ADAS document ref: 1021801-16 (00)
Project manager and report author: Susie Roques

Trial type: N rate and Blue N
Farm location: Rutland

Crop: Sugar beet

This trial was part of the AICC Crop Nutrition Club 2023, which has been run in conjunction with the Farm-PEP project led by ADAS. This report contains the results of a sugar beet trial testing the extent to which Blue N can compensate for a reduced N rate.

Treatments

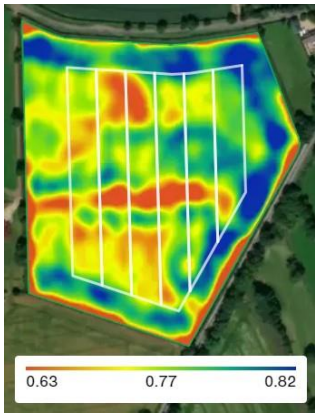
1 (control)	120 kg N/ha
2	100 kg N/ha + Blue N
3	100 kg N/ha
4	90 kg N/ha + Blue N

The trial was well designed with treatments replicated as far as field size permitted, and placed in a reasonably even field.

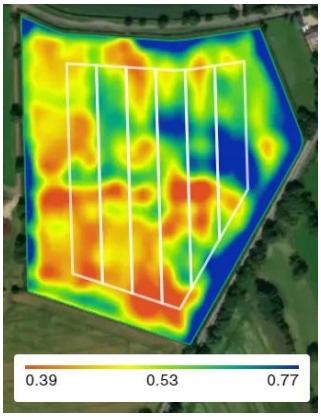
Satellite imagery

NDVI (normalized difference vegetation index) is a spectral reflectance index which shows a combination of canopy size and greenness, on a scale from 0 to 1. NDVI correlates with yield in most crops. NDVI images were sourced from www.datafarming.com.au, based on freely available 10m resolution data from the Sentinel 2 satellites. The scale varies between images but always runs from red (low) through orange, yellow and green to blue (high). The availability of imagery is constrained by the need for cloudless conditions.

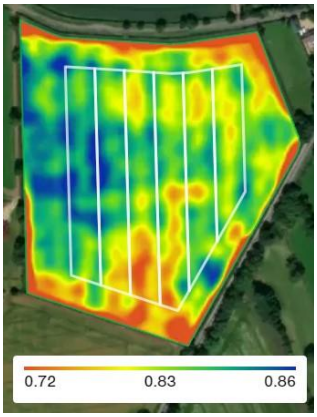
Prior to the trial starting, the main variation in the field ran across the tramlines so should not have biased the treatment comparison. Any NDVI effects were too subtle to be evident from DataFarming imagery.



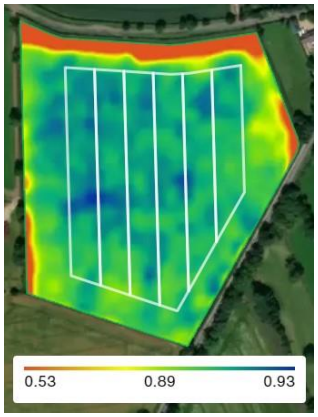
NDVI previous crop (25/03/22)



NDVI (10/06/23)



NDVI after treatments (06/09/23)



NDVI pre-harvest (30/11/23)

Agronomics analysis

Raw Sentinel2 satellite imagery was downloaded for two dates: 06/09/23 and 30/11/23. The images were processed and analysed using the ADAS Agronomics approach. A model of underlying variation was applied to the data to account for spatial variation across rows and along rows, and for the effect of the treatment. The statistical analysis led to estimates of the treatment effects and the associated standard errors. Thus, subject to the assumptions of the underlying statistical model, it was possible to calculate 95% confidence limits for the effects of treatment on NDVI.

Yield results

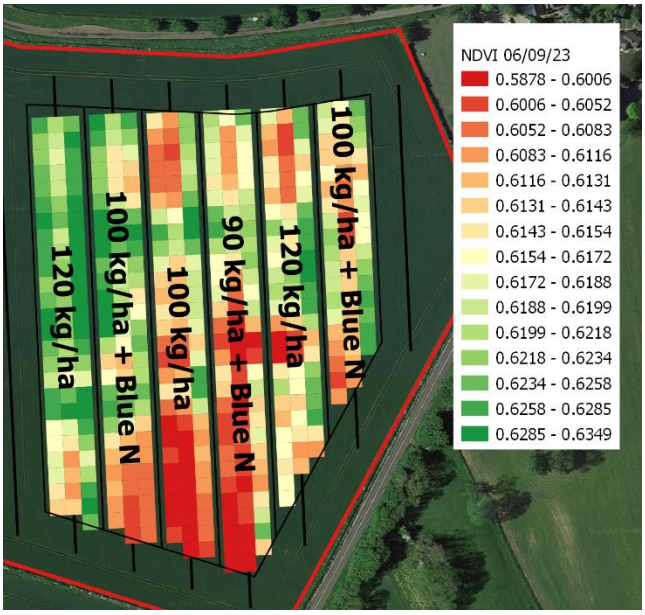
The average NDVI of the control treatment (120 kg N/ha) was 6.20 on 6th September and 6.38 on 30th November.

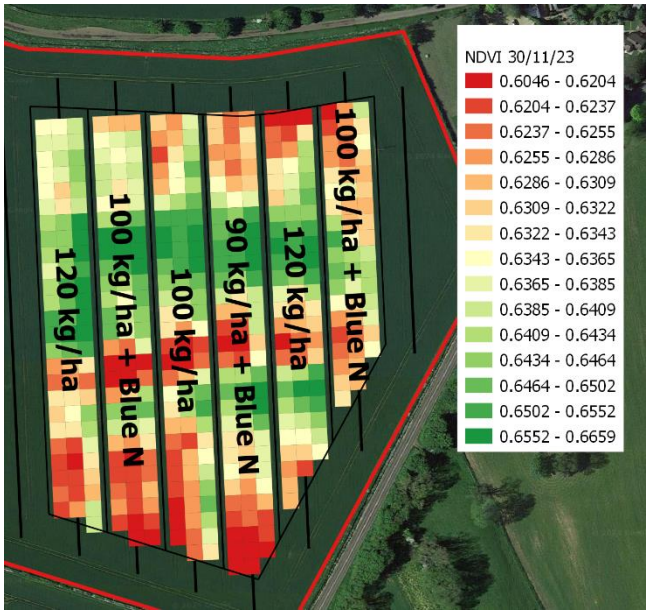
On 6th September, the other three treatments all had significantly lower NDVI than the control treatment, but the reduction in NDVI was smallest for the 100 kg/ha + Blue N treatment, suggesting that Blue N had gone some way to compensate for the reduction from 120 to 100 kg N/ha.

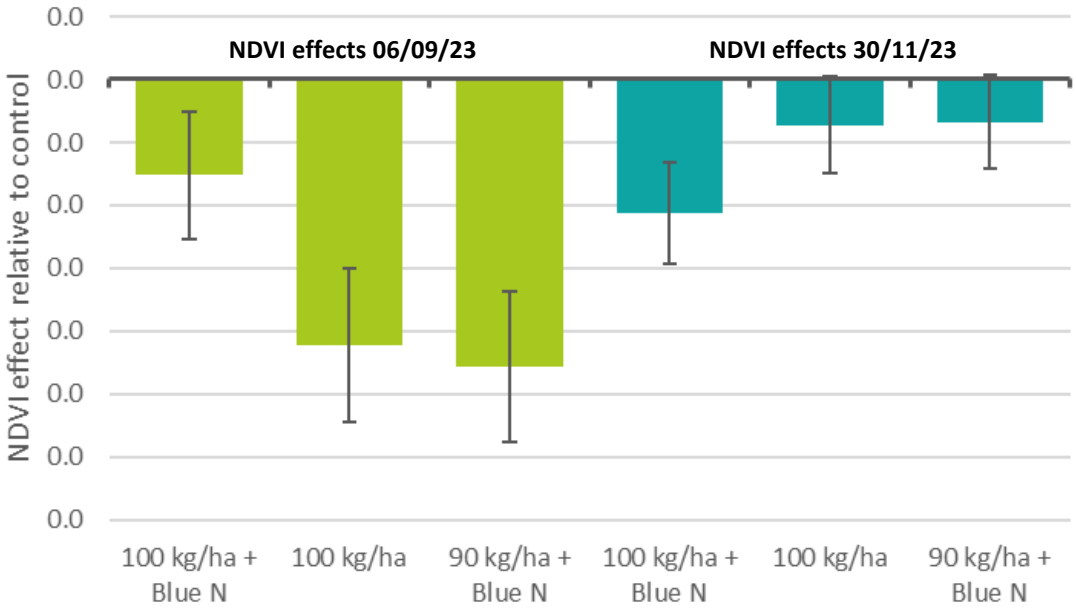
On 30th November the results were less clear: the largest reduction in NDVI was in the 100 kg/ha + Blue N treatment, with the other treatments not significantly different from the control at the 95% confidence level. However, as shown by the DataFarming image from this date, NDVI was starting to fall towards the east corner of the field, so the 100 kg/ha + Blue N treatment could have been disadvantaged by its location at the east edge of the trial.

In conclusion, Blue N appears to have mitigated but not fully compensated for a 20 kg/ha reduction in N rate. There was minimal difference between the 100 kg/ha and 90 kg/ha + Blue N treatments on 6th September, which also suggests that Blue N was contributing around 10 kg N/ha.

	120 kg N/ha	100 kg N/ha + Blue N	100 kg N/ha	90 kg N/ha + Blue N
Mean NDVI 06/09/23	6.203			
Effect on NDVI 09/06/23 relative to control with 95% confidence limits		-0.0030 ± 0.0020	-0.0084 ± 0.0024	-0.0091 ± 0.0024
Mean NDVI 30/11/23	6.383			
Effect on NDVI 30/11/23 relative to control with 95% confidence limits		-0.0042 ± 0.0016	-0.0014 ± 0.0015	-0.0014 ± 0.0015







Error bars show 95% confidence intervals