Nitrogen fertiliser requirements for representative soils of the Lower Burdekin cane growing district

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Background

- October 2009 the *Great Barrier Reef Protection Amendment Act was introduced* requiring growers to follow a regulated method for determining N application rates.
- In response to industry concern DEHP funded a number of trials across the Burdekin.
- The trials began in 2011
- Aim is to assess the suitability of nitrogen application rates in the Burdekin, giving consideration to profitability, sustainable production and the potential for impacts on the environment.

Current status

- To date established and harvested 19 replicated block trials in the Delta and BRIA cane growing areas
- 10 established in 2011, 4 established in 2012, 1 in 2013 and 4 established in 2014
- 14 are active, these are:
  - four plant
  - one 1st ratoon
  - three 2nd ratoon
  - six 3rd ratoon
- Active sites range in size from 4 to 10 hectares
- Another 4 sites are currently being established
    - 2 in the Delta and 2 in the BRIA

Trial design

Three to four treatments

- Treatment 1 – low rate (P130 kg N/ha, R170 kg N/ha)
- Treatment 2 – rate determined by the Regulated Method/Six Easy Steps (P170 kg N/ha, R210 kg N/ha)
- Treatment 3 – traditional grower rate (P210 kg N/ha, R250 kg N/ha)
- Treatment 4 – a high rate (P250 kg N/ha, R290 kg N/ha)

- Three to four replications at each site
- Six Easy Steps rate based on DYP of 180 t cane/ha and discount for soil mineralisation potential

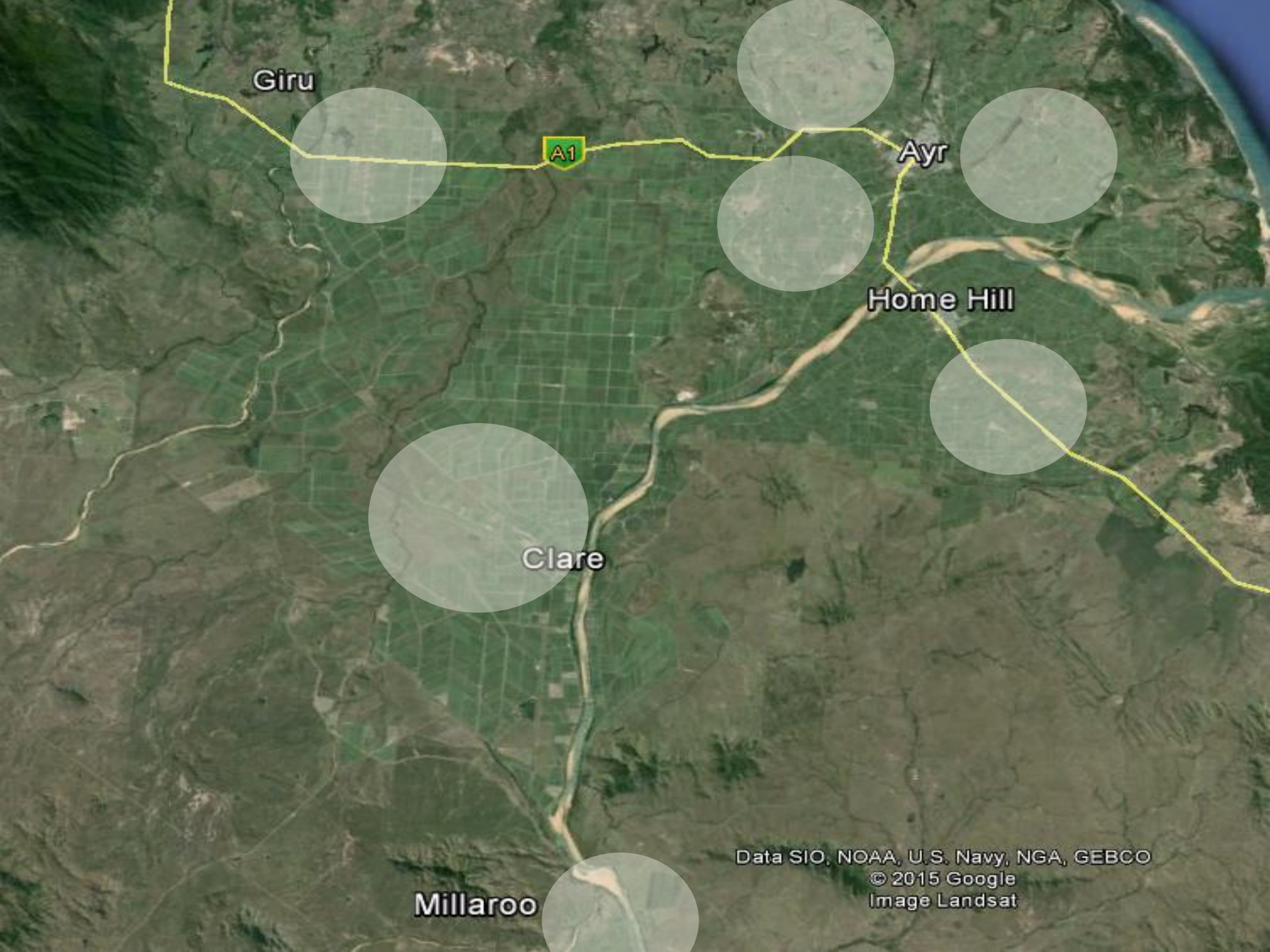
Giru
A1
Ayr
Home Hill
Clare
Millaroo
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Image Landsat

2014 Harvest results

Mean cane yield (tc/ha) for each nitrogen rate treatment at six 2nd ratoon trial sites

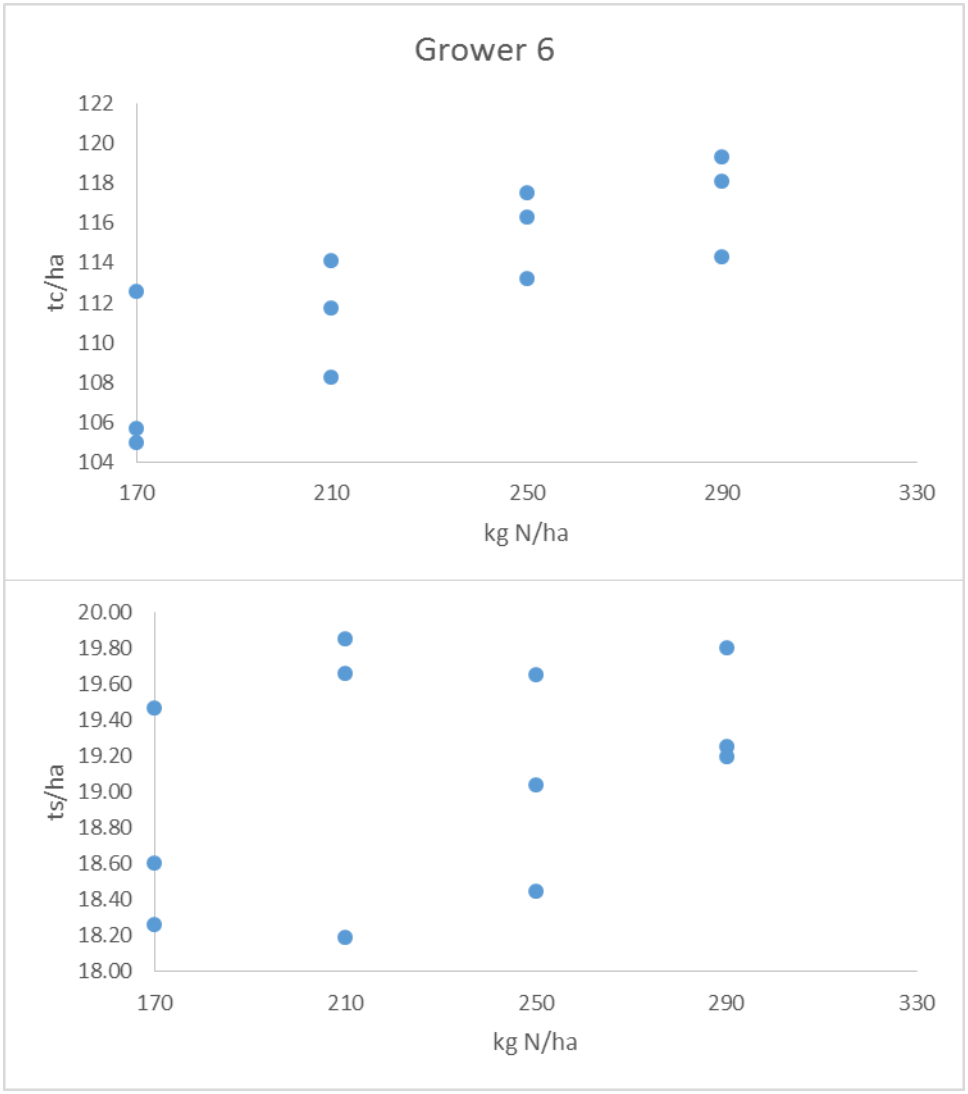
Grower ID	Treatments			
	170 kg N/ha	210 kg N/ha	250 kg N/ha	290 kg N/ha
2	107.5	105.8	106.2	
3*	143.5	145.5	150.6	154.1
6	107.7^{b}	111.4^{ab}	115.7^{a}	117.2^{a}
7	128.2	124.6	124.5	125.5
8	79.1^{b}	81.6^{b}	81.5^{b}	85.6^{a}
10	98.5^{c}	102.5^{bc}	106^{b}	112.9^{a}

Sites with $P<0.05$ are highlighted
Means followed by a common letter are not significantly different at the 5% level
*Indicates elevated levels of nitrates in irrigation water (>2 mg/L of NO_3-N)

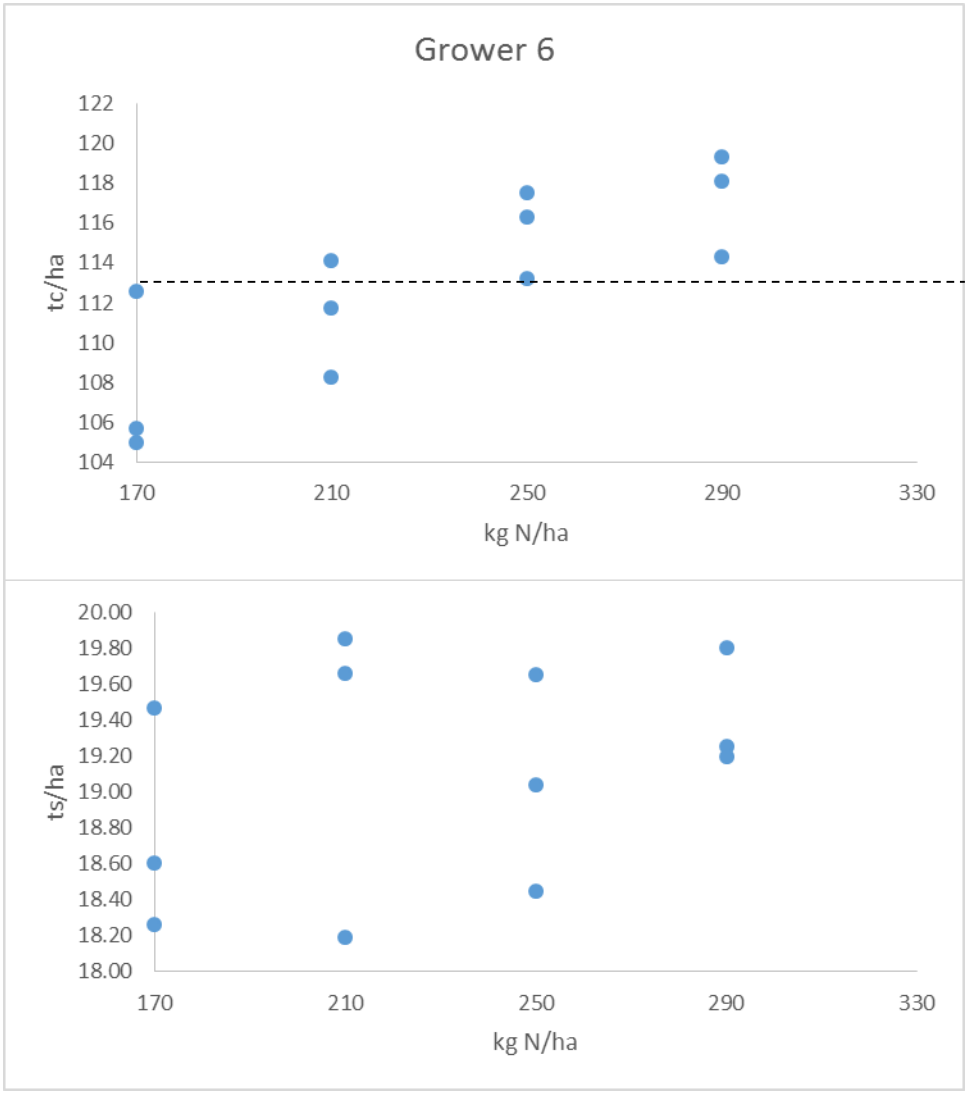
Mean sugar yields (ts/ha) for each nitrogen rate treatment at six 2nd ratoon trial sites

Grower ID	Treatments			
	170 kg N/ha	210 kg N/ha	250 kg N/ha	290 kg N/ha
2	16.3	16	15.9	
3	21.9	22.1	22.7	22.9
6	18.8	19.2	19.1	19.4
7	20	19.4	19.2	19.2
8	13.7	14	14	14.4
10	14.5	14.7	14.9	15.3

Grower 6


Grower 6
122
120
118
116
114
112
110
108
106
104
tc/ha
170
210
250
290
330
kg N/ha
20.00
19.80
19.60
19.40
19.20
19.00
18.80
18.60
18.40
18.20
18.00
ts/ha
170
210
250
290
330
kg N/ha

Grower 6


Grower 6
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kg N/ha
20.00
19.80
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19.20
19.00
18.80
18.60
18.40
18.20
18.00
ts/ha
170
210
250
290
330
kg N/ha

Mean cane yield (tc/ha) for each nitrogen rate treatment at four 1st ratoon trial sites

Grower ID	Treatments		
	210 kg N/ha	250 kg N/ha	290 kg N/ha
5	132.1	134.8	135.2
12	97.1	94.7	98.4
13	120.9[b]	130.4[a]	136.4[a]
14*	145.2	147.6	149.3

Sites with P<0.05 are highlighted
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Mean sugar yields (ts/ha) for each nitrogen rate treatment at four 1st ratoon trial sites

Grower ID	Treatments		
	210 kg N/ha	250 kg N/ha	290 kg N/ha
5	19.5	19.7	20
12	15.9	14.9	15.3
13	17.6[b]	19.6[a]	20.2[a]
14	21.3	21.5	21.7

Mean cane yield (tc/ha) for each nitrogen rate treatment for a plant crop

Grower ID	Treatments		
	150 kg N/ha	190 kg N/ha	230 kg N/ha
15	196.6	201.4	198.5

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Grower ID	Treatments		
	150 kg N/ha	190 kg N/ha	230 kg N/ha
15	26.2	25.7	25.5

Note. Moddus was applied to this trial site

Economic investigation

- DAF economist currently undertaking an economic investigation
- Data used for this investigation include:
  - yield, relative CCS, fertilising and harvesting costs and levies
- Using these data they will be able to:
  - Compare net revenue for each replicate
  - Compare the average net revenue of each treatment and for each crop stage
  - Calculate the average net revenue over the crop cycle
- Results to become available later this year

Apparent nitrogen fertiliser use efficiency (aNUE) -

kg of N applied to produce 1 tonne of sugarcane

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Grower ID	Crop Stage	Applied N (kg/ha)	Yield (tc/ha)	kg of N applied to produce 1 tonne of sugarcane	Crop Stage	Applied N (kg/ha)	Yield (tc/ha)	kg of N applied to produce 1 tonne of sugarcane
2	1st Ratoon	210	113	1.9	2nd Ratoon	210	106	2.0
6		210	122	1.7		210	111	1.9
8		210	82	2.6		210	82	2.6
10		210	125	1.7		210	102	2.1
5	Plant Crop	170	95	1.8	1st Ratoon	210	132	1.6
13		170	128	1.3		210	121	1.7
15		150	197	0.8				

A DYP of 180 t cane and the 1.4/1 multiplier would result in an apparent N use efficiency of 1.2 kg N/tonne cane (NOTE: Does not include discounts for soil N mineralisation)

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Closing comments

•N requirement calculated by the Regulated Method/Six Easy Steps was more than enough for maximum cane and sugar yields for most crops harvested in 2014.

• One 1st ratoon crop required more than the Regulated Method/Six Easy Steps recommended N application rate to achieve maximum cane and sugar yield.

  –This was also observed in the plant crop at the same site

THANK YOU