

## Master Thesis at FiBL

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**Title**                      **Functional microbial nitrogen cycling genes as influenced by recycled fertilizers and biochar in a multi-year field experiment**

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**Background**            In the project Recycle4Bio, FiBL together with Agroscope has established a field experiment to investigate the effects of various recycled fertilizers added alone or in combination with biochar. Anaerobically digested organic fertilizers such as biogas slurry, liquid and solid digestates are used in organic agriculture as an alternative or in addition to traditional manure. The combination of biochar with liquid organic fertilizers is supposed to reduce nitrogen losses and mitigate nitrous oxide emissions. Potential effects on the functioning and diversity of the soil microbial community are not yet known. *The following research questions should be addressed:*

- How are microbial nitrogen cycling genes influenced by the application of recycled fertilizers and biochar over time?
- Does the application of recycled fertilizers and biochar affect soil microbial diversity over time?

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**Procedure**            In this MSc thesis, DNA from frozen soil samples that were collected at several time points throughout the first 2.5 years of the field experiment will be extracted and amplified using qPCR at the new molecular lab facilities at FiBL to quantify relevant functional microbial genes for nitrogen mineralization, nitrification and denitrification processes. There is the option for sequencing the microbial community to assess effects of fertilizers and biochar on the composition and diversity of the soil microbiome. The student could develop ideas for additional analyses.

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**Requirements**        We seek a student who is highly motivated to work in the molecular lab. Experience with DNA extraction, qPCR and associated data analyses are beneficial. Knowledge and/or interest in soil microbiology, nitrogen cycling, organic fertilizer management and organic farming are useful.

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**Duration**              Starting in 2021

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**Contacts**              **Norah Efosa (PhD candidate)**  
Forschungsinstitut für biologischen Landbau FiBL | Ackerstrasse 113 | 5070 Frick | Tel +41 62 865 74 29 | [norah.efosa@fibl.org](mailto:norah.efosa@fibl.org)  
**Dr. Else Bünemann-König**  
Forschungsinstitut für biologischen Landbau FiBL | Ackerstrasse 113 | 5070 Frick | Tel +41 62 865 0482 | [else.buenemann@fibl.org](mailto:else.buenemann@fibl.org)

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## Literature

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- Hartmann M, Frey B, Mayer J, Mäder P, Widmer F. Distinct soil microbial diversity under long-term organic and conventional farming. *ISME J.* 2015 May;9(5):1177-94. doi: 10.1038/ismej.2014.210. Epub 2014 Oct 31. PMID: 25350160; PMCID: PMC4409162.
- Krause, Hans-Martin & Hüppi, Roman & Leifeld, Jens & El-Hadidi, Mohamed & Harter, Johannes & Kappler, Andreas & Hartmann, Martin & Behrens, Sebastian & Mäder, Paul & Gattinger, Andreas. (2018). Biochar affects community composition of nitrous oxide reducers in a field experiment. *Soil Biology and Biochemistry.* 119. 143-151. 10.1016/j.soilbio.2018.01.018.
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