Project **Catalyst**

An Economic Analysis of Project Catalyst field trials

Variety N-use Efficiency Trial – Burdekin grower: Richard Kelly

Reduced N in late ratoon Trial – Burdekin grower: Sam Marano

Groundwater Nitrate Trial – Burdekin grower: Brendan Swindley

Variety N-use efficiency trial – Burdekin grower: Wayne Dalsanto

Variable Rate Balance® Trial – Koumala grower: Serg Berardi

Variable Rate Nitrogen Trial – Mackay grower: Tony Bugeja

Targeting cane varieties to match soil type - Sarina grower: Manuel Muscat

Banded Mill Mud and Reduced N in a Late Ratoon – Tully grower: Sam Di Mauro

Queensland Government

Variety N-use Efficiency Trial – An Economic Analysis

Burdekin grower: Richard Kelly

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to provide data that was analysed to identify the costs, revenues and profitability of the trials.

In this study, Richard Kelly and Farmacist trialled various rates of Nitrogen (N) in a crop of Q240 to determine the N-use efficiency of Q240 and the N rate that optimised its performance. Yields and profitability were measured to compare the treatments.

Trial Design

Farmacist and Richard Kelly established the randomised strip trial in a first ratoon crop of Q240 during 2016 and harvested the trial in 2017. The trial compared three different N rate treatments at 147, 164 and 206 kilograms of N per hectare. Each N rate treatment had four replicates.

Costs

The only variation in growing costs was due to differences in fertiliser application rates. Harvesting costs and levies incurred also varied as these are in proportion to the yields of each treatment. All other costs were the same across the treatments.

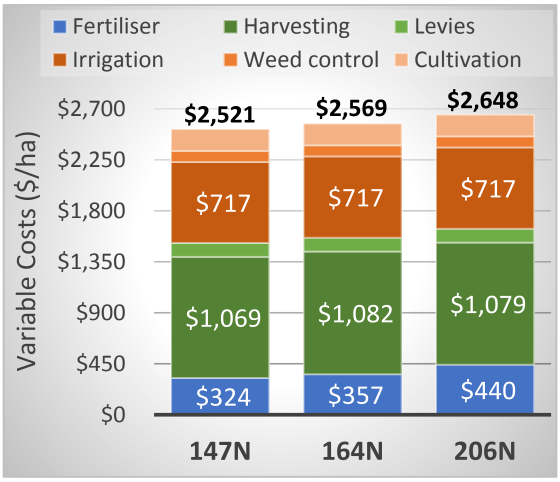

Figure 1: Variable cost break-down

Figure 1 shows a breakdown of all the variable costs for each treatment (averaged).

Results

Variable growing costs have been subtracted from revenue to compare the gross margin (profitability) of each N treatment.

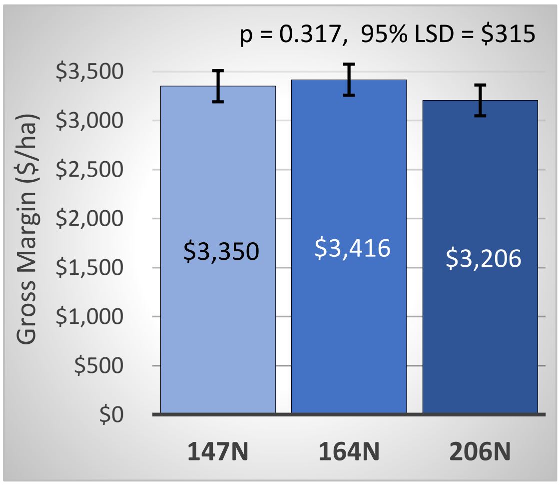

Figure 2: Average gross margin – error bars indicate the 95% least significant difference (overlapping bars indicate no significant difference).

Figure 2 shows that an N application rate of 164 kg/ha produced the highest average gross margin. However, a statistical analysis indicated that the differences in gross margins were not statistically significant and therefore could not confidently be attributed to the different treatments.

For more information on the economic analysis please contact:

Matthew Thompson - Ph: (07) 3330 4506
Email: Matthew.Thompson@daf.qld.gov.au

Tichaona Pfumayaramba - Ph: (07) 3330 4507
Email: Tichaona.Pfumayaramba@daf.qld.gov.au

The Department of Agriculture and Fisheries would like to acknowledge the project partners and growers for all their contributions.

Project **Catalyst**

Reduced N in late ratoon Trial

– An Economic Analysis

Burdekin grower: Sam Marano

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to provide data that was analysed to identify the costs, revenues and profitability of the trials.

In this study, Sam Marano and Farmacist trialled the application of reduced Nitrogen (N) rates in an older ratoon to determine the impact on performance. Yields and profitability were measured to compare the treatments.

Trial Design

The randomised strip trial was established on a third ratoon crop of Q208 during 2016 and harvested in 2017. Sam generally applies 190kg of N/ha in his older ratoons on the trial block, while SIX EASY STEPS recommends applying 210kg of N (yield potential of 180 tC/ha). To determine the impact of applying reduced N rates, the trial compared three different N rate treatments at 20kg intervals; 170, 190 and 210kg of N/ha. Each treatment had three replicates.

Costs

Given that the lower N treatments used less N, the fertiliser costs were lower. Harvesting costs and levies also varied as these are in proportion to the yields of each treatment. All other costs were the same across the treatments.

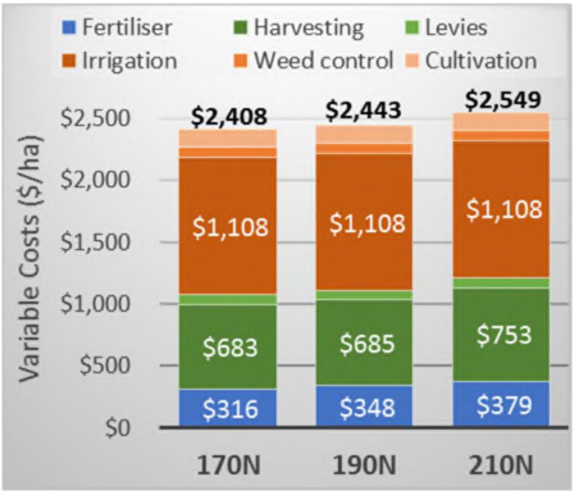

Figure 1: Variable cost break-down

Figure 1 shows a breakdown of all the variable costs for each treatment (averaged across the replicates).

Results

Variable growing costs have been subtracted from revenue to compare the gross margin (profitability) of each N rate treatment.

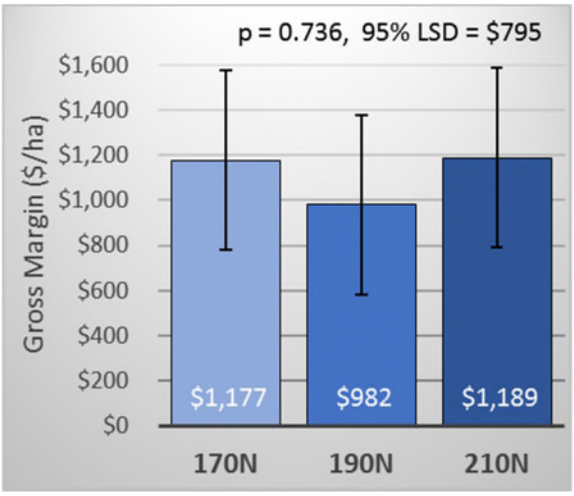

Figure 2: Average gross margin – error bars indicate the 95% least significant difference (overlapping bars indicate no statistical significance).

Figure 2 shows that the average gross margin of the 170N and 210N treatment were very similar. This is because the 170N treatment delivered relatively higher average CCS but lower average cane yield, while the 210N treatment produced the contrary. A statistical analysis of the economic results indicated that the differences in gross margins were not statistically significant and therefore could not be attributed to the different treatments.

For more information on the economic analysis please contact:

Matthew Thompson - Ph: (07) 3330 4506

Email: Matthew.Thompson@daf.qld.gov.au

Tichaona Pfumayaramba - Ph: (07) 3330 4507

Email: Tichaona.Pfumayaramba@daf.qld.gov.au

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Groundwater Nitrate Trial

– An Economic Analysis

Burdekin grower: Brendan Swindley

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to provide data that was analysed to identify the costs, revenues and profitability of the trials.

In this study, Brendan Swindley and Farmacist trialled applying a reduced rate of Nitrogen (N) to offset the nitrates supplied by Brendan's irrigation water.

Trial Design

The replicated strip trial was established in a second ratoon crop of Q183 during 2016 and was harvested in 2017. The objective was to assess whether N rates in high groundwater nitrate areas could be reduced without causing losses. The grower had already previously adopted a lower N application rate to compensate for nitrates being supplied by irrigation water. The trial was setup to compare the yield and profitability of the SIX EASY STEPS recommendation of 200kg of N/ha with the grower's usual practice of applying 170kg of N/ha (30kg below the recommendation). Each treatment had four replicates.

Costs

Using 200kg of N incurred higher fertiliser costs. Harvesting costs and levies varied slightly as these were dependent on yield. All other costs were the same across the two treatments.

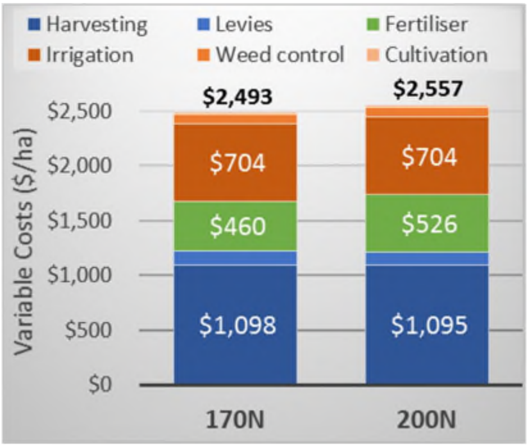

Figure 1: Variable cost break-down

Figure 1 shows a breakdown of all the variable costs for each treatment (averaged).

Results

Variable growing costs have been subtracted from revenue to compare the gross margin (profitability) of each N treatment.

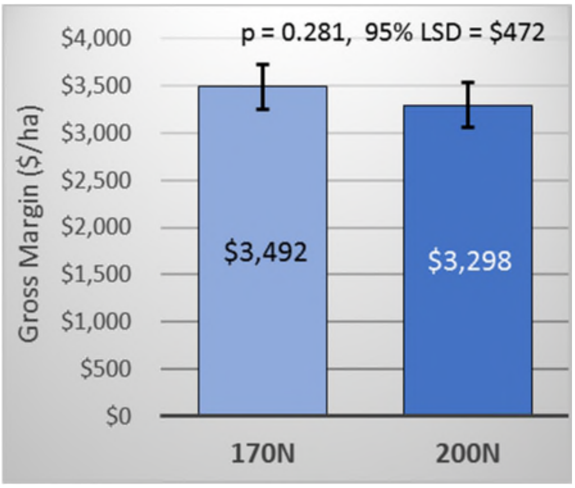

Figure 2: Average gross margin – error bars indicate the 95% least significant difference (overlapping bars indicate no significant difference).

Figure 2 shows that the average gross margin of the 170kg N per hectare treatment was the highest. However, a statistical analysis indicated that the differences in gross margins were not statistically significant and therefore could not confidently be attributed to the different treatments.

For more information on the economic analysis please contact:

Matthew Thompson - Ph: (07) 3330 4506
Email: Matthew.Thompson@daf.qld.gov.au

Tichaona Pfumayaramba - Ph: (07) 3330 4507
Email: Tichaona.Pfumayaramba@daf.qld.gov.au

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Variety N-use efficiency trial – An Economic Analysis

Burdekin grower: Wayne Dalsanto

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to provide data that was analysed to identify the costs, revenues and profitability of the trials.

In this study, Wayne Dalsanto and Farmacist trialled various rates of Nitrogen (N) in a crop of Q253 to determine the N-use efficiency of Q253 and the N rate that optimised its performance. Yields and profitability were measured to compare the treatments.

Trial Design

Farmacist and Wayne Dalsanto established the randomised strip trial in a first ratoon crop of Q253 during 2016 and harvested in 2017. The trial compared four different N rate treatments at approximately 20kg intervals; 162, 181, 201 and 223 kilograms of N per hectare. Each N rate treatment had three replicates.

Costs

Given that the higher N treatments used more N, their fertiliser costs were higher. Harvesting costs and levies also varied as these are in proportion to the yields of each treatment. All other costs were the same across the treatments. Figure 1 shows a breakdown of all the variable costs for each treatment (averaged across the replicates).

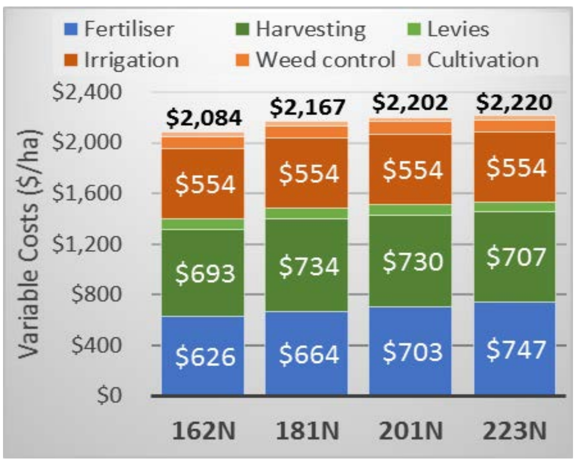

Figure 2: Variable cost break-down

Results

Variable growing costs have been subtracted from revenue to compare the gross margin (profitability) of each N rate treatment. Figure 3 shows that the average gross margin of the 181kg N per hectare treatment was the highest. A statistical analysis indicated that differences in gross margin were not quite statistically significant at the 5% significance level.

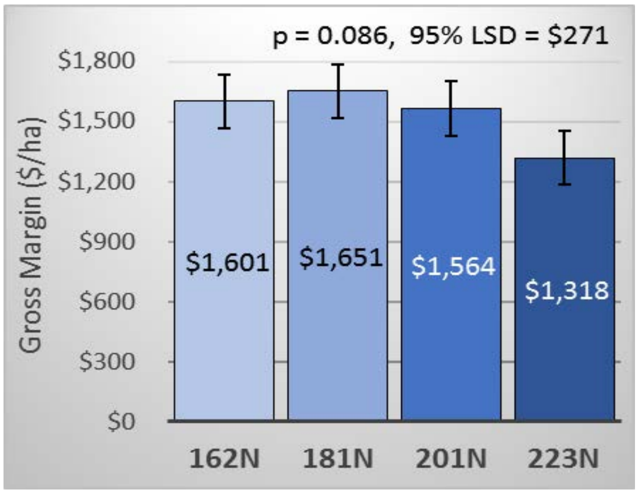

Figure 3: Average gross margin–error bars indicate the 95% least significant difference (95% LSD).

For more information on the economic analysis please contact:
Matthew Thompson - Ph: (07) 3330 4506 Email:
Matthew.Thompson@daf.qld.gov.au

Tichaona Pfumayaramba - Ph: (07) 3330 4507 Email:
Tichaona.Pfumayaramba@daf.qld.gov.au

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Variable Rate Balance® Trial

– An Economic Analysis

Koumala grower: Serg Berardi

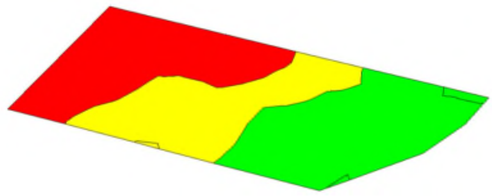
Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to provide data that was analysed to identify the costs, revenues and profitability of the trials.

In this study, Serg Berardi and Farmacist trialled varying the application rate of Balance® 750 WG on different soil types to determine its effect on yield and profitability. Varying the rate might help to save on weed control costs and reduce the risk of runoff.

Trial Design

The current trial was conducted by Farmacist and Serge Berardi on his Koumala farm over the 2016 and 2017 seasons. For the trial, three different rates of Balance® were applied onto various soil types. The three treatments were Balance® applied at: (1) 100g/ha, (2) 200g/ha and (3) a Variable Rate (VR). The VR treatment was applied at either 100, 150 or 200 g/ha depending on the CEC of the soil. Three replications were established for each treatment. Lower herbicide rates were applied to soils of lower CEC (loamy soil) and higher rates to soils of high CEC (high clay soil). The different rates were applied by changing the applicator speed and water volumes delivered per hectare. Figure 1 shows the field layout and corresponding application rates for VR treatments. The block was selected by the grower due to its varying soil type.

Paddock map



Key

Red = pH 5.5, CEC 3.03 (Loam): 100g/ha
Yellow = applied VR approx. 150g/ha
Green = pH 5.8, CEC 5.41 (Clay): 200g/ha

Figure 1: EC Map (source: Farmacist)

Costs

After EC mapping was undertaken, GPS was used to identify the various soil types in the paddock so that the recommended rate of Balance for each particular soil type could be applied.

The cost of EC mapping was $150 for the trial (commercial charge @ $35/ha) while the cost of the VR map is normally charged at 3c per tonne. Both of these costs spread over the crop cycle (4 ratoons) added approximately $12/ha to the application cost of the VR treatment. In this case, using GPS did not incur additional costs as Serg already had the necessary GPS equipment installed on his spray tractor.

Figure 2 shows the weed control costs (blue segment with enlarged white text) and other variable costs for each treatment in the ratoon crop (averaged). The application of 200 g/ha proved the most expensive ($82/ha) due to the amount of chemical and time taken to apply it at the higher rate (i.e. slower ground speeds and more tank refills per hectare).

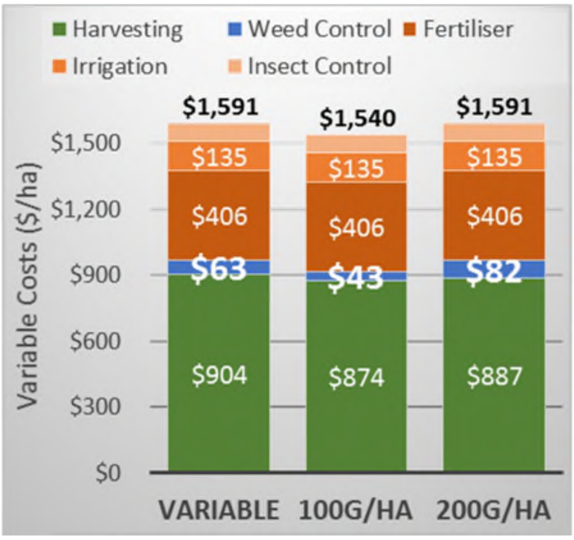


Figure 2: Weed control costs and break-down of variable costs

Results

Figure 3 shows the average gross margins for the three treatments. The results show that the average gross margin of the VR treatment was the highest. However, a statistical analysis indicated that the differences in gross margins were not statistically significant and therefore could not be attributed to the different treatments.

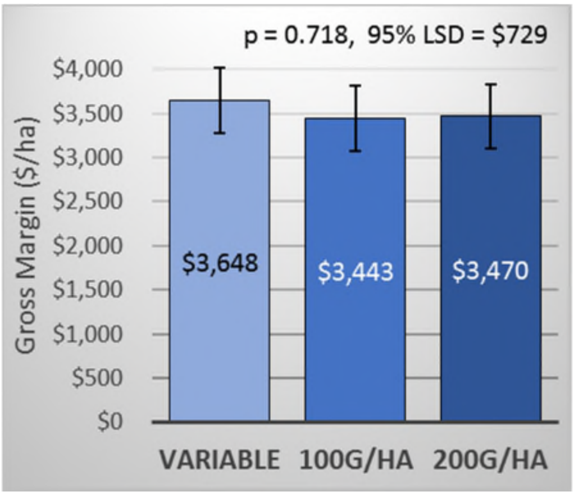


Figure 3: Average gross margins – error bars (small vertical lines at the top of each column) represent the 95% least significant difference. Overlapping bars indicate no significant difference.

For more information on the economic analysis please contact:

Brendon Nothard - Ph: (07) 4967 0605

Email: brendon.nothard@daf.qld.gov.au

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Variable Rate Nitrogen Trial – An Economic Analysis

Mackay grower: Tony Bugeja

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to provide data that was analysed to identify the costs, revenues and profitability of the trials.

In this study, Tony Bugeja and Farmacist trialled changing Nitrogen (N) application rates within the paddock based on soybean biomass to measure the influence on cane yield and profitability. While it is common practice to apply lower rates of N across the block following a high yielding soybean crop, the trial went a step further and varied the rate of N according to in-field measurements of soybean biomass. Varying the nitrogen rate is anticipated to save on fertiliser costs, ensure PRS is maintained and reduce the risk of runoff.

Trial Design

The trial was conducted by Farmacist and Tony Bugeja on his Mackay farm over the 2015 to 2017 seasons. After EC mapping, soybeans were planted across the varying soil types within the paddock. When the soybeans were ploughed in, the NDVI (biomass) of the soybeans was measured.

Two different rates of N were applied in the plant cane depending on the amount of biomass: (1) Low soybean biomass areas received 152kg of N per hectare, while; (2) High biomass areas received 27kg of N per hectare. In both treatments, 27kg of N was applied at plant while the low biomass areas were top-dressed with an additional 125kg of N.

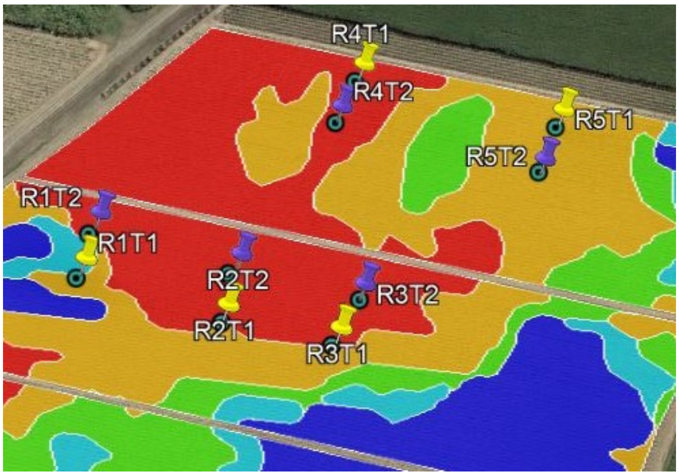

Figure 1: EC Map and replicates (source: Farmacist)
Key
Red Soil (low EC)
Orange Soil (low-moderate EC)
Yellow Markers – Low Yielding Soybean
Purple Markers – High Yielding Soybean

Figure 1 illustrates the trial layout. The trial used a simple comparison trial design. Sampling points (replicates) were selected according to soybean biomass levels and soil type so as to reduce soil variability between treatments.

Costs

The soybean biomass was measured with OptRx® crop sensors. Given crop sensors are a relatively new technology, they were applied at no charge to the grower for the trial (commercial charge is estimated at $35/ha), while the cost of the variable rate map is normally charged at 3c per tonne. Both of these costs applied commercially would add approximately $40/ha to the application cost of both treatments. GPS is required to identify the areas where the applicable N rate needed to be applied, but as Tony already had GPS no additional cost were incurred.

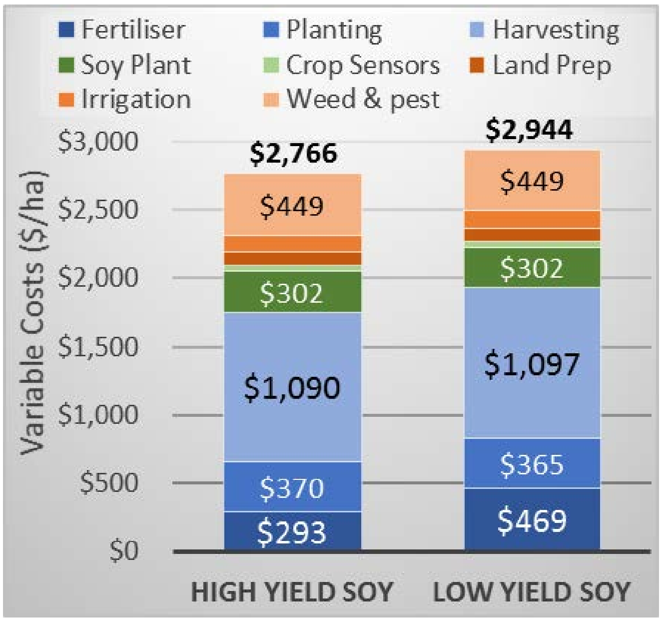

Figure 2: Break-down of variable costs

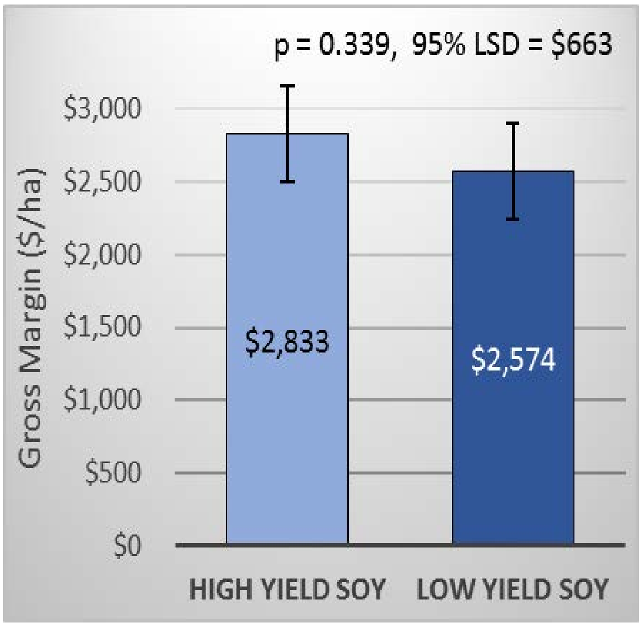

Figure 3: Average gross margins – error bars indicate the 95% least significant difference (overlapping bars indicate no significant difference).

Figure 2 shows the average variable cost differences between treatments. Due to lower fertiliser requirements and lower application costs, the high biomass treatment delivered a saving of $177/ha in costs.

Results

Figure 3 shows that the average gross margin of the high yielding soybean treatment was highest. However, a statistical analysis indicated that the differences in gross margins were not statistically significant and therefore could not confidently be attributed to the different treatments.

For more information on the economic analysis please contact:

Brendon Nothard - Ph: (07) 4967 0605
Email: brendon.nothard@daf.qld.gov.au

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Department of Agriculture and Fisheries

Project **Catalyst**

Targeting cane varieties to match soil type - An Economic Analysis

Sarina grower: Manuel Muscat

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to provide data that was analysed to identify the cost, revenues and profitability of the trials.

In this study, Manuel Muscat and Farmacist trialled four different cane variety combinations of Q138 and Q183 on sodic and non-sodic soils. Given that Q138 is believed to be more tolerant of sodic soils than other varieties such as Q183, the objective of the trial was to examine how planting Q138 in sodic areas of the paddock can improve yield and profitability. EC Mapping and GPS enable growers to alter varieties within the paddock for productivity improvements. Yields and profitability were measured to compare the treatments.

Trial Design

Farmacist and Manuel Muscat conducted the trial over the 2016 and 2017 seasons. The trial compared four treatments including: (1) Q138 only, (2) Q183 only, (3) mixed variety (50:50 Q138 and Q183), and (4) targeted dual variety – Q138 planted in sodic areas and Q183 planted elsewhere. Treatments had four replicates.

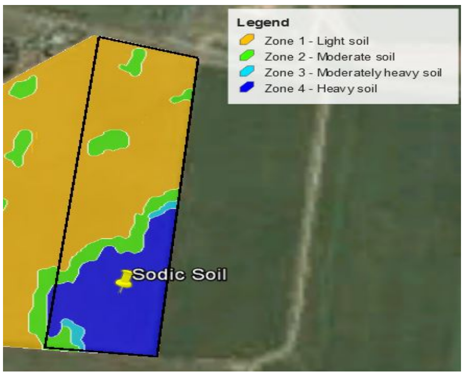

Figure 1: EC Map shows blue areas of sodicity and remainder of paddock (orange) that is not sodic.

source: Farmacist

Figure 1 shows the EC mapped block with sodic areas (blue) of the paddock planted to Q138 for the targeted dual variety treatment. The block was selected due to the mix of sodic and non-sodic soils.

Costs

Both the mixed variety treatment and the targeted dual variety treatment had higher planting costs. The mixed variety treatment required additional handling and machinery costs due to the use of a whole stick planter at the bulking stage of seed cane production (before planting the trial). The targeted dual variety treatment required a second pass with the planter given that the billet planter could not change varieties while planting. This extra pass increased the time taken to plant by approximately 37%. These additional planting costs are captured in Figure 2, while Figure 3 reflects the total variable cost for each treatment (averaged).

The commercial rate for EC mapping is estimated at $35/ha, while the variable rate map costs about 3c per tonne. Given that the map is used in each crop, the costs are spread over the crop cycle. Consequently, the EC mapping and map added $10/ha/yr to the application cost for the targeted dual variety treatment. Also, GPS was needed to identify the areas where Q138 needed to be planted but did not incur additional costs as GPS was already installed.

Figure 2: Seed Planting Cost Differences

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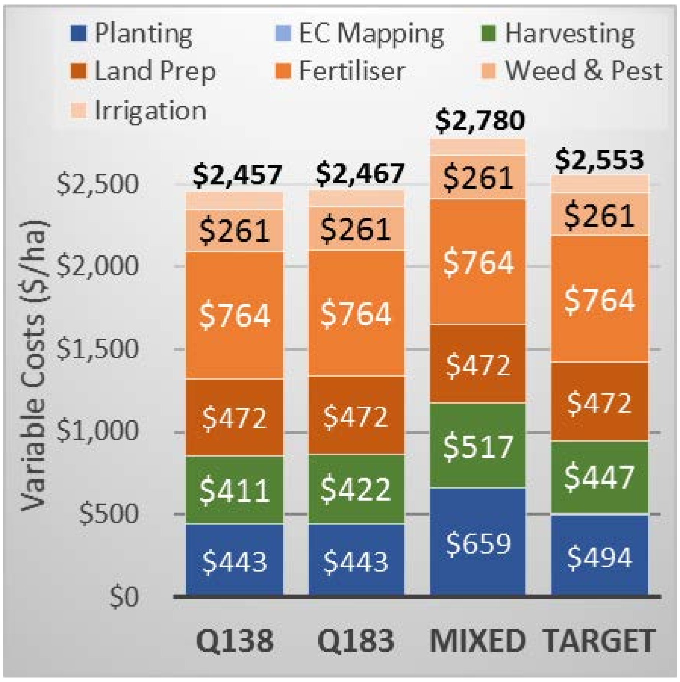

Figure 3: Variable Cost break-down

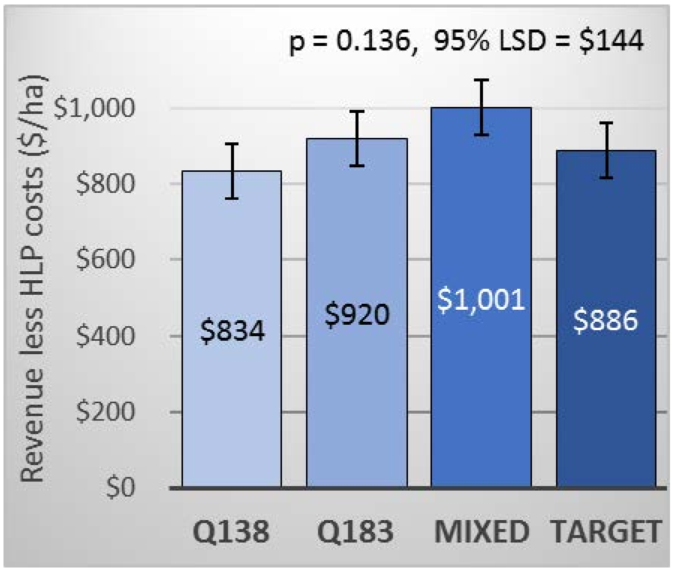

Figure 4: Average revenue less HLP Costs–error bars (small vertical lines at the top of each column) indicate the 95% Least Significant Difference.

Results

Given that harvesting costs, levies and seed planting costs vary between the treatments, these costs have been subtracted from revenue to provide a valid comparison of profitability (this far into the trial). The economic results from the trial show that average revenue less harvesting, levies and seed planting costs (HLP costs) of the mixed variety treatment was the highest, see Figure 4. A statistical analysis indicated that differences were not quite statistically significant at the 5% significance level. Unfortunately, waterlogging was experienced in all treatments during the trial, which may have influenced the yield results.

For more information on the economic analysis please contact:

Brendon Nothard - Ph: (07) 4967 0605
Email: brendon.nothard@daf.qld.gov.au

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Banded Mill Mud and Reduced N in a Late Ratoon – An Economic Analysis

Tully grower: Sam Di Mauro

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to provide data that was analysed to identify the costs, revenues and profitability of the trials.

In this study, Sam Di Mauro and T.R.A.P Services trialled banded mill mud in a late ratoon crop together with reduced Nitrogen (N) rates.

Trial Design

The trial was conducted by T.R.A.P. and Sam DiMauro on his farm in Tully. The trial was established after the second ratoon crop was cut in 2016. Sam generally applies a custom blend liquid fertiliser to his ratoons to deliver 140N, 10P, 90K and 10S.

For the trial, his usual practice of applying a liquid fertiliser blend was compared with a mud treatment with a reduced amount of fertiliser and a mud treatment with zero fertiliser. Mud in both these treatments was banded onto the stool at 100 t/ha. Each treatment was replicated three times. The treatments are described below:

Treatment 1
Liquid fertiliser at 140N, 10P, 90K & 10S

Treatment 2
Mud at 100t/ha + Liquid fertiliser at 49N, 4P, 32K & 4S

Treatment 3
Mud at 100t/ha

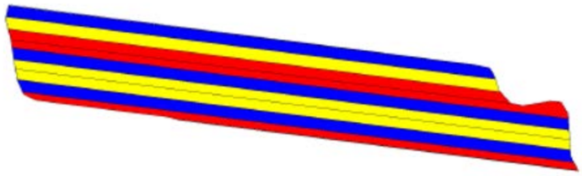

Figure 1: Map of trial block – colours indicate treatment placement (source: T.R.A.P Services)

Figure 1 shows the trial block site and the randomised strip trial design. This case study examines the third ratoon results, which was harvested in 2017. The trial will continue into the new cane crop being planted in 2018.

Costs

Mill mud has a high phosphorus content, generally enough to supply all the phosphorus requirements for at least one crop cycle at these banded rates.

Figure 2: Variable Cost Break-down

Figure 2 shows the composition of fertiliser costs, mill mud costs, harvesting costs and levies for the three different treatments.

The highest nutrition costs were for treatment 2 where both mill mud and a lower fertiliser rate were applied. All other costs were the same across the three treatments.

Results

The economic results from the 3rd ratoon show that the average gross margin of the 'no mill mud, full fert' treatment (usual grower practice) was the highest, see Figure 3. However, a statistical analysis indicated that the differences in gross margins were not statistically significant and therefore could not be attributed to the different treatments. This analysis will be updated when the plant crop is harvested at the trial site in the next crop cycle (2019).

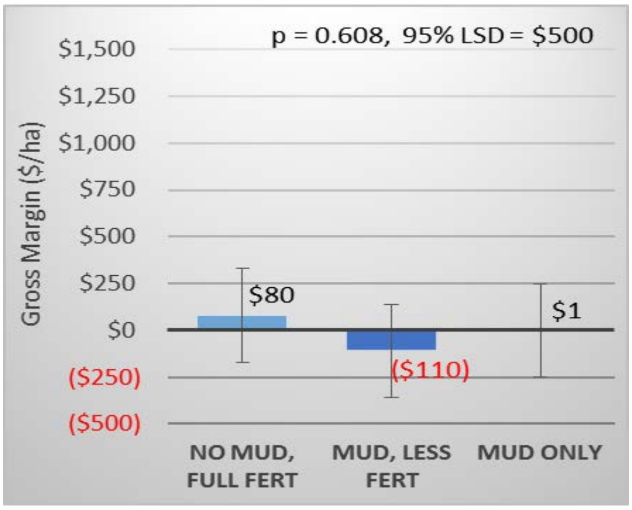

Figure 3: Gross Margins

The sensitivity of the gross margin to different mill mud costs will be carried out in future publications.

For more information on the economic analysis please contact:

Tichaona Pfumayaramba - Ph: (07) 3330 4507
Email: Tichaona.Pfumayaramba@daf.qld.gov.au

Matthew Thompson - Ph: (07) 3330 4506
Email: Matthew.Thompson@daf.qld.gov.au

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Technical, Reporting, Analysis & Project Services

Australian Government · Reef Trust · The Coca-Cola Foundation · WWF · Reef Catchments · Bayer CropScience · NQ Dry Tropics · terrain · Queensland Government