

Effects of cover crops on N₂O emissions in cereal cropping: potential tradeoffs for C-farming in subboreal regions

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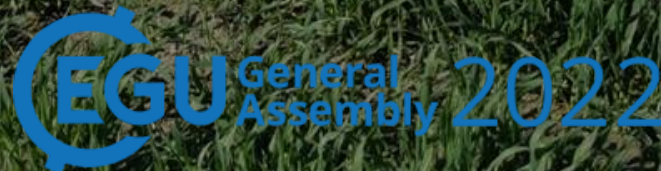
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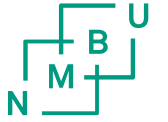


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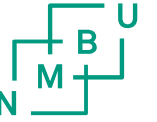
GHG mitigation in crop production



- Much focus on 'soil health' and 'carbon farming' lately
- N_2O emissions remain a problem: difficult to quantify, difficult to mitigate
- Increased use of cover crops in cereal farming to sequester carbon
- It is well known that winter emissions can dominate annual N_2O emissions in temperate/subboreal regions
- Little is known about how cover crops affect N_2O emissions throughout winter
- In the worst case, increased N_2O emissions from decaying cover crops could cancel out C gains



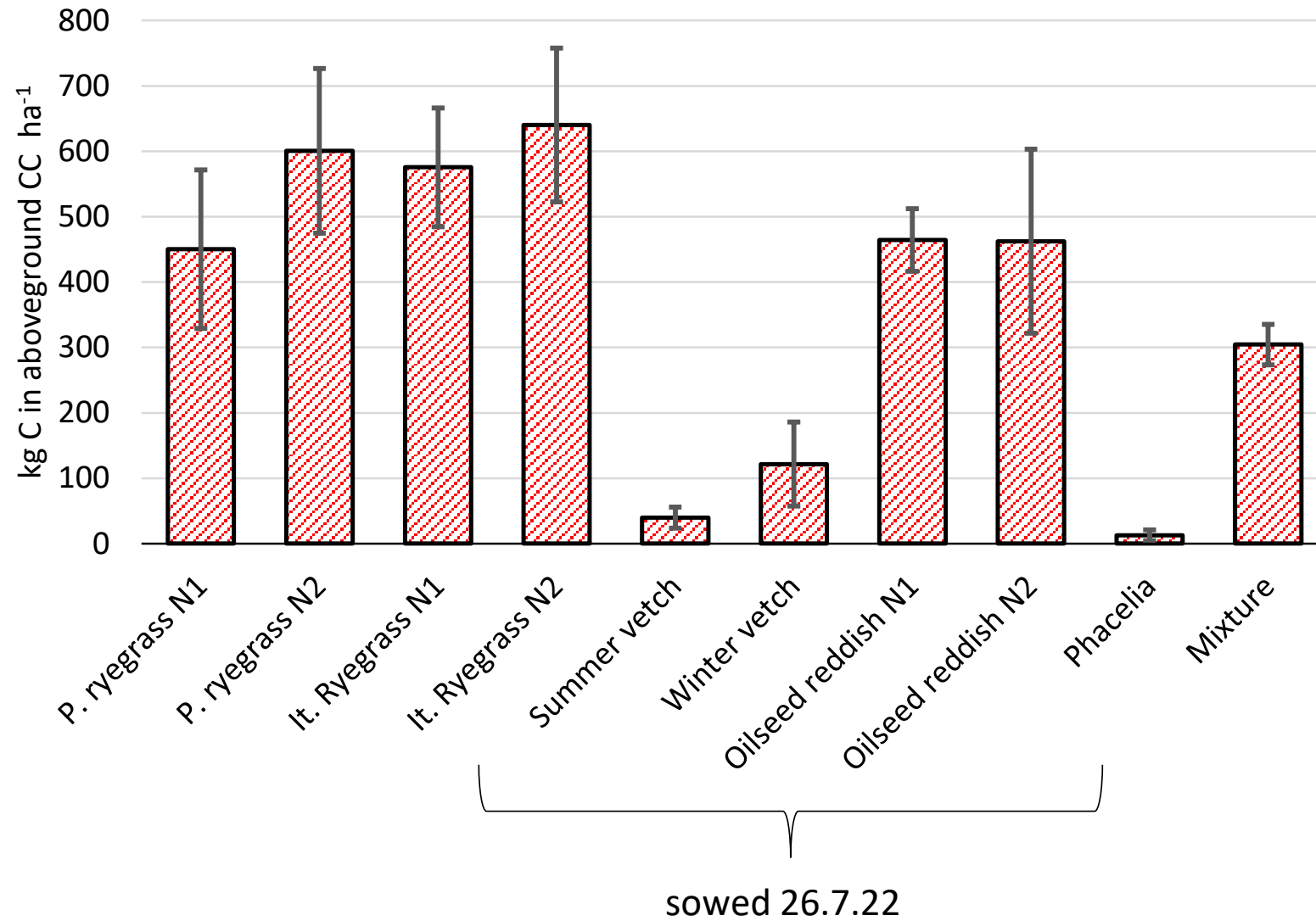
CAPTURE - cover cropping as climate action in cereal production in Norway



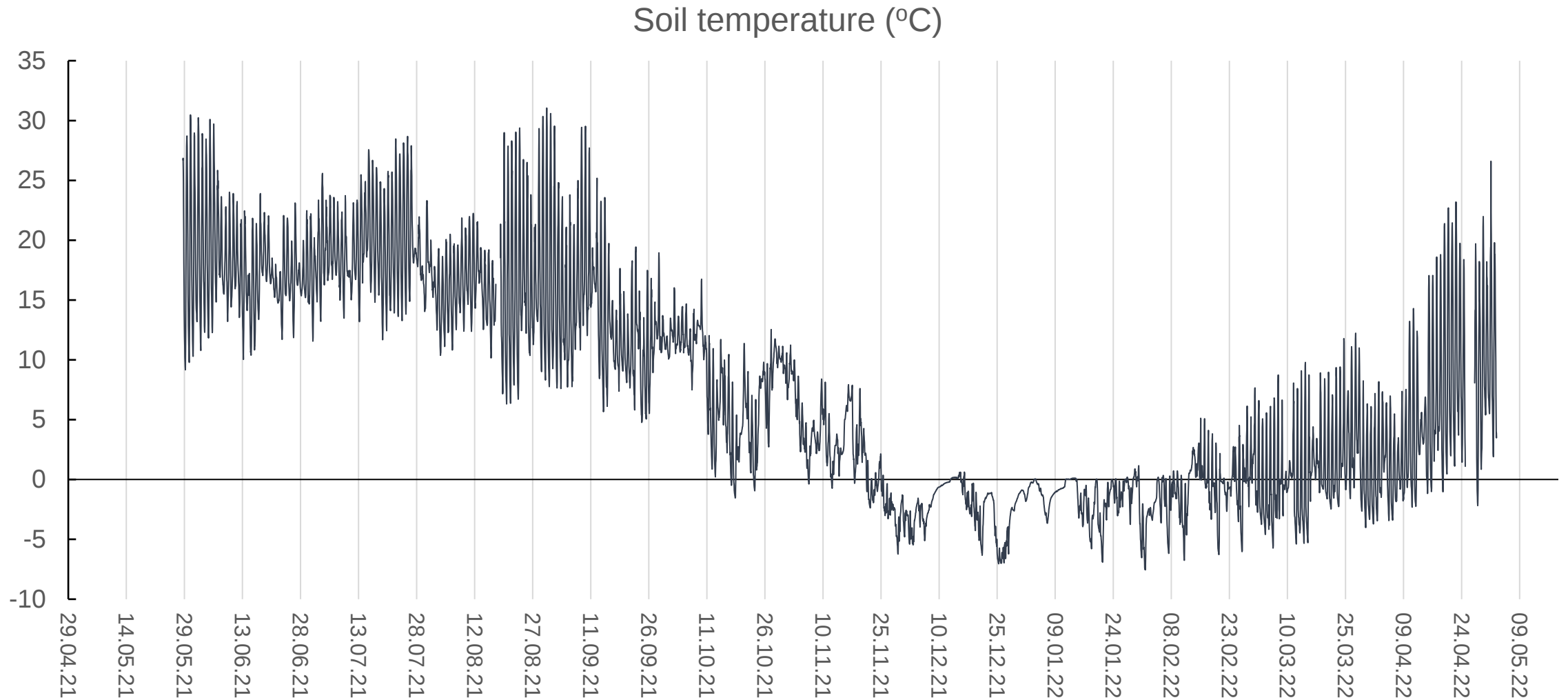
- Spring barley, 6 cover crops + control (P. ryegrass, Ital. ryegrass, winter and summer vetch, Phacelia, herb mixture - spring or summer sown, additional N in autumn)
- N₂O emissions (including winter emissions)
- Tradeoffs C-sequestration/GHG emissions

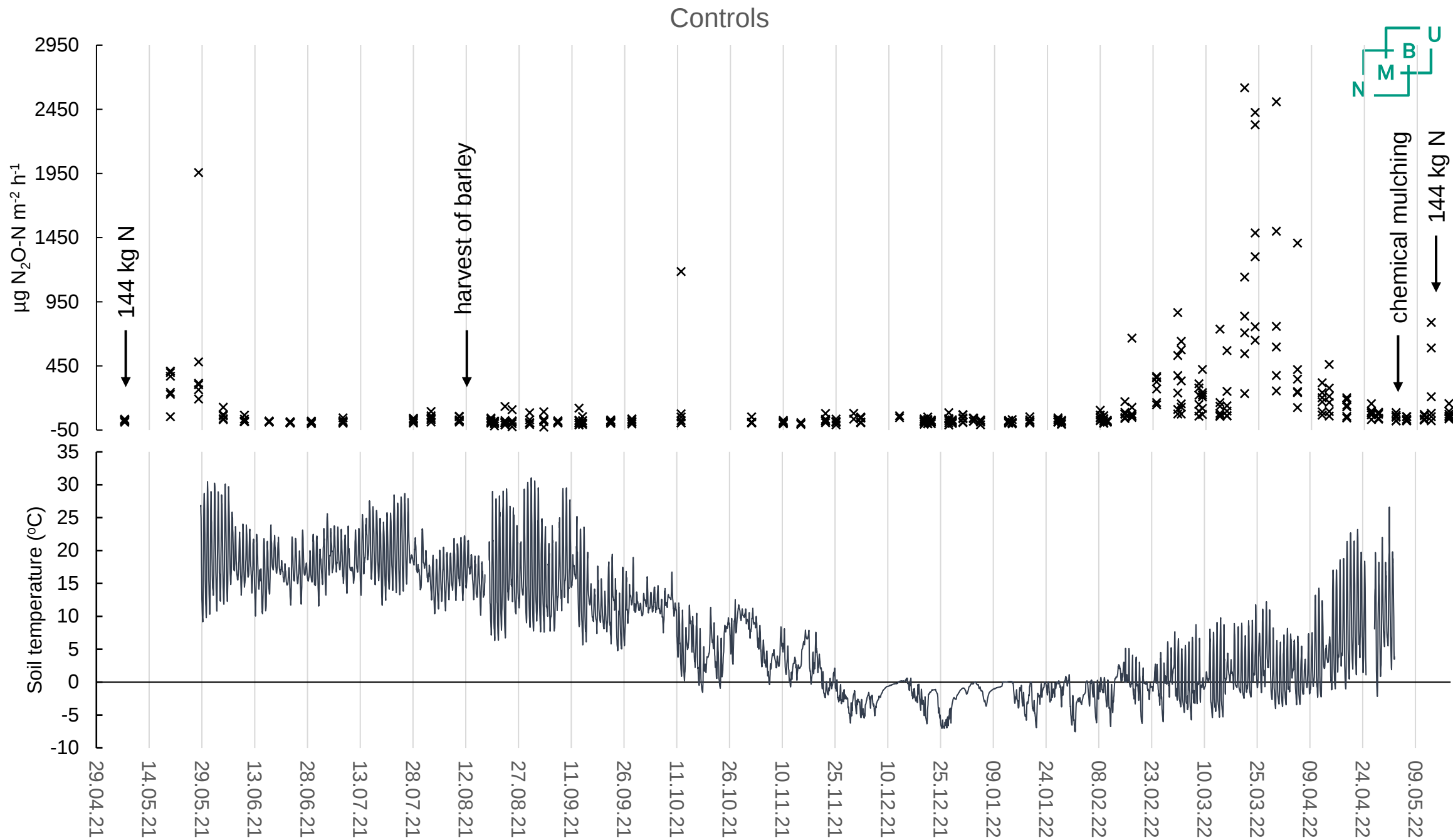


Standing aboveground C - 2.11.21

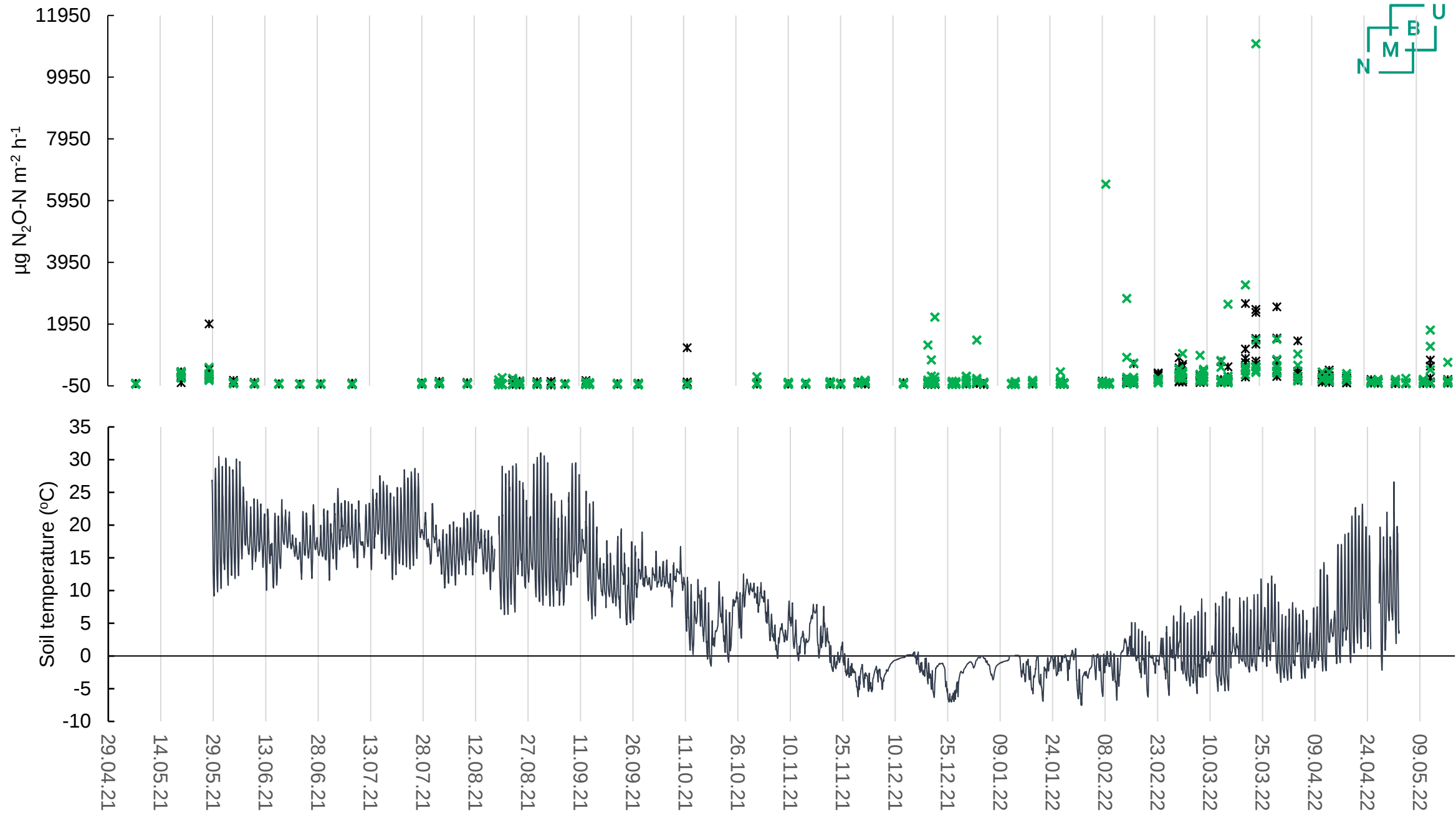


Mai 21 – April 22. snow poor winter – frequent freezing-thawing $\begin{matrix} \text{U} \\ \text{B} \\ \text{M} \\ \text{N} \end{matrix}$

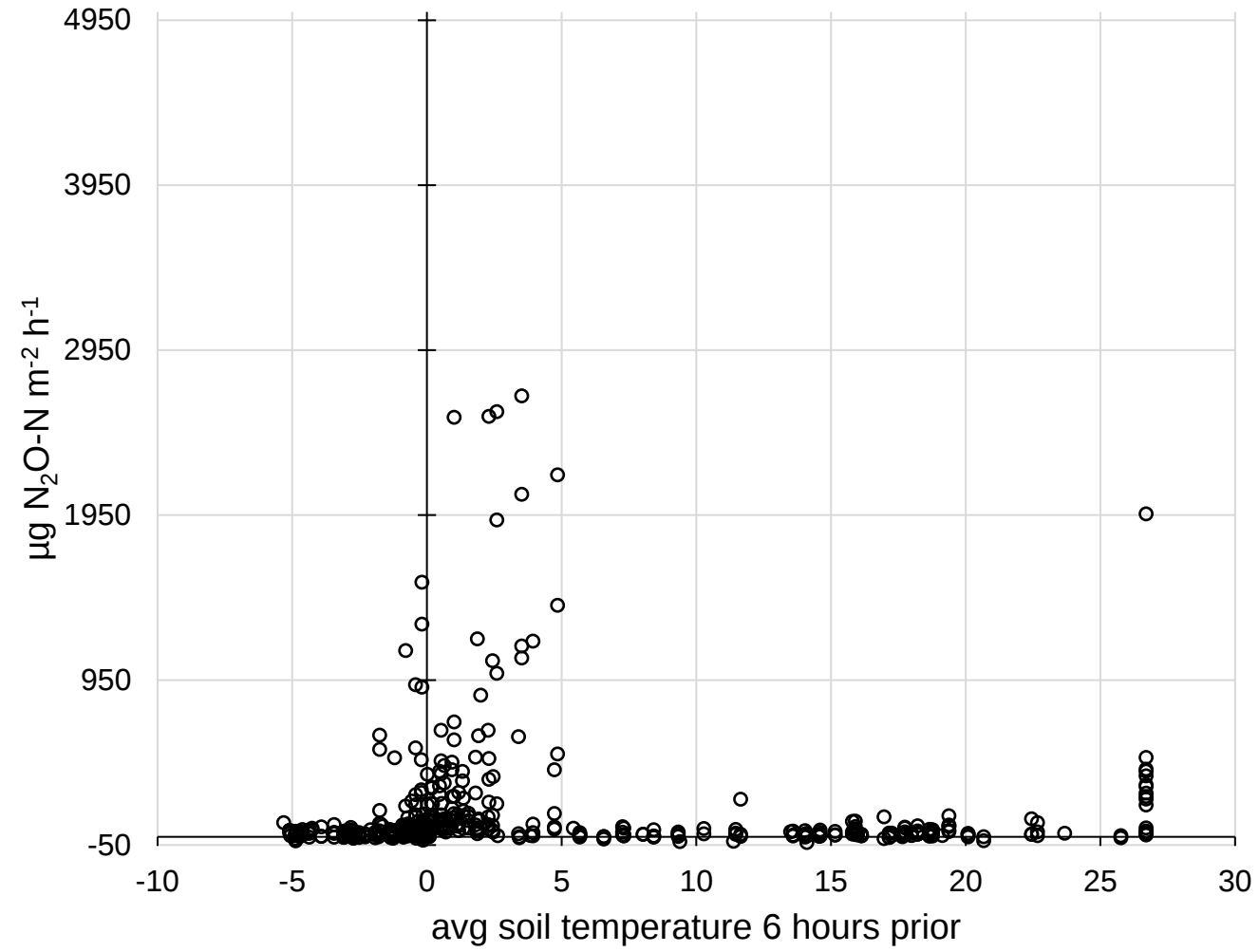




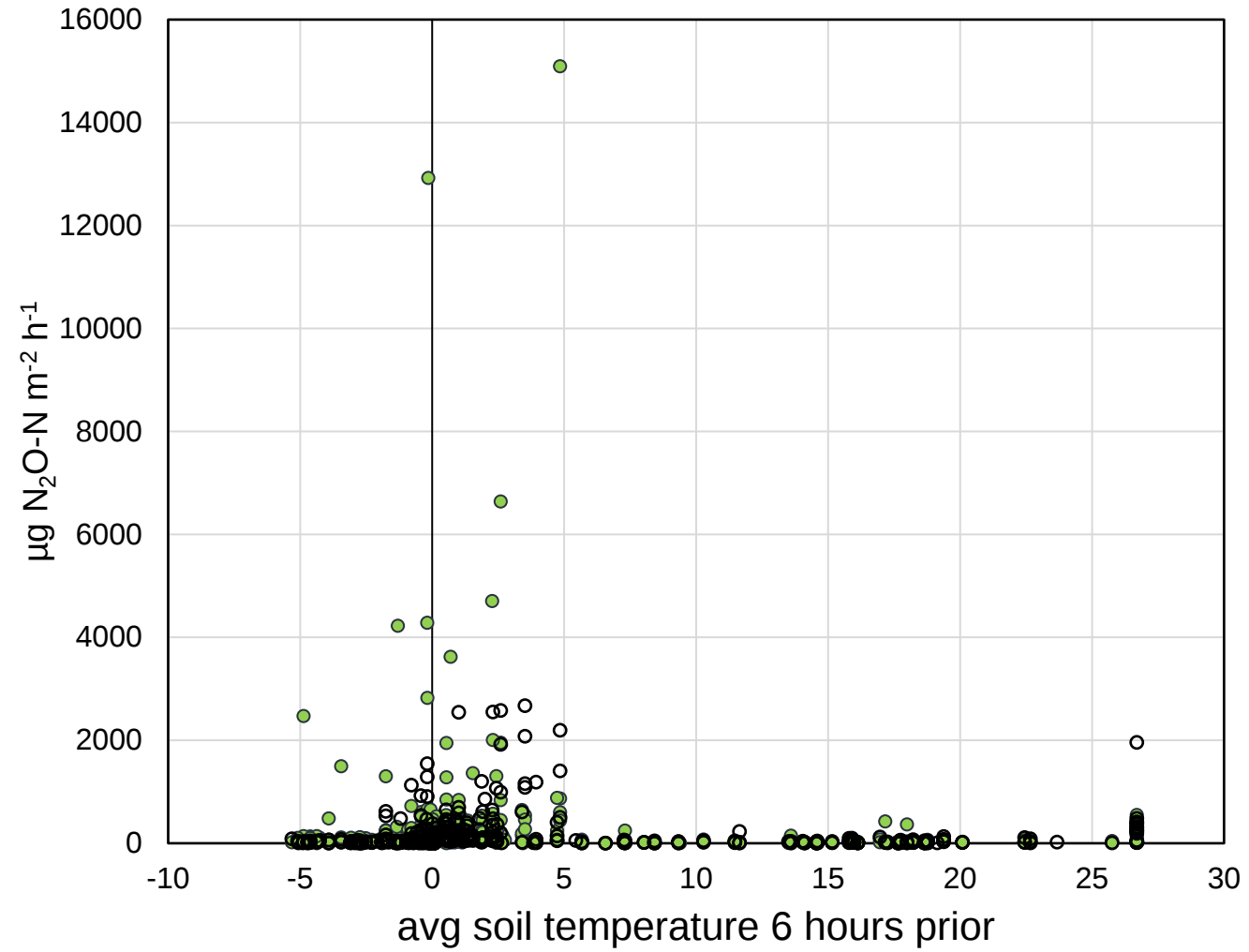
Control vs. Oilseed reddish



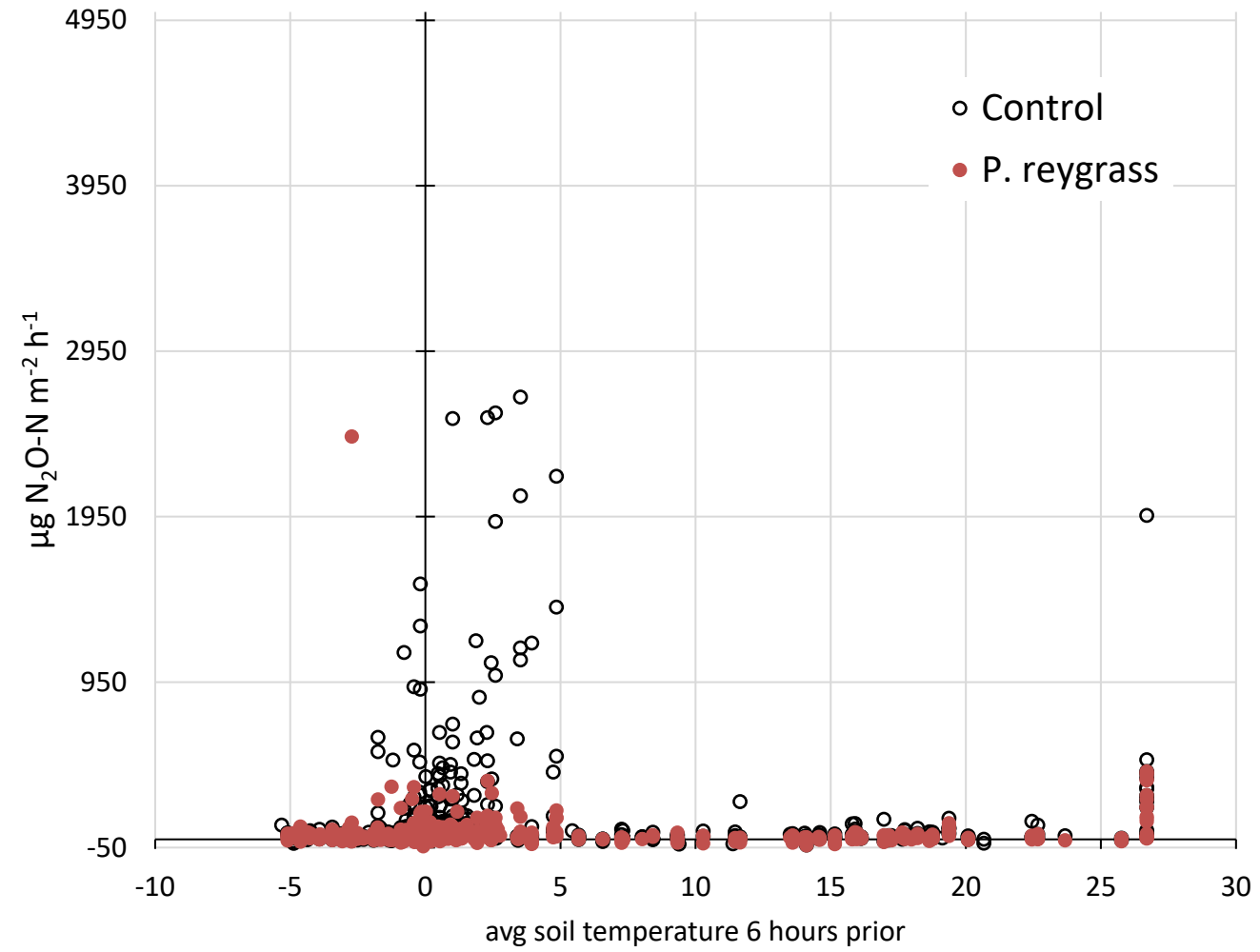
Controls



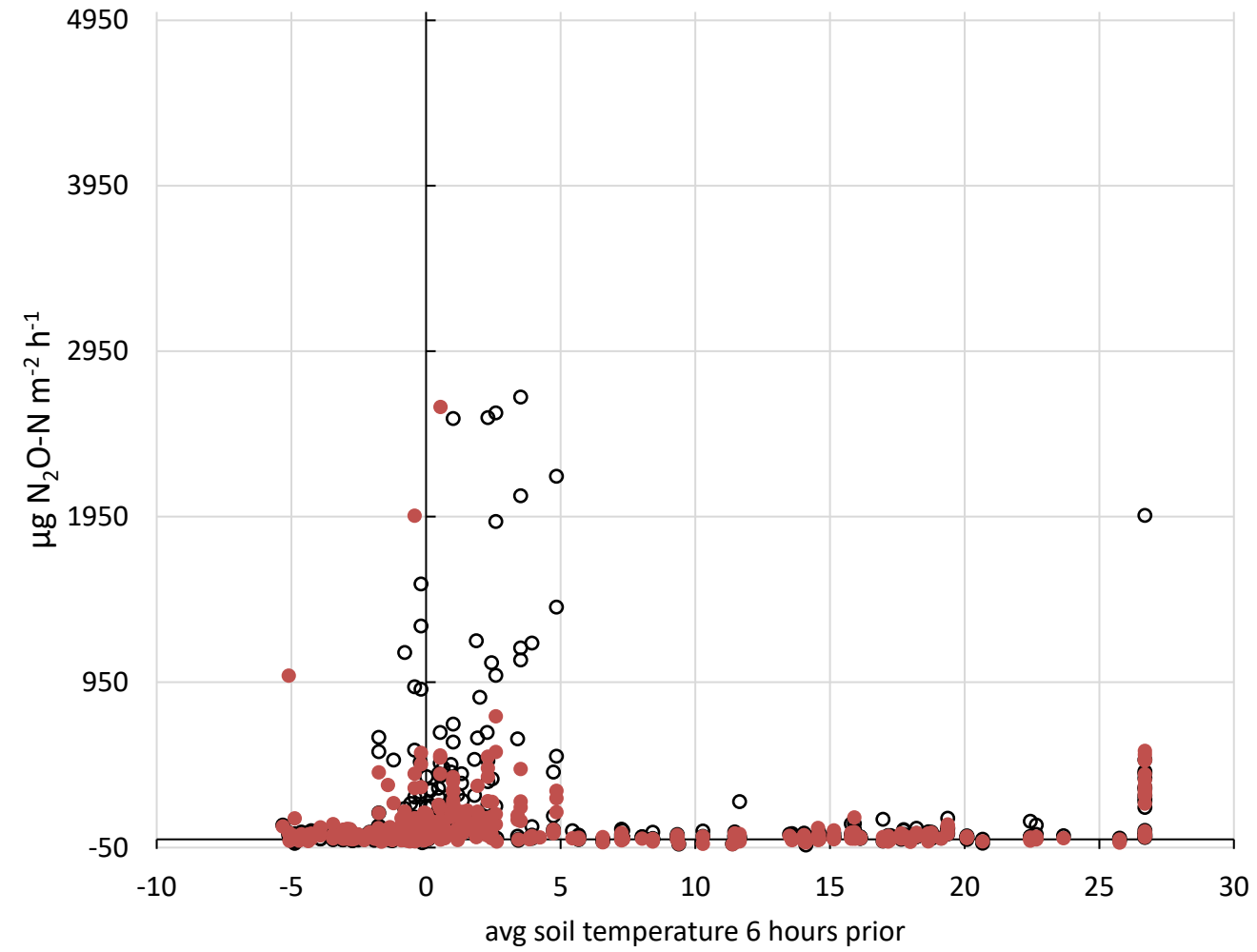
Oilseed redish



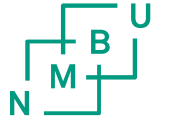
Perennial regrass



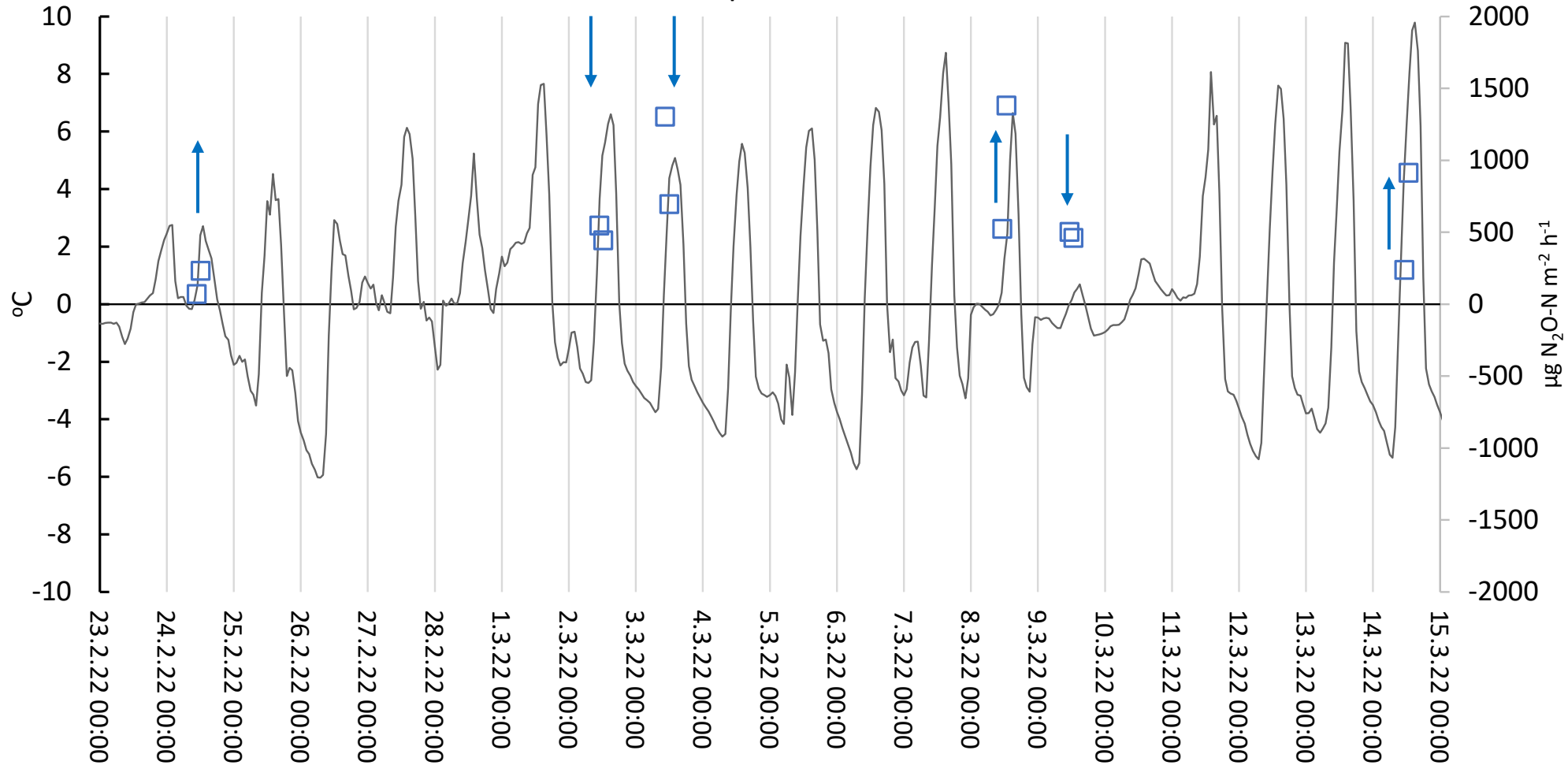
Italien reygrass



Daytime measurements during diurnal F/Y lead to overestimates in cumulative emissions

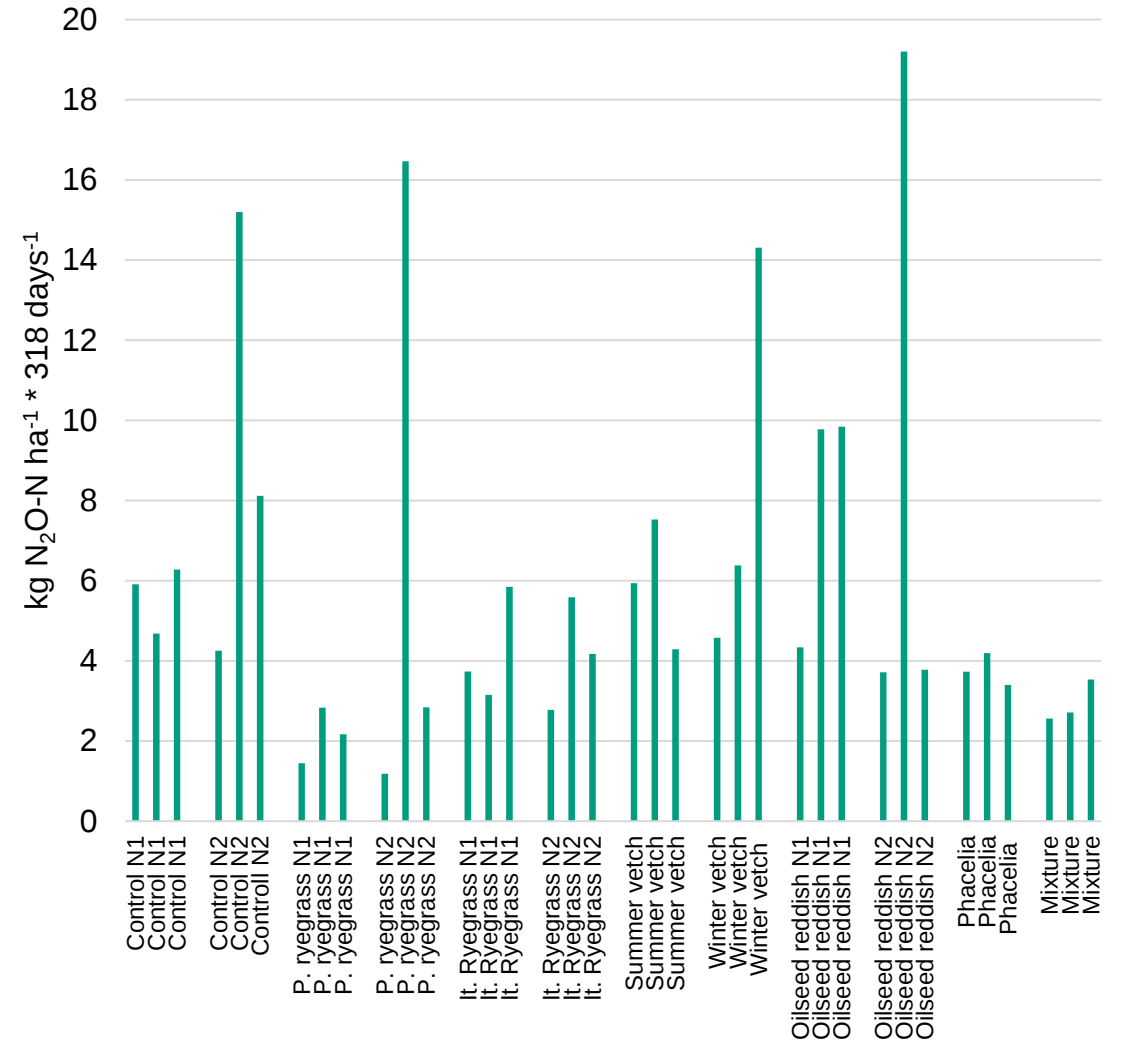
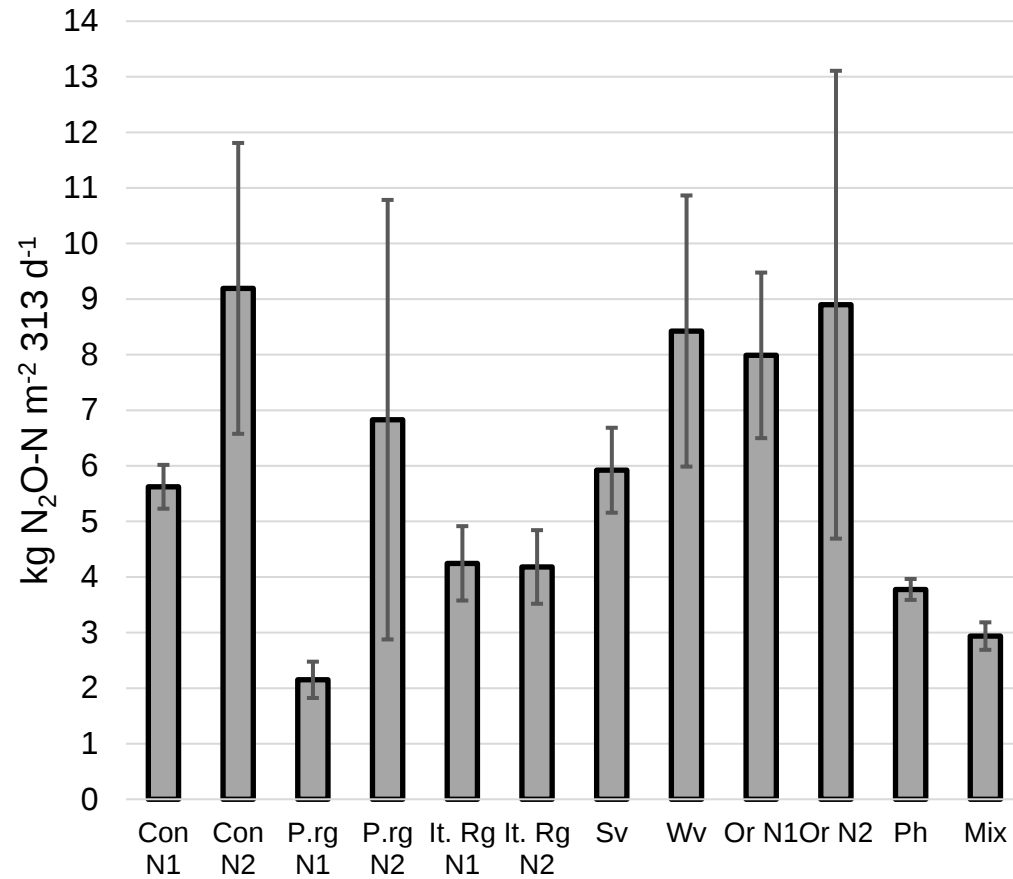


plot 16 Oilseed reddish N2

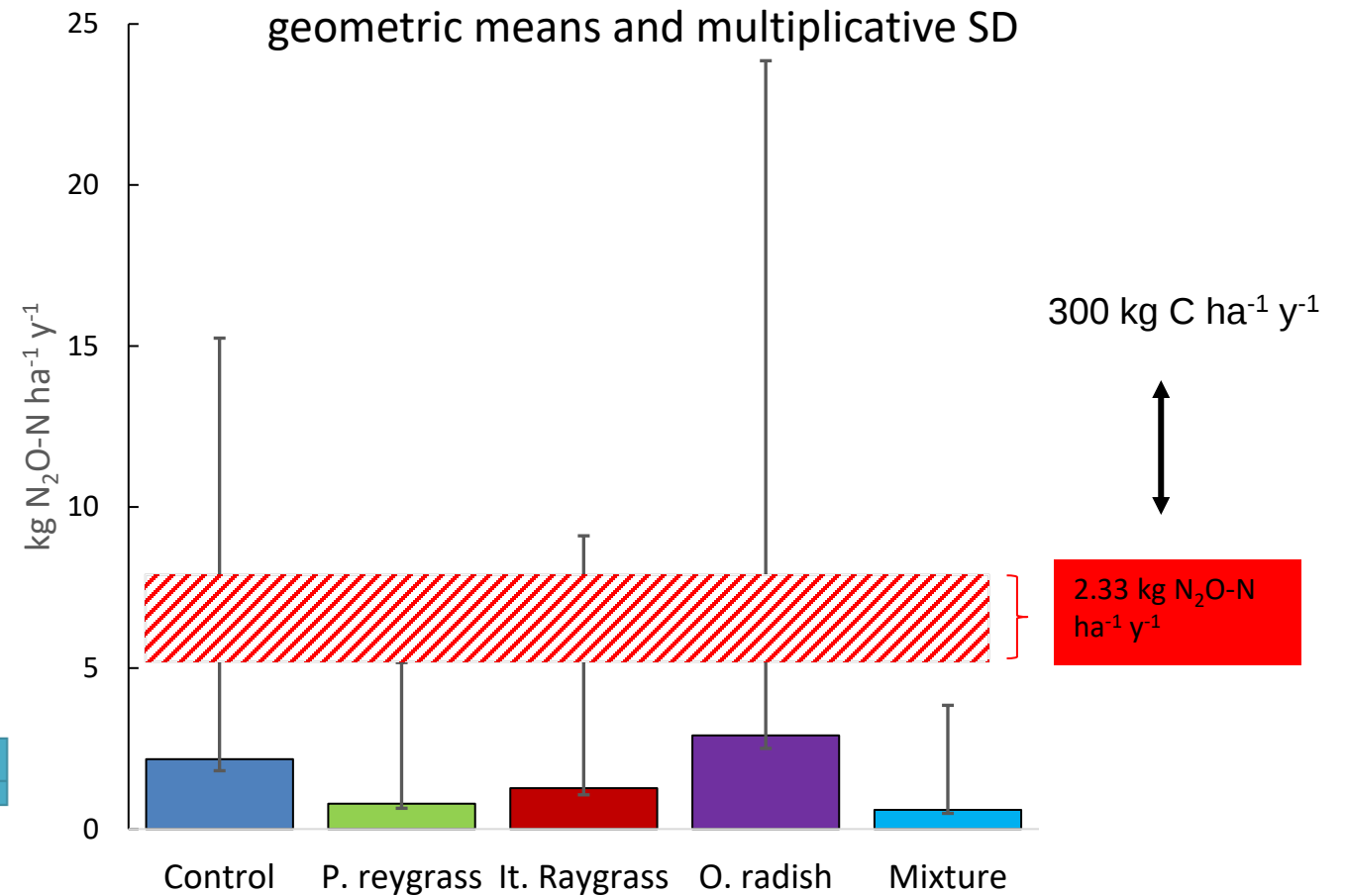
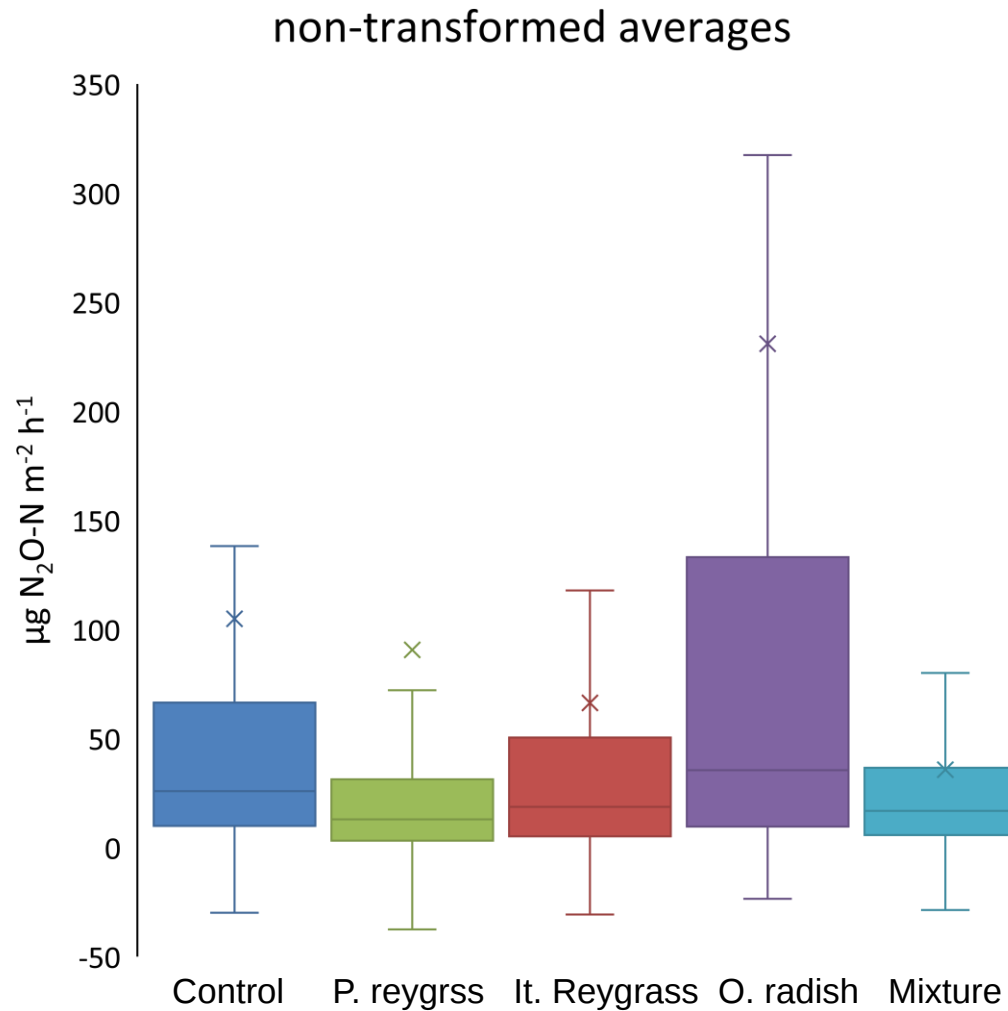
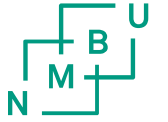


=> Use mean daily emissions for cumulation

Inflated cumulative emissions



Possible GHG tradeoffs of SCS by cover crops



Conclusions



- Cover crops reduce or increase N_2O emissions in subboreal winters
- Robust quantification of CC effects is needed to assess GHG tradeoffs in carbon farming; extrapolation by cumulation does not work in winter
- The focus should be on winter emissions – which are difficult to measure
- Frost resistant cover crops like perennial ryegrass or herb mixtures have a potential to reduce N_2O winter emissions
- Avoid brassicas like oilseed reddish!
- Legumes?
- N leaching?



Thank you for your attention