THE USE OF NITROGEN NUTRITION INDEX IN HERBAGE GRASS SEED PRODUCTION

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PUBLISHED RESULTS

- Best correlation (~0.66) and lowest RMSE (~0.18) at 432 to 545 GDD (stem elongation) where additional N can still be applied (Wang et al. 2019).
- Vleugels et al. 2017 concluded that Critical NNI values to attain maximum seed yield were 0.83 in the 2–3 node stage, 0.72 at the beginning of heading, and 0.59 at full ear emergence. NDVI values increased with increasing N rates, but were heavily dependent on the trial year, rendering them unusable on farm.
- Gislum et al., 2021 concluded 'that although it is possible to make in-season predictions of NNI, it does not always portray the differences in yield potential; thus, it is challenging to utilize it to optimize N application.
- Flowers et al. (2010) found 'a significant and strong relationship ($r^2 = 0.61$) between NDVI and N uptake across three site-years'

AIMS

The aim of this study is to test the use of NNI in experimental plots and discuss if the method can be implemented by farmers.

CURRENT N APPLICATION SCHEME IN DENMARK

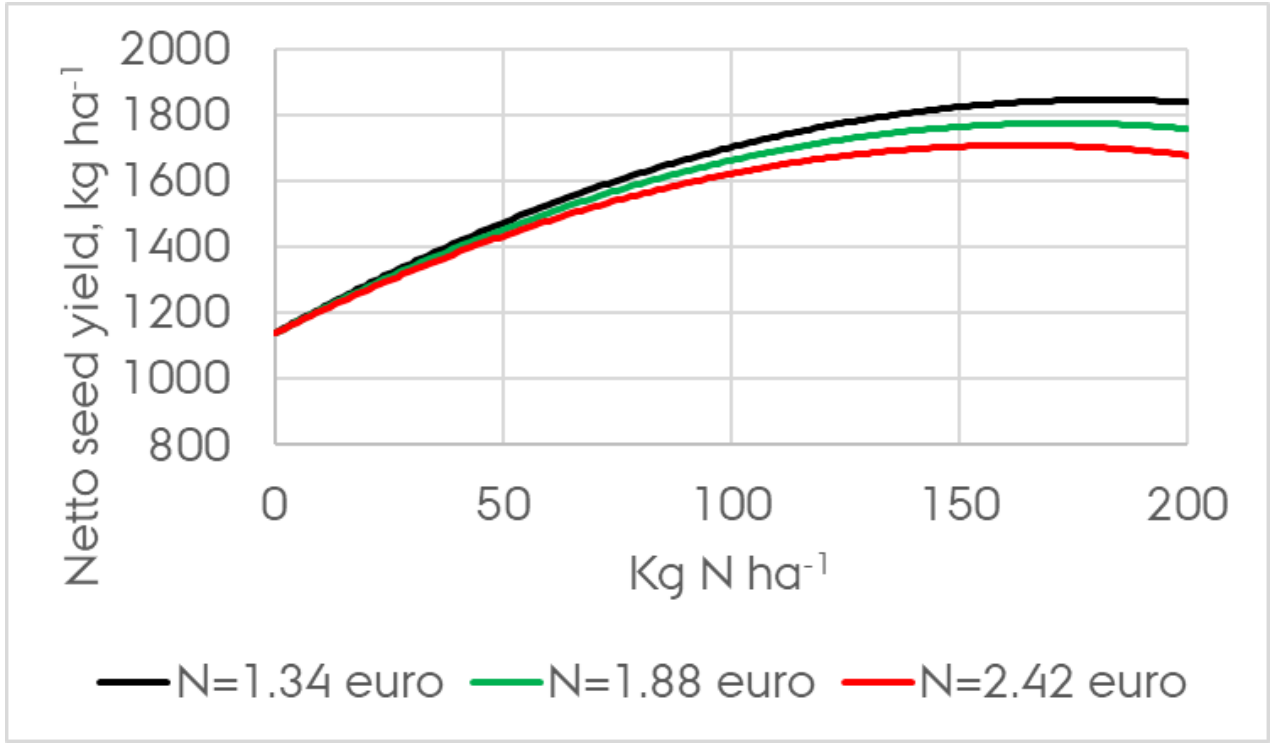
Nitrogen quota for each specie:

Perennial ryegrass - 170 kg ha^{-1}

Red fescue- 150 kg ha^{-1}

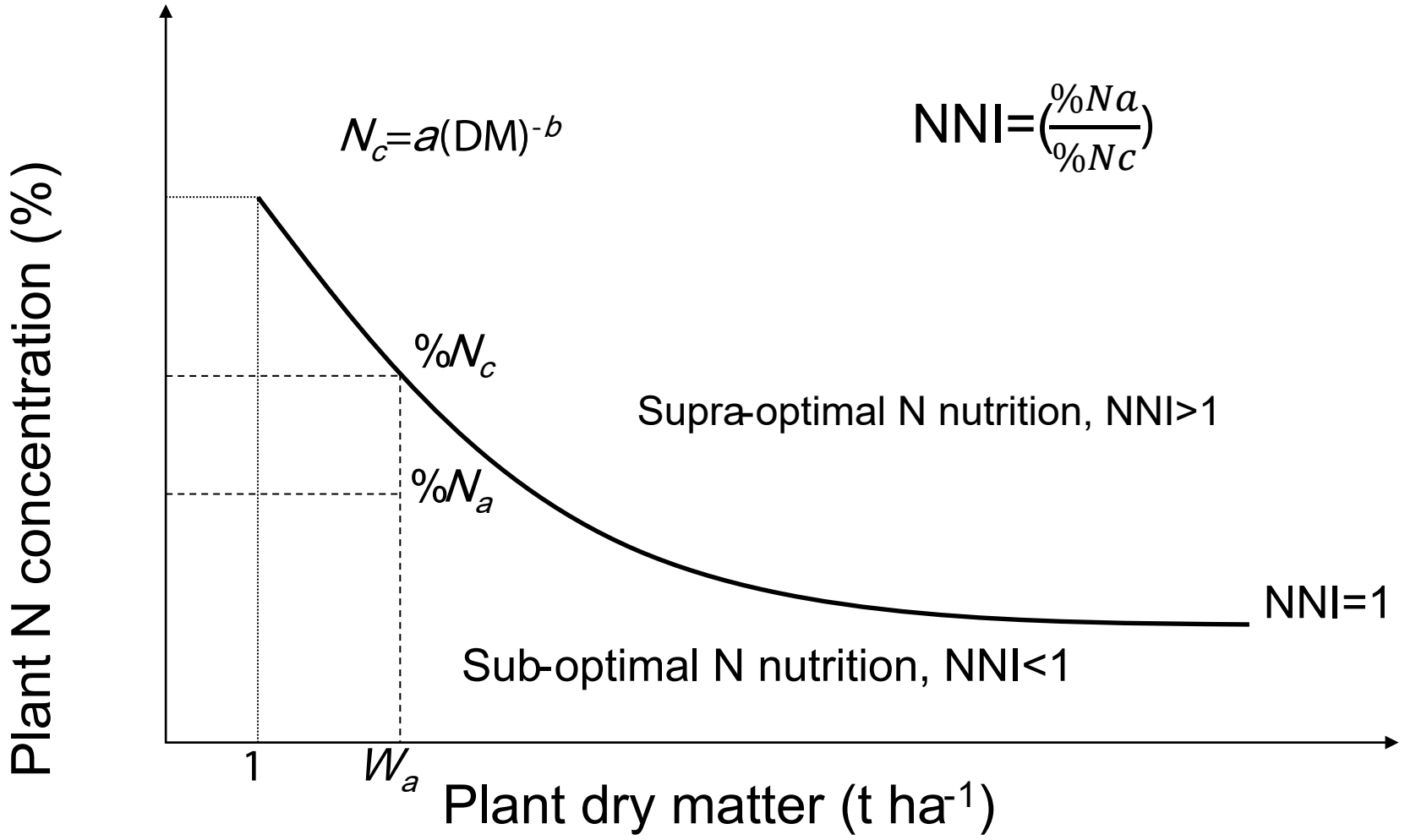
Tall fescue - 200 kg ha^{-1}

Seed growers seem to be happy with the current N quota, and this will not encourage them to test/gamble with new methods.

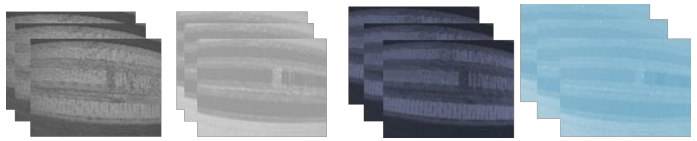


- Focus on environmental risks
- As part of the Farm to Fork strategy – one of the central pillars of the European Green Deal – the EU Commission aims to see a reduction in nutrient losses of at least 50% by 2030. This is expected to lead to a reduction in fertiliser use of at least 20%.

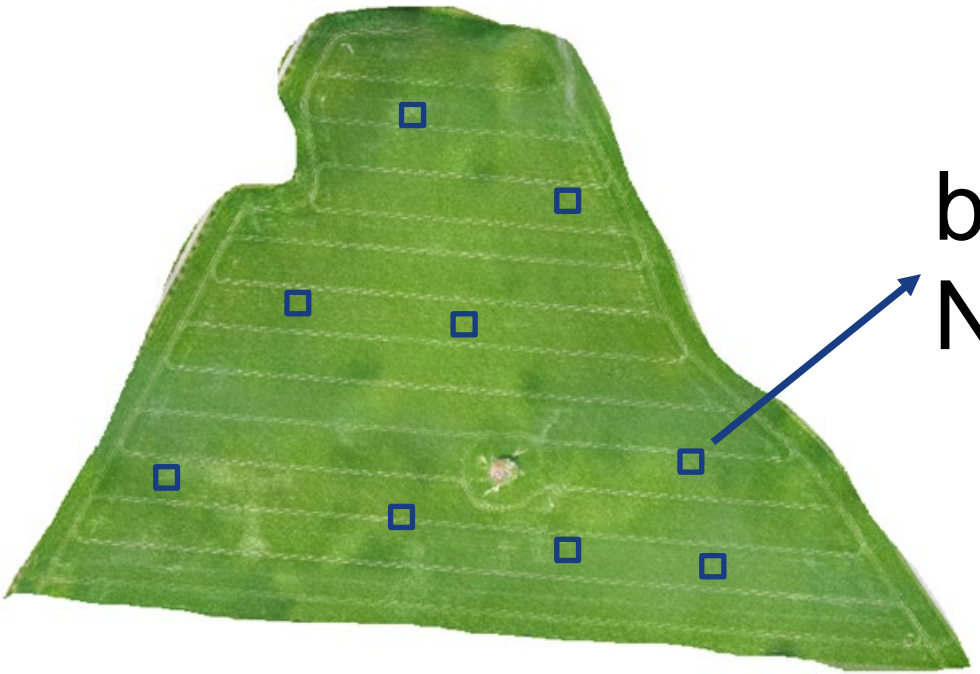
CRITICAL N DILUTION CURVE



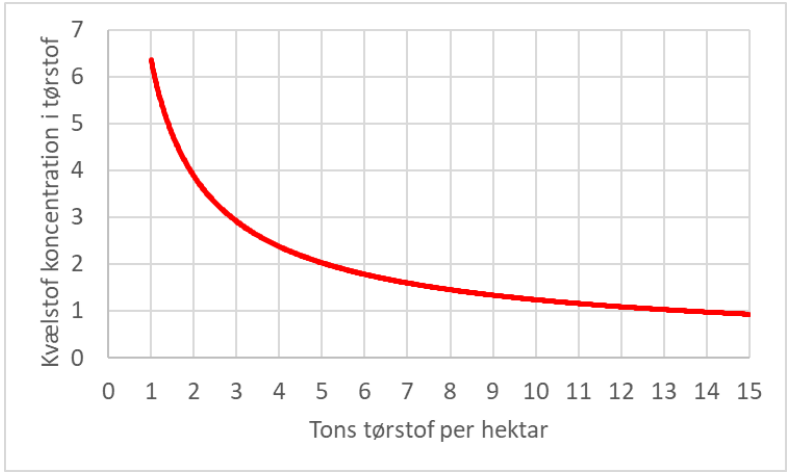
Multispektrale billeder (Sequoia)



biomass
N status



biomass
N status



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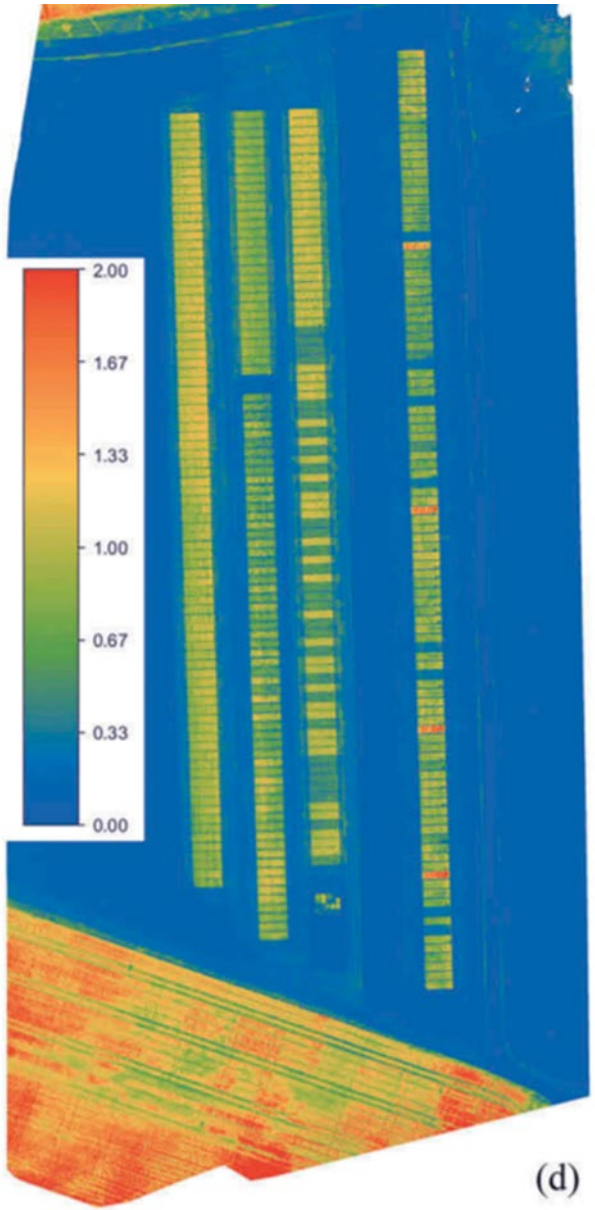
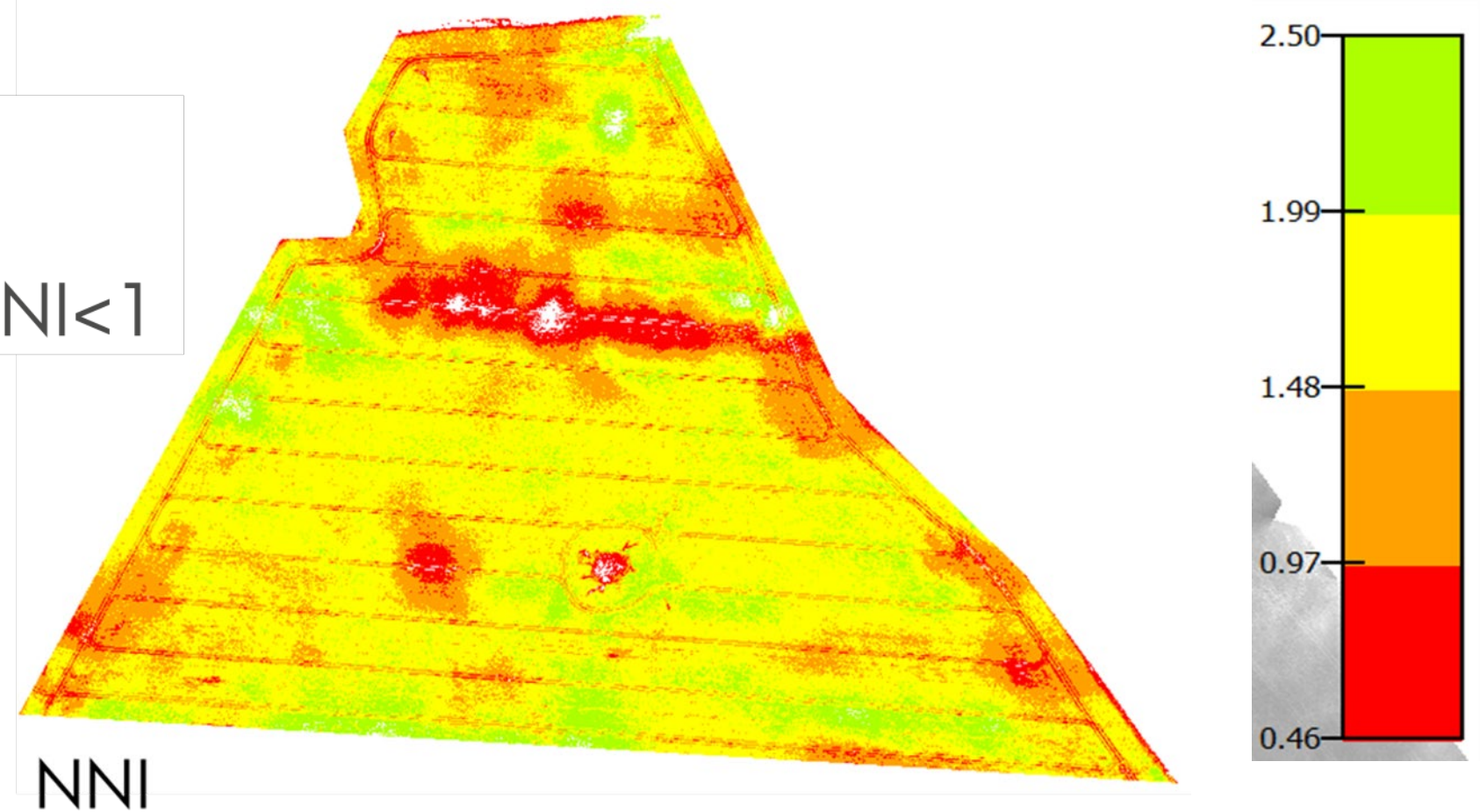
NNI – PLOT TRIAL

We have developed the critical nitrogen dilution curve and an algorithm that is able to calculated nitrogen nutrition index (NNI) based on sensor readings in grasses for seed production. This is implemented in our field plot experiments as seen in the figure to the right and has been shown in Wang et al. 2019 and Gislum et al. 2021.



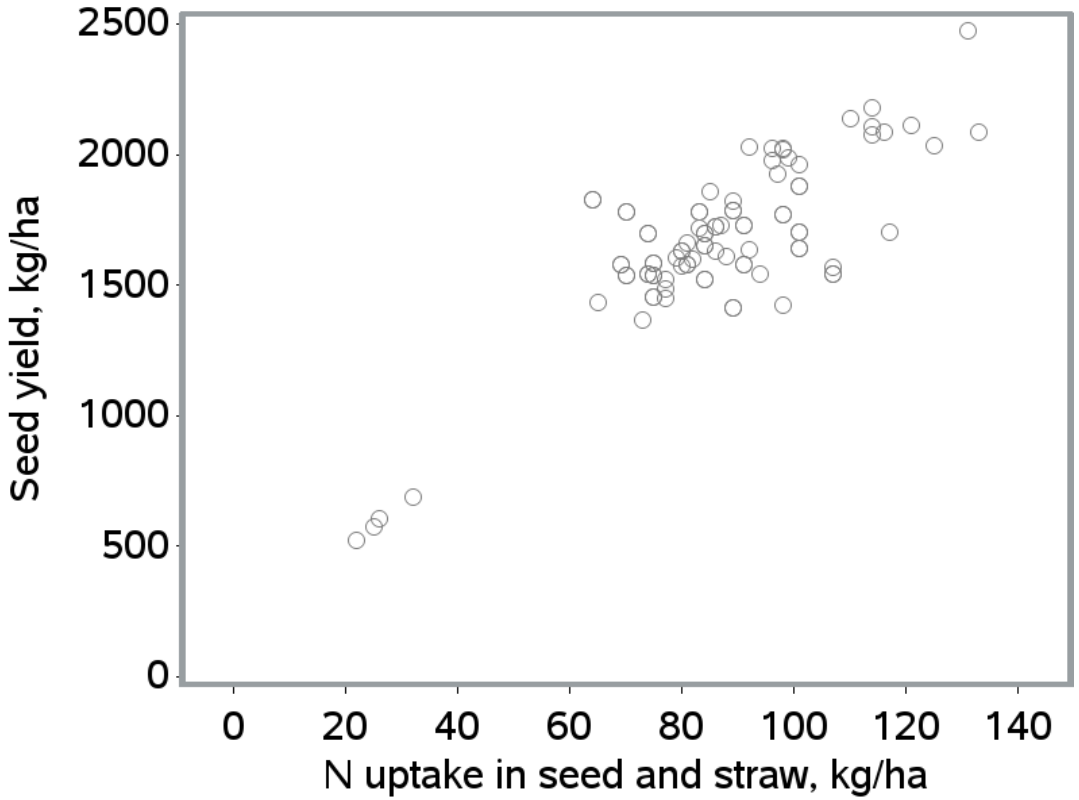
UAV IMAGE FOR N FERTILISATION

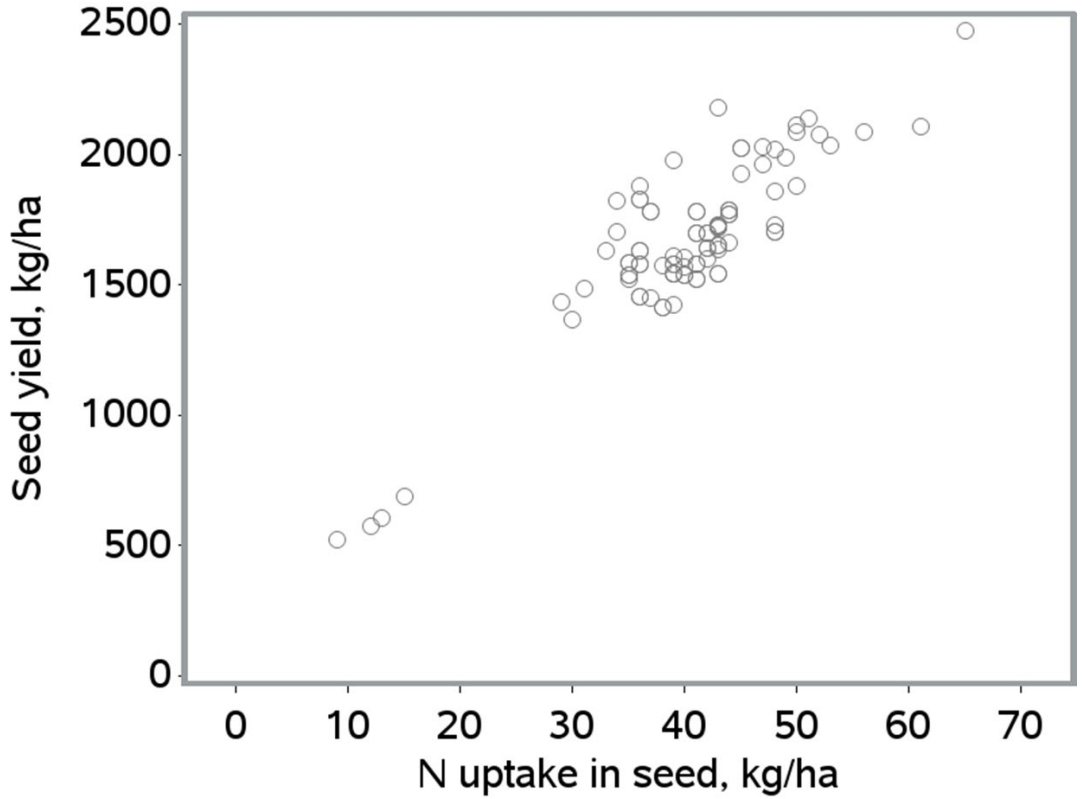
NNI:
19 hektar
1.3 hektar with NNI<1



NNI

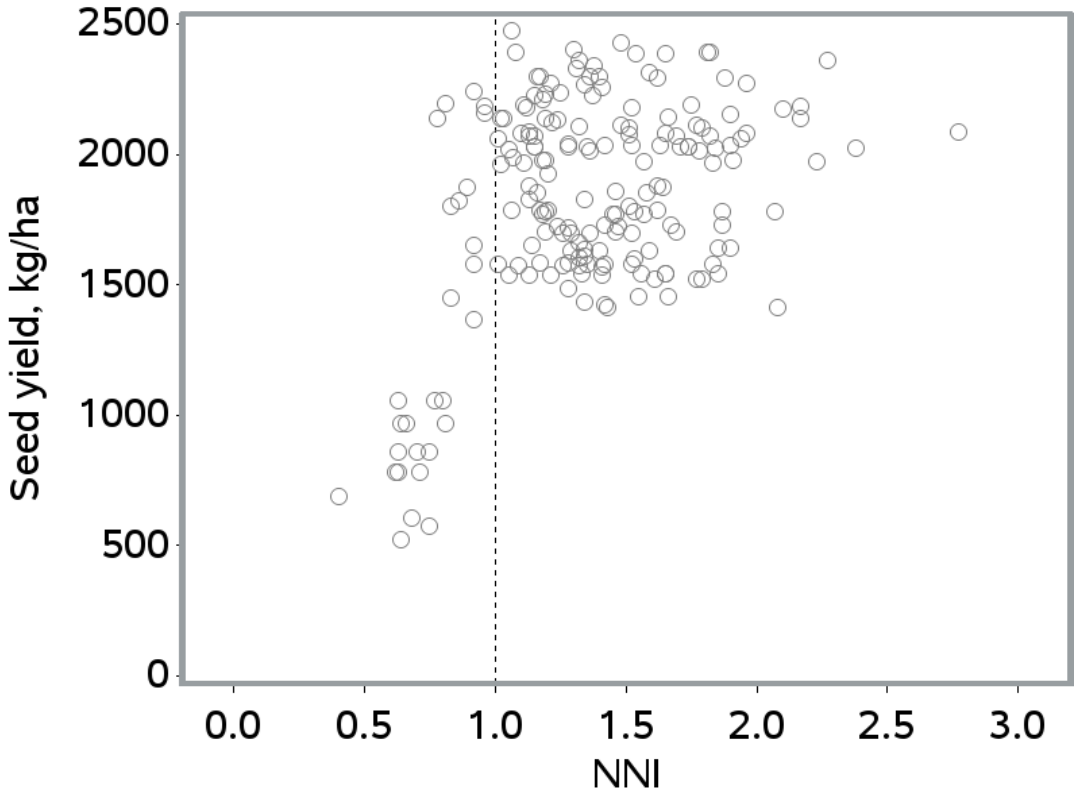
SEED YIELD AND N UPTAKE

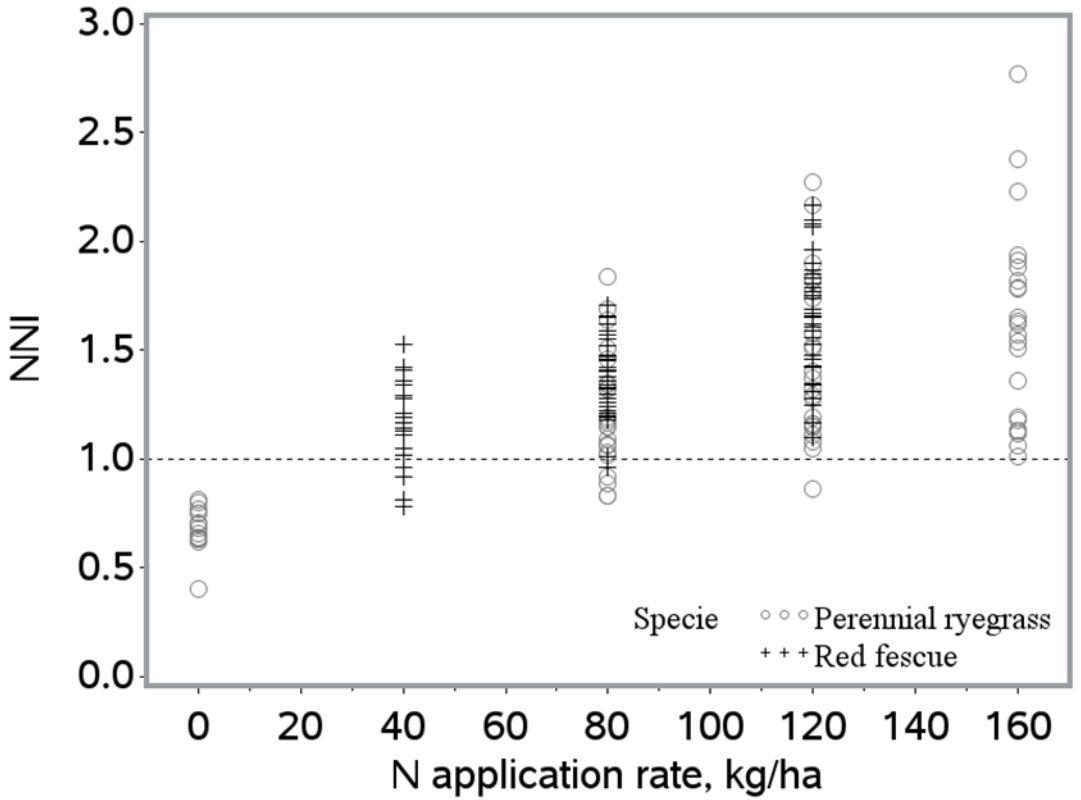




Flowers et al., 2010 found a critical N uptake at GS 30 to 31 at 158 kg ha^{-1}

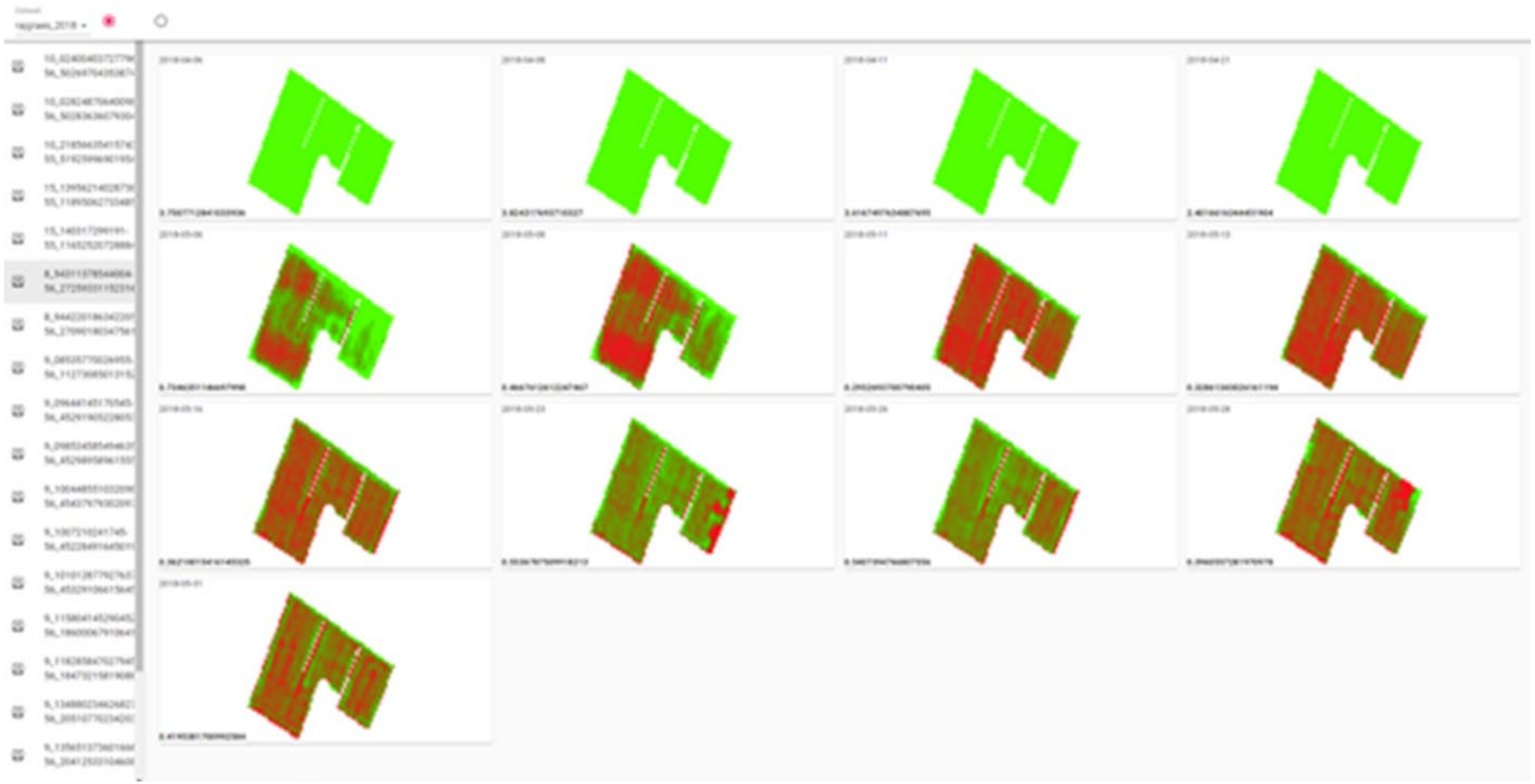
SEED YIELD, NNI AND N APPLICATION RAT





CONCLUSION AND TAKE HOME MESSAGES

- The Danish standard N application rates are sufficient to secure adequate N for red fescue and perennial ryegrass.
- An increase in NNI from one to two will not necessarily increase the seed yield.
- Based on the current situation it is advisable to combine the use of NNI with the current Danish N application system.



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