

Module: Livestock-plant-soil interactions & nutrient cycling module

List of potential projects WS 2024-2025

Are you passionate about fieldwork and eager to apply classroom knowledge to real-world challenges? Are you curious about the complex relationship between livestock, plants and soil? Do you want to explore how grassland can capture and store carbon? Would you like to acquire field and laboratory experience?

If so, one of these research projects might interest you.

1. Investigating soil compaction gradients in grazed grasslands

Soil compaction occurs when soil particles are compressed, reducing pore space, hindering the movement of air, water, and roots. Trees have the potential to influence soil structure and minimise compaction in their immediate vicinity – through root development, organic matter input, and other interactions. In this hands-on research project, you will explore how tree roots modify soil compaction gradients based on proximity. This project will involve fieldwork, where you'll collect data from grasslands with trees to analyse whether and how soil compaction changes.

Objective: to investigate the relationship between tree proximity and soil compaction gradients, and to analyse how tree root growth and organic matter influence soil structure and compaction.

By participating in this project:

- You'll develop hands-on experience measuring soil compaction and using tools to analyse soil resistance in grasslands.
- You will collect and manage data using scientific methods and learn how to process and interpret data, enhancing your critical thinking and analytical skills. You'll have the opportunity to design and lead your own project.

2. Soil moisture retention under different grassland management

The aim is to investigate how different grassland management (monocultures vs species-rich, frequent mowing vs grazing) affect soil moisture retention. Soil moisture retention influences productivity and carbon sequestration. Understanding how management relates to water conservation, can help improve soil health and water use efficiency.

Objectives: 1) to select appropriate treatments to test, and to measure and compare soil water retention across treatments, 2) to analyse soil characteristics influencing moisture retention.

By participating in this project:

- You will gain skills in field sampling techniques for soil moisture monitoring.
- You will improve your understanding of animal-plant-soil-water interactions.
- You will develop laboratory skills of soil properties analysis.

3. Soil carbon sequestration in grazing systems

Soil carbon sequestration is crucial in combating climate change. In grazing systems, where livestock, plants, and soil interact, there are many variables that influence how much carbon the soil can store. Grazing practices, species composition, and soil types all play significant roles in this process. This project will investigate how different grazing strategies affect soil carbon sequestration.

Objectives: 1) to investigate the impact of different grazing practices and soil types on soil carbon sequestration.

Through participation:

- You will understand the importance of grazing systems and soil types in carbon sequestration.
- You will learn how to analyse soil samples for carbon content in the lab.
- You will improve your ability to interpret findings and understand the relationships between grazing, soils, and carbon storage.

4. Soil organic matter and GHG emissions from soils

The organic matter in soils, plant debris inputs and other sources plays a crucial role in the soils carbon cycle. Some of it accrued on the carbon stocks, contributing to the carbon sequestration. But not everything stays in soils long term because of gaseous losses as methane (CH₄) and carbon dioxide (CO₂) therefore fuelling global warming or as dissolved forms of carbon. How much of the carbon in soils is lost? How does addition of organic matter influence losses? These questions will be investigated and discussed within this research project. Its objective is to quantify the impact of organic matter inputs on CH₄ and CO₂ soil fluxes. This project will allow you to

- learn about the soil carbon dynamics
- gain experience in GHG measurements with cutting-edge technology
- understand, analyse and discuss relationships between variables deriving from our own experimental data