NSW GOVERNMENT | Department of Primary Industries

AgGrow
AGRONOMY + RESEARCH

NSW DPI NUTRITION TRIALS

Merriwagga and Rankins Springs 2014

INDEPENDENT AGRONOMY ADVICE + CUTTING EDGE RESEARCH

Nitrogen and Sulfur Response Trials

KEY POINTS

* Nutritional strategies need to be fine tuned in marginal cropping areas to achieve the highest return on investment and minimise the risk.

* Nitrogen is still the most limiting nutrient to crop growth. There was a response to increasing pre-drilled nitrogen rates at Merriwagga. No yield responses were found by adding sulfur.

* Splitting nitrogen applications (pre-drilling before sowing and topdressing), at Rankins Springs gave a slight yield response over applying all nitrogen before sowing. Grain protein was higher where all nitrogen was pre-drilled before sowing.

BACKGROUND

Nutrition trials have shown a 300% return on investment from nitrogen in previous years.

In marginal cropping environments nutrition strategies need to be fine tuned to achieve the highest return on investment at the lowest risk.

Nitrogen and sulfur are just two of the major plant nutrients essential for crop growth.

TRIAL DETAILS

Two nutrition trials were established in the area in 2014. A nitrogen and sulfur response trial was established at Jeffrey Muirhead's, Merriwagga and a nitrogen response trial was established at Michael Pfitzner's, in the Rankins Springs area. These trials are part of NSW DPI's nutrition project.

The aim of these trials is to validate various nitrogen and sulfur nutrition strategies in the local environment.

Merriwagga:

The soil test results for this site were:

Nitrogen (total 0-60cm)	35.58 kg N/ha
Phosphorus (Colwell)	23 mg/kg P
Sulfur	2ppm
pH ($CaCl_2$)	5.1

Suntop wheat and Buloke barley were sown on the 1st May at 30 kg/ha. They were sown with 100 kg/ha of Trifos (equivalent to 20 kg/ha P).

A combination of nitrogen and sulfur treatments were randomly placed across the trial. There were four nitrogen treatments (0, 50, 100 and 150 kg N/ha) and four sulfur treatments (0, 10, 20 & 40 kg S/ha). The nitrogen treatments were pre-drilled before sowing, whilst the sulfur treatments were applied before the first rain. The growing season rainfall was 236.1mm. It was harvested on 30th October.

The trial was replicated three times.

Rankins Springs:

The soil test results for this site were:

Nitrogen (total 0-60cm)	132.48 kg N/ha
Phosphorus (Colwell)	44 mg/kg P
Sulfur	7ppm
pH ($CaCl_2$)	5.7

Suntop wheat was sown on 19th May at 30 kg/ha. It was sown with 100 kg/ha of Trifos (equivalent to 20 kg/ha P). This trial consisted of seven treatments replicated four times. The treatments were:

1) Control (N0) - no nitrogen was applied
2) N1 - 50 kg N/ha
3) N2 - 100 kg N/ha
4) N3 - 150 kg N/ha
5) N1 Split - 25 kg N/ha + 25 kg N/ha
6) N2 Split - 50 kg N/ha + 50 kg N/ha
7) N3 Split - 75 kg N/ha + 75 kg N/ha

The nitrogen treatments were pre-drilled before sowing, with the exception of the split treatments which had half of the nitrogen topdressed after sowing. It was applied before a predicted rain event on 22nd July when the crop was at the 4-5 tiller stage.

This trial had a lot of nitrogen applied. It also recieved a blanket topdressing of 60 kg N/ha towards the end of July.

The growing season rainfall was 236mm. It was harvested on 20th November.

Plot sizes for both trials were 1.75m x 12m. The trials were sown with a Morris Contour Drill plot seeder with 25cm row spacings x 7 rows.

Figures 1 and 8 show the effect of insufficient nitrogen on crop growth at Merriwagga, with Suntop wheat 0kg N/ha and 50kg N/ha treatments being compared (figure 1) and Buloke barley 0kg N/ha and 100kg N/ha being compared (figure 8).

Figure 1: Suntop wheat with 50 kg N/ha pre-drilled (left) v Suntop wheat nil N (right) at Merriwagga.

RESULTS AND DISCUSSION

Statistical analysis was carried out on the Merriwagga nitrogen and sulfur trial for grain yield. Significant differences were found for nitrogen rate. No significant differences were found for sulfur rate or for the interaction of nitrogen and sulfur. At the time of writing grain quality analysis was yet to be completed.

No statistical analysis was carried out on the Rankins Springs nitrogen trial. Below is a discussion of the observations of each of these trials.

Merriwagga NxS trial:

Establishment:

Establishment counts were carried out on 5th June, when the crop was at the early tillering stage (Figure 2). The overall average establishment count for the trial was 70 plants/m^2, with Buloke averaging 63 plants/m^2 and Suntop averaging 77 plants/m^2.

The highest plant count for barley was 74 plants/. m^2, which came from the 100kg N/ha plus 40kg S/ha treatment. The lowest plant count came from the 0kg N/ha plus 10kg S/ha treatment with 51 plants/m^2.

For the wheat the highest plant count came from the 100kg N/ha plus 20kg S/ha treatment, with 89 plants/m^2. The lowest plant count came from 50kg N/ ha plus 40kg S/ha treatment, with 65 plants/m^2.

Grain Yield:

The average grain yield for Merriwagga was 2.38 t/ha, with Buloke barley averaging 2.37 t/ha and Suntop wheat averaging 2.39t/ha.

Figure 3 shows the individual yields for each of the nitrogen and sulfur treatment combinations for barley and wheat. The highest yield for Buloke was the 150kg N/ha plus 0kg S/ha treatment, yielding 3.07 t/ ha. The lowest yield was the 0kg N/ha plus 0kg S/ha treatment, yielding 1.23 t/ha. For Suntop the highest yielding treatment was 150kg N/ha plus 0kg S/ha and the lowest was the 0kg N/ha plus 10kg S/ha treatment, yielding 1.48 t/ha.

The treatment which gave a significant difference was nitrogen rate by grain yield (Ffigure 4). There was a rate response to increasing nitrogen. All nitrogen rates were significantly different to each other, with the exception of the 100kg N/ha and the 150kg N/ha rate which were not significantly different. Yields ranged from 1.61 t/ha for the 0kg N/ ha rate to 2.9 t/ha for the 150kg N/ha rate.

Figure 2: Establishment counts for Buloke barley and Suntop wheat for each NxS combination

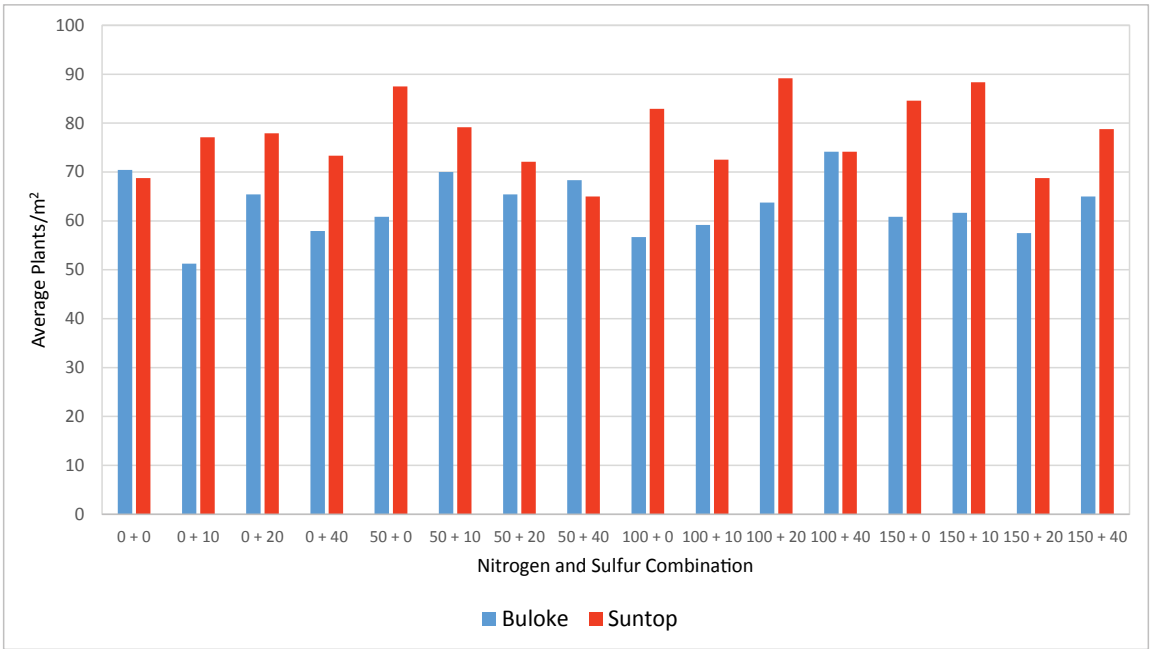


Figure 3: Average grain yield for Buloke barley and Suntop wheat for each NxS combination

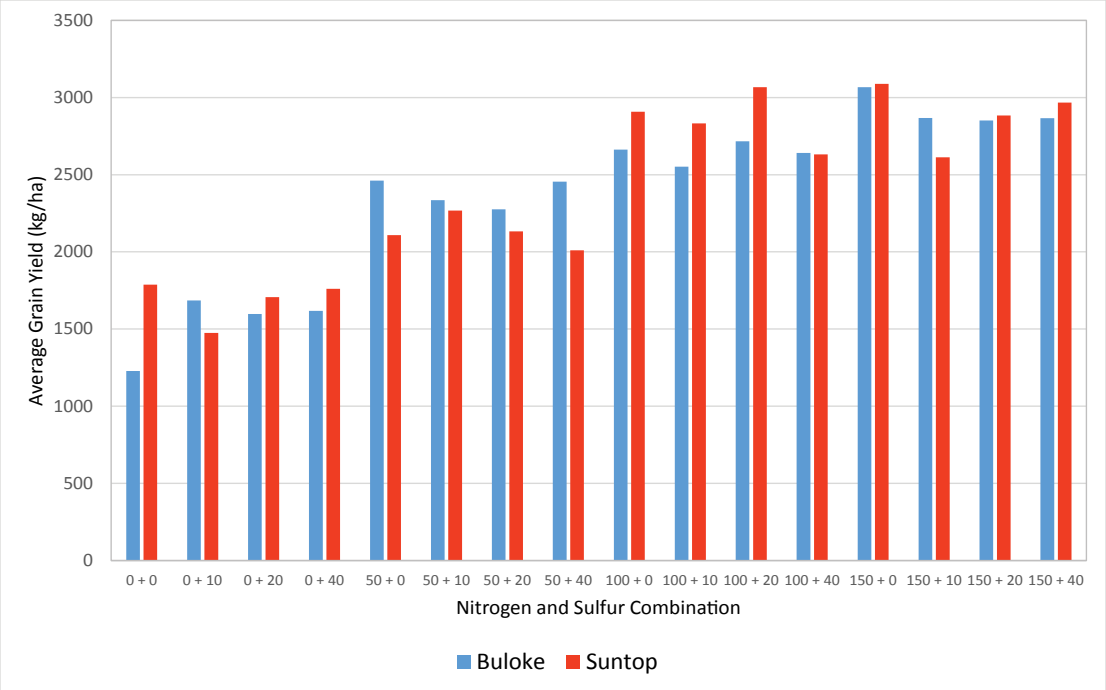
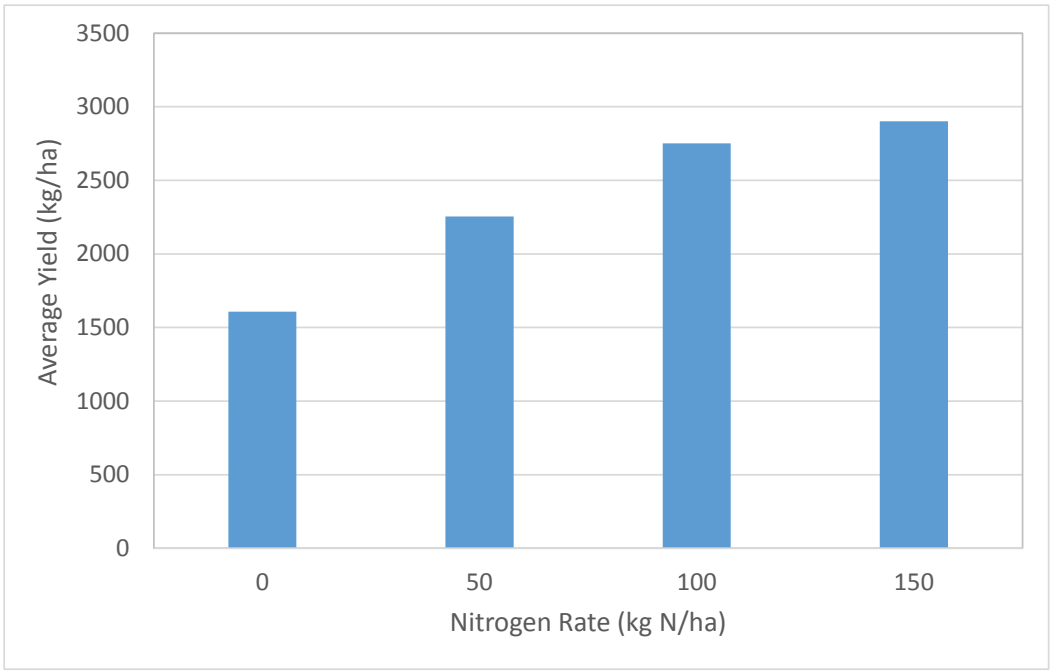


Figure 4: Average grain yield for each nitrogen treatment



Rankins Springs N trial:

Establishment:

Establishment counts were carried out on 5th June (Figure 5). The overall average establishment count for the trial was 113 plants/m^2.

The highest plant count was 119 plants/.m^2, which came from both the N1 split treatment (25 kg N/ ha pre-drilled + 25 kg N/ha topdressed) and the N2 treatment (100kg N/ha pre-drilled). The lowest plant count came from the N2 split treatment (50 kg N/ha pre-drilled + 50kg N/ha topdressed) with 103 plants/ m^2.

Grain Yield:

Grain yield for the split nitrogen treatments were slightly higher than where the nitrogen was not split, figure 6.

Grain yield ranged from 2.98 t/ha up to 3.45 t/ha. The average grain yield was 3.17 t/ha. The highest yielding treatment was the N2 Split treatment, where 50kg N/ha was pre-drilled before sowing and 50kg N/ha was topdressed.The lowest yielding treatment was the N3 treatment, where 150kg N/ha was pre-drilled before sowing.

Grain Protein:

Grain protein averaged 11.96% for this trial, ranging from 11.02% for the control (N0) treatment to 12.63% for the N3 (150kg N/ha) treatment.

The nitrogen treatments that were not split had a slightly higher protein than the treatments which were split (Figure 7).

When interpreting these results it is important to remember that the trial recieved a blanket nitrogen topdressing of 60kg N/ha in late July.

Figure 5: Average establishment count for each nitrogen treatment

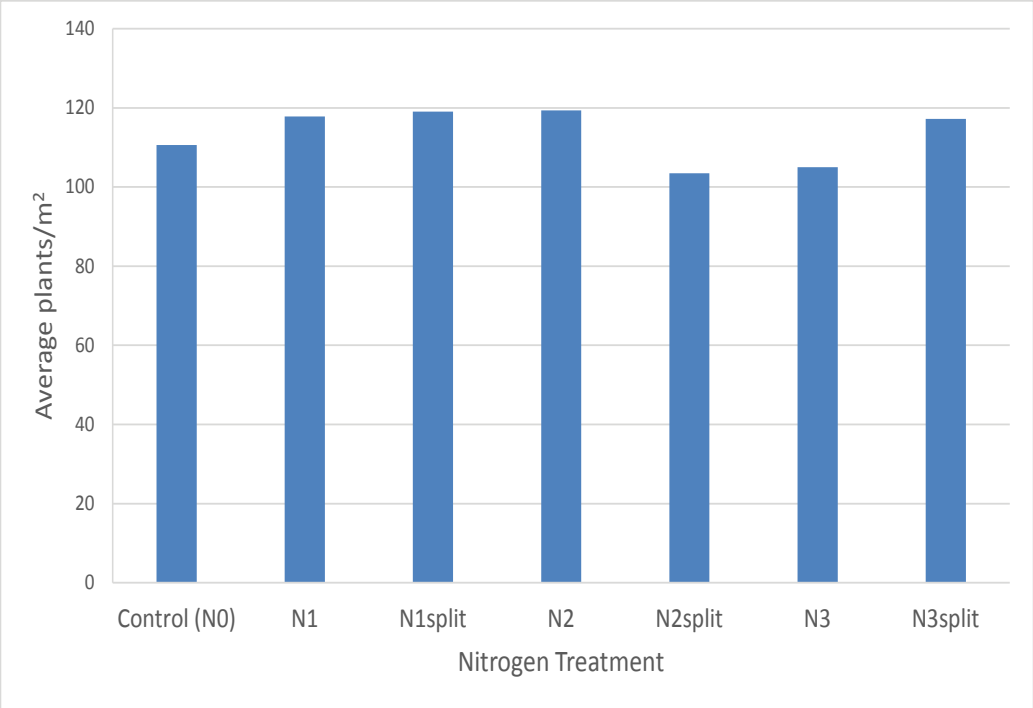


Figure 6: Average grain yield for each nitrogen treatment

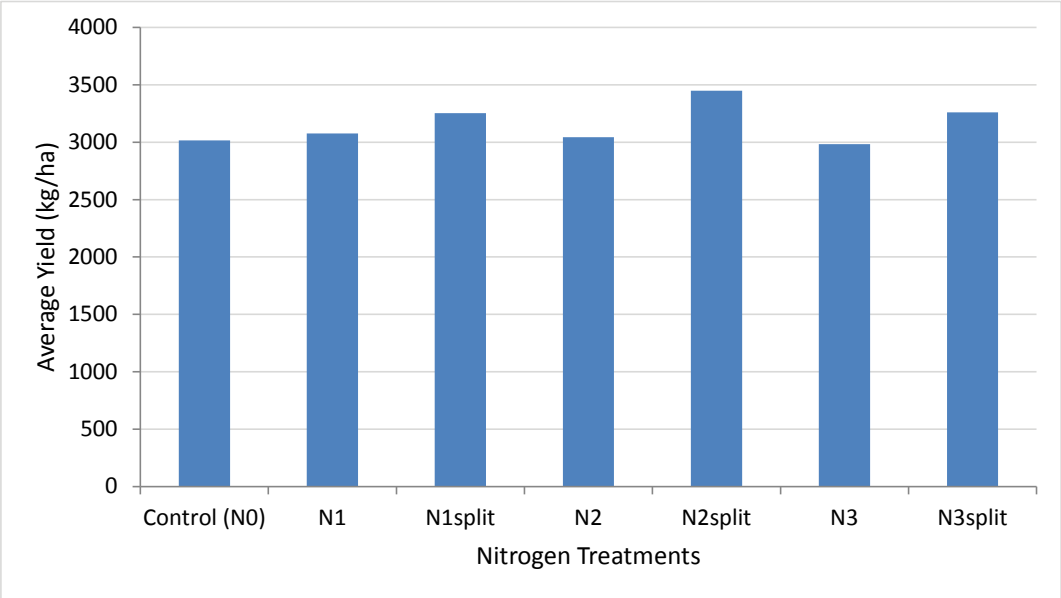


Figure 7: Average grain protein for each nitrogen treatment

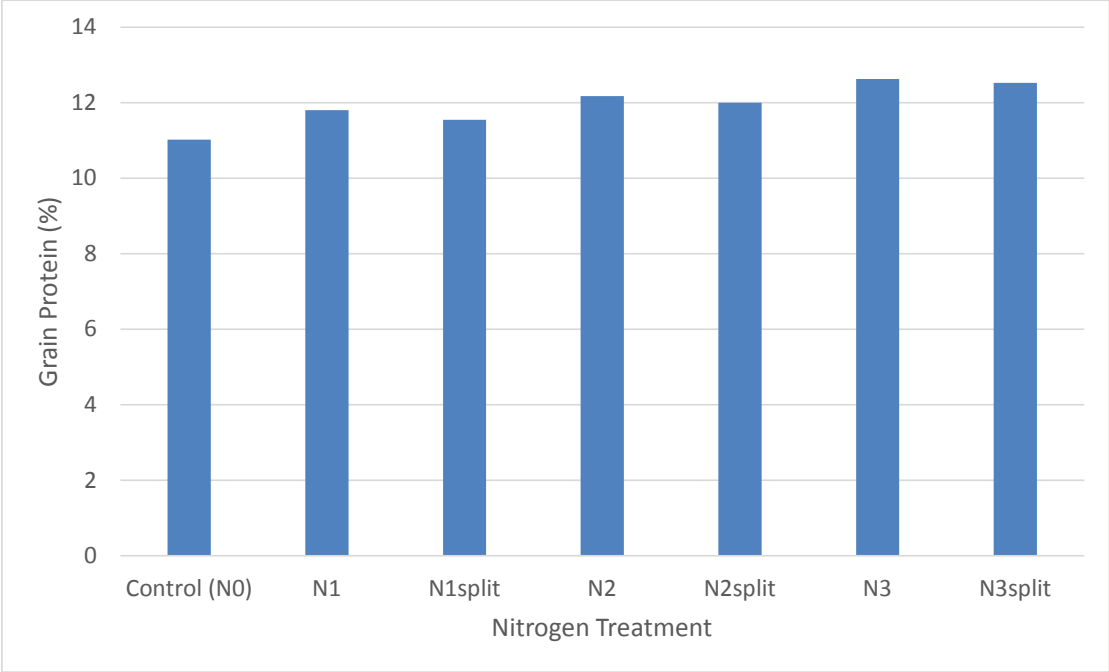


Figure 8: Buloke barley with 0kg N/ha (left) v Buloke barley with 100kg N/ha (right)

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