PRACTICE ABSTRACT

Increasing awareness of soil microbial ecosystem services

Problem

All agricultural soils harbour a microbiome, consisting of a high diversity of bacteria, archaea, fungi, and protists. Together they provide ecosystem services which are crucial for sustainable agriculture and a healthy environment (Figure 1). Agricultural soil management may not deliberately impact microbial diversity function, however it may possibly trigger adverse effects, e.g. higher production of greenhouse gases, increased levels of soil-borne plant pathogens or inefficient use of fertilisers.

Applicability box

Theme:
Learning, soil

Geographical coverage:
Worldwide

Application time:
All year

Period of impact:
Long term (5+years)

Equipment:
None nevertheless a special attention must be paid on the way they are used

Solution

Microbiomes strongly respond to environmental changes and management practices such as tillage (till versus no-till) and fertilisation. This responsiveness can be used for stirring their activities.

Farming systems should be managed to promote diverse microbiomes, thereby stabilizing microbial ecosystem services. Examples of adapted management schemes are described in recommendations. More knowledge on promoting beneficial microbiomes should be generated through research.

Benefits

Ecosystem services provided by soil microbiomes can be exploited to help to reduce fertiliser and pesticide inputs, as well as to help to improve soil structure and plant health. A better understanding of microbial soil ecosystem services can be instructive to select cropping systems and agricultural practices.

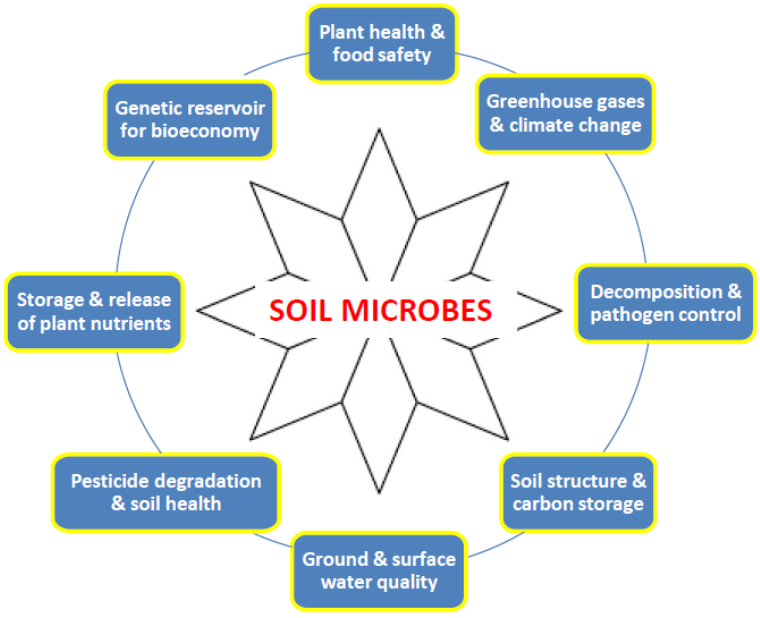

Figure 1: Schematic view on ecosystem services provided by soil microbiomes (Christoph Tebbe, Thünen Institute)

Practical recommendations

- Diversify Cropping systems: Crops provide energy and carbon to the soil microbiome via roots and residues. Crop diversity supports microbial diversity, thereby inhibiting enrichment of microbial pathogens.
- Include legumes: Bacteria inside of root nodules fix atmospheric nitrogen (N_2) thereby increasing soil N richness without adding mineral or organic fertilisers.
- Preserve soil structure: Microorganisms collaborate best inside of intact soil aggregates. Destroying these aggregates reduces the efficiency of their services and releases valuable C to the atmosphere.
- Do not fertilise with N without adding organic C: Microbial processes are thereby stabilised, and surplus N can transiently be stored in microbial biomass.
- Optimise temporal use of pesticide inputs. Microbial activities are temperature sensitive. Pesticides may not fully be degraded under low temperature and high rainfall conditions, causing environmental contamination.
- Minimise spatial areas of pesticide inputs. Pesticides can have off-target effects on soil microbiomes which can be reduced by targeted application techniques avoiding unintended dispersal.

Use the comment section on the https://www.diverimpacts.net/service/forum/forum/discussion.html to share your experiences with other farmers, advisors and scientists! If you have any questions concerning the method, please contact the author of the practice abstract by e-mail.

Further information

Weblinks

http://www.fao.org/soils-portal/soil-biodiversity/en/

About this practice abstract and DiverIMPACTS

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DiverIMPACTS: The project is running from June 2017 to May 2022. The overall goal of DiverIMPACTS - Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains towards Sustainability - is to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains.

Project website: www.diverimpacts.net

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