



CRN 44
Trial 2020
Melrose & Waiora

Rustica Time Release

CRN 44

Controlled Release Nitrogen

44% N as urea



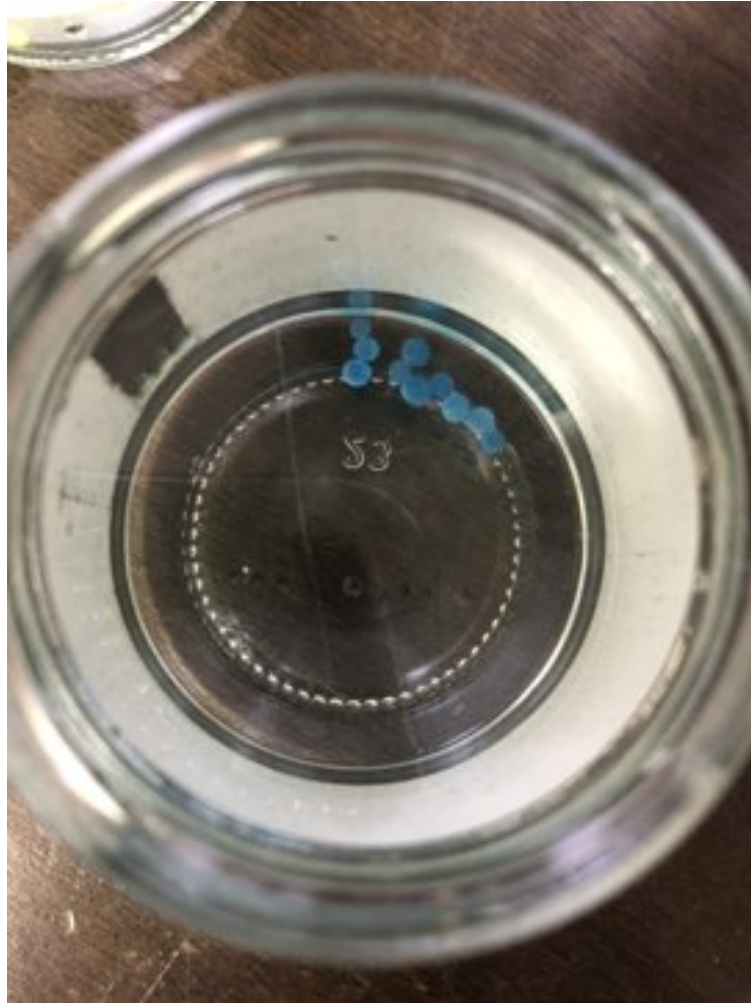
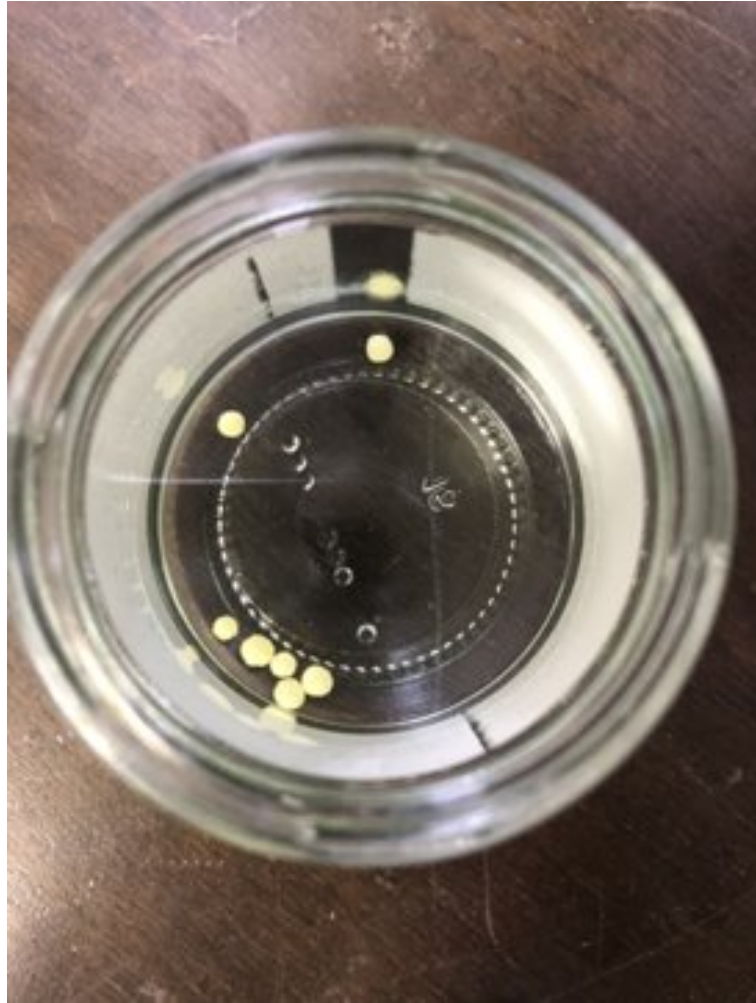
Haracoat PSCU 37



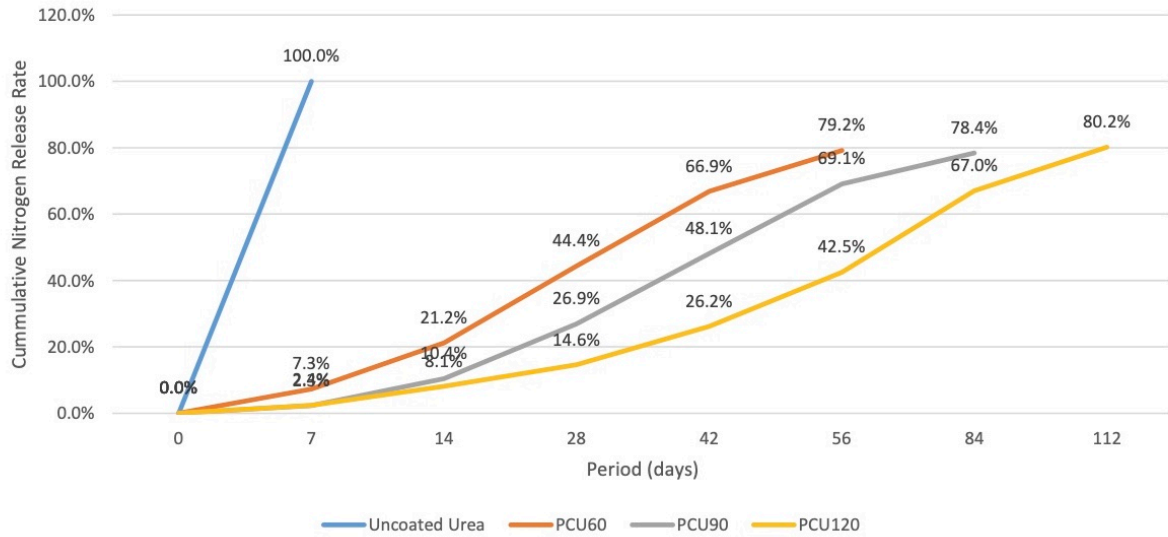
N Control 75



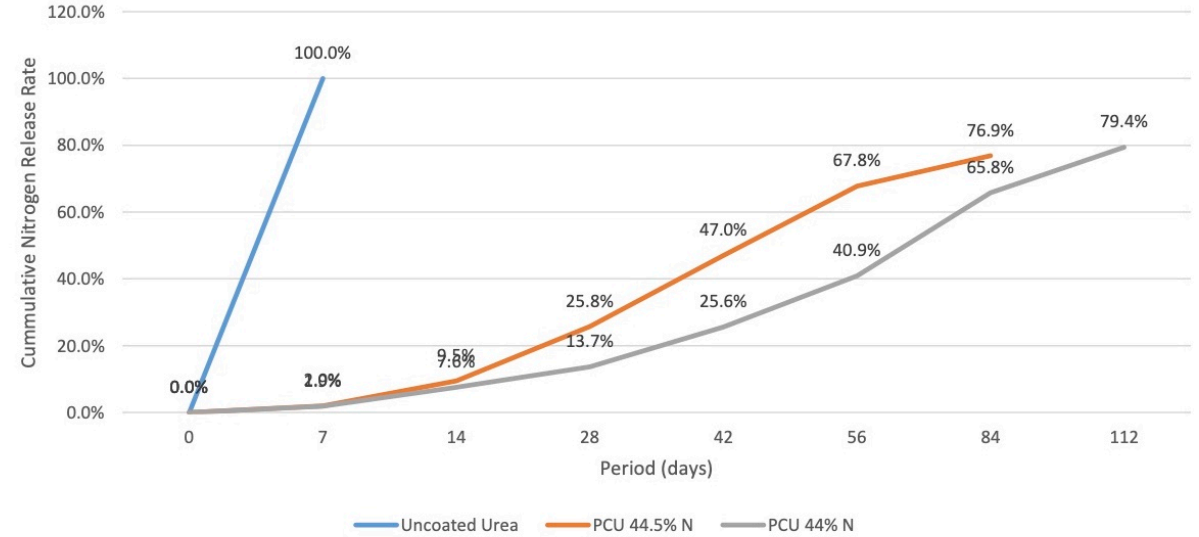
CRN 44



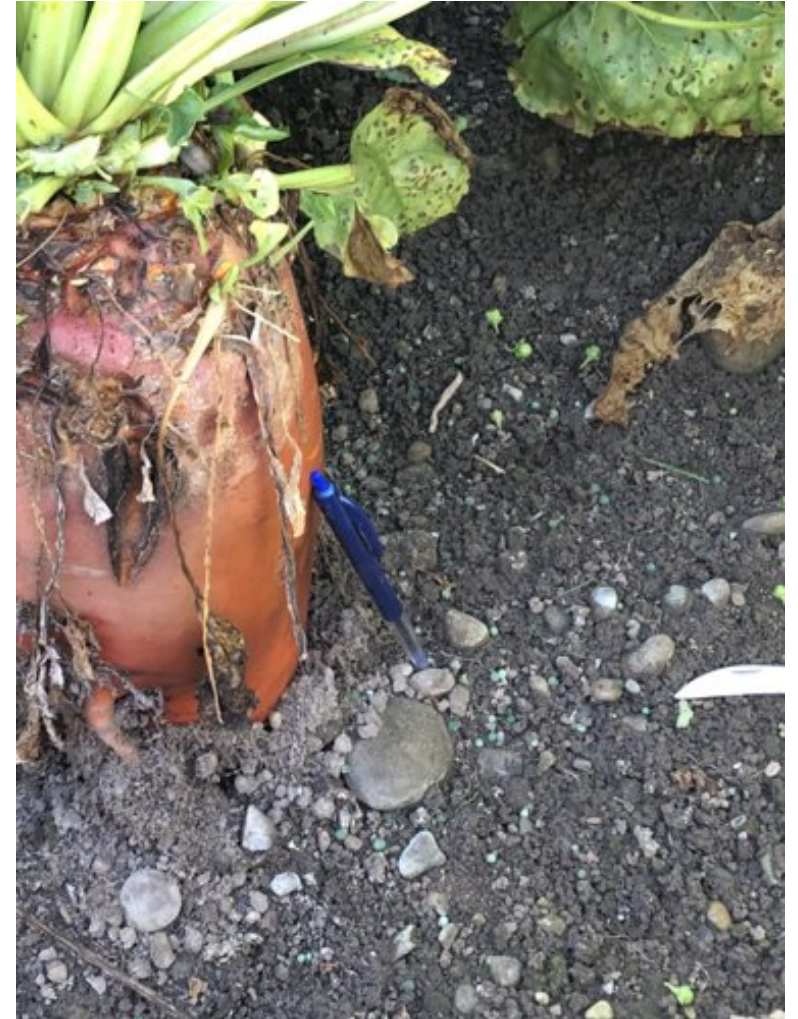
Polymer Coated Urea
Cummulative release curve @25°



Polymer Coated Urea
Cummulative release curve @15°



PCU60: Polymer Coated Urea 60 days
PCU90: Polymer Coated Urea 90 days
PCU120: Polymer Coated Urea 120 days



CRNK in Beet April 2019 - 120 days after application

CRN 44 - What do we really need to know ?

- How is it made?
- How does it work?
- What does it do?
- How much does it cost?
- What is the economic response?
- Why should I use it?
- What is the best way to use it?
- Are there any other advantages?

CRN 44 – Controlled
Release Nitrogen
(44% N as urea)

How is it made?

- Urea is screened and graded 2 – 5 mm
- Granules are pre-heated and prepared for coating
- Spray Coated with liquid polyolefin (long chain vegetable oil)
- Contains palm oil and soya oil etc. (biodegradable)
- Creates an elastic semi-permeable membrane (osmosis)

CRN 44 – Controlled
Release Nitrogen
(44% N as urea)

How does it work?

- Moisture is absorbed into the granule
- Urease enzyme hydrolyses urea (soil bacteria)
- Urea ammonifies, then nitrifies
- Nitrogen diffuses outward through the coating
- Rate of diffusion depends on the concentration gradient
- Rate of N release is controlled by temperature AND moisture.

CRN 44 – Controlled Release Nitrogen (44% N as urea)

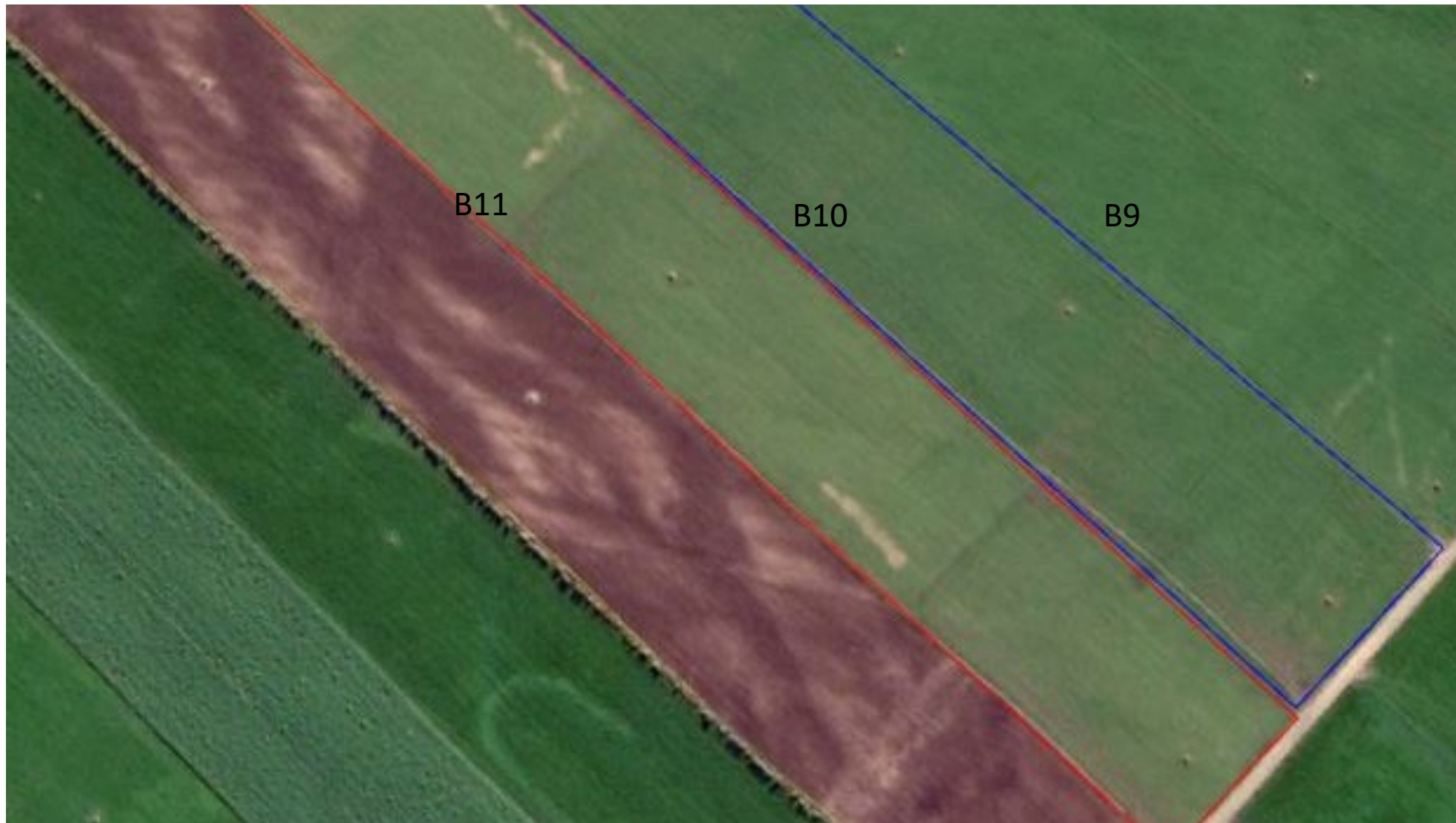
What does it do?

- CRN 44 controls the release of N
- Supply is closely matched to pasture requirement
- Prevents leaching AND volatilisation (NUE % is improved)
- Reduces luxury uptake and high N spikes (reduces non-protein N)
- Increases pasture DM production (increases NUE)
- Potential to improve animal health, cow metabolics and milk production (not measured yet)

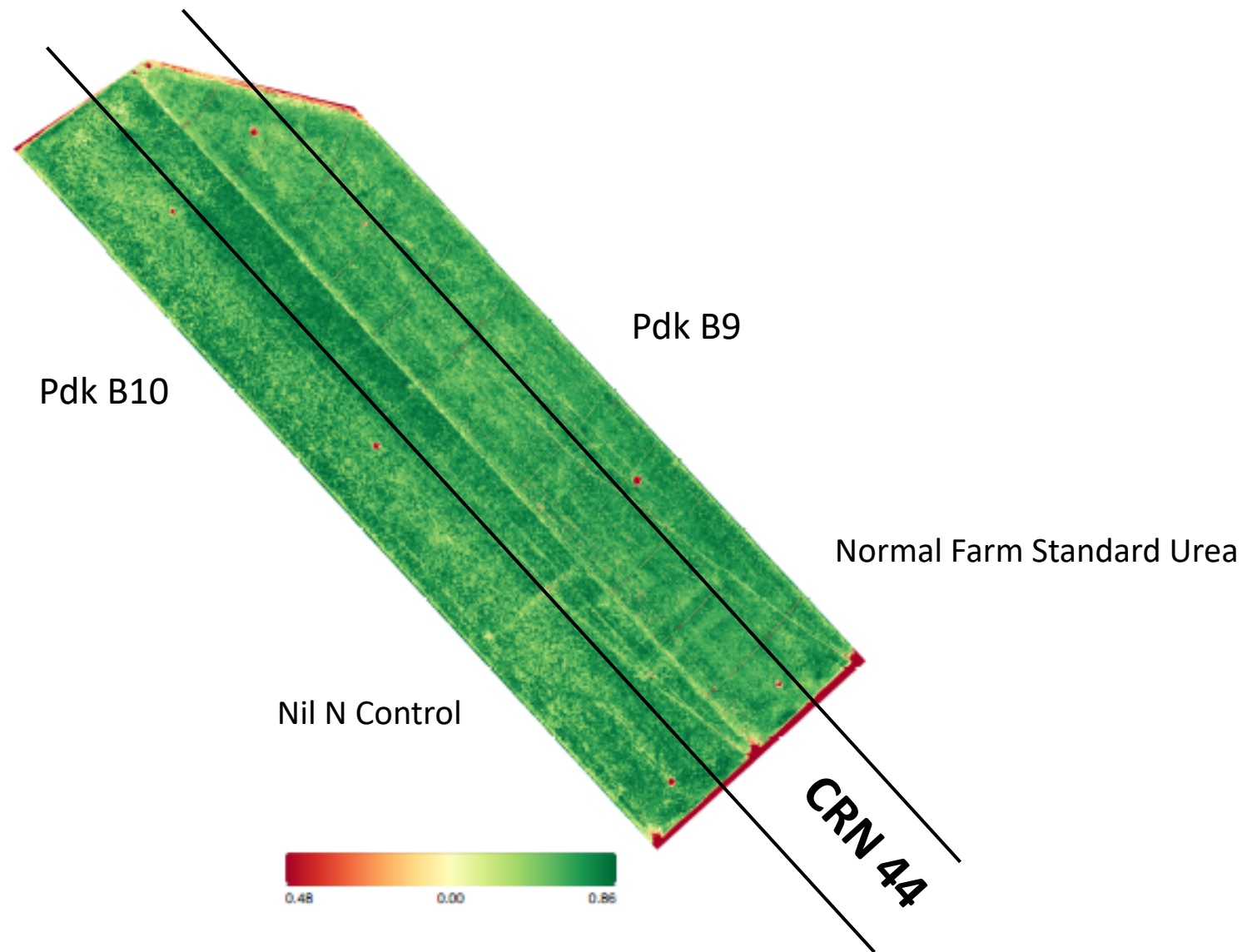
Trial Design & Background Information

- Winfield Answer Plots used as a template for the trial design
- <https://www.winfieldunited.com/research-and-innovation/answer-plot>
- Site inspection & Soil Test
- Paddock Selection - paddock history & pasture quality
- Preparation of trial sites (mowed/grazed)
- Coordination with normal rotation & farm fertiliser program
- Calculation of application rate and spreading CRN 44
- Measuring pasture response <https://www.agconsulting.co.nz/cms/>
- Collation of raw data, understanding results
- Interpretation of the information generated

Melrose Trial Results



This is a historical screenshot from Google Earth which shows the highly variable nature of Stoney Lismore soils at the site. This is the main reason for using whole paddock trials.



NDVI image of CRN 44 trial site at Melrose

Visible Spectrum Drone Shot - Easterly View



Aerial View Melrose Site 23rd March 2020

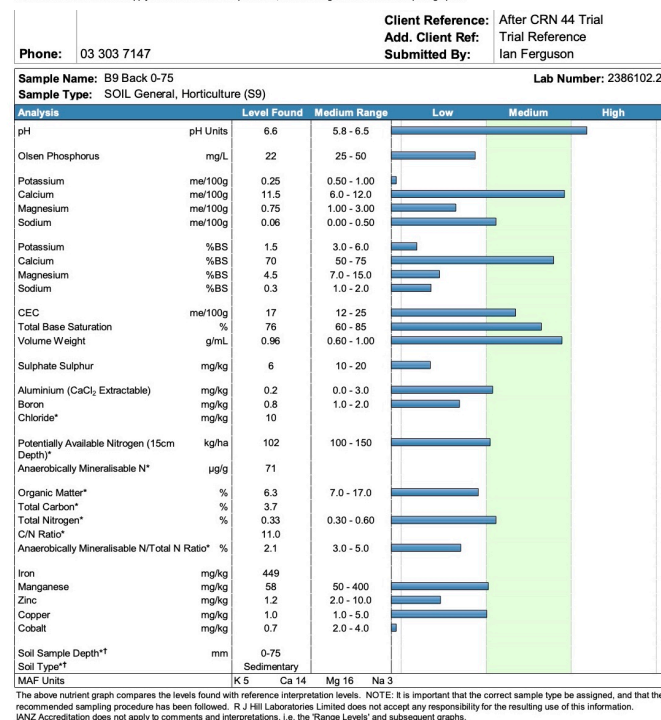
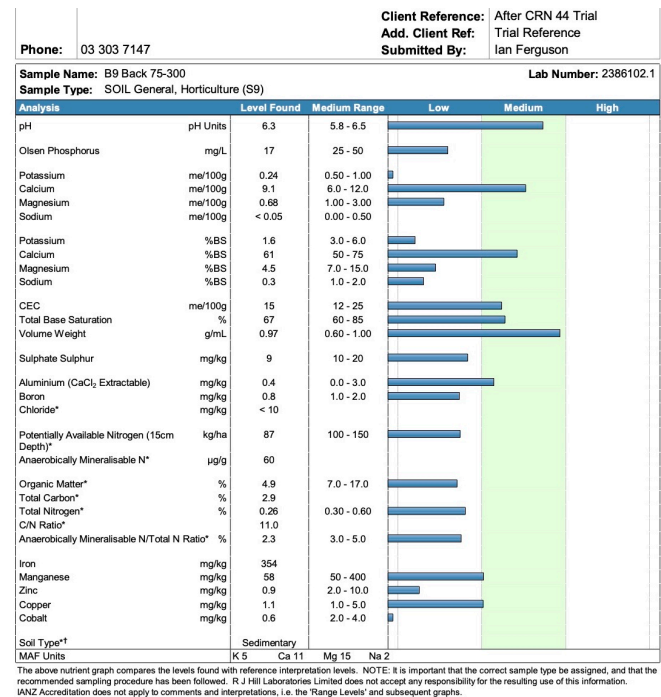
Melrose Soil Test Results 1-2-20

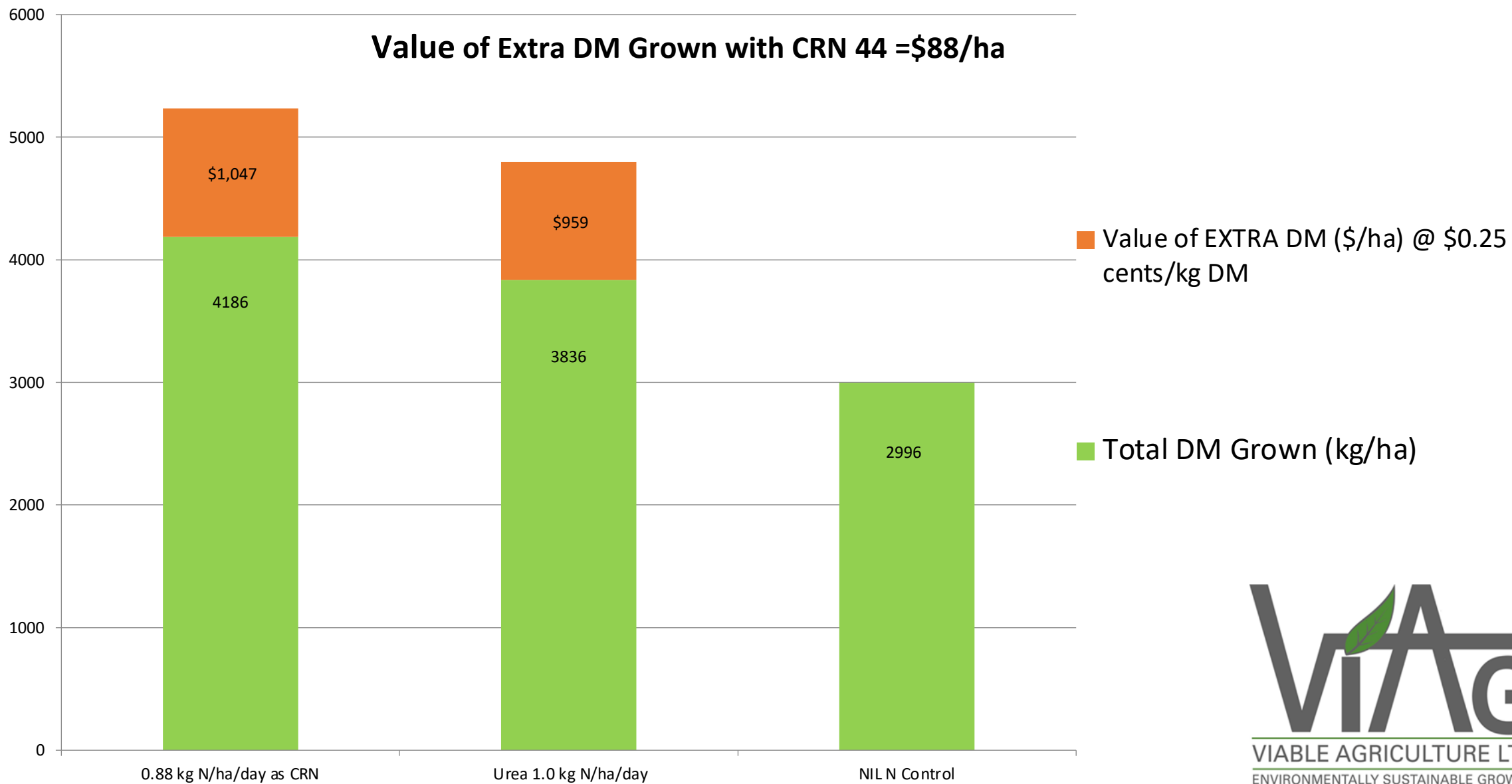
Client Reference: Mixed Pasture Ungrazed
Add. Client Ref: CRN 44 Trial
Submitted By: Ian Ferguson

Sample Name: Pdk B9 7.2ha **Lab Number:** 2315089.1
Sample Type: SOIL General, Horticulture (S9)

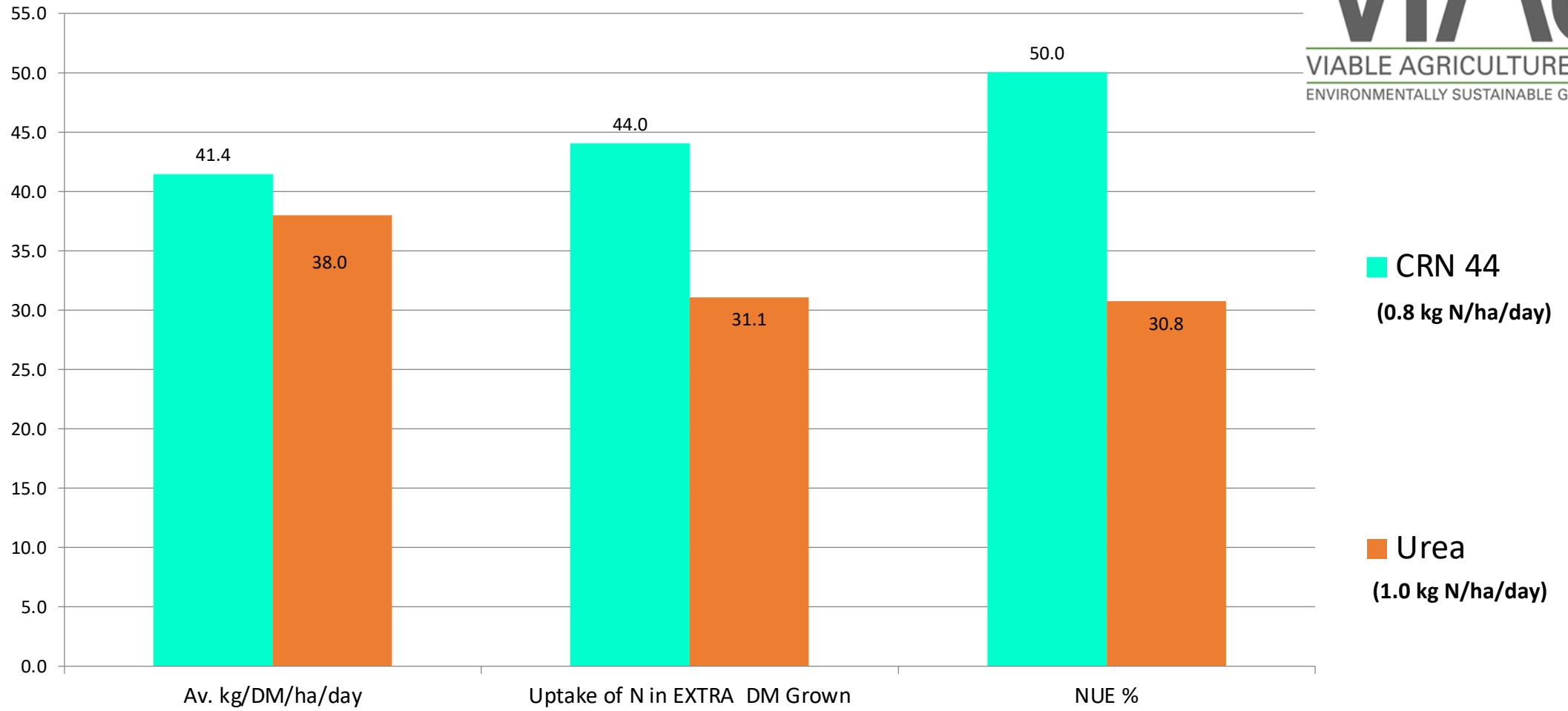
Analysis		Level Found	Medium Range	Low	Medium	High
pH	pH Units	6.3	5.8 - 6.5			
Olsen Phosphorus	mg/L	19	25 - 50			
Potassium	me/100g	0.25	0.50 - 1.00			
Calcium	me/100g	10.5	6.0 - 12.0			
Magnesium	me/100g	0.81	1.00 - 3.00			
Sodium	me/100g	0.08	0.00 - 0.50			
Potassium	%BS	1.5	3.0 - 6.0			
Calcium	%BS	64	50 - 75			
Magnesium	%BS	4.9	7.0 - 15.0			
Sodium	%BS	0.5	1.0 - 2.0			
CEC	me/100g	17	12 - 25			
Total Base Saturation	%	70	60 - 85			
Volume Weight	g/mL	0.91	0.60 - 1.00			
Sulphate Sulphur	mg/kg	10	10 - 20			
Aluminium (CaCl ₂ Extractable)	mg/kg	0.3	0.0 - 3.0			
Boron	mg/kg	0.9	1.0 - 2.0			
Chloride*	mg/kg	< 10				
Potentially Available Nitrogen (15cm Depth)*	kg/ha	86	100 - 150			
Anaerobically Mineralisable N*	µg/g	63				
Organic Matter*	%	5.3	7.0 - 17.0			
Total Carbon*	%	3.1				
Total Nitrogen*	%	0.32	0.30 - 0.60			
C/N Ratio*		9.5				
Anaerobically Mineralisable N/Total N Ratio*	%	2.0	3.0 - 5.0			
Iron	mg/kg	387				
Manganese	mg/kg	60	50 - 400			
Zinc	mg/kg	0.9	2.0 - 10.0			
Copper	mg/kg	1.0	1.0 - 5.0			
Cobalt	mg/kg	0.6	2.0 - 4.0			
'Total' Molybdenum*	mg/kg	0.2				
Soil Sample Depth*†	mm	0-300				
Soil Type*†		Sedimentary				
MAF Units		K 5	Ca 12	Mg 17	Na 3	

Stratification of Soil Nutrients Melrose 16th June 2020



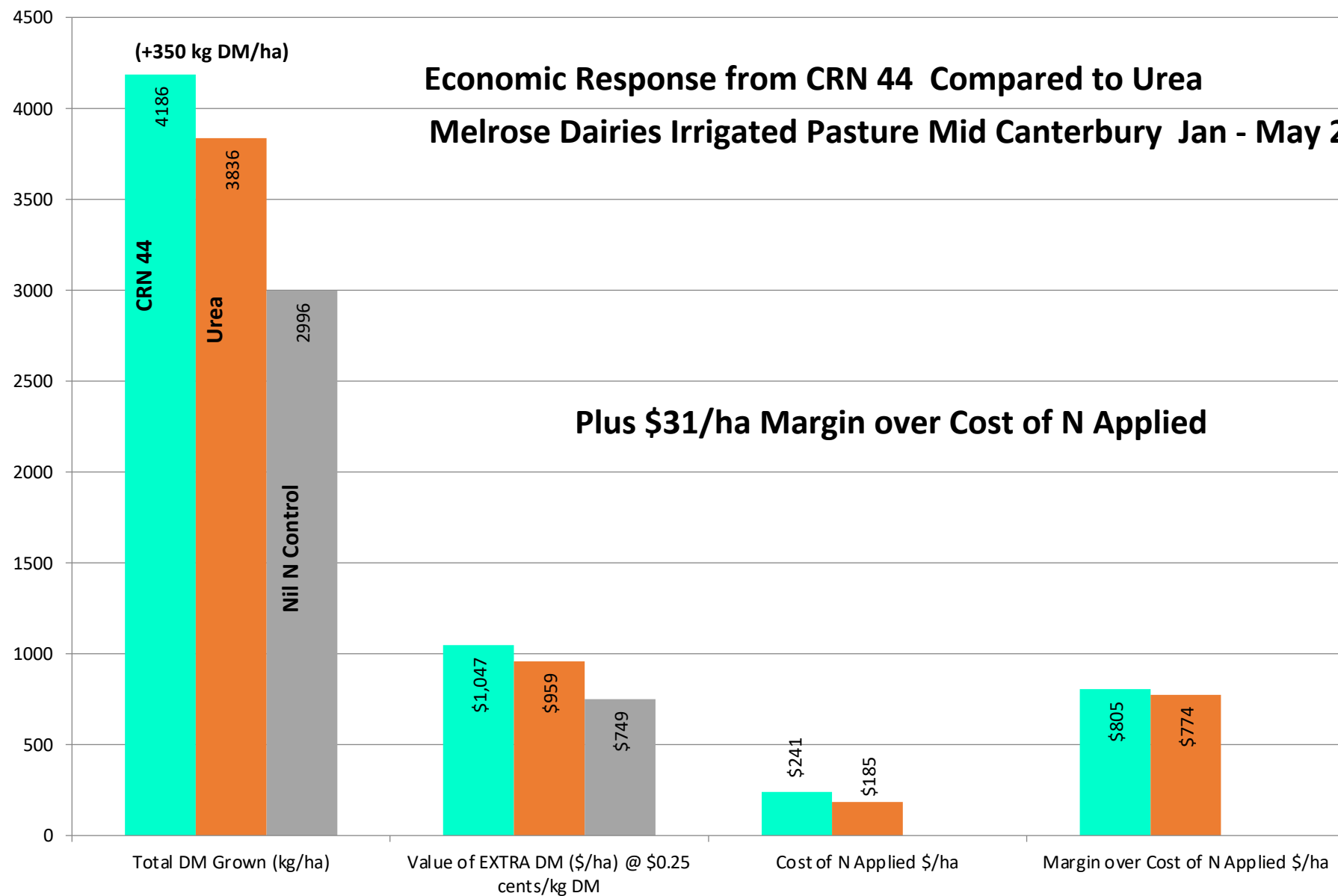


Nitrogen Use Efficiency (NUE %) CRN 44 Compared to Urea
Irrigated Dairy Pasture Melrose Dairies Mid Canterbury Jan - May 2020



Economic Response from CRN 44 Compared to Urea

Melrose Dairies Irrigated Pasture Mid Canterbury Jan - May 2020



0.88 kg N/ha/day as CRN

Urea 1.0 kg N/ha/day

NIL N Control

Melrose Dairies Nitrogen Use Efficiency (NUE %)

- Why use CRN 44?
- CRN 44 has produced 62% more DM per kg of N applied at Melrose
- This was achieved with 13% less N applied
- This is because of improved uptake & reduced losses of N
- The net cost of CRN 44 was 12% less than Urea per kg of N applied
- CRN 44 is significantly more cost effective at supplying N to the pasture

CRN 44 Compared to Urea & Nil N on Irrigated Dairy Pasture at Melrose Farm Mid Canterbury Jan – May 2020

- This trial shows the economic response of CRN 44 on dairy pasture
- The trial was installed at the end of January 2020 on Lismore soil
- Grazing & irrigation management was as per normal farm practice
- All product was applied using the normal spreading contractor
- CRN 44 was applied once only at 0.8 kg N/ha/day average
- Urea was applied after every round of grazing at 1.0 kg N/ha/day
- Both trials measured with Plate Meter by Ag Consulting Services
- Pasture measurements were conducted weekly and recorded.
- Control was Nil N applied

Value of Additional DM Production Using CRN 44

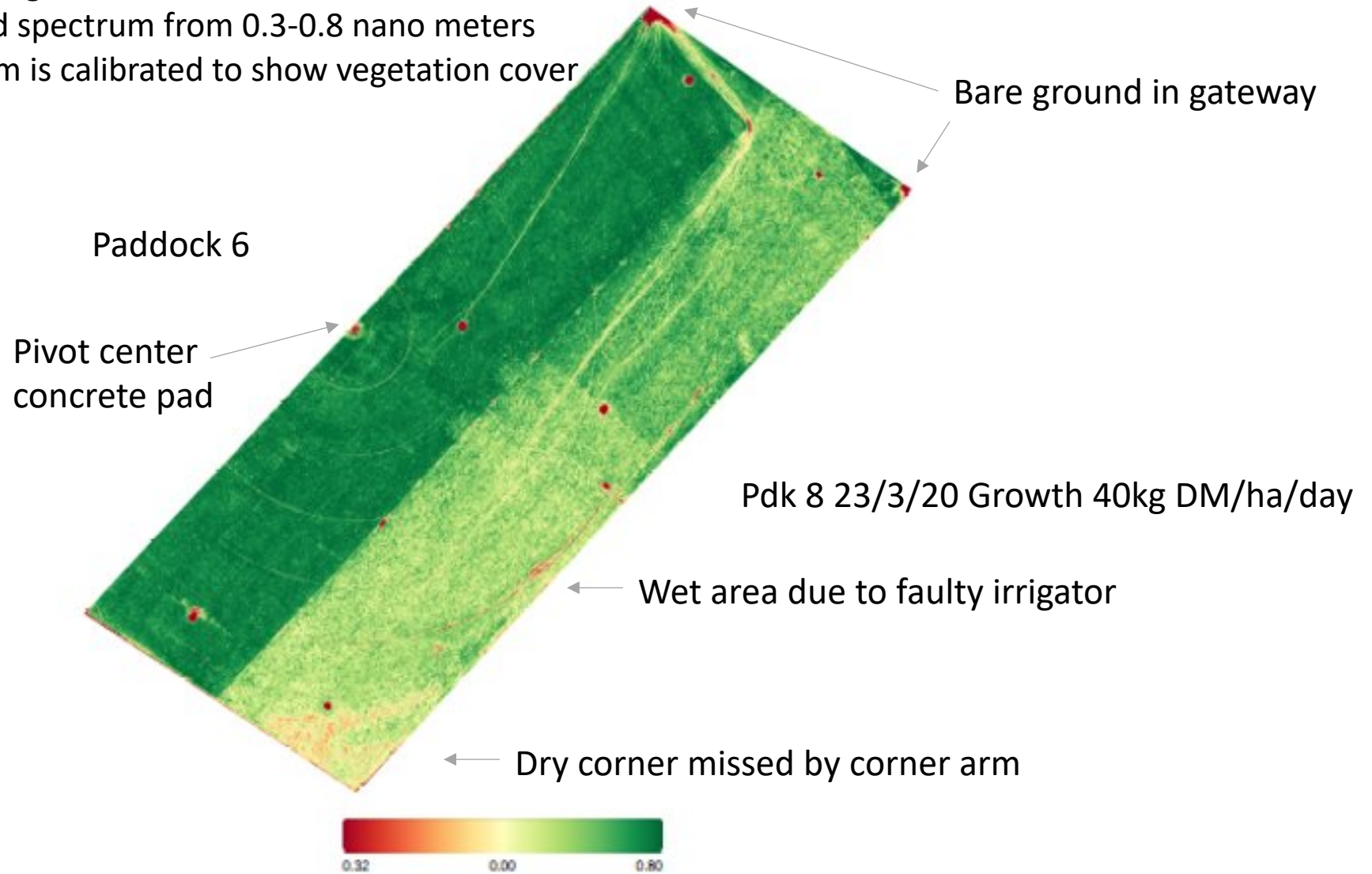
- At Melrose CRN 44 has produced 62 % more DM/kg N applied
- The cost of the DM grown using CRN 44 at Melrose was \$0.20 cents/kg N
- Rate of N applied as CRN 44 was 0.8 kg N/ha/day for total 4186 kg DM/ha
- CRN 44 grew an additional 350 kg DM/ha over Urea
- N applied as urea at 1.0 kg N/ha/day cost \$0.22 cents/kg DM
- Urea N produced 840 kg DM/ha more than NIL N Control to give 3836 kg/ha
- So margin over cost of N applied in this trial was \$31/ha for CRN 44
- Calculated with pasture at \$0.25 cents/kg DM and pasture at 3.7% N content

Back Track Trial Results



View of CRN 44 Trial at Back Track Dairy (Pdk 6)

NDVI = Normalised Difference Vegetation Index
= Uses part of the infrared spectrum from 0.3-0.8 nano meters
= This part of the spectrum is calibrated to show vegetation cover



Red dots = Water troughs

Flown 23/3/20
(same date as visible)

Average Growth Rate
70kg DM/ha/day

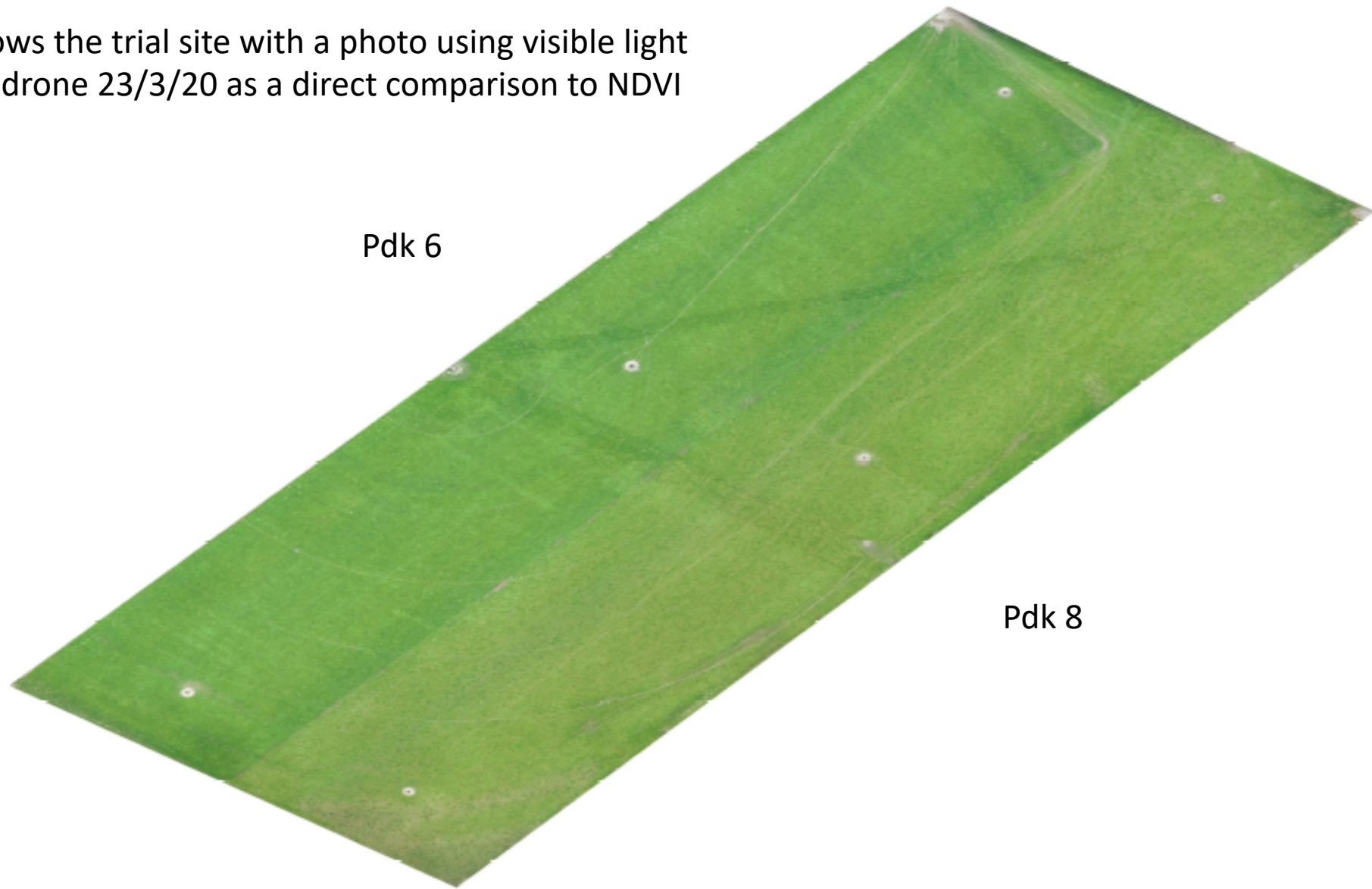
NDVI image of CRN 44 trial site at Back Track Dairies

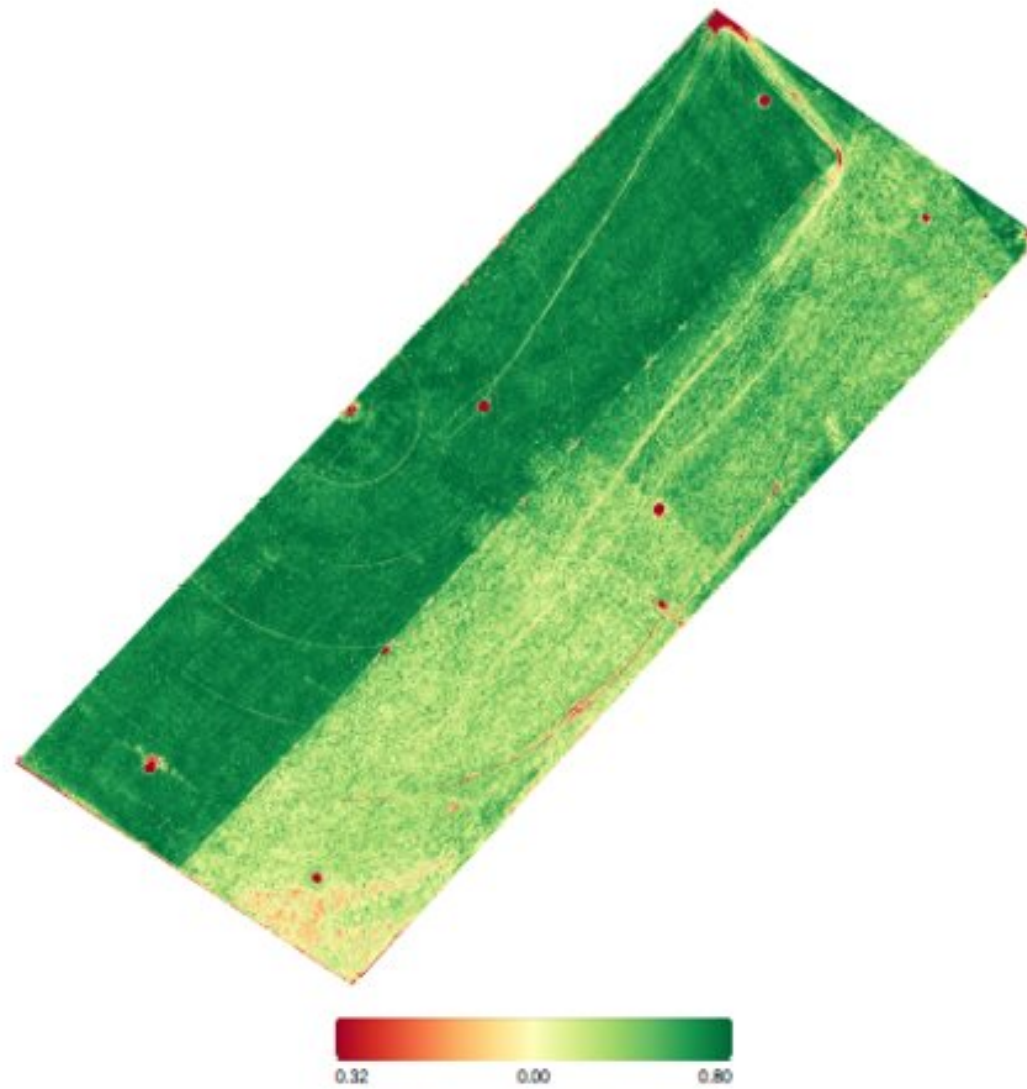
		Client Reference: Back Track Dairies			
		Add. Client Ref: CRN 44 Trial Site			
		Submitted By: Ian Ferguson			
Sample Name: Pdk #6 9.8Ha		Lab Number: 2312842.			
Sample Type: SOIL General, Horticulture (S9)					
Analysis	Level Found	Medium Range	Low	Medium	High
pH	pH Units	6.1	5.8 - 6.5		
Olsen Phosphorus	mg/L	16	25 - 50		
Potassium	me/100g	0.31	0.50 - 1.00		
Calcium	me/100g	7.0	6.0 - 12.0		
Magnesium	me/100g	0.71	1.00 - 3.00		
Sodium	me/100g	0.07	0.00 - 0.50		
Potassium	%BS	2.3	3.0 - 6.0		
Calcium	%BS	52	50 - 75		
Magnesium	%BS	5.2	7.0 - 15.0		
Sodium	%BS	0.5	1.0 - 2.0		
CEC	me/100g	14	12 - 25		
Total Base Saturation	%	60	60 - 85		
Volume Weight	g/mL	0.92	0.60 - 1.00		
Sulphate Sulphur	mg/kg	16	10 - 20		
Aluminium (CaCl ₂ Extractable)	mg/kg	0.5	0.0 - 3.0		
Boron	mg/kg	0.6	1.0 - 2.0		
Chloride*	mg/kg	< 10			
Potentially Available Nitrogen (15cm Depth)*	kg/ha	138	100 - 150		
Anaerobically Mineralisable N*	µg/g	100			
Organic Matter*	%	4.8	7.0 - 17.0		
Total Carbon*	%	2.8			
Total Nitrogen*	%	0.27	0.30 - 0.60		
C/N Ratio*		10.4			
Anaerobically Mineralisable N/Total N Ratio*	%	3.7	3.0 - 5.0		
Iron	mg/kg	235			
Manganese	mg/kg	49	50 - 400		
Zinc	mg/kg	0.7	2.0 - 10.0		
Copper	mg/kg	1.4	1.0 - 5.0		
Cobalt	mg/kg	0.8	2.0 - 4.0		
Total Molybdenum*	mg/kg	0.3			
Soil Sample Depth*†	mm	0-300			
Soil Type*†		Sedimentary			
MAF Units		K 6 Ca 8 Mg 15 Na 3			



Spreading CRN 44 Back Track

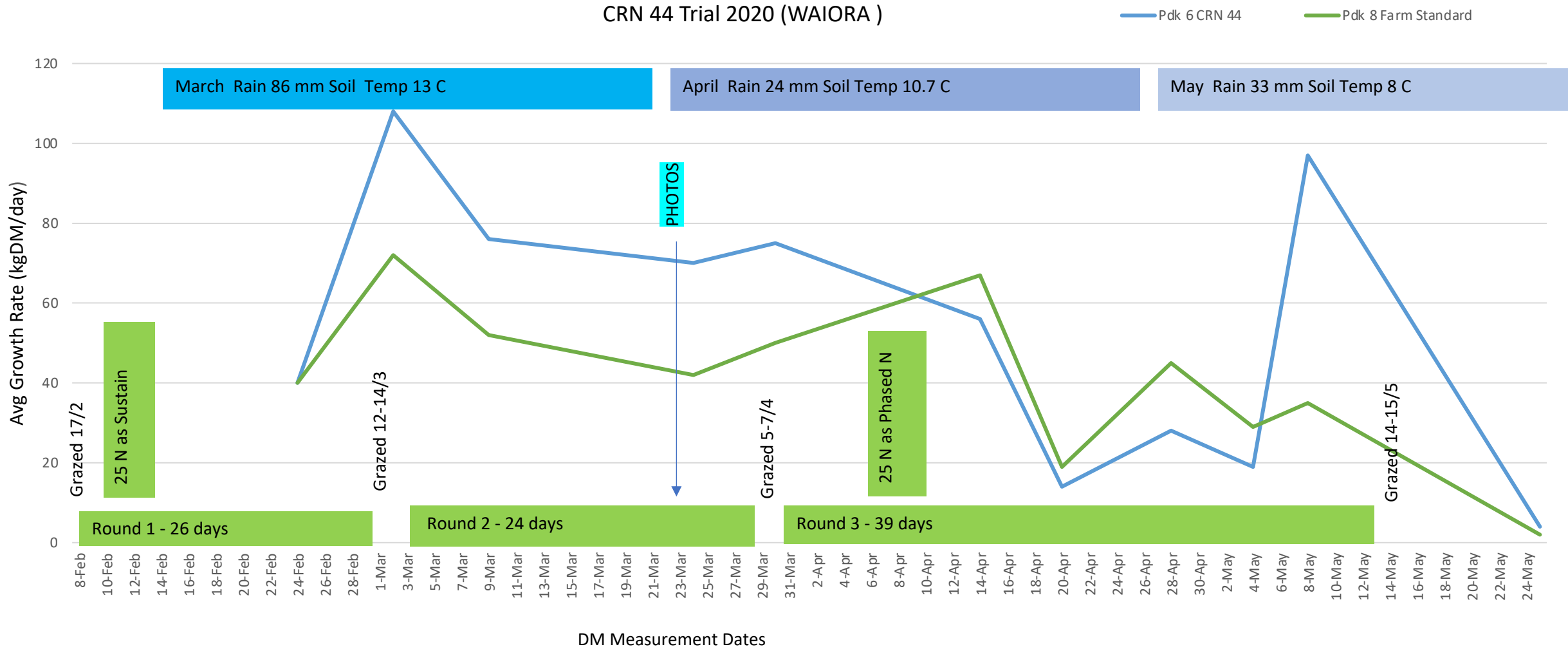
This slide shows the trial site with a photo using visible light
- Taken from drone 23/3/20 as a direct comparison to NDVI





NDVI image of CRN 44 trial site at Back Track Dairy

CRN 44 Trial 2020 (WAIORA)



CRN 44 Trial at Waiora - Back Track Dairies

- The same trial was run in parallel on two different farms
- Both farms used different fertiliser, application rates and timing of N
- Melrose was 1 kg N/ha/day as plain urea after every grazing
- Waiora was 0.5 kg N/ha/day as Sustain & Phased N (urea with agrotain)
- The response curve is very similar at both farms
- Drone shot shows significant visible response at both sites
- NDVI clearly shows higher pasture covers under CRN 44
- Irrigation was not meeting Pasture requirements in April

SUMMARY

CRN 44 is more cost effective

- Volatilisation losses make urea very inefficient and therefore more expensive
- CRN 44 gives outstanding value and reduces N losses
- CRN 44 supplies N to the pasture consistently for 90 – 100 days
- The supply of N from CRN 44 is closely matched to pasture requirements
- This flattens the high N spikes in pasture
- CRN 44 from Viable Agriculture will improve pasture production and reduce cost
- CRN 44 will minimise losses of N and improve compliance requirements
- CRN 44 will enhance the sustainability of your farming business

CRN 44 is more efficient

- Nitrogen is released from the granule by diffusion at a controlled rate
- The rate of diffusion & N release depends on temperature and moisture
- Luxury uptake is reduced and this extends the response curve of CRN 44
- This is because volatilisation and leaching is reduced to very low levels
- CRN 44 rate of release closely matches pasture uptake
- One application supplies N for 90 – 100 days
- This can save up to 4 applications over urea which reduces spreading cost

Rustica Time Release Coated Fertiliser Products CRN 44 CRK 42 CRNK

- Controlled Release Nitrogen (CRN 44) – 44% N as coated urea
 - Controlled Release Nitrogen and Potassium (CRNK)
 - 26% N as coated urea plus 17 % K as coated spherical granulated MOP
 - Vastly superior spreading accuracy in winter green feed crops
 - One application only saving on cost and eliminating crop damage
 - Highly efficient supply of N & K for crops and pastures
 - Extended responses in irrigated and rain-fed systems
 - Greater Nutrient Use Efficiency (NUE) & bigger Economic Response
 - Additional (synergistic) crop response by providing N & K together
 - Coated with patented biodegradable plant based polymers
 - Reduced environmental footprint for triple bottom line
- = Improved social, environmental and financial outcomes