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# Spread and Spray Trial – North Canterbury

The trial was on an Eyrewell dairy farm. It was started on 27th November 2008 and finished on 13th January 2009. The trial area was borderdyke irrigated ryegrass-white clover based pasture under normal dairying conditions. Residual pasture dry matter base line was recorded on 27th November and pasture growth was assessed on Day 11, 21 and 47 without grazing (as the pasture progressed through to a hay crop).

The objective was to measure the relative effect of spreading and spraying of differing urea rates (with or without LessN) on pasture growth.

The trial comprised 10 treatments in a randomised block design (Table 1) with 5 replications that provided a total 50 plots. One soil sample each was collected for plots 1-25 and 26-50. The soil test report shows a marked difference in N and K levels in both trial rows (see soil reports at the end) as could be expected in a borderdyke irrigated situation (plots 26 to 50 were closer to the water source and are likely to be more prone to leaching).

## Results

The results are presented in Table 1. Nitrogen response was calculated on the kg of dry matter grown per kg of nitrogen applied. Growth rates of the pasture were not high but there was generally a good response to application of nitrogen.

Table 1: Pasture dry matter assessed by Grass master probe on Day 11, 21 and 47.

| **Treatment*** | **Dry matter (DM) kg/ha**** | | | **N Response kg DM/kg N** |
|---|---|---|---|---|
| | **Day11** | **Day 21** | **Day 47** | |
| Control | 84 $^{c}$ | 567 $^{e}$ | 605 $^{de}$ | |
| LessN | 88 $^{c}$ | 577 $^{e}$ | 576 $^{e}$ | |
| Sprayed Urea 40 | 303$^{ab}$ | 703$^{cde}$ | 966$^{abc}$ | 19.6 |
| Spread Urea 40 | 228$^{bc}$ | 664 $^{de}$ | 738$^{cde}$ | 7.2 |
| Sprayed LessN 40 | 397 $^{a}$ | 907 $^{a}$ | 1150 $^{ab}$ | 29.6 |
| Spread LessN 40 | 260$^{ab}$ | 716$^{cde}$ | 866$^{bcd}$ | 14.2 |
| Sprayed Urea 80 | 271$^{ab}$ | 737$^{bcd}$ | 875$^{bcd}$ | 7.3 |
| Spread Urea 80 | 256$^{ab}$ | 822$^{abc}$ | 1024$^{abc}$ | 11.4 |
| Sprayed LessN 80 | 414 $^{a}$ | 874 $^{ab}$ | 1176 $^{a}$ | 15.5 |
| Spread LessN 80 | 354$^{ab}$ | 749$^{bcd}$ | 1104 $^{ab}$ | 13.6 |
| | | | | |
| **LSD 5%** | **166** | **153** | **288** | |
| **P** | **0.002** | **<0.001** | **<0.001** | |

* In Spread treatments, urea was applied as granules direct to the soil surface of each plot. Where LessN was applied, this was with dissolved urea in the sprayed treatments and with an equivalent amount of volume of water (200 L/ha) when nitrogen was not sprayed. The 40 and 80 values refer to kg of urea applied (40 kg/ha urea or 80 kg/ha urea.

** Treatments within the same column that share the same letter are not statistically significantly different from each other (95% confidence level).

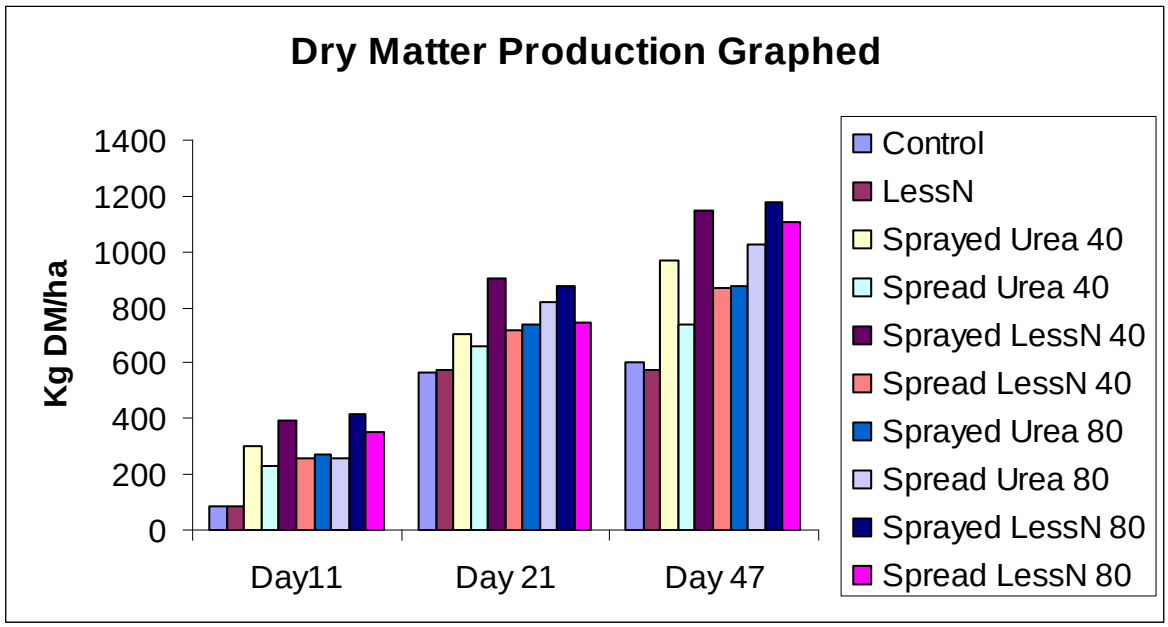
## Discussion

- The 80 kg/ha sprayed treatments with or without LessN did not perform well in terms of nitrogen response when compared to urea sprayed on at 40 kg/ha. In particular the urea at 80 kg/ha sprayed on without LessN had relatively poor performance. These high urea treatments did cause some scorching in of clover in the pasture soon after spraying ; such scorching has been observed in two other experiments but is not usually expected and is not encountered under field conditions at the 40 kg/ha urea rate.

- At day 11 all the liquid urea treatments were consistently superior in dry matter production compared with the corresponding solid urea treatments. This pattern continued throughout the experiment with the exception of 80 kg/ha Urea without LessN.

- Similarly, at day 11 all the LessN treatments were consistently superior in dry matter production compared with the corresponding treatments lacking LessN. This pattern continued throughout the experiment with the exception of LessN without nitrogen application at day 47 and LessN with 80kg/ha solid urea treatments at day 21.

- The LessN system (40 kg/ha urea sprayed on with LessN) was the best performing treatment on basis of the nitrogen applied. At day 21 the LessN system produced statistically significantly higher DM growth compared to solid LessN 40 and Liquid Urea 40 treatments and the advantage was still seen as statistically significant over solid urea at 40 kg/ha at day 47. The LessN system treatment produced similar dry matter production compared to when double the amount of nitrogen was applied.



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## Conclusion

The LessN system was the most efficient treatment for nitrogen response and outperformed solid urea at the same nitrogen rate and matched solid urea at a double rate. In this experiment, high rates of nitrogen sprayed on produced production per unit nitrogen applied which is probably related to the clover scorching that was observed at these high rates. Such scorching does not usually occur and there will still be room in many circumstances for the use of LessN with 80 kg/ha of urea. The standard LessN system though carries a much lower risk of leaf scorching.

LessN by itself will sometimes elicit a significant pasture response but this is less likely when the pasture is significantly limited by nitrogen uptake. In this pasture, soil available nitrogen measured as okay but uptake was likely to be limited by low soil moisture levels in the 48 hours post application.

There was some support in this experiment for the idea that LessN can be effective in conjunction with solid urea fertiliser application. This requires further research and it is likely that better responses would be seen if the solid nitrogen was applied in advance of spraying to ensure the plants have sufficient nitrogen presence to respond effectively to the LessN application.


## Soil Analysis:

## Plot 1-25

| Analysis | | Level Found | Medium Range | Low / Medium / High |
|---|---|---|---|---|
| pH | | 6.0 | 5.8 - 6.3 | |
| Olsen P | (mg/L) | 58 | 20 - 30 | |
| Potassium | (me/100g) | 0.77 | 0.50 - 0.80 | |
| Calcium | (me/100g) | 9.4 | 6.0 - 12.0 | |
| Magnesium | (me/100g) | 1.66 | 1.00 - 3.00 | |
| Sodium | (me/100g) | 0.11 | 0.20 - 0.50 | |
| CEC | (me/100g) | 20 | 12 - 25 | |
| Base Saturation | (%) | 59 | 50 - 85 | |
| Volume Weight | (g/mL) | 0.85 | 0.60 - 1.00 | |
| Sulphate-S | (mg/kg) | 17 | 7 - 15 | |
| Available N (15cm Depth) | (kg/ha) | 301 | 150 - 250 | |

| | | | | |
|---|---|---|---|---|
| Base Saturation | K 3.8 | Ca 46 | Mg 8.2 | Na 0.6 |
| MAF Units | K 14 | Ca 10 | Mg 32 | Na 4 |
| Anaerobically Mineralisable N | 236 ug/g | | | |

## Plot 25- 50

| Analysis | | Level Found | Medium Range | Low / Medium / High |
|---|---|---|---|---|
| pH | | 5.9 | 5.8 - 6.3 | |
| Olsen P | (mg/L) | 52 | 20 - 30 | |
| Potassium | (me/100g) | 0.48 | 0.50 - 0.80 | |
| Calcium | (me/100g) | 8.1 | 6.0 - 12.0 | |
| Magnesium | (me/100g) | 0.97 | 1.00 - 3.00 | |
| Sodium | (me/100g) | 0.14 | 0.20 - 0.50 | |
| CEC | (me/100g) | 18 | 12 - 25 | |
| Base Saturation | (%) | 55 | 50 - 85 | |
| Volume Weight | (g/mL) | 0.83 | 0.60 - 1.00 | |
| Sulphate-S | (mg/kg) | 11 | 7 - 15 | |
| Available N (15cm Depth) | (kg/ha) | 198 | 150 - 250 | |

| | | | | |
|---|---|---|---|---|
| Base Saturation | K 2.8 | Ca 46 | Mg 5.6 | Na 0.8 |
| MAF Units | K 8 | Ca 8 | Mg 18 | Na 5 |
| Anaerobically Mineralisable N | 158 ug/g | | | |

The above nutrient graph compares the levels found with reference interpretation levels. NOTE: It is important that the correct sample type be assigned, and that the recommended sampling procedure has been followed. R J Hill Laboratories Limited does not accept any responsibility for the resulting use of this information.

**No Laboratory Comments**