Above- and below-ground biomass and N uptake of catch crops affecting soil N_{min} over winter

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Background and Objectives THG ZWIFRU

Fig. 1: (a) Plant and root system of oil radish. (b) Root sampling with the monolith method

N_2O-emissions	Soil structure
Impact of catch crops on…	
N-supply to following crops	N_{min}-course

Biomass production and N uptake of different catch crop types?

Catch crop effect on the course of N_{min} during autumn and winter?

Fig. 2: (a) Drone with RGB camera in use (Calibration trial). (b) Glass plate with roots prepared for root scanning

Material & Methods

- Location: Hevensen (Göttingen)
- Soil type: Luvisol (Parabraunerde) (Ut3/Ut4)
- Altitude: 162 m
- Rainfall: ⌀ 645 mm
- Experimental design: Randomized block

- Catch crops: 2 x Oil radish (OR), Spring vetch (SV), Oat (OT), Winter rye (WR), Fallow (FA)
- Measurements: N_{min}-content, biomass production, root length density, C/N-content, RGB and spectral analyses

Crop rotation: **Pea** → **Catch crops** → **Sugar beet / 1x Maize** → **Winter wheat**

Results

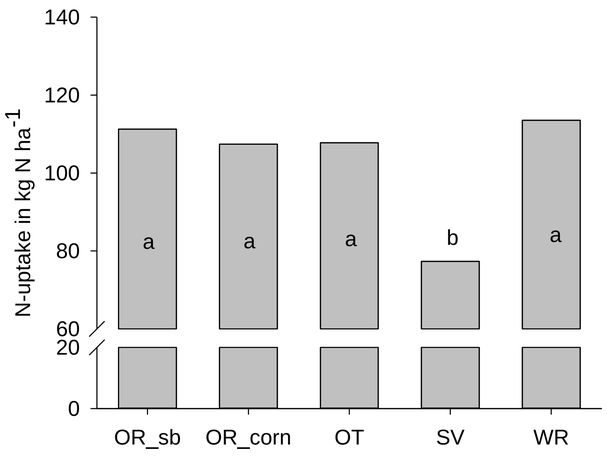

Fig. 3: N-uptake of catch crops in Hevensen (2018). Means with identical letters are not significantly different (p<0,05, Tukey)

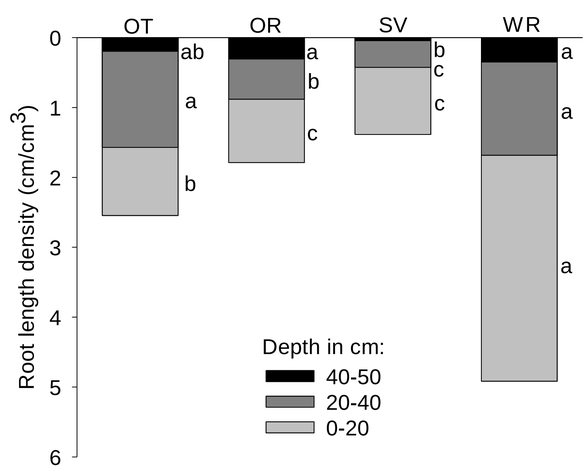

Fig. 4: Root length density (fine roots, cm/cm³) of catch crops in Hevensen (2018). Means with identical letters are not significantly different (p<0,05, Tukey)

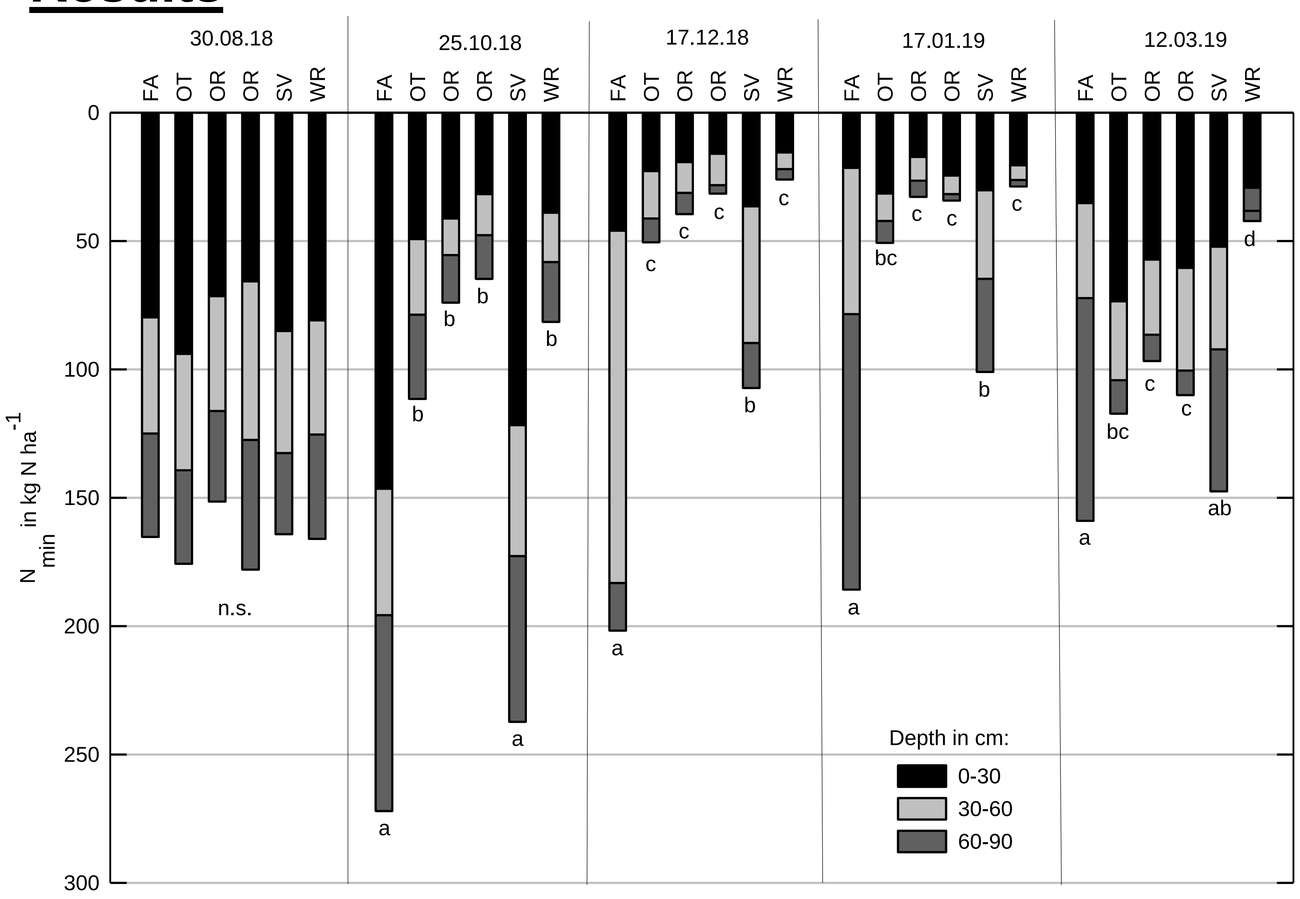

Fig. 5: Course of N_{min}-values under different catch crops in Hevensen 2018/2019. Means with identical letters are not significantly different (p<0,05, Tukey)

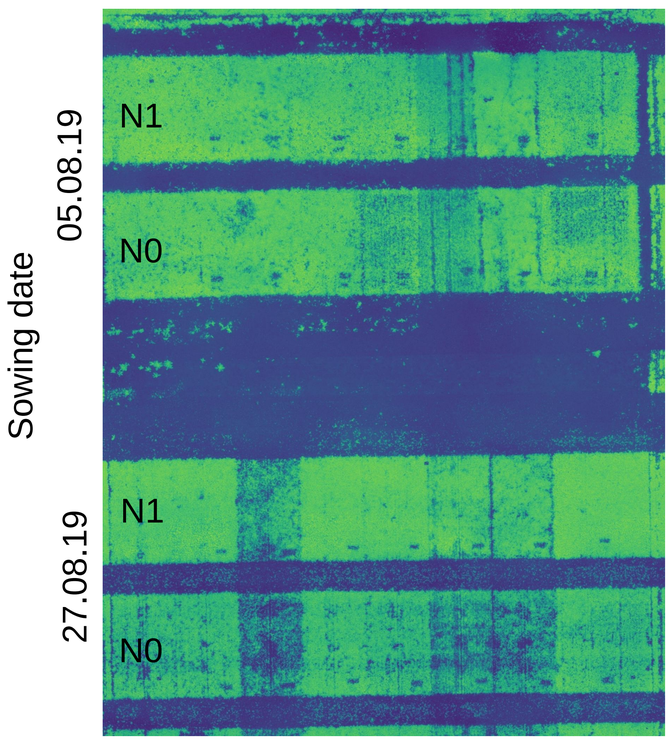

Fig. 6: NDVI image of the Satellite trial in Mengershausen (N1 = 40 kg N/ha and N0 = 0 kg N/ha), Oct 2019

Summary

- Winter rye had the highest **biomass production**
- **N-uptake** of winter rye, oil radish and oat was identical, and significantly lower in spring vetch
- Winter rye had the highest **fine root length density** in 0-20 cm soil depth; in 20-40 cm it was similar to oat but higher than for oil radish and spring vetch; in 40-50 cm spring vetch had the lowest root length density
- **N_{min}-values** substantially decreased from August to December under winter rye, oil radish and oat but remained high under spring vetch and fallow
- From December to March **winter rye** had the **lowest N_{min}-values**

Conclusion: **Catch crops significantly reduce the soil mineral N content.**

Project partner

University of Hohenheim / LWK Niedersachsen / P.H. Petersen / Thünen-Institute / Georg-August-University of Göttingen / Christian-Albrecht University of Kiel

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