DONAGHYS
PERFORMANCE FIRST

Spread and Spray Trial – Leeston

The objective of spread spray trial was to measure the relative effect of spreading and spraying of differing urea rates (with or without LessN) on pasture dry matter growth. The trial was conducted on a Leeston dairy farm. It was started on 23rd February 2010. On application day, air temperatures peaked at 34°C. The trial area was irrigated ryegrass-white clover based pasture under normal dairying conditions. Residual pasture dry matter base line was recorded on 23rd February (soil temperature 18.5°C) and treatments were applied on same day. Pasture growth was assessed on Day 25 after treatment application.

The trial comprised 7 treatments in a randomised block design (Table 1) with 5 replicates providing a total of 35 plots.

Results

The experiment was not ideal given the high temperatures above 30°C at the time of spraying. This increased the risk of leaf scorch (which was noted on clover on the 80 kg/ha urea sprayed treatment) and also meant that LessN foliar uptake and efficacy might be lowered. There still appeared to be a favourable effect of LessN in combination with foliar nitrogen (this tended to outperform solid urea at the same nitrogen rate though this was not statistically significant).

The results are presented in Table 1 for probe and mowing data. Nitrogen response was calculated on the kg of dry matter grown per kg of nitrogen applied for the probe and mowing data.

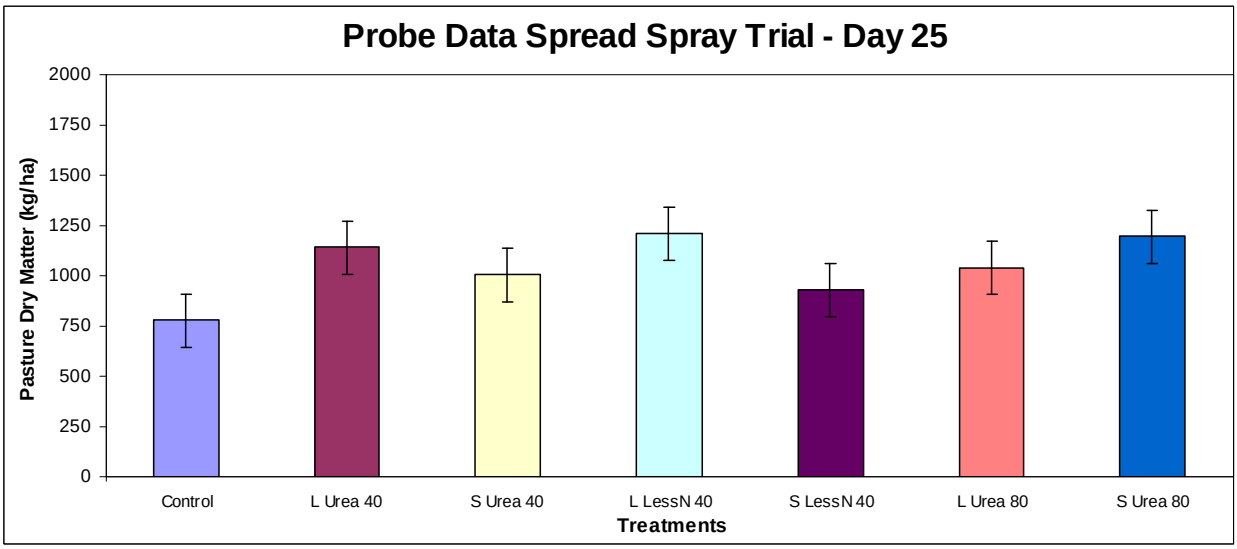
The spread urea treatments all had normal expected nitrogen response levels (from around 8 to 12). Sprayed urea treatments had very different response rates with the 80 kg/ha urea performing poorly (though this was not statistically significant, it fitted with the visual observation of clover leaf scorch). The highest nitrogen response was with the LessN system at 23.5 kg DM grown per kg N applied according to probe data (18.5 according to mowing data).

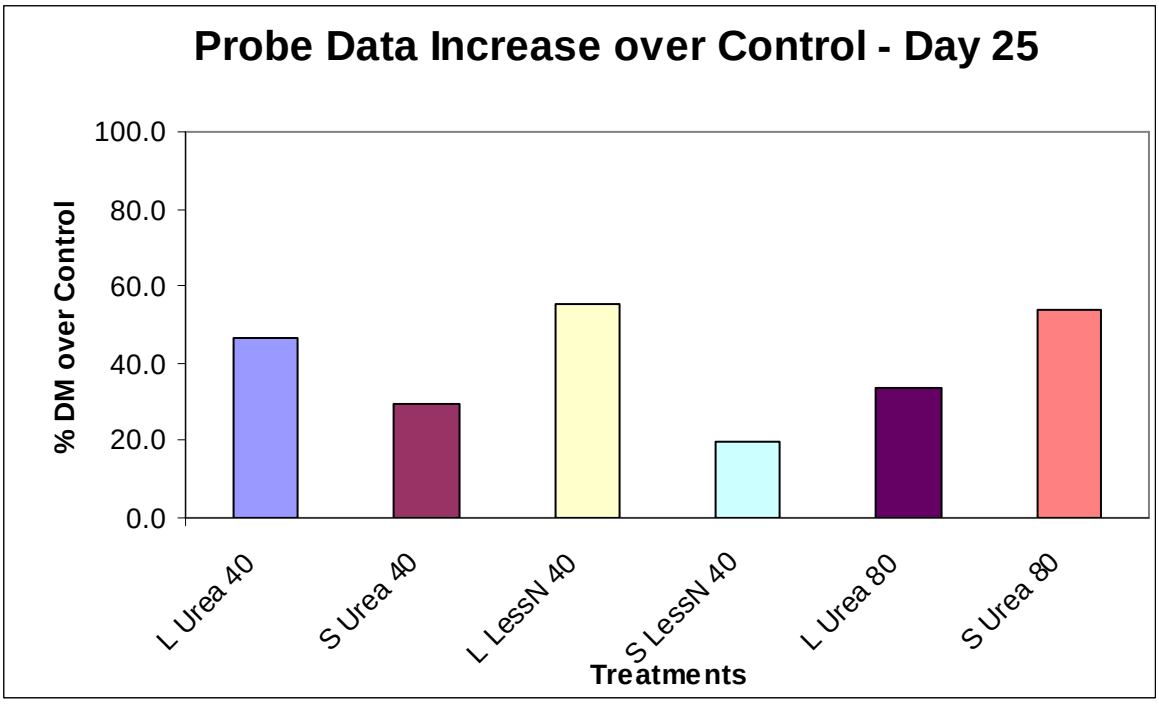
Table 1: Pasture dry matter assessed by Grass master probe and Mowing on Day 25

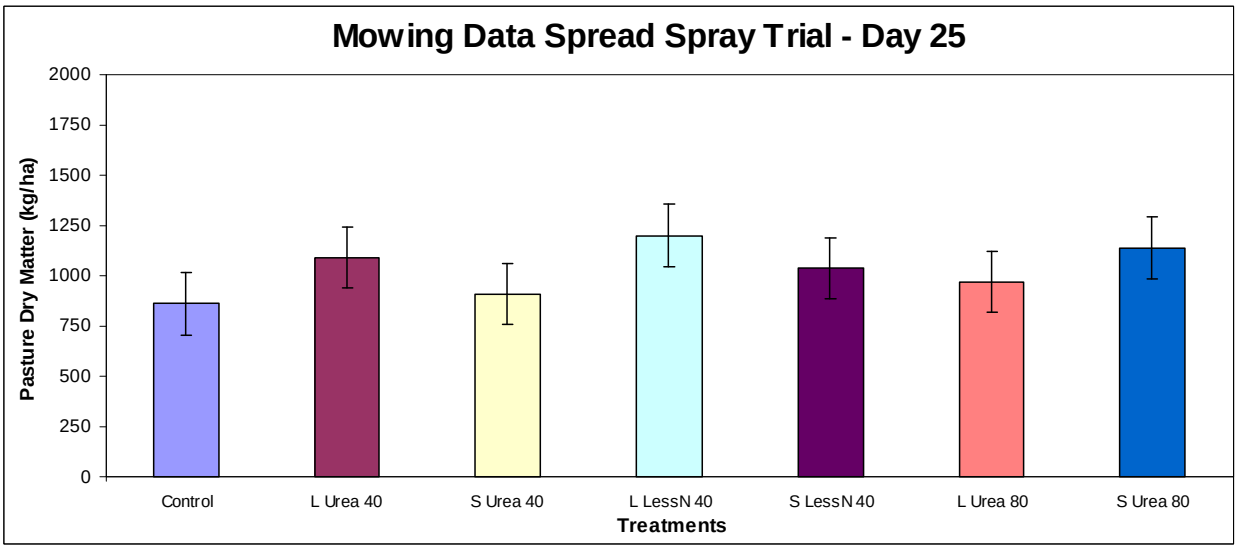
Treatment*	Dry matter (DM) kg/ha Day 25**		N response kg DM/kgN	
	Probe	Mowing	Probe	Mowing
Control	778 [b]	860		
Sprayed Urea 40	1142 [a]	1091	19.8	12.6
Spread Urea 40	1007 [ab]	909	12.4	2.7
Sprayed LessN 40	1211 [a]	1200	23.5	18.5
Spread LessN 40	931 [ab]	1037	8.3	9.6
Sprayed Urea 80	1039 [ab]	1139	7.2	7.6
Spread Urea 80	1196 [a]	971	11.4	3.0
LSD 5%	**289**	**307**		
p	**0.025**	**0.231**		

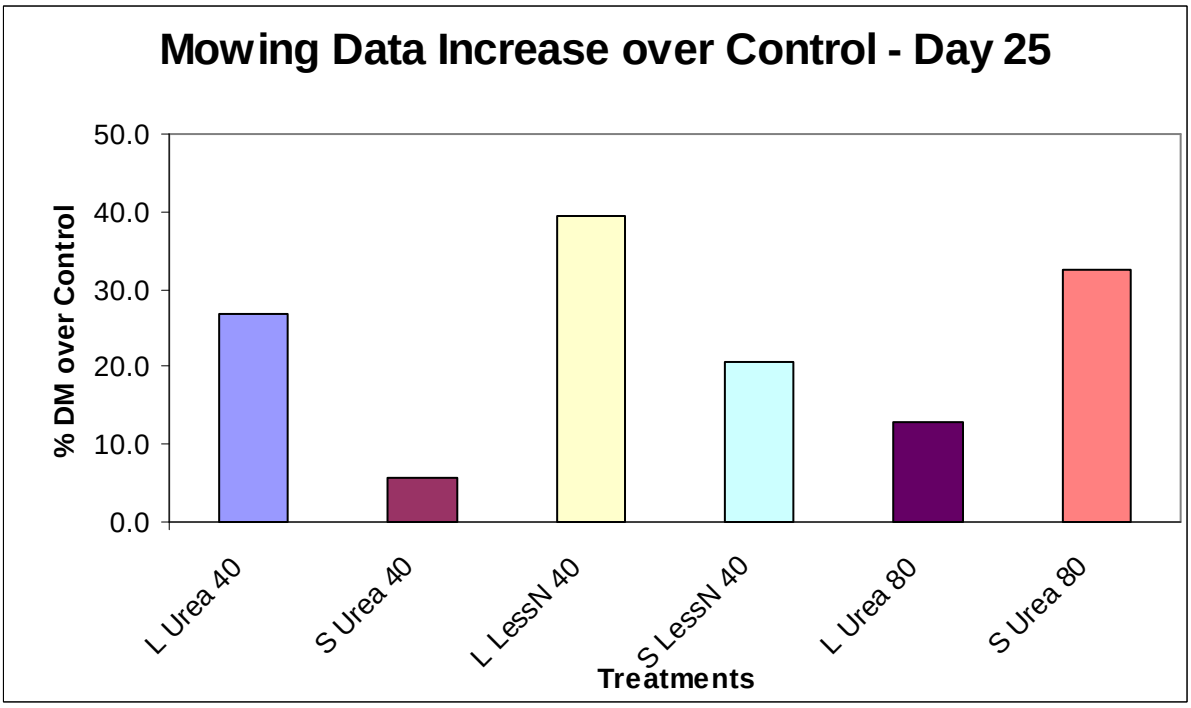
* In Spread treatments, urea was applied as solid prills to each plot. Where LessN was applied, this was with dissolved urea in the sprayed treatments and with an equivalent amount of volume of water (200 L/ha) when nitrogen was not sprayed. The 40 and 80 values refer to kg of urea applied (equivalent to 18.4 kg N/ha and 80 kg N/ha respectively).

** Treatments within the same column that share the same letter are not statistically significantly different from each other (95% confidence level). The overall ANOVA for the mowing data was not statistically significant so treatment differences should not be considered as statistically significant.


Probe Data Spread Spray Trial - Day 25
Pasture Dry Matter (kg/ha)
2000
1750
1500
1250
1000
750
500
250
0
Control
L Urea 40
S Urea 40
L LessN 40
S LessN 40
L Urea 80
S Urea 80
Treatments


Probe Data Increase over Control - Day 25
% DM over Control
100.0
80.0
60.0
40.0
20.0
0.0
L Urea 40
S Urea 40
L LessN 40
S LessN 40
L Urea 80
S Urea 80
Treatments





Conclusion

The LessN system in this grazing rotation was the most efficient treatment for nitrogen response and tended to grow more dry matter than the solid urea treatment at the same nitrogen rate (this was not statistically significant but fitted with previous observations in spread spray experiments that have been statistically significant) and tended to exceed solid urea at a double rate.

Treatments Reapplication:

After grazing, a baseline was taken and then treatments were reapplied to the same plots. The pasture growth was assessed in last week of April, 23 days after treatment application. The second grazing cycle data should be interpreted in terms of decreasing daylight and soil temperature.

Nitrogen responses were lower than in the previous grazing cycle and no important statistically significant differences were seen. Nitrogen responses were even lower according to the mowing estimation but this may be an underestimation due to low pasture cover at the start of this cycle (due to close grazing to a mean residual of 1148 kg DM compared to cycle 1 starting pasture cover of around 1465) and the pasture not growing very tall by the end of the pasture cycle (mowing only catches pasture cover over a fixed height and does not include lower growth).

Again the LessN system treatment of LessN with 40 kg/ha urea sprayed on gave the best nitrogen response.

Table 2: Pasture dry matter assessed by Grass master probe and Mowing on Day 23

Treatment*	Dry matter (DM) kg/ha Day 23**		Nitrogen Response kg DM/kg N	
	Probe	Mowing	Probe	Mowing
Control	826 [d]	1038		
Sprayed Urea 40	992 [bc]	1039	9.0	0.1
Spread Urea 40	956 [bcd]	1062	7.1	1.3
Sprayed LessN 40	1083 [ab]	1186	14.0	8.0
Spread LessN 40	947 [cd]	1123	6.6	4.6
Sprayed Urea 80	1204 [a]	1125	10.4	2.4
Spread Urea 80	1201 [a]	1148	10.2	3.0
LSD 5%	**134**	**226**		
p	**<0.001**	**0.284**		

* In Spread treatments, urea was applied as solid prills to 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 (equivalent to 18.4 kg N/ha and 80 kg N/ha respectively).

** Treatments within the same column that share the same letter are not statistically significantly different from each other (95% confidence level). The overall ANOVA for the mowing data was not statistically significant so treatment differences should not be considered as statistically significant.

Soil Analysis (Before Treatment Application):

Soil was analysed separately for Block 123 and for block 4, 5 due to visual differences in pasture growth at start of the trial. The soil was a moderately heavy Waterton gley silt loam with some drainage issues. Blocks 4 and 5 had quite acid soil at pH 5.1, likely affecting productivity. Nutrients in both tests were shown as from medium to high levels and so unlikely to be significantly limiting for pasture production. Drainage appeared to be poorer in Blocks 4 and 5 fitting with the lower pH and higher sulphate sulphur readings.

Block 1, 2 and 3

Analysis		Level Found	Medium Range	Low / Medium / High
pH	pH Units	5.6	5.8 - 6.3	
Olsen Phosphorus	mg/L	40	20 - 30	
Potassium	me/100g	0.54	0.50 - 0.80	
Calcium	me/100g	13.3	6.0 - 12.0	
Magnesium	me/100g	3.19	1.00 - 3.00	
Sodium	me/100g	0.26	0.20 - 0.50	
CEC	me/100g	25	12 - 25	
Total Base Saturation	%	70	50 - 85	
Volume Weight	g/mL	0.80	0.60 - 1.00	
Sulphate Sulphur	mg/kg	10	7 - 15	
Available Nitrogen (15cm Depth)*	kg/ha	196	100 - 150	
Anaerobically Mineralisable N*	µg/g	165		
Base Saturation %		K 2.2	Ca 54	Mg 12.8	Na 1.0
MAF Units		K 9	Ca 13	Mg 57	Na 9

Block 4 and 5

Analysis		Level Found	Medium Range	Low / Medium / High
pH	pH Units	5.1	5.8 - 6.3	
Olsen Phosphorus	mg/L	47	20 - 30	
Potassium	me/100g	1.60	0.50 - 0.80	
Calcium	me/100g	10.5	6.0 - 12.0	
Magnesium	me/100g	2.45	1.00 - 3.00	
Sodium	me/100g	0.36	0.20 - 0.50	
CEC	me/100g	24	12 - 25	
Total Base Saturation	%	62	50 - 85	
Volume Weight	g/mL	0.88	0.60 - 1.00	
Sulphate Sulphur	mg/kg	28	7 - 15	
Available Nitrogen (15cm Depth)*	kg/ha	306	100 - 150	
Anaerobically Mineralisable N*	µg/g	232		
Base Saturation %		K 6.6	Ca 44	Mg 10.2	Na 1.5
MAF Units		K 29	Ca 12	Mg 48	Na 15