

The Effect of Nitrification Inhibitors on Crop Production in Germany

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Background

Nitrification inhibitors (NI), applied with the fertiliser, can reduce N₂O emissions, minimise nitrogen losses via leaching, and improve nitrogen use efficiency (NUE). However, their effectiveness can vary depending on climatic conditions and soil characteristics.

Aim

This study investigates the effect of different NIs on crop yields under field conditions. Yield impacts must be considered to fully assess the agronomic relevance of the NIs and to identify possible trade-offs between environmental benefits and productivity.

Material und Methods

The joint research project NitriKlim investigates the impact of various NI on nitrogen dynamics at seven field sites across Germany. From 2023 to 2025, data are collected using two field experiment setups: winter wheat on alternating fields and diverse crop rotations over three years. Various combinations of NI with mineral fertilisers and slurry are investigated. A range of data is recorded, including, but not limited to, yields, protein content, soil properties and other relevant metrics.

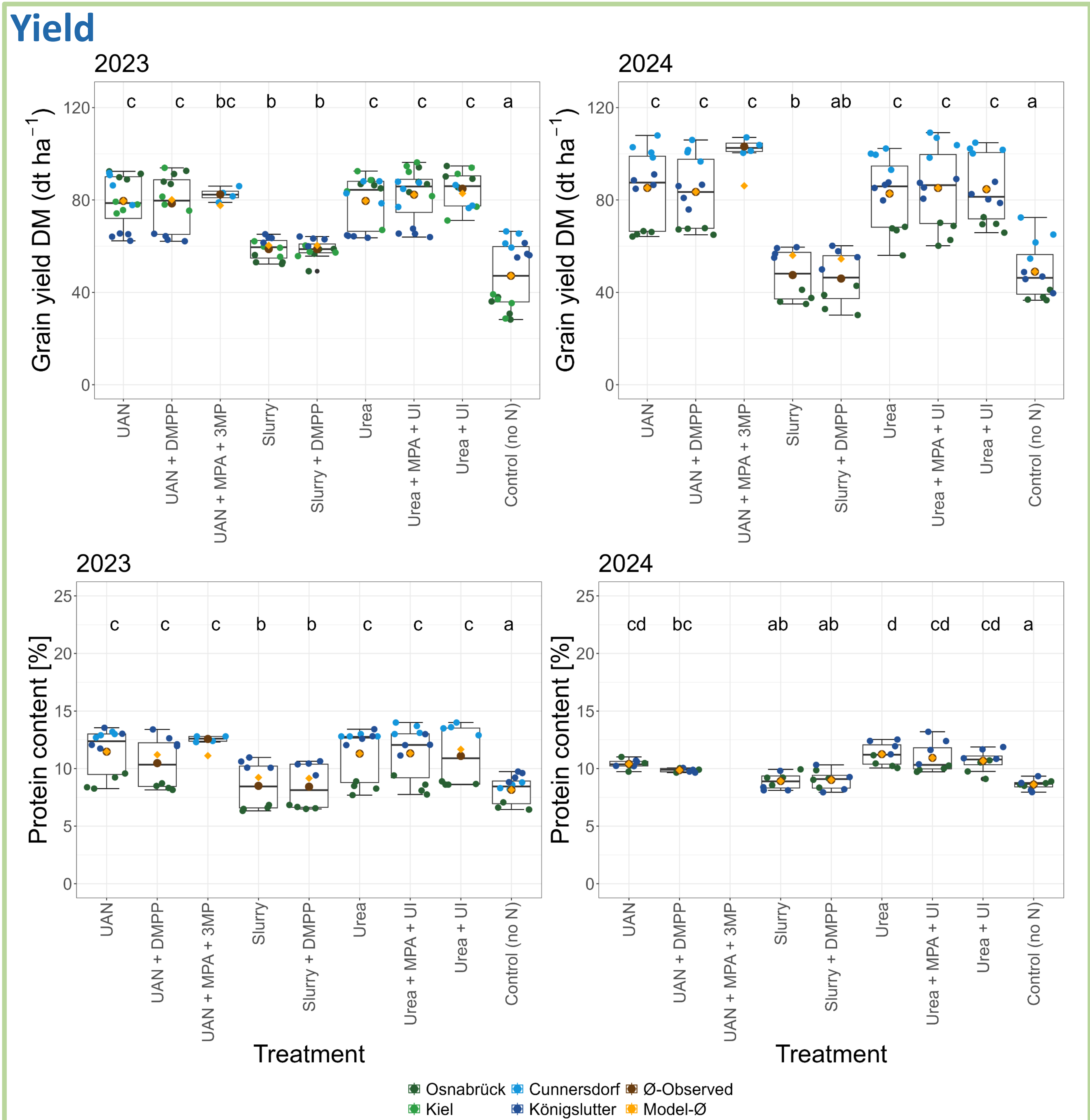


Fig. 1: (a) Grain yield as dry mass (dt*ha⁻¹), (b) proteincontent in the grain (%) of different fertilisation treatments across 4 different loactions in 2023 and 2024. Observed mean value and model based adjusted mean value are shown in blue. Different letters indicate significant differences (Tukey, p<0.05). Field trials conducted with 4 replicates per site.

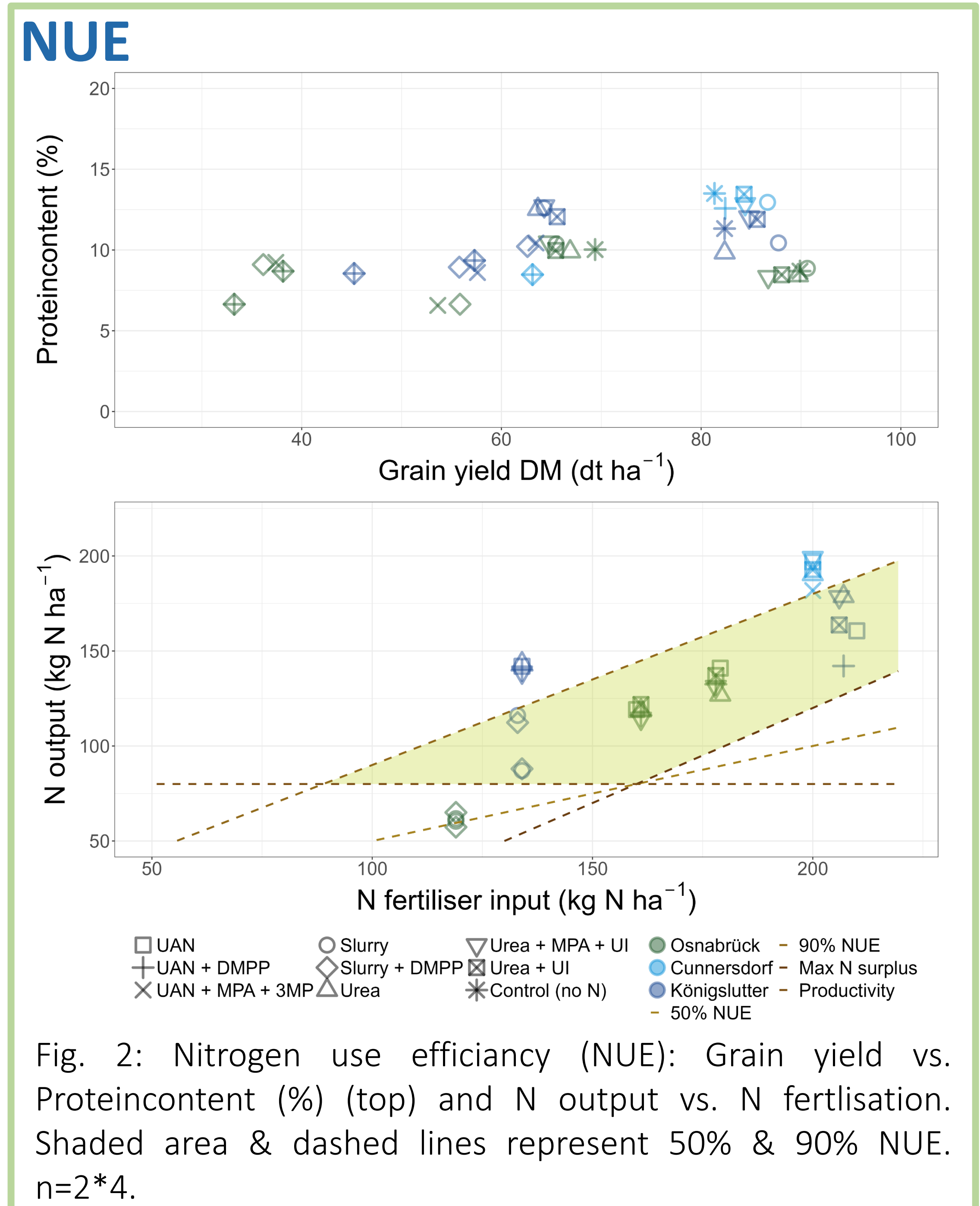


Fig. 2: Nitrogen use efficiency (NUE): Grain yield vs. Proteincontent (%) (top) and N output vs. N fertilisation. Shaded area & dashed lines represent 50% & 90% NUE. n=2*4.

Conclusion

- NI application had no significant effect on the yield.
- NI performance depends on weather conditions and soil characteristics.
- Tendency towards higher yield under sandy soil conditions.
- Tendency towards lower protein content.
- No generalizable effect on NUE.
- Experiment with crop rotation (data not shown) showed comparable results as winter wheat on alternating fields.