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This is a report summarising the key results from the Bionature on-farm trials run with a small network of Nelson wheat growers in 2025.

Bionature Nelson Trials

Report 2025

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Cope & Bionature

Bionature Nelson Grower Research

Introduction

Nelson is an excellent milling wheat variety with high protein quality prized by millers, and traits in the field that appeal to farmers, including its high disease resistance, excellent nitrogen use efficiency and its reliability and consistency.

Despite good yields, and a general satisfaction amongst growers with the performance of the crop, we find that too many crops are failing to hit the desired level of protein. In collaboration with Bionature we set out to explore a nutritional programme to help Nelson wheat reach its full potential.

Building on the established knowledge of nitrogen use efficiency (NUE) and research undertaken by Bionature to date, a set of farm trials was set-up in the Spring of 2025 to test the application of a Bionature wheat nutrition programme to evaluate the efficacy of the products for increasing yield whilst maintaining or improving protein and specific weight. The network of field scale trials wat set up with the following aim:

1. Compare farm standard practice against standard practice plus the Bionature crop nutrition programme to establish efficacy of the programme in improving NUE, by measuring yield and protein content of grain.

Workplan

1. Develop a farm trial network to assess Bionature product performance in a real-world context, in support of sustainable wheat production, and improved supply chains to the benefit of both farmers and end users of milling wheat.

2. Apply the Bionature nutrition products to a preexisting plot scale experiment in parallel to the farm trials to assess the efficacy of the Bionature programme in improving NUE on winter milling wheats.

3. Analysis of data will be carried out to evaluate the effect of Bionature products on NUE, yields and grain quality to meet the specific aims of milling wheat growers and end users including WildFarmed and Heygates.

Trial Sites

The number of farms taking part ensured a robust and reliable dataset that provided an accurate test of Bionature product efficacy. The number of sites/fields has been selected to ensure good statistical power.

Farm	Location	Field	Soil Type
1.CR Ashby & Sons	Cambridgeshire	1	Medium
2.Leverton Farms	Lincolnshire	2	Heavy
3.I & S Clarke	Hampshire	3	Medium
		4	Medium
4.JC Brown	Bedfordshire	5	Medium
5.SN & WR Smith	Derbyshire	6	Medium
		7	Medium
6.Chapel Farms	Lincolnshire	8	Light
7.DB & NE Smith	Essex	9	Heavy
		10	Light
8.J Parrish & Son	Bedfordshire	11	Medium

Climate Data

The spring and summer season was characterised by unprecedented dry, warm and sunny conditions. Drought stress was common among many crops. An overview of the climate for the duration for the trial relative to the 30year average can be found in Appendix 2.0.

Methodology

Simple filed scale trials will be set up across multiple farms according to the following design:

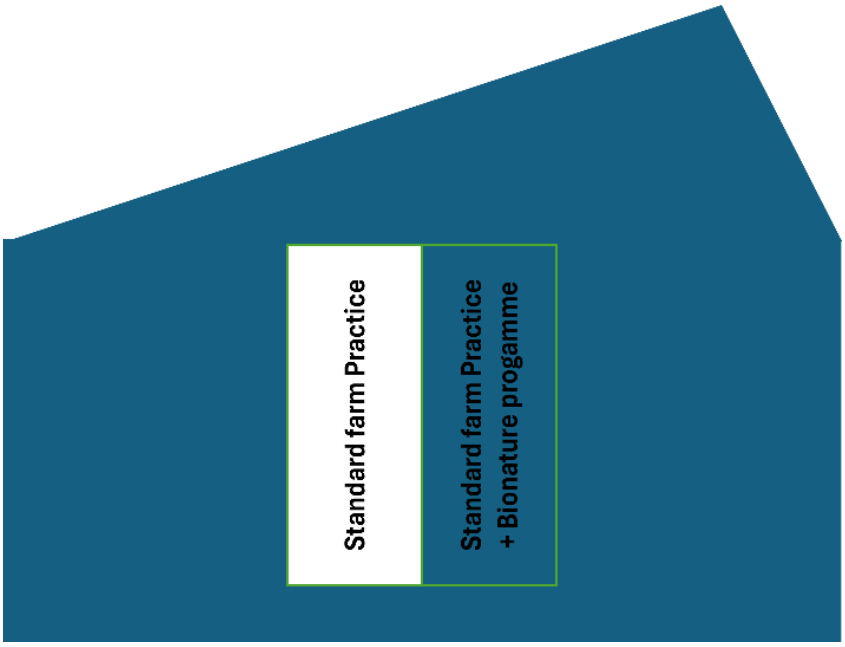


Figure 1. Example of field trial layout and data collection areas.

Farmers treated the field according to standard farm practice plus the Bionature programme, and left a "control" strip approximately 1ha large (2-3 combine header widths) in the middle of the field as a comparison. All data collection including yields and grain samples was taken from the control area and an adjacent, equally sized area as indicated by the green boxes in **Figure 1.** This provided a direct and reliable comparison of crop performance with/without Bionature products.

Due diligence was carried out whilst recruiting farmers to ensure they understood the requirements of the trial and their commitment to producing high quality data.

Application Protocol

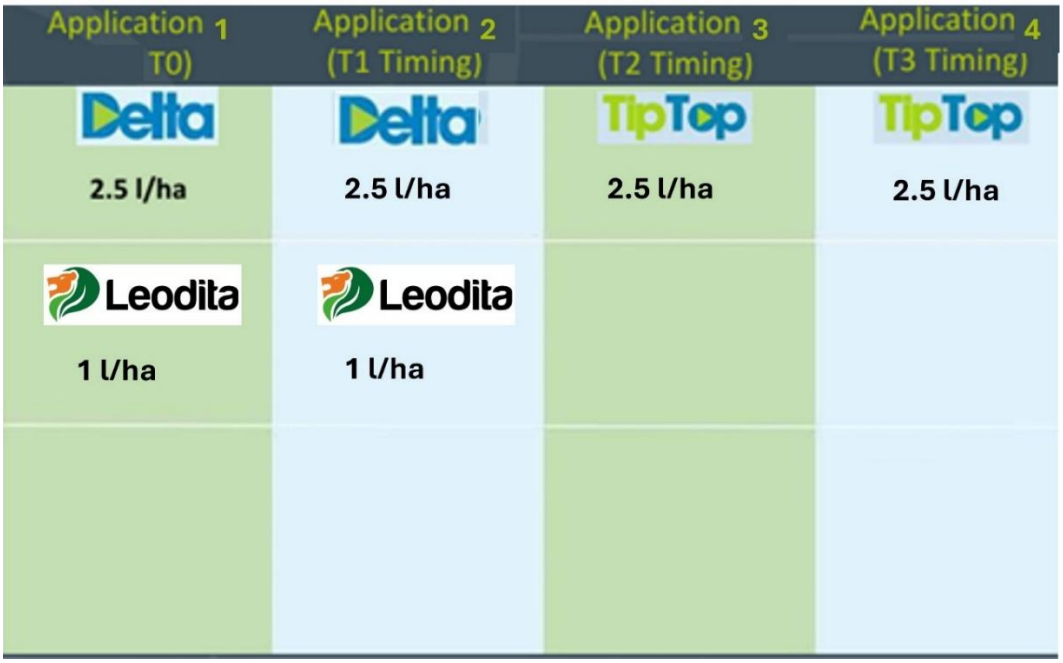


Figure 2. Application list

Data Collection

One visit per farm took place at late milk/early dough (BBCH 78-83) to assess the crop. The following assessments were made across each experimental unit split into 5 transects. Data was collected at each transect providing five data points in total per experimental unit. Field assessments were carried out by Cope Seeds. Yield data was collected by the farmers at harvest, and grain samples from each experiment strip taken and sent to Cope Seeds. Grain samples were analysed at Cope Seeds using the Infratec machine.

Assessment/unit	Method/measurement
Biomass (%)	Visual score using control as 100%
Height (cm)	Crop height in cm using a tape measure
Ear number (m2)	Ear counts along a meter row at 3 points per transect
Spikelet number /ear	Count of spikelets on 5 random ears per transect
Green leaf area (GLA) (%)	% score of green leaf area remaining
Yield (t/ha)	Grain yield from harvest collected by the farmer using combine data
Protein (%)	Grain protein on harvested grain by Infratec machine at Cope Seeds post harvest
Specific Weight (kg/hl)	Grain hectolitre weight by Infratec machine at Cope Seeds post harvest

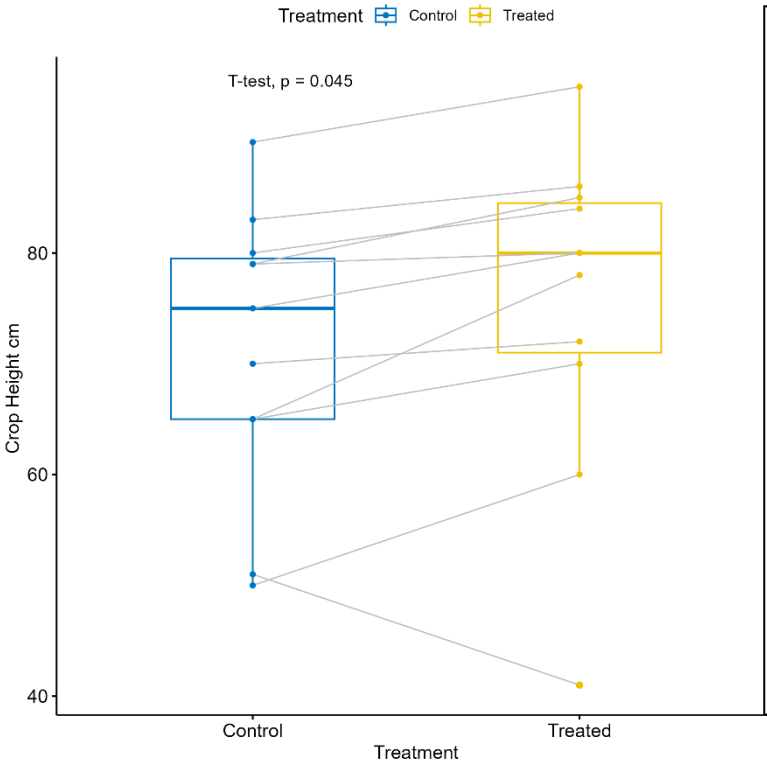
Data Analysis

All data was analysed using the R statistical software package (version 4.4.2). The statistical test performed was a paired t-test, with each experimental field (11 in total), was split into pairs, a treated and untreated block and was analysed through the “PairedData” package. The packages “ggplot2” and “ggpubr” were used to make all graphs.

Results and Discussion

The full raw dataset can be found in Appendix 1. The following is a summary of the data collected across the season, visualised in box and whisker plots to demonstrate the spread and also the paired approach of the data analysis. There are 11 “trial site” pairs on which data analysis has been carried out. T-test p-values less than or equal to 0.05 indicate a significant result (i.e. the observed effect has not occurred by chance).

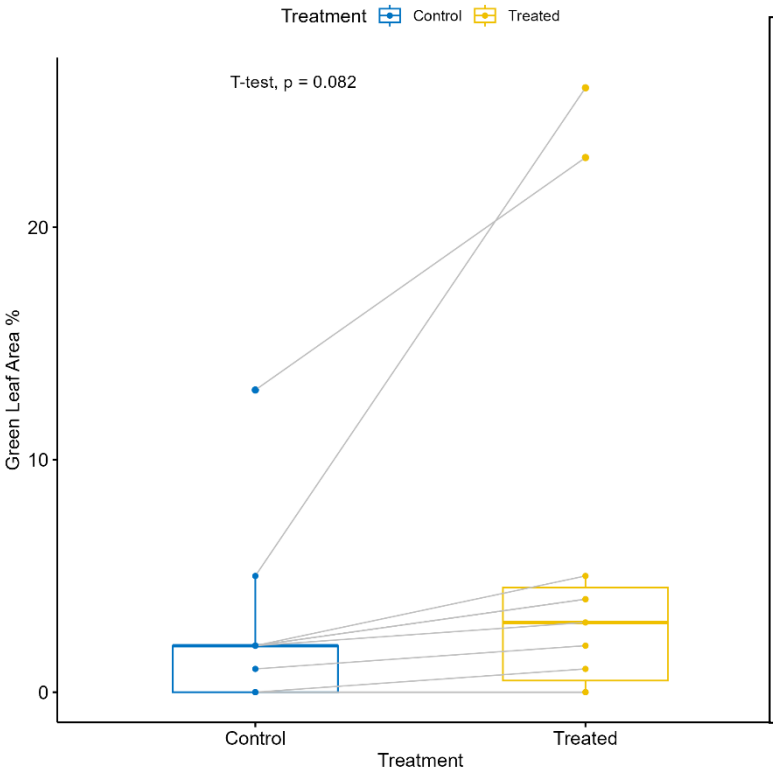
Crop Height



Crop height was significantly increased by an average of 10cm across the trials.

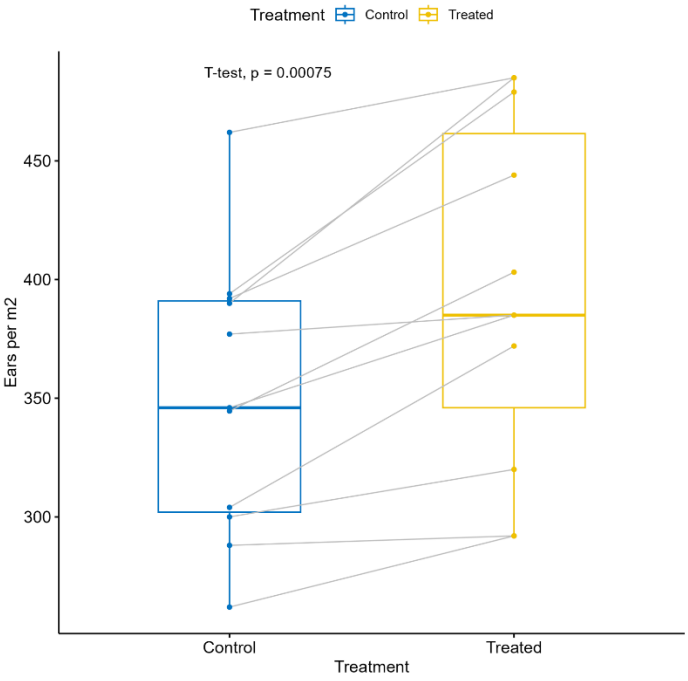
Crop height can be considered a proxy for nutrient availability with additional nitrogen allowing the crop to grow taller.

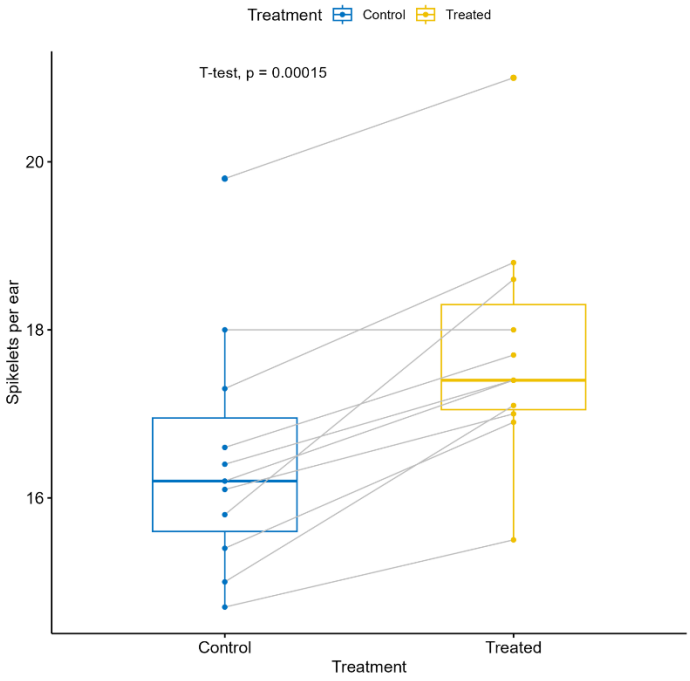
Green Leaf Area



GLA can be considered an indicator of improved crop health and reduced crop stress. There was a strong trend for an improvement in green leaf area. Though the p-value fell just short of 0.05 there was a strong indication at two sites that the treatment had caused a large improvement in GLA. These sites were visited early enough to observe these differences. Given the very dry warm spring and summer, and the increased crop stress and early crop development as a result, assessments were carried out too late to observe differences in GLA. Despite this there were modest improvements in GLA across all trial sites. For a photo

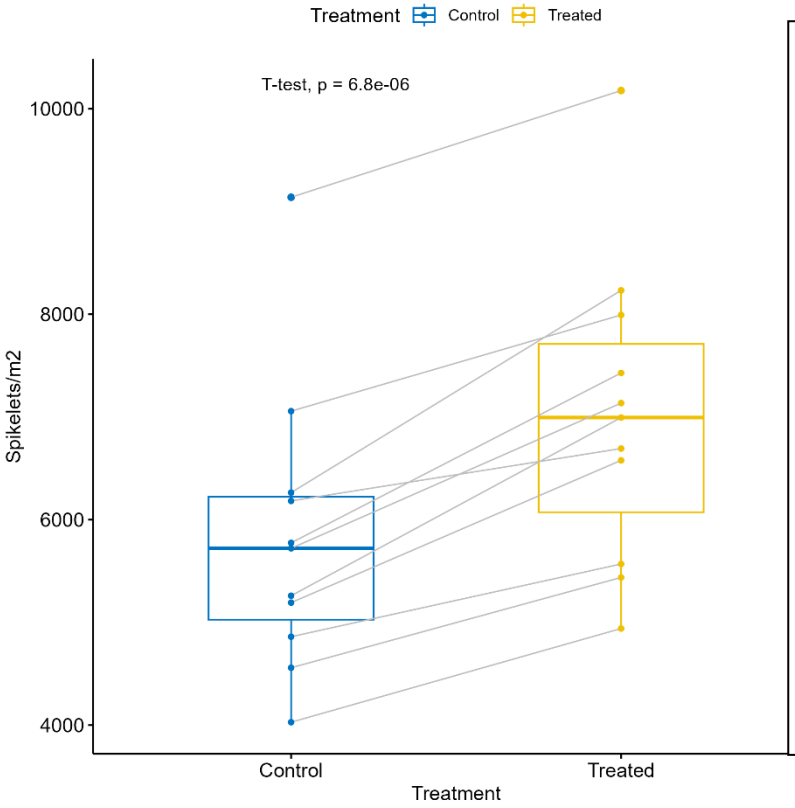
Ear number and size





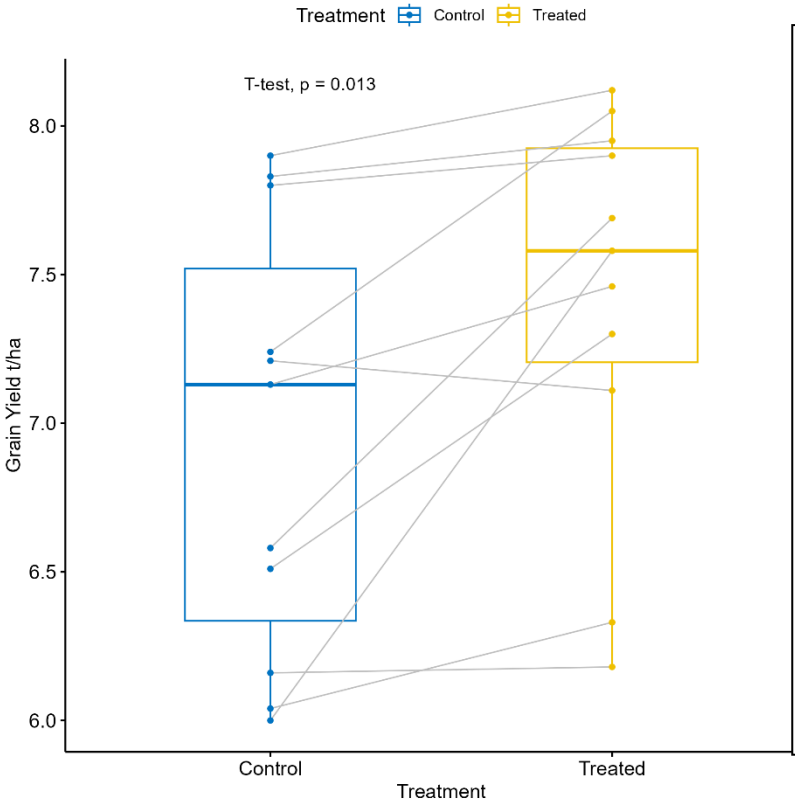
Both the number of ears per metre squared (p=0.008) and the number of spikelets per ear (0.0002) were significantly increased. These are the two most important yield components with a strong indication at the time that yield was highly likely to be improved by the Bionature treatment. There was an increase in these two characters at all trial sites. For a photo demonstrating increased spikelets per ear see Appendix 4.0

Spikelet numbers



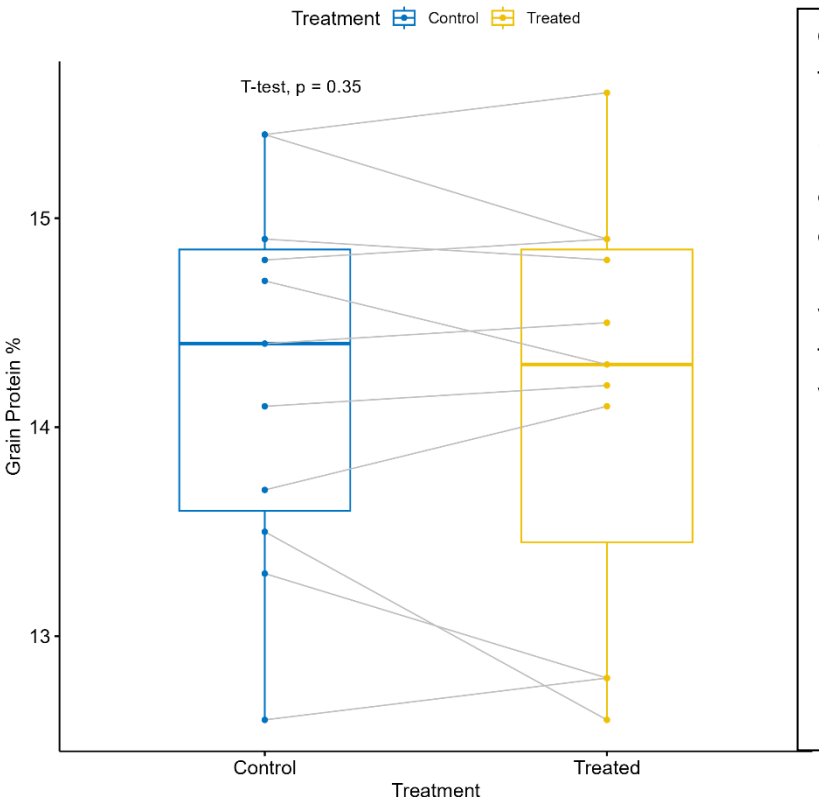
Combining ear number per metre squared and spikelets per ear provides an additional cumulative comparison for the two main yield components. There was a very strong effect on spikelet number per m2 (essentially grain number per unit area). This result was the strongest indication that the Bionature treatment would give a yield increase. IT enabled a prediction to be made of a 1.2t/ha yield gain. See Appendix 5 for yield estimates.

Grain Yield



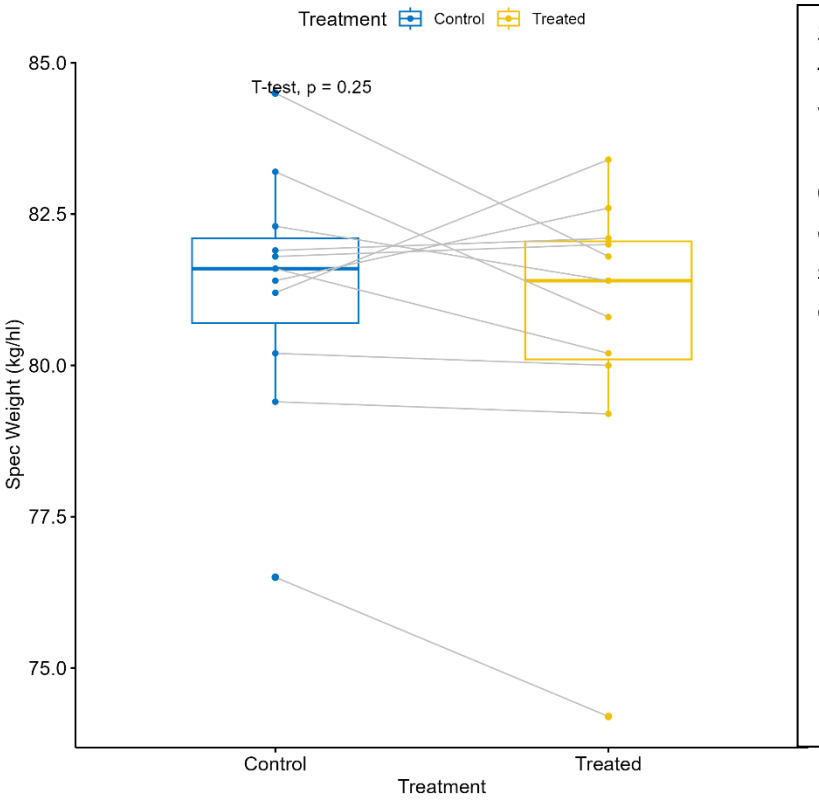
Grain Yield was significantly increased by 0.5t/ha (p=0.01). Field data and yield estimates predicted over 1t/ha increase. In a challenging season 0.5t/ha represents a £100/ha increase based on latest Nelson prices at 14% protein premium (23/9/25).

Protein



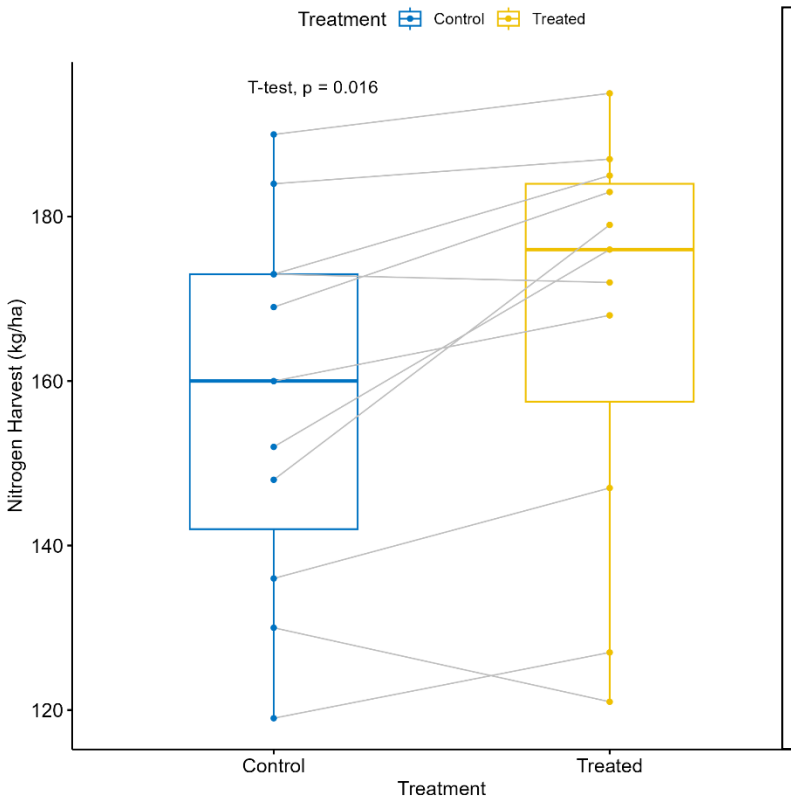
Grain Protein was left unaffected by the Bionature programme. This is a positive result considering the increased grain yield would be expected to come with a protein dilution. Proteins were above 14% providing the full milling premium with Heygates. A key question of the trials was could yield be increased without diluting protein and this has been found to be the case.

Specific Weight



Specific weights were unaffected by the Bionature programme. Spec weights were over 80kg/hl representing full breading spec (above 76kg/hl). There were good conditions for high spec weights this season (sunny, warm, late rain, low disease pressure)

Nitrogen Harvest



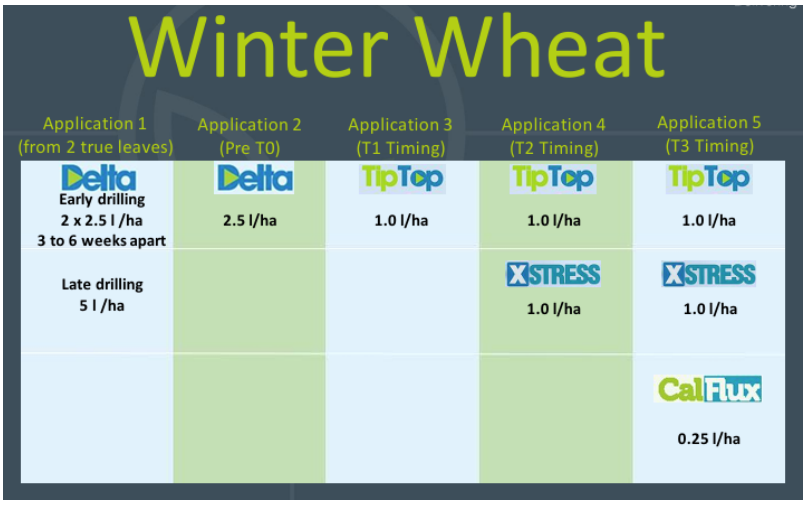
The nitrogen harvest was significantly increased by 10kg/ha (p=0.02) The programme applied last season contained 0.95 kg/ha N. This suggest that the programme has increased NUE by a moderate amount (in a poor year for nutrient uptake) Average N uptake for all trial sites was 158kg/ha (range of 120 -190kg/ha).

Conclusions

It was an extremely challenging season due to the spring/summer drought and heatwaves. Bionature products are designed to make the crop more stress tolerant but the early applications are crucial to helping the crop cope and show resilience later in the season.

Field assessments have shown improvements in, ear number per m2, spikelets per ear, crop height and green leaf area (though assessments were carried out too late to see the full effect). Harvest data showed a 0.5t/ha improvement whilst quality was left unaffected. Given the yield increase, no effect on protein can be considered a positive result. There was a significant increase in the nitrogen harvest and therefore nitrogen use efficiency of the crop.

There were some encouraging results for the trials last season with several significant improvements to characters in the field and a modest yield improvement. It should be noted that the full programme was not applied and it is the recommendation of this report that the trials be repeated in the 25/26 growing season with a similar number of trial sites, but with the full Bionature wheat nutrition programme applied.

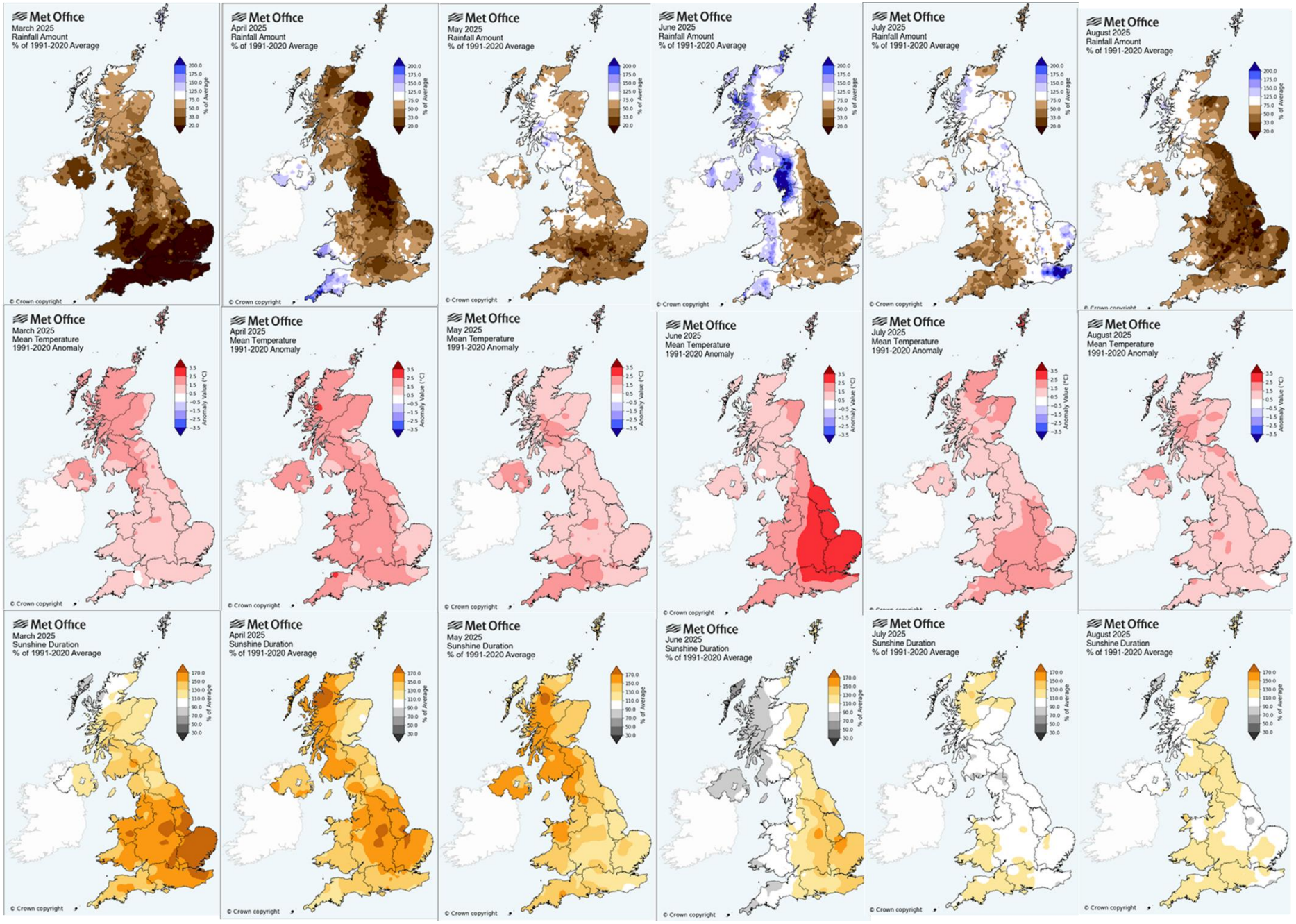


Appendix

1. Raw Data for 2025 field trials

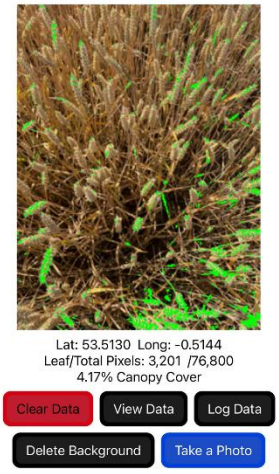
	Farmer	Field	Row W	Type	GS	GLA %	Height /cm	Ear#	Ear/m	Sp#	Sp/m2	Moist %	Raw Yield	Protein %	Spec W kg/hl	GY @15%	SpW @15%m
1	Colin Chapel	1	0.13	Control	85	5	51	51.2	394	14.7	5774	15.0	6.0	15.4	81.4	6.00	81.4
2	Colin Chapel	1	0.13	Treated	83	26	41	62.3	479	15.5	7428	14.1	7.5	14.9	81.7	7.58	82.6
3	David Parrish	2	0.13	Control	85	1	70	44.8	344.6	16.6	5721	12.8	6.0	13.5	82.4	6.16	84.5
4	David Parrish	2	0.13	Treated	83	2	72	52.4	403.1	17.7	7134	12.5	6.0	12.6	79.5	6.18	81.8
5	Doug Myers	3	0.13	Control	87	0	79	50.7	390	16.1	6263	13.6	6.4	13.3	78.9	6.51	80.2
6	Doug Myers	3	0.13	Treated	87	0	85	63.1	485	17.0	8232	13.8	7.2	12.8	78.9	7.30	80.0
7	Ian Clarke	4	0.13	Control	85	2	65	49.0	377	16.4	6182	14.8	6.6	14.4	81	6.58	81.2
8	Ian Clarke	4	0.13	Treated	83	5	78	50.0	385	17.4	6692	14.0	7.6	14.5	82.5	7.69	83.4
9	Ian Clarke	5	0.13	Control	85	2	65	45.0	346	15.0	5192	13.9	7.2	14.7	80.6	7.24	81.6
10	Ian Clarke	5	0.13	Treated	83	4	70	50.0	385	17.1	6577	14.2	8.0	14.3	79.5	8.05	80.2
11	Martin Smith	6	0.13	Control	85	13	90	60.0	462	19.8	9138	13.9	7.7	14.9	82.1	7.80	83.2
12	Martin Smith	6	0.13	Treated	85	23	95	63.0	485	21.0	10177	15.0	7.9	14.8	80.8	7.90	80.8
13	Martin Smith	7	0.25	Control	87	0	75	98.0	392	18.0	7056	13.6	7.7	15.4	81	7.83	82.3
14	Martin Smith	7	0.25	Treated	87	0	80	111.0	444	18.0	7992	13.4	7.8	15.6	79.9	7.95	81.4
15	Peter Brown	8	0.25	Control	87	0	50	75.0	300	16.2	4860	12.4	5.9	12.6	79.5	6.04	81.9
16	Peter Brown	8	0.25	Treated	87	0	60	80.0	320	17.4	5568	12.7	6.2	12.8	79.9	6.33	82.1
17	Tristan Ashby	9	0.25	Control	87	0	83	76.0	304	17.3	5259	15.0	7.9	13.7	76.5	7.90	76.5
18	Tristan Ashby	9	0.25	Treated	87	1	86	93.0	372	18.8	6994	15.8	8.2	14.1	75	8.12	74.2
19	Will Smith	10	0.13	Control	83	2	79	34.0	262	15.4	4028	14.6	7.1	14.1	81.4	7.13	81.8
#	Will Smith	10	0.13	Treated	83	4	80	38.0	292	16.9	4940	14.4	7.4	14.2	81.4	7.46	82.0
21	Will Smith	11	0.13	Control	85	2	80	37.5	288	15.8	4558	16.1	7.3	14.8	80.4	7.21	79.4
#	Will Smith	11	0.13	Treated	85	3	84	38.0	292	18.6	5437	16.1	7.2	14.9	80.3	7.11	79.2

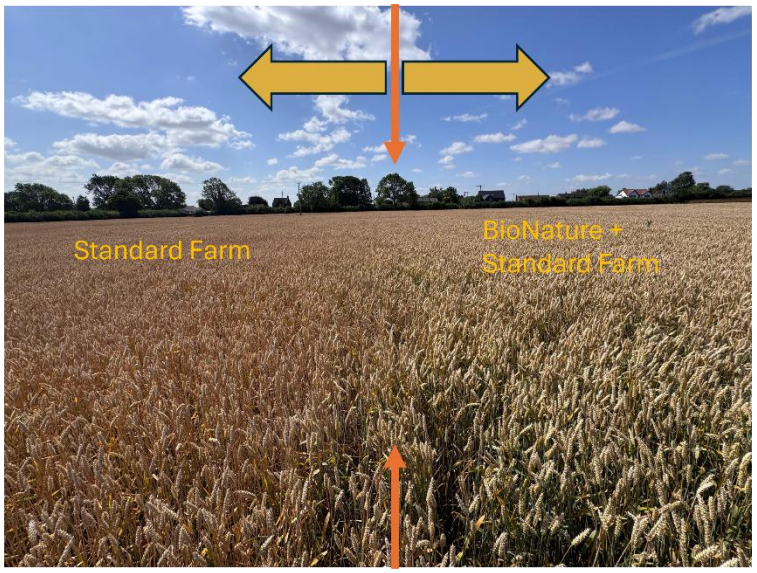
2. Climate averages over the six months of the trials (Met Office monthly average compared to 30 year average)



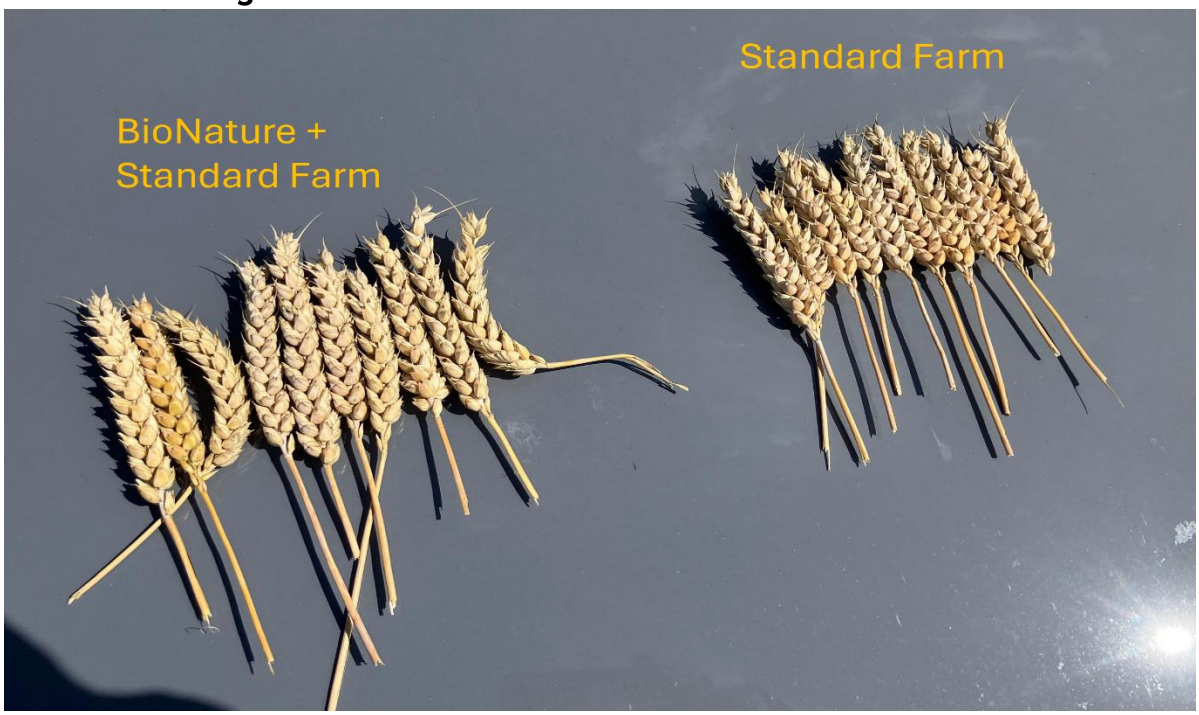
3. A. Photo showing improved GLA at Martin Smith's.

B. Photos and NDVI from Chappel Farm showing increase in GLA from Bionature treatment





4. A. Photo showing increased ear size at Ian Clarke's



5. Yield estimates calculated from Spikelets/m2 compared to actual yield results.