 'Biodiversity Promotes Healthy Agricultural Systems and Benefits Human Health'

Dr. Miri Tsalyuk (MT Ecological Consulting) was contracted on behalf of Biodiversa+ by the Swedish Environmental Protection Agency (SEPA) to produce a policy brief based on the Biodiversa+ 2018-2019 BiodivHealth research call results. The BiodivHealth call on "Biodiversity and its influence on animal, human and plant health" aimed to support research projects at the nexus of biodiversity and health issues.
The call was supported by 16 national/regional funding organisations from 11 countries: FWF (Austria), FWO, BELSPO, F.R.S.-FNRS (Belgium), BNSF (Bulgaria), ETAg (Estonia), ANR, GUA-REG (France), DFG, VDI/VDE-IT (Germany), Irish EPA (Irland), RCL (Lithuania), NCN (Poland), UEFISCDI (Romania), SAS (Lsovakia), SNSF (Switzerland).

Knowledge and methodology used
The Policy Brief 'Biodiversity Promotes Healthy Agricultural Systems and Benefits Human Health' is based on the scientific results of four out of the ten research groups funded by this call: FunProd, NutriB2, VOODOO, and SuppressSoil. .
The Brief summarises some key results of the projects and provides relevant policy recommendations linked to current EU policy processes. The Brief was drafted by Miri Tsalyuk Ecological Consulting (MT, hereafter) in consultation with the SEPA working group, Biodiversa+ Science & Policy Work Group, and with researchers from the respective projects.
Two clustering workshops were held in 2023 to select the main themes and key messages in policy briefs on the BiodivHealth research call and to determine the main results that will be featured in each brief. Participants included coordinating professors of the research group, MT, and members of Biodiversa+.
The research results in the brief are based on scientific manuscripts from the research groups and were drafted in close collaboration with the scientists of each manuscript. General scientific literature was used to provide context and corroboration for the presented results. All sources used are listed below. Key messages and policy recommendations were reviewed by a policy advisory group summoned to prepare this brief.

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Sources of information consulted for key research findings

(Numbers denote citation number within the brief)

Biodiversa+ funded peer-reviewed scientific publications:

[1] de la Riva, E. G. *et al*. From functional diversity to human well-being: A conceptual framework for agroecosystem sustainability. Agric. Syst. 208, 103659 (2023).
[2] Ulrich, W. et al. From biodiversity to health: Quantifying the impact of diverse ecosystems on human well-being. People Nat. 5, 69–83 (2023).
[9] Bucher, R. *et al*. Functional diversity of ground beetles improved aphid control but did not increase crop yields on European farms. Ecol. Appl. (2024)
[10] Parreño, M. A. *et al*. Critical links between biodiversity and health in wild bee conservation. Trends Ecol. Evol. 37, 309–321 (2022).
[11] Filipiak, Z. M., Ollerton, J. & Filipiak, M. Uncovering the significance of the ratio of food K:Na in bee ecology and evolution. Ecology 104, e4110 (2023).
[12] Drescher, N., Wallace, H. M., Katouli, M., Massaro, C. F. & Leonhardt, S. D. Diversity matters: how bees benefit from different resin sources. Oecologia 176, 943–953 (2014).

[14] Maurer, C., Sutter, L., Martínez-Núñez, C., Pellissier, L. & Albrecht, M. Different types of semi-natural habitat are required to sustain diverse wild bee communities across agricultural landscapes. J. Appl. Ecol. 59, 2604–2615 (2022).
[19] Maurer, C. *et al*. Landscape simplification leads to loss of plant–pollinator interaction diversity and flower visitation frequency despite buffering by abundant generalist pollinators. Divers. Distrib. 00, e13853 (2024).
[20] Proesmans, W. *et al*. Urbanisation and agricultural intensification modulate plant–pollinator network structure and robustness. Funct. Ecol. 38, 628–641 (2024).
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[22] Tuerlings, T., Buydens, L., Smagghe, G. & Piot, N. The impact of mass-flowering crops on bee pathogen dynamics. Int. J. Parasitol. Parasites Wildl. 18, 135–147 (2022).
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[24] Streicher, T., Tehel, A., Tragust, S. & Paxton, R. J. Experimental viral spillover can harm Bombus terrestris workers under field conditions. Ecol. Entomol. 48, 81–89 (2023).
[25] Todorović, I., Moënne-Loccoz, Y., Raičević, V., Jovičić-Petrović, J. & Muller, D. Microbial diversity in soils suppressive to Fusarium diseases. Front. Plant Sci. 14, (2023).
[26] Harmsen, N. *et al*. Natural plant disease suppressiveness in soils extends to insect pest control. Microbiome 12, 1–16 (2024).
[27] Todorović, I. *et al*. Manure amendments and *fungistasis*, and relation with protection of wheat from *Fusarium graminearum*. Appl. Soil Ecol. 201, 105506 (2024).

Biodiversa+ funded Publications under review:

[5] Ruedenauer, F. A. *et al*. Uncovering species-specific differences in the nutritional niches of bees. In prep.
[8] Baudry, J., Ulrich, W., Birkhofer, K. & Rembiałkowska, E. Organic farming and human health: the role of functional diversity. In prep.
[15] Greiner, L. *et al*. The interplay of landscape composition and configuration on social bee fitness. In prep.
[16] Parreño, M. A. *et al*. Landscape heterogeneity shapes bee-collected pollen diversity and bee diversity, and pollen foraging traits define species-specific responses of wild bees in managed grasslands. In prep.
[17] Leroy, C. & Al., E. Functional traits and interspecific responses of bumblebee body conditions to grassland managements. In prep.
[18] Leroy, C. *et al*. Quality rather than quantity: Hedgerows and semi-natural habitats positively impact body condition and emergence rate in a solitary bee (*Osmia cornuta*). In prep.

Other research papers consulted to contextualise and corroborate the Biodiversa+ research findings:

[3] Afshin, A. *et al*. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 393, 1958–1972 (2019).
[4] Cardoso, P. et al. Scientists' warning to humanity on insect extinctions. Biol. Conserv. 242, 108426 (2020).
[6] Nieto, A. *et al*. European Red List of bees. (2014). doi:10.2779/77003.
[13] Ayad, A. S., Benchaabane, S., Daas, T., Smagghe, G. & Loucif-Ayad, W. Assessment of Efficacy of Algerian Propolis against the Parasitic Mite *Varroa destructor* and Safety for Honey Bees by Spray Treatment. Insects 2024, Vol. 15, Page 75 15, 75 (2024).

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Other publications cited:

[7] European Commission. EU Soil Strategy for 2030 Reaping the benefits of healthy soils for people, food, nature and climate. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0699&qid=1637656572074

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Relevant EU policy instruments and their websites:

- The European green Deal: Striving to be the first climate-neutral continent. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
- Biodiversity strategy for 2030. https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en
- The Common Agricultural Policy (CAP): 2023-27. https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-2023-27_en#keyareasofreform
- CAP Eco-schemes. https://agriculture.ec.europa.eu/common-agricultural-policy/income-support/eco-schemes_en
- Directive 2009/128/EC. Sustainable use of pesticides. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009L0128-20190726
- Regulation (EC) No 1107/2009 Placing of plant protection products on the market. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009R1107-20221121
- Regulation (EU) 2024/1991 on nature restoration (Nature Restoration Law). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1991&qid=1722240349976
- EU Pollinators Initiative: A new deal for pollinators. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2023%3A35%3AFIN&qid=1674555285177
- EU Pollinator Monitoring Scheme (EUPOMS). https://wikis.ec.europa.eu/pages/viewpage.action?pageId=23462107
- EU Soil Strategy for 2030 Reaping the benefits of healthy soils for people, food, nature and climate. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0699&qid=1637656572074%20
- Soil Monitoring and Resilience (Soil Monitoring Law). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0416&qid=1726564706984