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Economics of Variable Rate Nutrient Application (VRA) in sugarcane

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Overview

- Background – QLD central sugarcane growing region
- Spatial and temporal variability
- Research questions
- Trial design
- Results
- Conclusion

Background



Central cane growing region

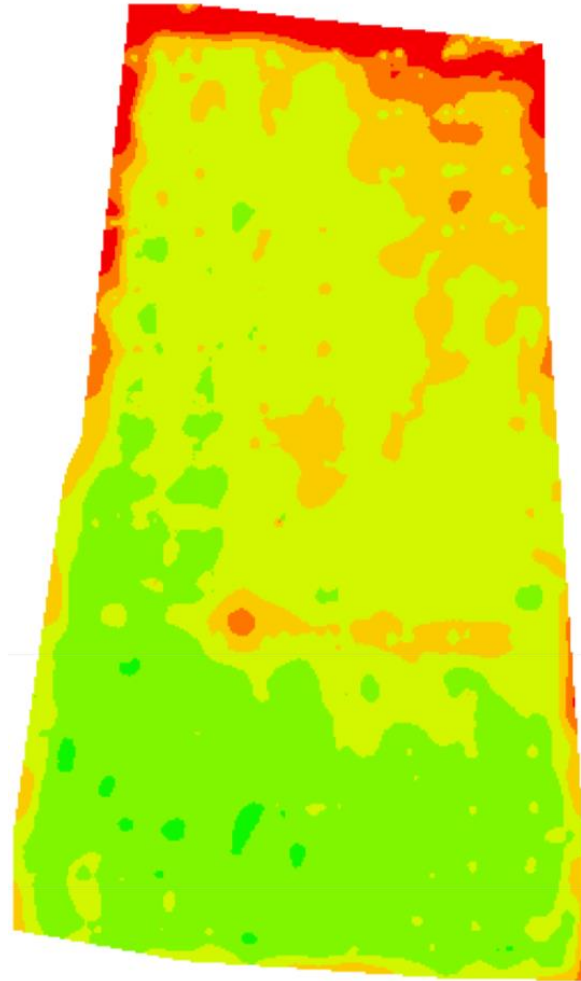
Mackay Whitsunday Catchment
≈ 10,785km²
≈ 18% under sugarcane

Reef health is poor

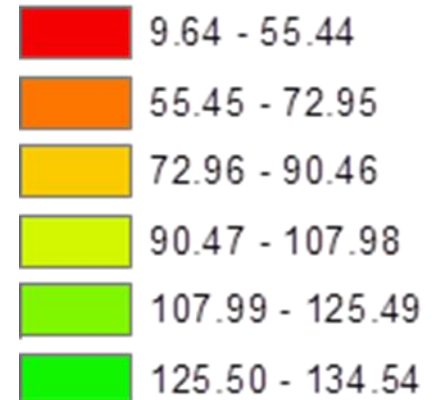
Reef Plan 2013 = ↓ DIN by 50%
By 2020

2014 Reef Plan report card =
Nutrient and pesticide remain a
high priority.

Temporal and spatial variability



Yield Estimate (t/ha)



Research Questions

1. Is Variable Rate Application (VRA) of nutrients a viable mechanism to reduce nitrogen (amongst others) in the central sugarcane growing region reaching the GBR?
2. Can the sugar industry reduce nitrogen (N) rates economically to aid in the improvement of water quality entering the Great Barrier Reef (GBR)?

Yield monitoring and remote sensing

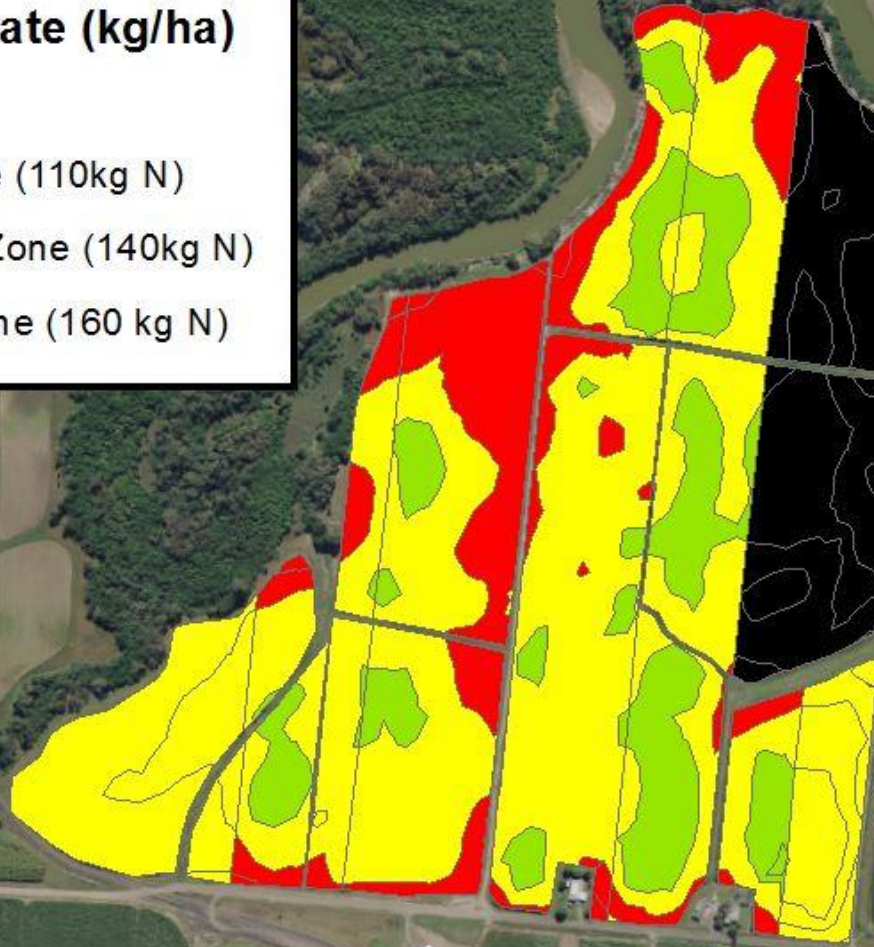
- Few accurate yield monitors in cane harvesters
- Remote sensing used in the absence of yield monitors
- Enabled relatively accurate yield estimations
- Over 10 years worth of yield estimation data for the Mackay Whitsunday region
- Enables trends of productivity to be analysed

Trial Design

Legend

Fertiliser application rate (kg/ha)

- 0 - Fallow
- 425 - Low Yield Zone (110kg N)
- 540 - Medium Yield Zone (140kg N)
- 625 - High Yield Zone (160 kg N)

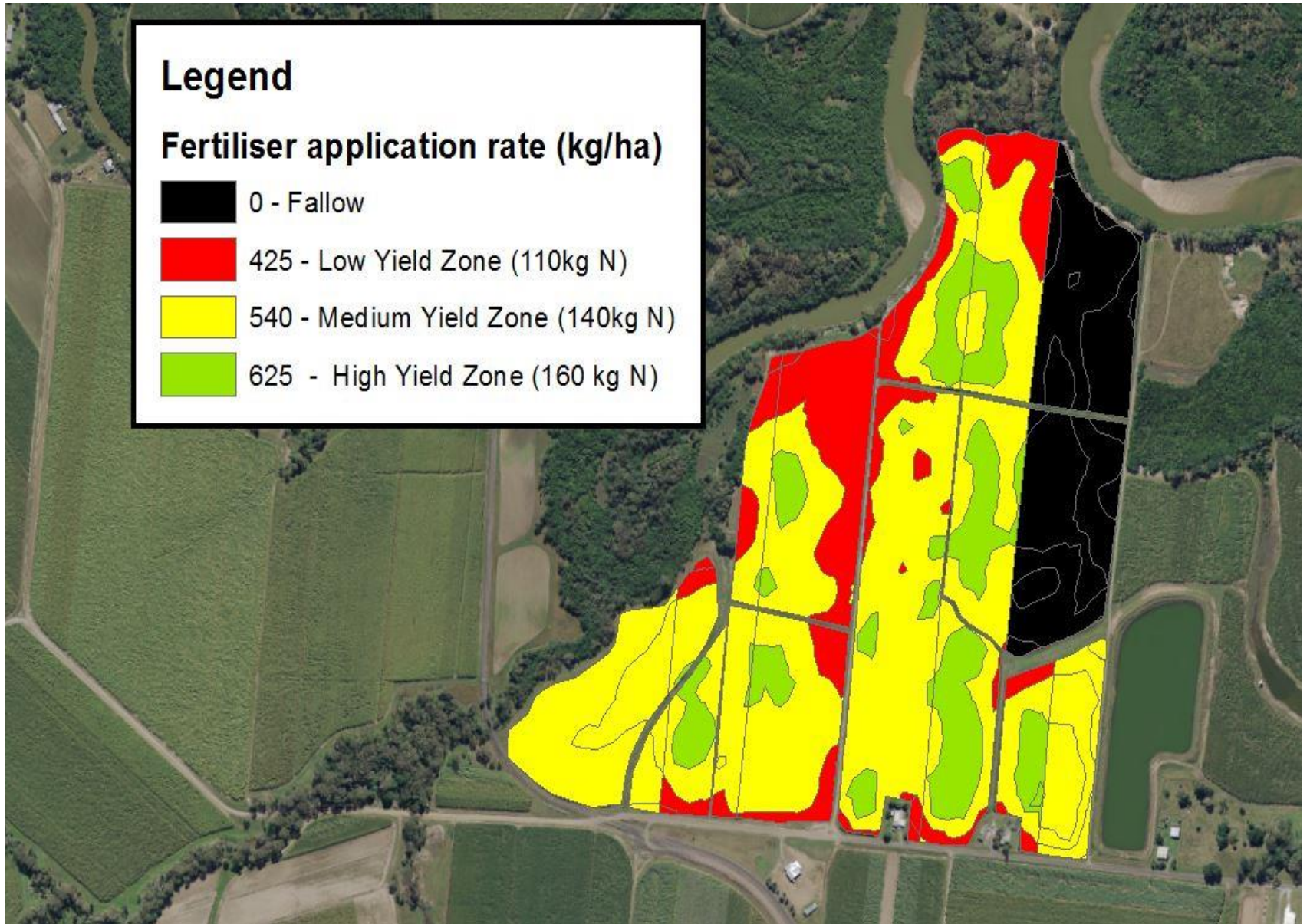


Practice	Conventional	VRA
Fertiliser	Garget Ratooner N:25.6 P:2.4 K:16 S:2.3	Garget Ratooner N:25.6 P:2.4 K:16 S:2.3
Fertiliser Rate kg/ha	625kg/ha	High 625kg/ha Med 540kg/ha Low 425kg/ha
Area (ha)	37ha	High zone 10ha Med zone 21ha Low zone 6 ha
Nitrogen (ha)	160kg/ha N	High 160kg/ha N Med 140kg/ha N Low 110kg/ha N
Implement used	Stool splitter – Manual controller	Stool splitter – Variable rate controller

Legend

Fertiliser application rate (kg/ha)

- 0 - Fallow
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Assumptions	Value
Sugar price (\$/t)	435
Molasses (\$/t)	119
Clean Fibre (\$/t)	3
Harvest costs (\$/t)	7.50
Levies (\$/t)	0.70
Real discount rate	7
Capital invested (\$)	12,835 (9750+3085)
Time horizon (years)	10
Consultancy Agronomist (hrs)	10

Results	Value
Yield and sugar quality	Unchanged
Total farm gross margin improvement (%)	7
Whole farm NPV (\$) NPV (\$/ha)	-12,301 -293
Total reduction in N (%)	14

Conclusion

1. *Is VRA a viable mechanism to reduce the N in the central sugarcane growing region?*

Yes, we received a 14% reduction in N in this trial without compromising yields or sugar quality.

Therefore, where possible it is a viable mechanism to reduce N in the Mackay Whitsunday region.

Does not meet the 2020 target of a 50% reduction in dissolved inorganic nitrogen (DIN), but its start.

Conclusion

2. Can the sugar industry reduce nitrogen (N) rates through VRA of nutrient economically to aid in the improvement of the Great Barrier Reef (GBR)?

In this case study the cost of capital outweighs cost savings.

However, where contractors are used or grower groups can purchase the capital together, VRA practices may yield better economic results.

Questions?



Discussion

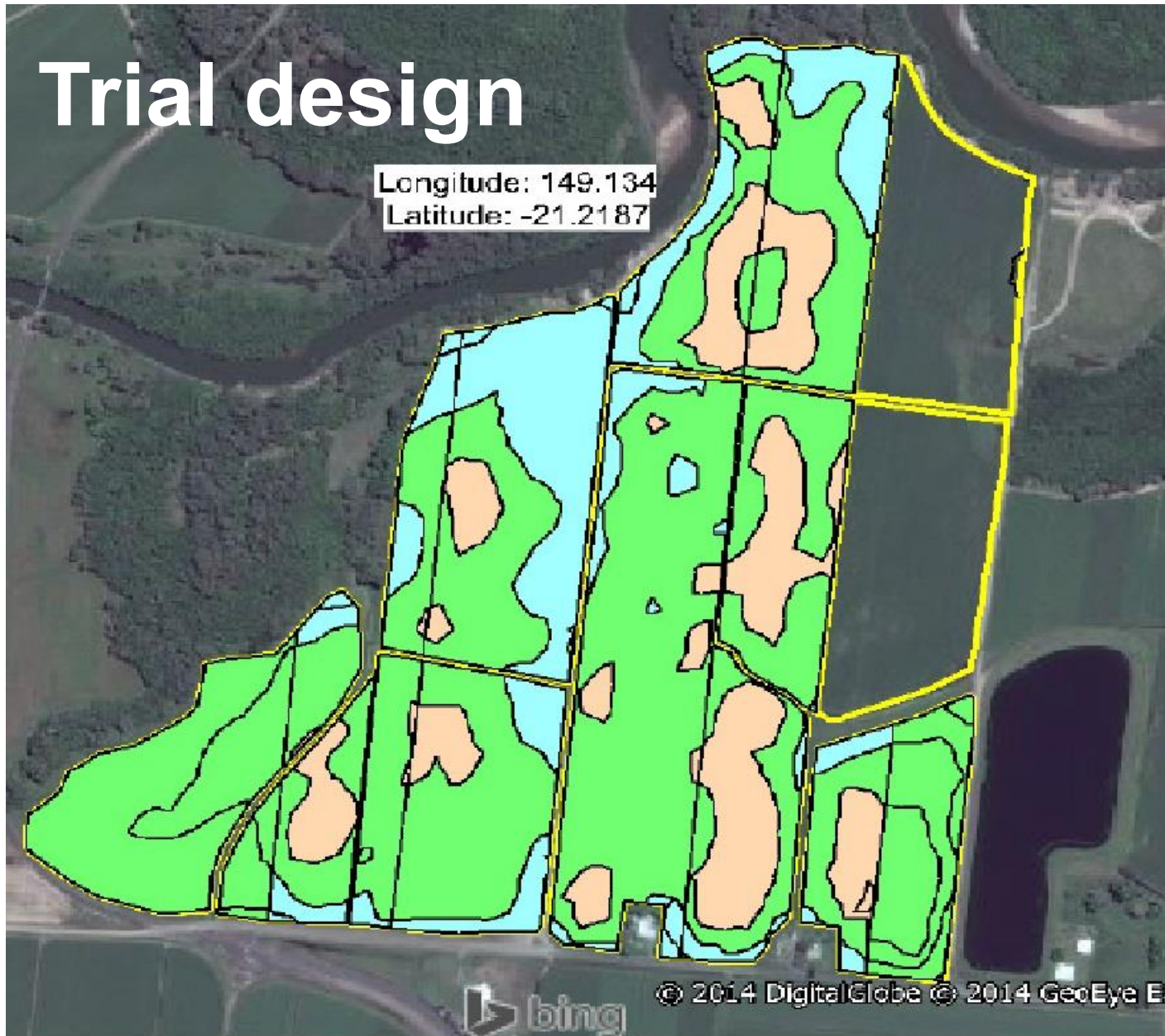
Gross margin change is positive in this analysis.

At 7% real discount rate the NPV is negative

While in the trial yields and sugar quality were not changed, the NPV sensitivity does highlight the risk growers face when deciding to implement a similar VRA system.

Trial design

Longitude: 149.134
Latitude: -21.2187



		Net present value		
Yield	Discount rate %	Cane price (\$/t)		
		385	435	485
-10%	5	-\$73,119	-\$82,184	-\$91,465
	7	-\$67,668	-\$75,914	-\$84,356
	9	-\$62,938	-\$70,472	-\$78,186
0	5	-\$12,248	-\$12,248	-\$12,248
	7	-\$12,301	-\$12,301	-\$12,301
	9	-\$12,347	-\$12,347	-\$12,347
+10%	5	\$48,167	\$57,680	\$66,977
	7	\$42,651	\$51,304	\$59,761
	9	\$37,864	\$45,771	\$53,498



PA in the sugar industry at present

Common place

GPS software,

Controlled traffic, minimum tillage, auto steer,

EC mapping, geo referenced soil sampling

Emerging technologies

Yield monitors

Remote sensing

Variable rate controllers

Telemetry

Desirable technologies

Crop quality sensors

Electronic consignment