

Master thesis: Long-term effects of different fertilizer types and application intensities on soil biological processes

Starting date: March 2026 (or upon agreement)
Duration: 6-12 months
Working Place: Agroscope Reckenholz, Zürich
Language: English/German
Contact: Florian Gschwend
Email: florian.gschwend@agroscope.admin.ch

Background

Microorganisms are crucial for a variety of soil processes and ecosystem services. Application of fertilizers can strongly affect soil microbial communities. However, the long-term effects of different fertilizer types applied at different intensities on soil microbial communities remain insufficiently understood, especially in deeper soil layers.

This master's thesis aims to gain a better understanding of how different fertilizer regimes shape soil microbial communities in different soil layers. The thesis thereby contributes to more sustainable agricultural soil management.

Soil samples from Switzerland's oldest long-term agricultural field trial (ZOFÉ¹) collected in spring 2025 will be analyzed using next-generation sequencing technologies to assess bacterial and fungal communities across 12 different treatments. Obtained data will subsequently be related to soil microbial carbon, nitrogen and phosphorus transformation rates, allowing for an integrated assessment of soil processes affected by different management options.

The thesis provides the opportunity to learn and apply molecular and statistical tools used to study soil ecosystems. Through wet and dry lab methods, experience broadly applicable to different research questions and ecosystems will be gained. The project is conducted in close collaboration with three Agroscope research groups, offering insights into diverse agricultural research topics.

Main activities:

- Molecular laboratory work: DNA extraction and purification, PCR, Illumina sequencing
- Data analysis and visualization using R
- Scientific presentation of the results

Required skills:

- Interest in agriculture and its impact on soil ecosystems
- Knowledge of molecular laboratory work and basic statistical analysis (e.g. in R)
- Ability to work independently and responsibly
- Good written and spoken English

¹<https://www.agroscope.admin.ch/agroscope/en/home/topics/environment-resources/monitoring-analytics/long-term-trials/zofe.html>



Effects of different fertilizer types and application intensities are studied on the «Zurich organic fertilizer experiment» (ZOFÉ) since 1949.



Soil biological processes are crucial for agricultural production systems.



Molecular analyses are used to determine soil biological communities.

