

1. PriOrity Effect Mechanisms (POEM)

Bachelor and master projects carried out as part of the DFG-funded POEM project will use a unique grassland field experiment set up in 2020 and 2021 by our research group in Niederhaverbeck, in the Lüneburger Heide. The main objective of this experiment is to understand better how the order of arrival of three plant functional groups (forbs, grasses, and legumes) affect the structure and functioning of dry grassland plant communities (both aboveground and belowground).

Prerequisite to work on POEM: Interest in plant ecology, community assembly, and/or ecological restoration; Interest in learning field methods used to assess the structure and measure the functioning of plant communities. Having some basic skills in R is an advantage, but it is not absolutely needed (what is not known can be learned).

In the framework of POEM, the following Bachelor/Master projects are available for 2022:

Project 1.1: How does plant functional group order of arrival during assembly affect the structure and functioning of dry grassland plant communities?

This project will consist of the following tasks: (1) collecting the plant biomass of each individual species located inside randomly positioned quadrats in our experimental plots (harvests organised in June 2022); (2) process the samples in the lab (drying biomass) and measure the total shoot dry weight of each species in each quadrat, (3) analyse the data and interpret the results, and (4) present your findings in a bachelor or master thesis written as a scientific paper. Plant community data collected in 2020 and 2021 will also be available for the thesis.

Timeframe for this project: This project is expected to start in May 2022.

Car driving licence: Yes

Contact: Benjamin Delory (Benjamin.Delory@leuphana.de) and Vicky Temperton (Vicky.Temperton@leuphana.de)



Mixture plots of the first sub-experiment (POEM2020) in June 2021.

Project 1.2: How does plant functional group order of arrival during assembly affect root productivity and vertical root distribution of dry grassland plant communities?

This project will consist of the following tasks: (1) regularly taking high resolution pictures of roots growing at different depths along minirhizotron tubes installed in our experimental plots using a state of the art camera (VSI-BARTZ MS-190). During the growing season, root images quill be acquired every two weeks; (2) classifying and annotating root images taken in the field; (3) segmenting roots present in the images using a deep learning approach (no prerequisite and no coding skills needed); (4) calculate root traits (e.g., total root length/surface in each image); (5) analysing data; and (5) present your findings in a bachelor or master thesis written as a scientific paper. Root data collected in 2021 will also be available for the thesis.

Timeframe for this project: This project is expected to start in March 2022.

Car driving licence: Yes

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Minirhizotron image taken in a grassland field experiment with the VSI-BARTZ MS-190 camera from Vienna Scientific Instruments (Austria). Scale bar: 5 mm.

2. Plant-soil interactions in grasslands (ChemLEGACY)

Bachelor and master projects carried out as part of the DFG-funded ChemLEGACY project will focus on plant-plant and plant-soil interactions in grassland ecosystems. The main objective of this project is to improve our understanding of plant species coexistence by explicitly considering the role of soil chemicals in plant-soil interactions and their dependence on root traits.

Prerequisite to work on ChemLEGACY: Interest in plant-plant and plant-soil interactions; Interest in learning methods used to measure plant functional traits. There is no need for a

background in chemistry to work on this project. Having some basic skills in R is an advantage, but it is not absolutely needed (what is not known can be learned).

Project 2.1: Can plant responses to soil chemical legacies be predicted using root traits?

This project will consist of the following tasks: (1) setting up and conducting a plant-soil feedback experiment in our greenhouse (Rotes Feld), which will involve daily maintenance tasks (collection and application of soil solution samples, watering of plants, etc.); (2) measuring plant biomass production and root traits (image analysis); (3) analysing data; and (4) present your findings in a bachelor or master thesis written as a scientific paper.

Timeframe for this project: The plant-soil feedback experiment is expected to start in late spring 2022 / early summer 2022. The experiment will last approximately 2 months. Once the experiment is completed, the bachelor/master student is expected to contribute to data collection in the laboratory (root trait measurements).

Car driving licence: Yes, if possible (having a car driving licence is an advantage as samples will have to be transported between Rotes Feld and the main Leuphana campus).

Contact: Benjamin Delory (Benjamin.Delory@leuphana.de)



Experimental setup used to collect soil solution samples from dry grassland plant communities.

3. GRASSWORKS: What works and why in grassland restoration in Germany?

Come work in the exciting Grassworks project, that is investigating for the first time what leads to success in grassland restoration across three regions in Germany!

Bachelor and master projects carried out as part of the BMBF-funded GRASSWORKS project will sample multiple restored and reference grassland sites around Lüneburg. The main objective of this study is to understand what leads to restoration success in grasslands in Germany, both from an ecological and social perspective. Specifically, ecologically we are quantifying vegetation, wild bees, butterflies, and soils. There is a core team of people employed in the Grassworks project, but as ever, there are always more questions one wants to answer than people to work on answering them, so we would like to complement the work of the set team with bachelor and master projects that aim at understanding specific components of the diversity of the restored and reference sites in the North Region that Lüneburg is the centre of.

Prerequisite to work on GRASSWORKS: Interest in ecology and/or ecological restoration; Willingness to do field and lab work and to learn some species and gain habitat knowledge. Basic knowledge of R is an advantage.

In the framework of GRASSWORKS, the following Bachelor/Master projects are available for 2022 (also 2023):

Project 3.1: Vegetation composition in the surrounding landscape of restored and degraded grassland in northern Germany.



Grassland meadows near the river Elbe, in the Biosphere Reserve Elbtalau

This project includes following method: The core project is assessing insects and vegetation and soil nutrients in 40 different restoration sites in the North. This is a really ambitious and exciting endeavour, and we also are assessing how the surrounding landscape configuration and diversity affects the outcome of restoration success. Here we are looking for someone to do this assessment of the surrounding landscape, which will be an important part of understanding impacts on restoration success in the overall project.

Your task: At 30 (or less) plots around Lüneburg, the plant species composition in different land use types (grassland, field and forest) will be determined. Each site is sampled for exactly 1.5 hours (300 m buffer around the plots). Basic knowledge in plant identification is required. The exact number of sites to sample will depend on your time availability and what is realistic and feasible. This method is a commonly used method to assess vegetation and landscape heterogeneity for conservation measures and is thus very useful for you to learn.

Finally, the results are to be presented in a bachelor or master thesis and oral presentation as for all bachelor and master projects.

Timeframe for this project: This project is expected to start in June 2022

Car driving licence: Yes

Contact: Alina Twerski (alina.twerski@leuphana.de) and Vicky Temperton (Vicky.Temperton@leuphana.de)

Project 3.2: How does litter decomposition (Tea Bag index) differ in restored and not restored grasslands in northern Germany?

This project includes following tasks: (1) weighed green and rooibos tea bags and bury them in restored and not restored grassland sites and positive references (30 sites in total) around Lüneburg; (2) collecting the samples after three months and process the samples in the lab; (3) analyse the data and interpret the results, and (4) present your findings in a bachelor or master thesis written as a scientific paper.

For further information:

Keuskamp, J. A., Dingemans, B. J., Lehtinen, T., Sarneel, J. M., & Hefting, M. M. (2013). Tea Bag Index: a novel approach to collect uniform decomposition data across ecosystems. Methods in Ecology and Evolution, 4(11), 1070-1075.

Timeframe for this project: This project is expected to start in May/April 2022, or could be done in spring 2023 too.

Car driving licence: Yes

Contact: Alina Twerski (alina.twerski@leuphana.de) and Vicky Temperton (Vicky.Temperton@leuphana.de)



Tea bags used in the experiment