

# Combining digital and standard fertilization methods to reduce N surplus in winter wheat

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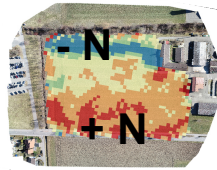
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- Inaccurate use of nitrogen (N) fertilizers in agriculture causes severe environmental problems.
- N available to the plant is affected by spatial variability and the timely synchronization between inputs and demand, which can be addressed via site-specific N management.
- This study tests a combination of digital and standard methods to provide decision-support for N fertilization in winter wheat in Switzerland.
- **Hypothesis:** site-specific and variable rate (VR) fertilization reduces N input compared to standard uniform application (ST) without affecting yield, thus increasing N use efficiency (NUE) and reducing N surplus.

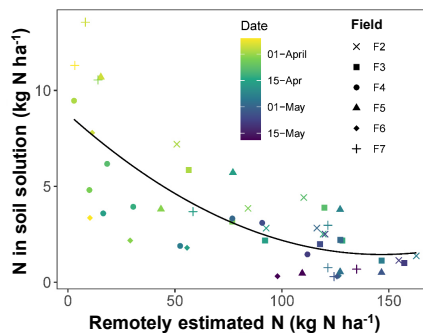
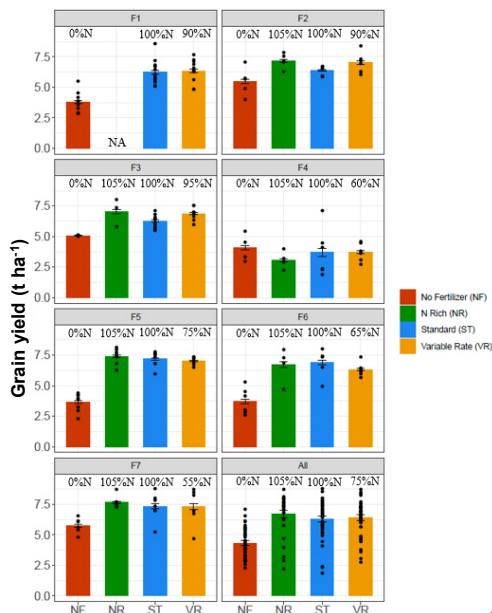


Data collection:  
Spectral images and soil solution

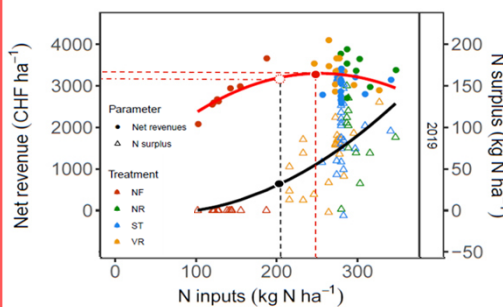
Creation of application map

Site-specific N application in the field

- Grain yields were in the range 5–8 t ha<sup>-1</sup>.
- No sign. differences between VR and ST.
- N fertilizer reduced in the VR between 5 and 40% increasing NUE.



- Distinct relationship between remotely estimated plant N uptake (REN) and nitrate-N in soil solution (NSS)
- The timely integration of both seems related to improved NUE and reduced N surplus



- Concept linking economic and environmental performance.
- Net revenues in VR 4% higher than in ST.
- Surplus N 32% lower in VR than in ST
- Balanced N supply varied from 180 to 205 kg N ha<sup>-1</sup>

**In conclusion**, by monitoring and managing the N variability observed in crop and soil, the established methods offer solutions to reduce N surplus. Sensor-based monitoring can lead the way to these practices, aiming to maintain profitability quality, and reduce ecological impact.

## References

- [1] Argento F et al. (2021). Combined digital and standard methods to optimize nitrogen (N) management and reduce N surplus in winter wheat (*T. aestivum*) production. Diss. ETH No. 27550, 1-137.
- [2] Argento F et al. (2021). Site-specific nitrogen management in winter wheat supported by low-altitude remote sensing and soil data. *PrecAg*, 22, 364-386