



SATELLITES REVEAL NITROGEN LOSS

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Preliminary results/hypothesis

Preliminary results with only 13 data points showed a positive relationship between NDVI of catch crops in the autumn 2017 and the nitrate content in February 2018 ($R^2=0.40$). The **hypothesis** is that, higher NDVI reflects higher nitrogen uptake in autumn, and more nitrogen is available as nitrate for the following crop, in February, where mineralization has taken place.

PROJECT AIM

By using new satellite technology, this project aims to reveal the amount of nitrogen uptake by catch crops and, thereby, enable a more precise prediction of the nitrogen need for the following crop. This project also aims to establish a relationship between the satellite measurements and the amount of nitrogen in catch crops.

Normalized difference vegetation index (NDVI)

NDVI is calculated as follows: $NDVI = (NIR - Red) / (NIR + Red)$, where 'NIR' and 'Red' is the spectral reflectance measurements attained in the visible and near-infrared regions. The NDVI values acquired in this study are the average NDVI values from October 2018 in a specific area of a field.



FIGURE 1. An example of an NDVI map with 10x10 m cell grid in a field growing catch crops.

Results

In October 2018, there was an exponential correlation found between plant uptake of nitrogen ($kg\ N\ ha^{-1}$) and measured NDVI in catch crops ($R^2 = 0.51$) (Figure 2).

NDVI becomes saturated at a high biomass, indicated by NDVI values around 0.8 or higher, therefore the correlation is limited by the NDVI values above 0.8. This limitation can be seen in Figure 2. Furthermore, the variation in NDVI before the saturation point could be due to the type of catch crop or location.

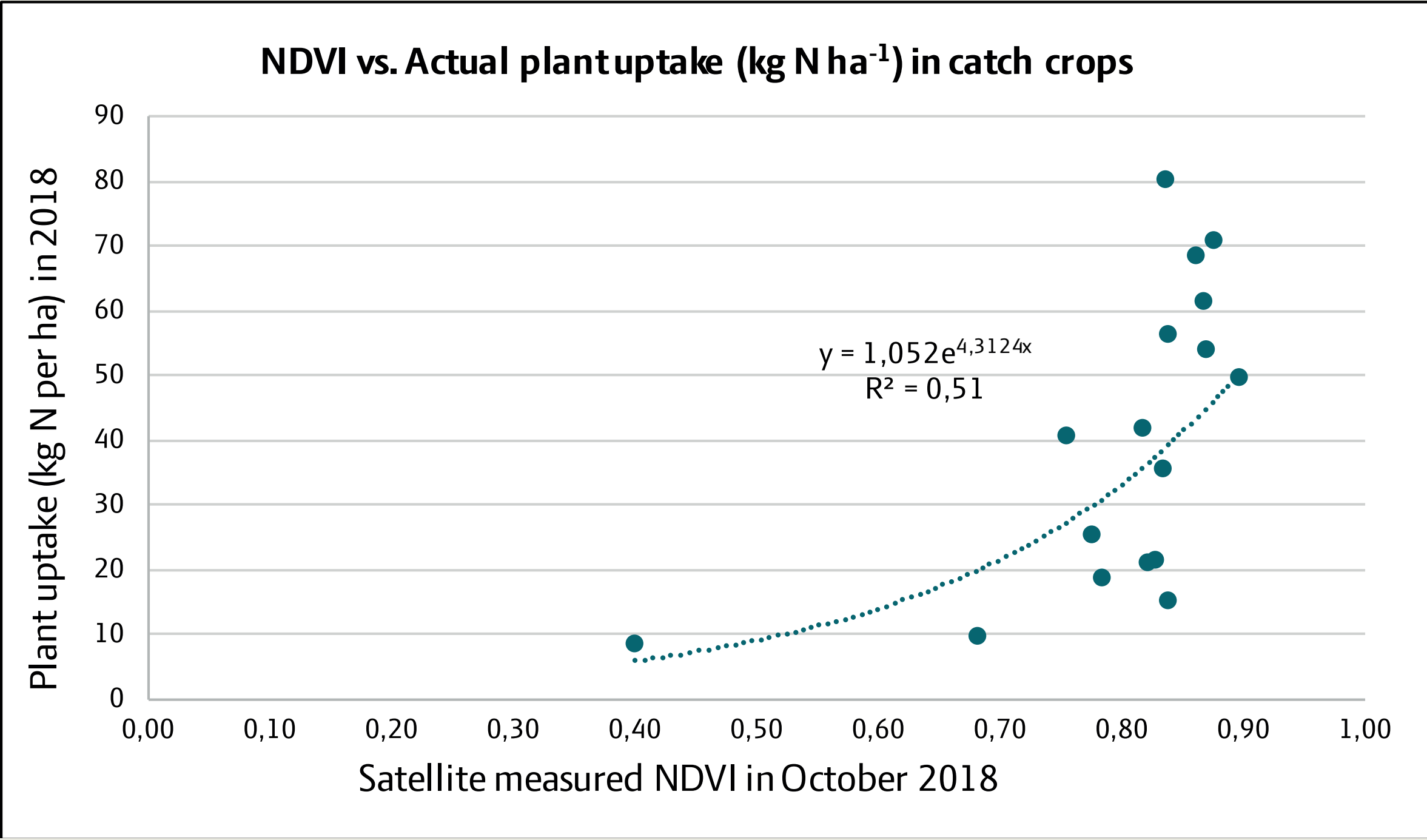


FIGURE 2. Correlation between plant uptake in $kg\ N\ ha^{-1}$ and satellite-measured NDVI in October 2018 in catch crops.

Conclusion

NDVI is most accurate in the first growth stages, before the plant has excessive foliage. More studies are required to evaluate the use of NDVI to predict field conditions. Due to the uncertainty in the NDVI values, it is evident that more measurements are required before obtaining a concrete conclusion regarding the correlation between plant uptake of nitrogen or N-min and measured NDVI.

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