

Master thesis on nitrification inhibitors in a lysimeter trial

Starting date: flexible

Duration: 6 months

Working Place: Reckenholz - Agroscope

Language: English

Contact: Simone Gerber

Email: simone.gerber@agroscope.admin.ch

Background:

Nitrogen (N) is often applied in excess to ensure high crop yields. However, this surplus N can be lost to the environment, lead to the contamination of groundwater through leaching as nitrate (NO_3^-) and contribute to emissions of N_2O , which is a potent greenhouse gas.

Nitrification inhibitors are suggested as a strategy to mitigate these N losses to the environment. These chemical compounds inhibit the first step of the nitrification process, the microbially-driven transformation of ammonium (NH_4^+) to NO_3^- . Maintaining N more in NH_4^+ -form, which is less prone to be lost to the environment than NO_3^- , extends the time window for plants and microbes to take up the N. The ultimate goal is to better synchronize the N supply with the crop N demand to increase N use efficiency and reduce the environmental footprint.

In our current lysimeter trial with a typical crop rotation for Switzerland, we are quantifying N losses through leaching water and N_2O emissions. Additionally, we are monitoring the NO_3^- and NH_4^+ content of soil pore water of the rhizosphere. With this experimental set up we study the efficacy of nitrification inhibitors and gain a deeper insight into their effects on the nitrogen dynamics and losses.



Aim:

The aim of this study is to evaluate the efficacy of nitrification inhibitors in reducing environmental N losses by quantifying their impact on NO_3^- leaching and N_2O emissions throughout a crop rotation

Task:

- Practical work on the lysimeter facility and in the laboratory
- Data visualisation and statistical analysis
- Writing a scientific thesis

Setting:

You will work closely with the whole project team, especially with PhD student Simone Gerber and Michael Simmler. You will be part of the Digital Production group at Agroscope Tänikon and collaborate closely with the Water Protection and Substance Flow group at Agroscope Reckenholz.