

These trials are part of a comprehensive programme undertaken to measure the effect of the LessN system on Nitrogen fertiliser response in pasture.

- To date there have been 51 fully replicated trials conducted in New Zealand.
- 10 Trials have been conducted by leading crown research organisations
- 41 have been conducted by Donaghys scientific team or independent agronomy contractor, Grassworks.
- The trials conducted by Donaghys have been audited byASUREQUALITY, who reported that “the adopted trial design and statistical analysis are scientifically robust”.

Four trials (Three independent and one Donaghys) returned insignificant response against control for both Nitrogen alone and the LessN system.

Mean of 46 trials with N response

| Trial | Dry Matter Kg / ha / day | | | | Nitrogen Response | | |
|-------|--------------------------|---------|---------|----------|-------------------|---------|----------|
| Days | Control | Urea 40 | Urea 80 | LessN 40 | Urea 40 | Urea 80 | LessN 40 |
| 24 | 39 | 42 + | 58 | 59 | 10.1 + | 12.3 | 25.4 |

1 Introduction

Two trials were conducted to investigate the effect of LessN on pasture growth in summer 2008. For comparison, a standard urea fertiliser was included in the treatment combinations. LessN is a bio-stimulant manufactured by Donaghys Industries Ltd. The two trials were carried out on highly productive dairy farms in Canterbury (trial 1) and Waikato (trial 2). Specific details of the trial sites are in the following section.

2 Site description

2.1 Trial 1 Canterbury

Trial 1 was carried out at [REDACTED] Mid-Canterbury on a Waimakariri sandy loam soil. The treatments were applied to an established high producing pasture, which has historically been grazed by dairy cows. The main species within the pasture were permanent ryegrass and white clover. The paddock was irrigated via centre pivot at a rate of approximately 5mls per day. The paddock chosen was of high fertility with an annual application of 250kg/ha Sulphur Super 20 + Selenium prills. Eco-N (nitrification inhibitor) is also applied annually. The last application of Urea was applied to the site on the 13th December 2007. This paddock receives dairy shed effluent through the centre pivot on a regular basis (although this was stopped whilst the trial was being carried out).

Figure 2.1: Trial site 1 at [REDACTED], Canterbury showing trial plots being sprayed with the various treatments, 1st February 2008.



2.2 Trial 2 Waikato - Dairy

Trial 2 was carried out at [REDACTED], Arapuni in central Waikato on Tirau ash on free draining sand. Treatments were applied to established high producing pasture which has been used for dairy cow grazing for many years. The main species within the trial paddock is permanent ryegrass and white clover. The paddock is irrigated with a Bosch long lateral irrigation system at a rate of 5mL/day. Water comes from the Little Waipa Stream which runs down the boundary of the property. The last application of urea was on 26th December 2007 (23 kg nitrogen/ha).

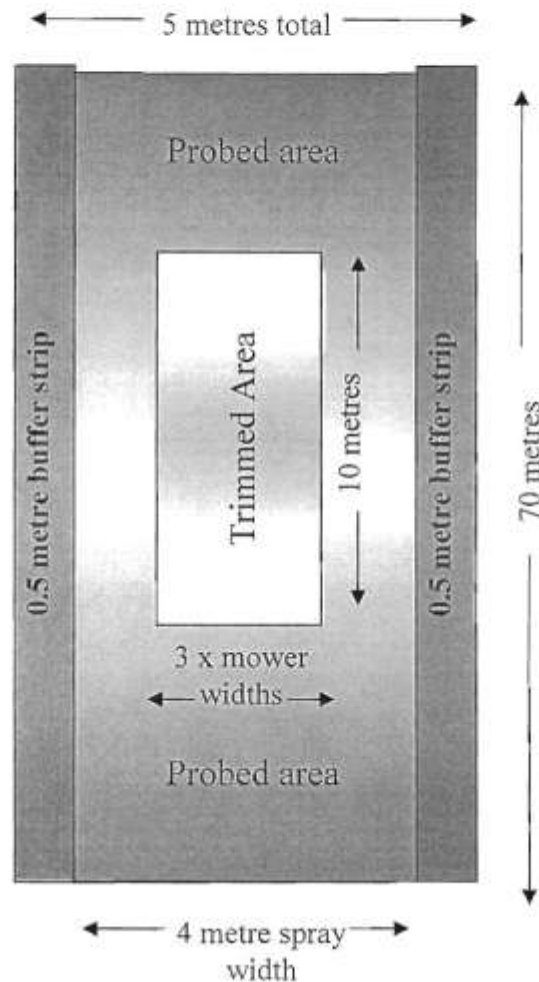
3 Trial design

Four treatments were randomly allocated in a randomised block design with five replicates (Table 3.1). The same design was used for both trials. Each plot was 70m x 4m (280m²) with a 0.5 metre buffer strip between each plot. (Fig 3.1).

Table 3.1: Trial Design for Donaghys LessN Trials 2008

| Plot No | Rep | Treatment No | Treatment |
|---------|-----|--------------|------------------------------|
| 1 | 1 | 2 | 40 kg/ha Urea + 3 l/ha LessN |
| 2 | 1 | 1 | Control (NO Urea or LessN) |
| 3 | 1 | 3 | 80 kg/ha Urea |
| 4 | 1 | 4 | 40 kg/ha Urea |
| 5 | 2 | 2 | 40 kg/ha Urea + 3 l/ha LessN |
| 6 | 2 | 3 | 80 kg/ha Urea |
| 7 | 2 | 4 | 40 kg/ha Urea |
| 8 | 2 | 1 | Control (NO Urea or LessN) |
| 9 | 3 | 2 | 40 kg/ha Urea + 3 l/ha LessN |
| 10 | 3 | 4 | 40 kg/ha Urea |
| 11 | 3 | 3 | 80 kg/ha Urea |
| 12 | 3 | 1 | Control (NO Urea or LessN) |
| 13 | 4 | 4 | 40 kg/ha Urea |
| 14 | 4 | 3 | 80 kg/ha Urea |
| 15 | 4 | 1 | Control (NO Urea or LessN) |
| 16 | 4 | 2 | 40 kg/ha Urea + 3 l/ha LessN |
| 17 | 5 | 4 | 40 kg/ha Urea |
| 18 | 5 | 1 | Control (NO Urea or LessN) |
| 19 | 5 | 3 | 80 kg/ha Urea |
| 20 | 5 | 2 | 40 kg/ha Urea + 3 l/ha LessN |

Figure 3.1: Plot layout showing 1) centrally located trimmed area (used for actual Dry Matter yields and estimated pasture growth) and 2) probed area (used for pasture cover, estimated Dry Matter measurements and pasture composition).



All fertiliser treatments were dissolved in warm tap water and applied at a rate of 200 litres/ha. The control had no urea or LessN applied but water was applied at 200 litres/ha.

The nitrogen fertiliser was Urea (46-0-0) supplied by Ravensdown Fertiliser Co-operative Ltd.

Paddocks were grazed evenly with dairy cattle and/or topped prior to the commencement of the trial. The trial was grazed with dairy cows to fit in with the normal grazing rotation of the farm. This was 18 days for both trial farms during the trial. The minimum pasture cover was at least 1200 kg/DM/ha at the beginning of the trial.

4 Measurements

The following measurements were taken prior to fertiliser application (day 1).

- *Pasture species composition.* Random clips were taken from each plot using hand shears. The clipped pasture was then sub-sampled, dissected, dried and weighed.
- *Pasture cover.* At site 1 (Canterbury) 80 random pasture probe (Tru-Test: GrassMaster II) readings were taken from around the outside of the trim area of each plot.
- *Trim area preparation.* An area measuring 10 m by 3 mower widths was trimmed in the middle of each plot (Fig. 3.1). Thirty probe/plate readings were taken after mowing to determine the residual pasture mass.

The following measurements were taken from each plot (at day 18 and 34 for the Canterbury site and 16 and 33 from the Waikato site).

- *Actual dry matter yield.* One strip was cut using a rotary mower from the trimmed area in the middle of each plot. The cut material was weighed green and a sub-sample was removed to calculate dry matter percent. This sub-sample was weighed green, dried and weighed again.
- *Estimated dry matter yield.* Thirty pasture probe/plate readings were taken to measure pre and post-cutting pasture mass from within the trim area of each plot. This probe/plate data was used to derive the calibration equations to calculate pasture growth from the outer plot area. Sixty probe readings were taken from the outer plot area in Canterbury. The probe readings were repeated after the cows had grazed the plots at day 19 in Canterbury.

5 Results

5.1 Estimated pasture growth

Average pasture growth as estimated by mower yield and probe/plate data for both sites (Table 5.2).

Table 5.1: Mean pasture growth (kg DM/ha/day) for site 1 (Canterbury) and site 2 (Waikato). LSD is Least Significant Difference. Treatments within a date-site with differing letters are significantly different (P<0.05).

| | Sampling date | Day | Treatment | Mower Pasture Growth (kg DM/ha/day) | Probed Pasture Growth (kg DM/ha/day) |
|---------------------|---------------|-----|----------------------------|-------------------------------------|--------------------------------------|
| Site 1 (Canterbury) | 18/02/08 | 18 | Control | 38.0 a | 58.7 b |
| | | | 40kg/ha Urea | 49.5 a | 65.3 ab |
| | | | 80kg/ha Urea | 52.3 a | 73.2 ab |
| | | | 40kg/ha Urea + 3L/ha LessN | 49.3 a | 75.7 a |
| | | | LSD 5% | 16.2 | 14.4 |
| | 06/03/08 | 34 | Control | 57.5 a | 37.0 a |
| | | | 40kg/ha Urea | 57.1 a | 42.0 a |
| | | | 80kg/ha Urea | 57.7 a | 52.5 a |
| | | | 40kg/ha Urea + 3L/ha LessN | 49.6 a | 38.8 a |
| | | | LSD 5% | 18.1 | 21.9 |
| Site 2 (Waikato) | 20/02/08 | 16 | Control | 46.5 a | |
| | | | 40kg/ha Urea | 44.7 a | |
| | | | 80kg/ha Urea | 51.98 a | |
| | | | 40kg/ha Urea + 3L/ha LessN | 51.12 a | |
| | | | LSD 5% | 15.8 | |
| | 09/03/08 | 33 | Control | 78.5 ab | |
| | | | 40kg/ha Urea | 77.7 b | |
| | | | 80kg/ha Urea | 94.6 a | |
| | | | 40kg/ha Urea + 3L/ha LessN | 88.5 ab | |
| | | | LSD 5% | 15.0 | |

Donaghys Note:

There was a greater grazing of the LessN treated area compared to all other treatments (statistically significantly greater than control) and this corresponds to findings on other experiments. It seems likely, in Donaghys' opinion, that the intensive one day grazing in this experiment led to a lag in growth on the LessN treatment plots that has not been seen in other extended LessN trials in Canterbury.

5.2 Pasture Composition

Pasture composition results for both sites are shown in table 5.3.

Table 5.2: Mean pasture composition for site 1 (Canterbury) and site 2 (Waikato) on day 1 of trial.

| | Sampling Date | Day | Green Leaf % | Green Stem % | Clover % | Dead % | Weed % |
|---------------------|---------------|-----|--------------|--------------|----------|--------|--------|
| Site 1 (Canterbury) | 31/01/08 | 1 | 67.1 | 0.0 | 17.7 | 0.9 | 14.3 |
| Site 2 (Waikato) | 02/02/08 | 1 | 53.3 | 2.1 | 12.4 | 17.8 | 14.4 |