

PROJECT CATALYST

PROJECT CATALYST 2020 – **OUR REEF LEGACY, IMPROVING WATER QUALITY**



WATER QUALITY

“Unbiased observation and data remain the foundation”
David Freebairn

REEF CREDITS

Getting paid to improve water quality

PRECISION AG DRONES

The latest applications for cropping systems



Image: Project Manager Ross Neivandt and General Manager Andrew Campbell, passionately support Catalyst growers and their innovation

It's exciting to see the Project Catalyst Annual Forum back in Mackay, just as it was in 2017 not long after I began working with Catchment Solutions. This year we have once again listened to your feedback in assembling a program filled with current, relevant content that will provide us with a memorable couple of days.

2019 marked the end of the Australian Federal Government Reef Trust 3 program which funded Project Catalyst alongside the Coca Cola Foundation over the previous three years.

Thanks to our grower initiatives these are just some of the outcomes the project delivered over that period:

- 133 innovation and early adoption trials. Detailed Trial reports are available on the Project Catalyst website.
- 26,000 hectares of cane farming lands impacted by sugar cane growers directly involved with Project Catalyst innovation and early adoption trials.
- Reduction in DIN (Dissolved Inorganic Nitrogen) by 62 tonnes per year.
- Reduction in Sediment loss by 319 tonnes per year.

- 2,978 participants attended 67 events including the Annual Grower Forums, Field Days, Shed Meetings, Training Sessions and Bus Trips held during the project period. This level of grower and industry interaction allows for networking to occur across geographic regions that otherwise may not be possible.
- Production of 3 practice fact sheets, 15 detailed economic reports, 38 videos and 5 grower stories published on the Project Catalyst website and YouTube Channel.

Another first for the project was that founding partner, WWF-Australia, held their board meeting in North Queensland and visited the farm of Joe Muscat who very kindly hosted a BBQ lunch and a tour around his property. I received feedback that the board were very impressed with the work Joe, his son Stephen and their families have implemented on their farms, to minimise water loss, reduce input costs and improve productivity. Getting to see these achievements in person, makes such a difference to people who only hear about this work in reports and third person conversations.

On a very positive note, Project Catalyst has been successful in securing a further two years of funding from the Great Barrier Reef Foundation. This has allowed 10 new innovation trials to commence, as well as support the continuation of 30 existing trials. On top of this, agronomic and extension support is being provided to another 40 growers for broader adoption practice change implementation.

As you can see, a lot has been happening with Project Catalyst and 2020 looks to continue the trend with plenty of activity. Project Catalyst Forum provides a wonderful opportunity to take stock of all of our activities, renew old friendships and discuss what are the next step changes we can work on, to further improve productivity and environmental outcomes.

I hope you really enjoy the Forum experience and get the most out of what it has to offer.

Andrew Campbell
General Manager, Catchment Solutions



FEATURE



SPEAKERS

Inspiring change through innovation



MACKAY

Recycling water for irrigation



BAYER

Focus on stewardship beyond 2020



NQ DRY TROPICS

Reef Trust Tender results are in



Great Barrier
Reef Foundation



CASE STUDIES

12

WATER TRIALS

Sam Marano - Assessing groundwater nitrate levels to reduce N.
Paul Villis and Jason Crichton - Actively measuring and recording irrigation data.

20

SOIL TRIALS

Manuel Muscat - Tailoring variety to soil type for improved productivity and increased nitrogen use efficiency.
Adrian Darveniza - Measuring the difference between early and late plant with minimum and zero tillage.
Richard Hobbs - The economic analysis of reduced N application after Sunn Hemp trial.
Alan Lynn - Improving overall soil conditions and plant health trialling lime products.

40

NUTRIENT TRIALS

Hesp, Stockham, Villis and Mugica - Banding mill mud results.
David Ellwood - Evaluating reduced nutrient application on late harvest.
John and Dean Pastega - The economics of a variable rate SuSCon application trial.
Steve Young - Using low cost sensors to produce cane yield maps and improve VR maps for growers.



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PROGRAM

SUNDAY, FEBRUARY 23RD

WELCOME FUNCTION Thanks to NQ Bulk Ports and Rabobank
Mackay Entertainment & Convention Centre (MECC) – Civic Lawn/Fig Tree

17:00 – 20:00	Delegates Check-in (Collect name tag) - Join us for drinks and canapes
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MONDAY, FEBRUARY 24TH **GROWER FORUM DAY 1**

Mackay Entertainment & Convention Centre (MECC)

07:30 – 08:00	Delegates Check-in (Collect name tag)
08:00 – 08:10	Housekeeping and Introductions – MC Kim Kleidon
08:10 – 08:15	Welcome – Bill MacDonald, Reef Catchments Limited
08:15 – 08:45	Keynote Speaker 1: David Freebairn, Soil Scientist <i>'How changes in management influence hydrology and water quality'</i>
08:50 – 09:20	Reef Report Card – Healthy Rivers to Reef, Charlie Morgan, Executive Officer
09:30 – 09:45	Virtual Farm Tours – Living Legacy

09:45 – 10:15 MORNING TEA Thanks to Reef Catchments

10:25 – 12:00	Trial Data Presentations – Panel discussion followed by questions
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12:00 – 13:00 LUNCH

13:05 – 14:00	Breakout Session 1 Thanks to Rabobank Group 1: Mike Berwick – 'Reef Credits – Paying to improve water quality' Group 2: Neil Cliffe – 'Climate Variability – Opportunities and challenges'
14:05 – 15:00	Breakout Session 2 Thanks to ALS Global Group 1: Neil Cliffe – 'Climate Variability – Opportunities and challenges' Group 2: Mike Berwick – 'Reef Credits – Paying to improve water quality'

15:00 – 15:30 AFTERNOON TEA Thanks to SUNCORP

15:35 – 15:55	GBRF Presentation: Ana Perez, Program Manager, Reef Trust Partnership – 'Investing to improve the quality of water that enters the Great Barrier Reef'
16:00 – 16:20	Keynote Speaker 2: Charlie Clack – 'Price, Trade & Climate – 2020 Outlook & Beyond'
16:25 – 16:35	Wrap Day 1 & Preview Day 2 – CLOSE
16:35 – 16:45	Group photo

FORUM DINNER Thanks to Mackay Regional Council & The Great Barrier Reef Foundation
Mackay Entertainment & Convention Centre (MECC)

18:00 – 18:45	Pre-Dinner Drinks (<i>Ballroom Foyer</i>)
18:45 – 23:00	Formal Dinner: MC Rod Quantock OAM (Australia You're Standing in it) Special Guest Dinner Speaker: Graeme Sait – 'The Anthropocene – Consequences and agricultural solutions'

TUESDAY, FEBRUARY 25TH **GROWER FORUM DAY 2**

Mackay Entertainment & Convention Centre (MECC)

08:00 – 08:10	Welcome to Day 2 + Day 1 recap
08:15 – 08:45	Keynote Speaker 3: Marcus Bulstrode, Senior Development Officer, DAF – 'Drone Based Precision Agriculture – Current applications for cropping systems'
08:45 – 09:45	Trial Data Presentations – Panel discussion followed by questions
09:45 – 10:00	Virtual Farm Tours – Inspiring Change

10:00 – 10:30 MORNING TEA Thanks to Wilmar BioEthanol (Australia) Pty Ltd

10:35 – 11:05	Graeme Sait – 'Building Resilience – Strategies to succeed against the odds'
11:10 – 12:10	Trial Data Presentations – Panel discussion followed by questions

12:15 – 13:45 LUNCH

13:15 – 13:35	Ross Neivandt, Project Coordinator Project Catalyst – "Moving Forward Together"
13:40 – 14:00	Wrap Up - Close



Katrina Dent
Reef Catchments CEO

Welcome

to the Mackay Whitsunday region

Reef Catchments is proud to see the Project Catalyst Forum return to the Mackay Whitsunday region.

Project Catalyst continues to get the balance right between staying true to its original vision and continuing to innovate. The original vision was to ensure the project was led from the ground up and continued to promote innovative practices by a lead group, often in very trying times.

The strength of Project Catalyst is the diversity of stakeholders and willingness of growers to share ideas across growing areas. The willingness to learn and share ideas grows each and every year. Project Catalyst growers are an inspiration in their approach to sharing ideas, making the time to share the positives and negatives, and then going back to the farm to implement what they have heard about. Forums like this allow growers to adopt a new idea or practice while also taking out some of the risk. No one can afford to undertake a trial that is going to impact their bottom line, so where you can learn from others to refine the approach and reduce the risk that has to be a win / win situation.

Project Catalyst, and the Forum, allows growers to tell their story, to promote the innovative ideas and practice changes that are occurring across the Reef regions to reduce sediment and chemical runoff into rivers and waterways that connect to the Great Barrier Reef. In telling the story, growers can also highlight the range of pressures facing the industry, and how this group of growers and stakeholders are working hard to improve water quality and ensure a strong and prosperous sugarcane industry.

It is a credit to all in attendance, and those involved in Project Catalyst, that you continue to be an inspiration and agricultural leaders that push the boundaries to achieve your business goals.



Innovative Practices

Project Catalyst has been at the forefront of the evaluation of a range of innovative cane farming practices, many of which are being more widely adopted across the sector. As we head into the second decade of the project, we've reflected on the successes of the project to date, and what we'd like to achieve in the coming years.

To kick this off, in February 2019 we held a workshop hosted by Coca-Cola that brought together project participants and others from across the sugarcane industry, to provide their insights into priorities for the industry into the coming decade. The guidance provided by this group has been invaluable in helping us to frame the priorities for the project over coming years, and I'd like to thank those who contributed to this exercise.

Commencing this year, funding from the Coca-Cola Foundation will be directed to accelerating the adoption of precision agriculture to shift growers to best practice cane farming. This is an exciting development for the project and one that complements and builds on our extensive innovation credentials. As this is new territory for the project, we will commence this as a pilot and will be seeking growers to participate in 2020.

I think this initiative is vitally important as it will help to reinforce Project Catalyst's credentials by showcasing how our investment in innovation is leading to farm-wide adoption of best practices that are good for business whilst also improving water quality.

We were thrilled to successfully secure funding from the Great Barrier Reef Foundation for two years through to March 2021. This funding enables the project to continue 30 existing trials through to completion and to establish 10 new innovation trials. Expressions of Interest were sought mid-year and it was pleasing to see the quality of applications received. We now have 10 new innovation trials commencing, and we welcome new growers and service providers to the project.

Each year the WWF Board undertake a field trip and in 2019 they toured tropical Queensland that included visiting Joe Muscat's farm where they were able to chat with Joe and other Project Catalyst growers. A special thank you to Joe Muscat for hosting the visit and for the other Mackay growers for attending and contributing to the day's discussions.

Remember to check the Fact Sheets, Grower Stories and trial results that are all on the project website <https://www.projectcatalyst.net.au/>.

In October, it was wonderful to see Jayson Dowie, one of our service providers, recognised at the 2019 Reef Champion Awards as the co-winner of the Reef Extension Officer Champion Award. Jayson has played an instrumental role in the roll-out of the extension project RP161 in the Burdekin.

I look forward to catching up with you at the Forum.

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SPEAKER PROFILES



Dr David Freebairn

Keynote Speaker "Water Quality"

From love of a stubble burn as a farm boy to messy stubble as a soil scientist, Dr David Freebairn counts bringing together decision support aids and 120 years of daily rainfall, temperature and radiation data, gathered by 4500 Australian Bureau of Meteorology (BOM) weather stations, curated by the Queensland Government's Silo data base, among his career highlights. "A rich history of each property is reflected in these long-term weather data. If you were to manually flick through your own weather records, page by page, year by year you can build up a rich picture of probabilities to answer the questions you have in mind."

Trained in agricultural science, Dr Freebairn specialises in Soil Science, Hydrology, Water quality and systems analysis. From Department of Natural Resources and Mines Principal Soil Scientist of 31 years, to representing Queensland Government interests in dryland salinity research directions in the late 90's. It was learning to measure and demonstrate, how changes in management influence hydrology and water quality on grain farms, and how this became a win for both productivity and the environment that forms the foundation of Dr Freebairn's presentation. To provide an insight into delivery of information and learning, using mobile technology based on his experience of two successful Apps (Australian CliMate and SoilWater.App).

"Sugar cane growers share similarities and challenges, from a grain industry perspective. Scientists learn as they go, and faster when farmers are part of the game. Changes in land and soil management can be win/wins and when backed by technology, can enhance the richness of decision making."

A brief history of the journey towards profitable conservation cropping in the grain industry will be used to demonstrate what worked for farmers and scientists. With no recipes for measuring runoff, water quality and erosion, DPI scientists (mid 1970's onward) had to make up methods as they went. "A time of exploration, some failures and luck. While many results sold themselves to farmers, good data management and scientific publication were and still are a required part of quality assurance. But unbiased observation and data remain the foundation for improved farm management and environmental outcomes."



Graeme Sait

Dinner Speaker "The Anthropocene – Consequences and agricultural solutions"

Day 2 Speaker "Building Resilience – Strategies to succeed against the odds"

Dinner - Born and raised in NZ, Author and Educator Graeme Sait is a popular columnist for several publications and prolific writer with hundreds of published articles to his credit. His communication skills are most evident during his passionate, charismatic presentations which are often described as "life-changing" and "inspirational". A recognised world leader in sustainable agriculture/horticulture, Graeme is a sought-after keynote speaker at conferences around the world.

Setting the premise of a perfect storm involving topsoil loss, mismanagement of water, increasing chemical use, loss of biodiversity, an insect Armageddon, nitrogen abuse, rapid extinction and, of course, the spectre of climate change. At dinner Graeme will reveal multiple strategies to sequester carbon, increase biodiversity, reduce chemicals and water pollution, restore degraded soils, reduce chemicals and to increase urban cooling. In fact, he will help you understand how horticulture can save the planet.

"We are currently confronted with multiple challenges that are increasing stress levels and reducing the bank balances of many farmers. However, challenges produce opportunities. This presentation will focus upon the positive potential of these opportunities to help lift the spirits and purpose of the farming community."

According to Graeme, nature is the perfect blueprint and real science involves adherence to natural laws and principles. "This wondrous creation should surely inspire humility and gratitude but, unfortunately, we have arrogantly assumed we could improve upon perfection. We have taken more than we have given and, as a result we are facing our greatest challenge."

Day 2 - In this presentation, internationally acclaimed author/educator, Graeme Sait, will share strategies to counter the threats outlined during his dinner presentation. You will learn how to boost pollinators, build the soil glue (humus) that retains topsoil, increase your resilience to weather extremes and manage pests more efficiently. You will also discover how to increase profit sustainably, to better position yourself in the driver's seat in this brave, new world.



Rod Quantock OAM

MC

Rod Quantock OAM is a multi-award-winning comedian and one of the reasons Melbourne is the live comedy capital of Australia. Rod began writing and performing comedy at Melbourne University in the late Sixties and graduated to Melbourne's fledgling alternative nightspots in the early Seventies where he learned his craft and gained a reputation as a unique and pioneering comic talent, one he still retains more than 50 years later.

In 2007 Rod was the first comedian in the world to devote an entire show to climate change.

In the years since he has performed many more. Shows like 'Bugger the Polar Bears', 'This is Serious', 'Pardon My Carbon' and 'The People We Should Eat First', have won critical acclaim around the country.

When he is not working as a freelance writer, performer and speaker for the public, non-profit and private sectors, he is a prominent environmental, social and political activist.

In 2015 he was awarded an Order of Australia Medal for his contribution to the performing arts, the environment and sustainability.



Dr Neil Cliffe

Climate Variability in the Sugar Industry – Opportunities and challenges

Neil Cliffe is Program Manager of the Drought and Climate Adaptation Program (DCAP), investing in improving management of climate risk across the agriculture sector, including the sugar industry.

DCAP funded research and extension activities are aiming to fill the gap between daily weather forecasts and longer-term seasonal climate outlooks, with new, experimental multi-week, medium term and longer-term forecasts being assessed for their skill, application and usefulness for farmer decision-making. Neil's extensive experience with DPI (22yrs) and DAF over the last 7yrs give an insight to farmers. "Managing climate risk in agriculture is challenging for farmers. Improving the skill and usefulness of weather and climate forecasts will support better management of farming systems and lead to a more productive, profitable and sustainable sugar industry."

Examples of where seasonal climate forecast information can add value to sugar industry decision making processes at a range of time scales and lead times, include: irrigation management, harvesting management, ratoon management, planting, nutrient management, machinery and infrastructure investment, marketing, etc.

Further to this, DCAP is developing new and innovative insurance products to better manage climate risk, as Neil will explain, "An index-based insurance product which allows growers to insure for cyclone impacts has been developed with input from Canegrowers and QFF. The feasibility of extending this product through an industry mutual fund arrangement is currently being explored." According to Neil the new climate forecasts and insurance products will support improved management of climate risk and lead to a more productive, profitable and sustainable sugar industry.

Neil's presentation will cover, "Information/ outputs on Drought and Climate Adaptation Program projects relevant to managing climate variability in the sugar industry will be shared with growers. Examples of new forecasts, both in terms of forecast periods and the ways forecasts are depicted will be demonstrated."



Mike Berwick

Reef Credits - Paying to improve water quality

The best thing about maturity, has to be the ability to call on a library of knowledge gained over decades of experiences. For Mike Berwick the experience began at the University of Melbourne in 1969, where he studied Ag Science, before getting hands on in FNQ at Heathlands Station, Cape York Peninsula.

Vet Science and Physiology completed 7yrs of higher education at University of Queensland in the late 70's. Fast forward 10 years and Mike found himself as media advisor to Senator Graham Richardson, Australian Government Minister for the Environment in 1989.

Farmer 1993-2013

Farm producing barramundi in freshwater ponds using surplus water for irrigating fruit trees, timber and small crops. 80% of the property was rehabilitated through a combination of planting 14,000 local tree species and natural regrowth on an ex cattle property almost entirely cleared earlier this century. This was integrated, sustainable farming at its best producing protein, fruit, carbohydrates and timber

Media, politics and the environment dominate the decades to follow as Mike served on multiple advisory committees and councils, including serving his community as Mayor of the Douglas Shire Council from 1991-2008. But it's his work in Natural Resource management that he dedicated 12 years of his life until recently.

My role in GreenCollar has been part of the team building a market mechanism to improve water quality from catchments draining to the GBR called the Reef Credit

The Reef Credit Scheme is a market-based solution offering a new way to improve the quality of water entering the Great Barrier Reef. See: <https://www.reefcredit.org>

It will enable land managers to undertake projects that improve water quality through changes in land management to generate a tradeable unit of pollutant reduction or 'Reef Credit'.

My role has been engaging with landowners, science, industry, conservation and agronomic services, presenting at conferences and workshops and dealing with federal, state and local government.



Dr Marcus Bulstrode

Keynote Speaker "Drone Based Precision Agriculture – Current applications for cropping systems"

At the South Johnstone Research Facility, 100kms south of Cairns, you'll find Marcus Bulstrode who's spent many years working in the Wet Tropics. 'Evaluating the trend and condition of riparian vegetation in Australia's Wet Tropics region' as a PhD Candidate, Marcus' research focused on evaluating ways to facilitate self-repair in riparian vegetation communities to re-establish ecosystem functions and develop greater resilience to disturbance. These conditions also reduce the requirement for on-farm weed control.

But, it's his work with DAF, drones and weeds since 2015 that has been gaining attention. Germinating from a conversation with sugarcane grower Dick Camilleri and his idea to develop a small aerial spot spraying system, a trial was set in motion. The trial, combines drone mapping technology with spot spraying of weeds in sugarcane farming systems. It took a couple of years to get the project up and running, to purchase the spray drone, and complete the training and licensing required to fly it, but it's well underway. "Innisfail Canegrowers purchased a large spray drone which we've been testing on paddocks in the Wet Tropics. Prior to flying the spray drone, I use a smaller drone to map the weeds. This information is loaded into the spray drone's flight path, so it will move up and down rows spraying as it goes, reducing pesticide use and limiting potential run off."

Drone based precision agriculture (PA) is developing rapidly and in many novel directions, according to Marcus. "Crop yield assessments, though important, are just one area in which this versatile form of remote sensing can assist with crop production systems. The coming together of easily captured drone imagery and 3D point cloud analysis have created a range of powerful new tools."

Marcus will present practical examples of where Drone based PA is being applied in coastal cropping systems, the evolution of drones and how the technology has been focused onto the agricultural sector. Concluding with where current developments are taking the technology.

"Technology provides direct benefits to on-farm decision making. These decisions can support increases in profitability, crop yield and sustainability."



Charlie Clack

Price, Trade & Climate – 2020 Outlook & Beyond

Charlie joined Rabobank in 2014 and specialises in sugar market coverage across Australia and South East Asia, aiming to engage with clients across the supply chain – from growers to traders and end-users. In his presentation he will examine the potential impact of future climate change, both globally and locally, on global sugar trade flows. “I hope to highlight the importance of sustainable best practice in a world where trade, consumer expectations and climatic norms are changing.

Charlie holds a first-class degree in Agricultural Business Management from the University of Reading. He has previously worked in supply chain roles at McDonalds UK and remains involved with his family’s farming enterprise in the South West of England. An agricultural economist, Charlie previously worked within Rabobank’s Agri Commodity Markets Research team in London, where he was responsible for price forecasting and fundamental analysis of global grain and softs futures.

“The aim is to highlight where future opportunities and challenges exist for cane growers, amid the backdrop of climate change (& other sustainability challenges).”

Rabobank’s latest 12-month sugar price outlook will also be presented.



Ana Perez

The Reef Trust Partnership – Investing to improve the quality of water that enters the Great Barrier Reef

Ana is the Program Manager of the Reef Trust Partnership (RTP) for the Great Barrier Reef Foundation and has a passion for the protection of our unique living icon.

She is an Environmental Engineer with a proven track record in the design, coordination and delivery of environmental initiatives around a range of technical areas.

Ana has managed several local and regional conservation and development programs in her role of Environmental Coordinator at the Americas Fund of Peru and contributed to the development of a coastal risk management tool, CoastAdapt, whilst at Australia’s National Climate Change Adaptation Research Facility.

Through her position at the GBRF Ana has provided support to both the Water Quality and Crown-of-Thorns Starfish (COTS) Control Components of the RTP, and coordinated the development of the Partnership’s Monitoring and Evaluation Plan.

Ana is keen to share her role and that of the Foundation, “On behalf of the Great Barrier Reef Foundation, I will present the Foundation’s areas of investment that have been identified to reduce the load of priority pollutants that flow from the catchments to the Reef. These series of interventions will be implemented as part of the Water Quality Component of the Reef Trust Partnership – a \$443 million grant from the Australian Government over six years.”

Project Catalyst trials have been funded to continue via the RTP and understanding the process is the key to maintaining outcomes into the future. “The content of the presentation will be of interest to growers who want to get involved in one of our streams of work as information about the Foundation’s current and future open calls for funding will be provide.”



Charlie Morgan

Mackay-Whitsunday-Isaac regional report card – What have we learned after 5 years?

The Mackay-Whitsunday-Isaac Healthy Rivers to Reef Partnership has been in existence since 2014 and has produced 5 annual waterway health report cards. An alliance of science, all levels of government, industry, NRM’s, education and conservation, with values that mirror those of Project Catalyst.

What have we learned in that time? What is the data showing us? Where are the gaps? Executive Officer, Charlie Morgan will provide an overview of the Partnership who, what, why and how, including a snapshot of what the report cards have told us about the health of our waterways.

“Information is key. The Agricultural sector needs access to the latest waterway health information. We also need to share the good news stories of where growers, industry and the community are working hard to maintain or improve waterway health.”

Project Catalyst growers have contributed many ‘good news stories’ showcasing water quality improvement and this presentation will be an opportunity to gain an overview of the many threats, whilst celebrating their wins. “This Forum offers an extremely important opportunity to share information on the health of the region’s waterways including communities who depend on those waterways.”





Coca-Cola: A year of collaboration towards 2030

Photo by Kim Kleidon

As Project Catalyst enters its second decade, Coca-Cola Australia, WWF-Australia and its partners celebrate another year of success, innovation and ultimately working to the betterment of the Great Barrier Reef.

Over the past 11 years, The Coca-Cola Foundation has supported Project Catalyst to test and validate new approaches to improve farm productivity and reduce water pollution flowing into the Great Barrier Reef. It's been an incredible success story and a partnership that reflects the true spirit of innovation and collaboration.

As we enter a new decade and look ahead to 2030, we know that efforts to cut farm pollution will continue to be critical to boosting the Reef's resistance to coral bleaching, and to speeding its recovery.

We must continue to innovate – and indeed, spread this culture of innovation that Project Catalyst has so successfully cultivated over the past 11 years.

A YEAR OF COLLABORATION AND EVOLUTION

The achievements of the past 11 years have continued to build year on year, and 2019 was no exception. Last year, the project generated further strong federal government support through a Great Barrier Reef Foundation grant.

From July 2019, this funding has ensured the continuation of 30 existing trials, plus 10 new innovations and 40 broader adoption trials to commence during the upcoming growing seasons.

In February 2019, Coca-Cola Australia was

pleased to host an industry workshop, where 25 delegates from the sugar industry came together to discuss how to drive ongoing value to both the canegrowing community and the Great Barrier Reef. The workshop brought together professionals from across the industry to share learnings, ideas and how we might collaborate further for the future of sustainable sugar farming.

It was clear from this workshop that Project Catalyst has also created an important community for our growers. The supportive environment, peer-to-peer learning opportunities and diversity of project partners each bringing a different perspective to the project, has undoubtedly contributed to its ongoing success.

EVOLVING TO 2030

In 2007, our company set an ambitious goal to return to communities the same amount of water we use in creating our beverages by 2020. Project Catalyst has been critical to helping The Coca-Cola Company achieve this ambitious global goal five years ahead of time; the first Fortune 500 Company to do so.

As we now look to 2030, Coca-Cola's commitment to water replenishment will not end here. In the coming years, Coca-Cola plans to grow its conservation efforts, dedicated to improving communities and watersheds around the world.

Through discussions about the future of Project Catalyst, we set a key challenge: is there an opportunity for Coca-Cola to fund greater opportunities for growers, spread awareness and

increase the network of Project Catalyst, whilst keeping the unique culture of innovation alive?

Thanks to a dedicated steering committee, led by Andrew Rouse from WWF-Australia, Andrew Campbell at Catchment Solutions, several Project Catalyst growers and industry representatives, Coca-Cola's funding will continue to evolve in 2020 aiming to reach a larger, critical mass of growers and demonstrate improved water quality outcomes for the Great Barrier Reef while also creating tangible business benefits for growers.

We're excited about the opportunities ahead and the chance to grow the presence of Project Catalyst in the region. Maintaining Project Catalyst's unique commitment to innovation, its spirit of collaboration and peer-to-peer learning will continue to be front and centre.

Senior Manager Public Affairs and Sustainability at Coca-Cola South Pacific, Sarah Prestwood, says Coca-Cola is extremely proud to have supported this program since its inception.

"Project Catalyst has in a sense, been ahead of its time in our global water strategy. It's seen as a leader in the Coca-Cola system in how to drive water quality impacts and we are often asked by other markets around the world how Project Catalyst has continued to achieve results year on year.

"Project Catalyst brings together a truly diverse group of people and we look forward to welcoming more growers to the project in 2020. A heartfelt thanks to all the growers, industry representatives, NRMS and indeed WWF-Australia who continue to make this project the success that it is."





SAM MARANO

Groundwater Nitrates

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to provide data that were 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 to determine the impact on yield performance given his irrigation water supplied additional N in the form of nitrates. Economists determined profitability to compare the treatments.

TRIAL DESIGN

The randomised strip trial was established on a third ratoon crop of Q208 during 2017. This was harvested in 2018. Sam generally applied 190kg N/ha in his older ratoons on the trial block, while SIX EASY STEPS recommended applying 210kg N/ha (yield potential of 180 t/ha). To determine the impact of applying reduced N rates with groundwater nitrates, the trial compared two different N rate treatments of 170kg and 100kg of N/ha. Each treatment had four replicates.

Table 1 - Treatments

T1	170 kg N/ha
T2	100 kg N/ha

KEY FINDINGS

- Applying a lower N rate (100kg N/ha) reduced fertiliser costs by \$113/ha.
- A higher average CCS and gross margin was achieved at the lower N rate (100 kg N/ha), although differences in gross margin were not statistically significant.
- Results suggest it is worthwhile investigating the contribution of ground water nitrates to crop N uptake further.

COSTS

Figure 1 shows a breakdown of all the variable costs in the third ratoon for each treatment (average). The 100N treatment had less fertiliser applied and thus costs were \$113/ha lower. Harvesting costs and levies also varied as these were charged in proportion to yield. All other costs were the same for both treatments.

RESULTS

Both the 170N and 100N treatments obtained similar average cane yields although observations for the 100N treatment showed more variability between replicates. However, average CCS was higher for the lower N rate (100N) and almost statistically significant at the 0.05 level ($p=0.051$).

Variable growing costs were subtracted from revenue to compare the gross margin (profitability) of each N rate treatment. Figure 2 shows that the average gross margin for 100N was higher than for the 170N treatment. A statistical analysis of the economic results indicated that the differences in gross margins were not statistically significant (likely due to the large cane yield variability) and therefore could not confidently be attributed to the different treatments.

CONCLUSION

The groundwater used for irrigation in this locality was identified as being high in nitrates.

This trial sought to determine the extent to which applied N could be reduced, while maintaining yield and profitability. Coupled with a higher average CCS, applying lower levels of N reduced variable costs resulting in a higher average gross margin. While these gross margin differences were not statistically significant, the results suggest it is worthwhile investigating the contribution of groundwater nitrates to crop N uptake further.

Introducing a control treatment (zero N) into the trial design would further validate the trial results. Measurement of nitrate levels in irrigation water and repeated trials would also provide more data for the validation of results. With a better understanding of the nitrate levels already available in the irrigation water, adjusted nutrient management plans could potentially improve the profitability of Sam's cane farm as well as improve water quality outcomes.

For more information on the economic analysis please contact Tichaona Pfumayaramba
Ph: (07) 3330 4507
Email: Tichaona.Pfumayaramba@daf.qld.gov.au

Table 2: Average cane yield and CCS

	T1	T2	p-value
Cane yield, tc/ha	87.2	89.4	0.695
CCS, units	16.38	16.7	0.051

Figure 1: Variable Cost Breakdown

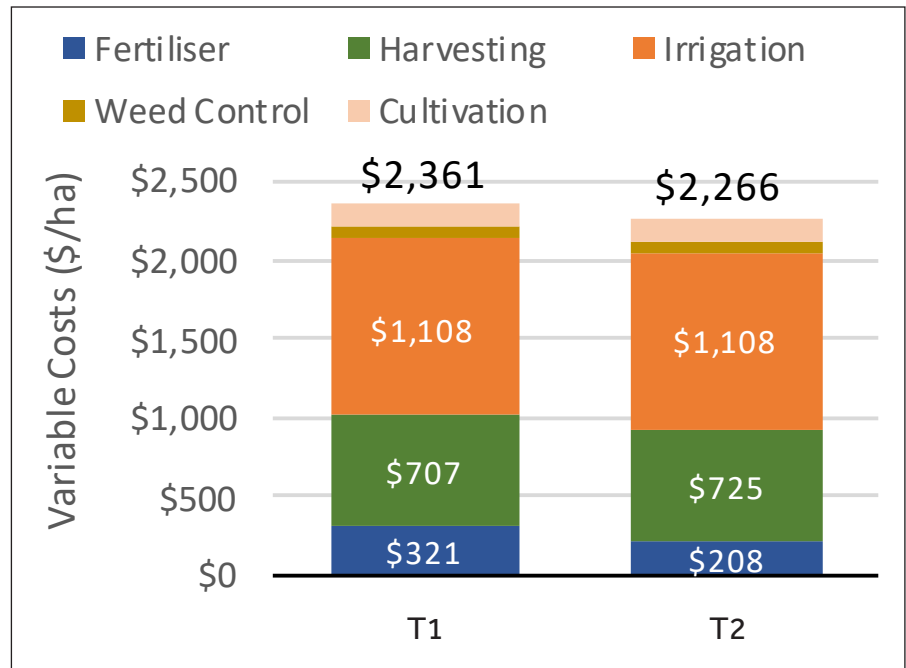
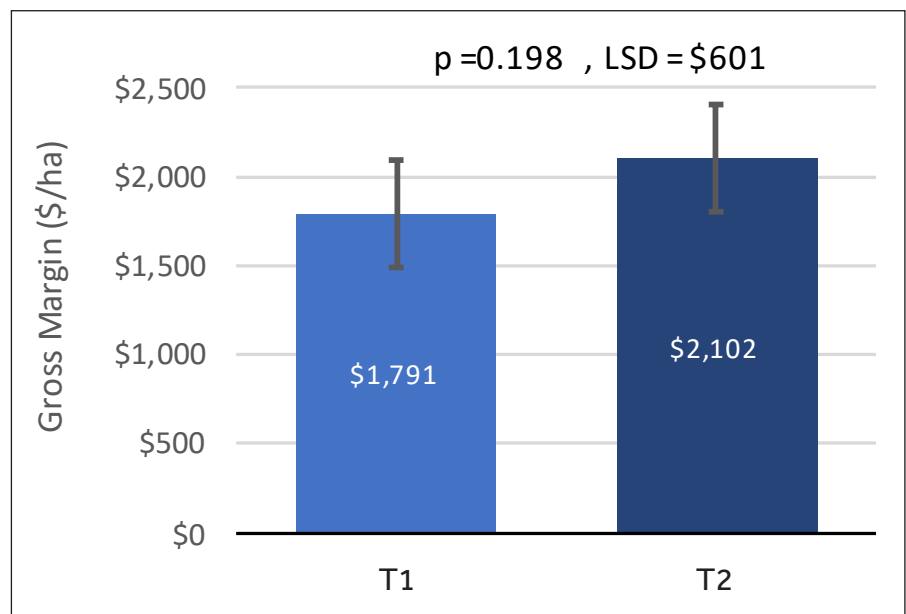


Figure 2: Average gross margin – error bars indicate the 95% least significant difference (overlapping bars indicate no significant difference).



⋮ Note: The trial results are specific to this grower, paddock and prevailing conditions

Local farmers have access to recycled water



MACKAY Regional Council's Mackay South Water Recycling Facility is the largest regional reuse scheme of its type in Australia.

Every year over 5000 megalitres of raw sewage from the city of Mackay and the township of Walkerston is processed into high quality recycled water suitable for irrigation of the local sugar cane crop.

Approximately 3200 hectares of land cultivated for sugar cane production is now serviced with an irrigation distribution system to allow local farmers to access the recycled water.

Since it began more than 10 years ago, 31 farmers have accessed the scheme which is located approximately 10 kilometres south east of Mackay.

All cultivated land within the project area is allocated 2,5 megalitres of recycled water per hectare. Each participant in the scheme has access to their own storage system, located on their individual properties. Storage systems vary in size between 20 megalitres and 50 megalitres. These storage systems are replenished with recycled water as and when more supply is required.



Two major storage reservoirs, 2200 megalitres and 530 megalitres, as well as 25 kilometres of distribution pipelines and a distribution pump station make up the balance of the irrigation scheme.

Significant increases in yield have been experienced by the growers since the introduction of this irrigation scheme resulting in a greater return to growers and the local economy.

Third generation cane farmer Wayne Simpson said council's vision a decade ago had solved major issues for growers using bores.

"Before the scheme we relied solely on bores. We were starting to get salt intrusion, which limited the water we could use.

"The major benefit is that the recycled water for the scheme is replenished throughout the year, so we are not reliant on rainfall or bores to maintain our crops during dry spells," he said.

"We use as much water as possible as it's not only great for our crops and has huge environmental benefits, but it also means that council doesn't have to find an alternative way to dispose of the effluent.

"We have a great working relationship with council. The scheme has really proven its worth. Everyone in the community benefits," Mr Simpson said.

The Mackay South Water Recycling Facility provides environmental benefits including:

- Providing an alternative to direct release of effluent from MSWRF to the outfall at Bakers Creek, therefore significantly reducing the nutrient and sediment pollutant loads flowing to the Great Barrier Reef
- The nutrients in the effluent help reduce fertiliser usage in the scheme.
- The provision of recycled water to growers reduces the need for growers to draw from underground water supplies, assisting in the prevention of salinity problems by maintaining adequate water table levels





PAUL VILLIS AND JASON CRICHTON

Irrigation Record Keeping

Sugarcane grown in the Burdekin region is under a fully irrigated system. Approximately 95% of sugarcane grown in the Burdekin is irrigated through furrow irrigation. Though water is an essential element of the Burdekin growing system, there is only a small number of growers who are actively measuring and recording their irrigation data. This can be a difficult exercise for a number of reasons. Growers tend to have multiple irrigation sets per block, and the number of cups in each of these sets can change depending on the time of year, crop stage and height of the water table. Furthermore, the growers with access to a channel system have meters on those gates or bores to monitor the volume of channel water being used; however, many growers use underground bores to irrigate their crops and these are usually unmetred. Lastly, depending on the number of blocks and sets that a grower has, recording irrigation data can lead to a huge number of entries, which can be difficult to manage and develop into usable data.

So, why bother recording irrigation data? In an environment where power and water prices are on the rise, collecting irrigation records can be hugely beneficial to growers. Collecting irrigation records allows growers to develop a baseline water use for their crops and blocks by comparing the megalitres of water applied to the blocks (ML/ha per irrigation or over the season) and comparing water applied to cane yields (ML per tonnes of cane). By calculating water use values over a season, growers can identify areas of the farm that are performing more or less efficiently and investigate the differences between these areas. For example, there could be different soil types, irrigation

water quality, varieties and/or crop age. Growers can also compare water use to their power bills and identify which blocks are costing more to irrigate and work to improve the conditions of that block. Comparing yield to volume of water applied allows growers a new way to analyse their farm and make more informed decisions concerning elements such as crop rotation and fallow paddock management. The volume of water applied per irrigation can vary throughout the year; and by monitoring the variation in volume, growers are able to see where they may be applying more or less water than required and adjust their irrigation practices to suit. Per irrigation volumes are also useful in identifying paddock issues such as deep drainage and issues with soakage. Growers can compare irrigation volume data and crop water use to assess irrigation application efficiency.

To help growers collect irrigation data, Farmacist has been developing an irrigation record module as part of the Farmacist smart phone app. The app is designed to spatially calculate the area of each set (to account for odd shaped blocks) and calculate the volume of water applied using either the pump flow rates or calibrated cup flow rates. Once the grower's farm has been entered into the app (including blocks, sets and pump/cup flow rates), the grower only has to select the block, select the set, select which pump/cup colour they're using, and then press START! Once the irrigation is finished, the grower can press STOP on the record. Then, the app will then calculate (and record) the set area, the total megalitres applied and the volume applied in both ML/ha and mm. It's as easy as start and stop.

Jason Crichton and Paul Willis have been using the irrigation record app to record irrigation data on two of the farms that they manage in the Airdmillan region of the Burdekin. Jason has been using the app since February 2019 and his feedback has been positive. The app has been easy to use and allowed him to collect 479 irrigation records with a few taps of his phone screen. More development of the app is required to collate the data into reports that present block and farm summaries; however, as a method of monitoring irrigation volumes over the season it's been very useful. Jason also uses the app to check how long it's been since a block or set was last irrigated. Once the app is further developed, Jason and Paul will be able to view the cumulative volume of water applied to each block and receive irrigation record reports which will provide each irrigation entry, set, block and farm summaries.

A good example of how irrigation record data can be used to estimate irrigation efficiencies is by comparing application volumes to crop water use. To use some data collected by Jason, there was 12 days between the irrigations on the 27/10/2019 and the 8/11/2019. The average evapotranspiration rate for November is 6mm/day, which equates to a total evapotranspiration amount of 72mm over 12 days. At this stage, the sugarcane canopy was likely 100% closed and actively growing – this requires a crop factor (Kc) of 1.2, making the crop water use value 86.4mm. On the 8/11/2019 106.3mm of irrigation water was applied. This equates to

an approximate irrigation application efficiency of 81.3%. This calculation does not take in losses such as run off or deep drainage losses; however, as a quick efficiency calculation it's quite useful.

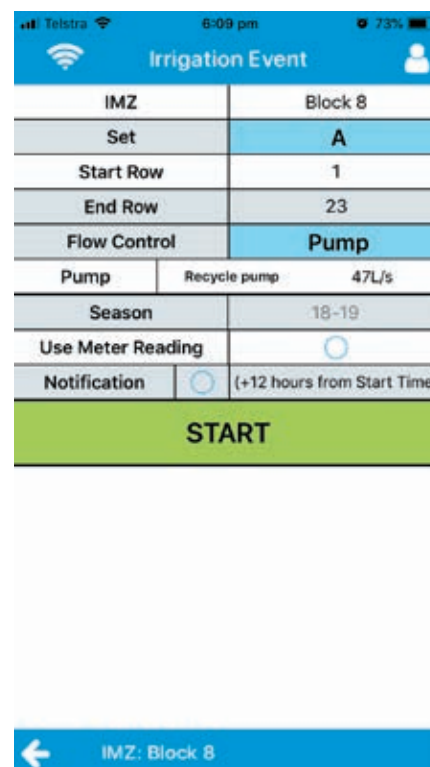
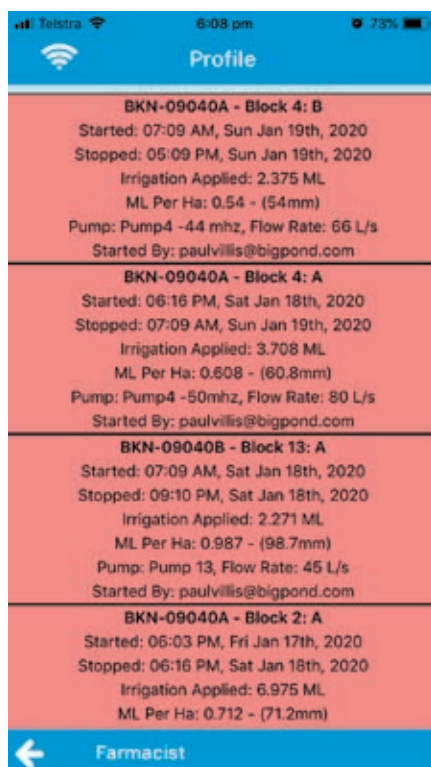
Collecting consistent irrigation records can be a difficult process and can require a bit of creativity at times to develop a simple to use system that can provide accurate data to the grower. With the support of growers such as Jason and Paul, in consistently using the irrigation record app, we're well on our way to being able to get a better understanding of water use and it's impact on yield in the Burdekin region.

Table 2 - Example of Plant Cane Data Data

Block 5		Set A			
Start		Stop		ML/ha	mm
6:26 am	29/5/19	7:43 am	30/5/19	1.321	132.1
8:50 am	2/7/19	7:03 am	3/7/19	2.212	221.2
5:13 pm	7/8/19	2:35 pm	8/8/19	2.126	212.6
7:38 am	6/9/19	8:33 am	7/9/19	2.48	248
12:22 pm	29/9/19	2:52 am	30/9/19	1.442	144.2
6:56 am	14/10/19	6:21 pm	14/10/19	1.136	113.6
6:38 pm	27/10/19	7:32 am	28/10/19	1.284	128.4
6:46 am	8/11/19	5:27 pm	8/11/19	1.063	106.3
6:44 am	29/11/19	5:29 pm	29/11/19	1.071	107.1
6:08 pm	6/12/19	6:51 am	7/12/19	1.178	117.8
7:37 am	24/12/19	6:43 pm	24/12/19	1.105	110.5
7:02 am	31/12/19	4:59 pm	31/12/19	0.99	99
6:54 am	7/1/20	9:39 pm	7/1/20	1.468	146.8
6:16 pm	13/1/20	6:47 am	14/1/20	1.246	124.6

Table 1 - Example of Ratoon Cane Data

Block 5		Set A			
Start		Stop		ML/ha	mm
6:01 am	14/4/19	6:02 am	14/4/19	0.606	60.6
5:19 pm	6/5/19	6:47 am	7/5/19	0.679	67.9
6:21 am	29/5/19	6:25 pm	29/5/19	0.608	60.8
6:46 am	24/6/19	6:21 pm	24/6/19	0.584	58.4
7:25 am	10/8/19	7:07 pm	11/8/19	1.194	119.4
6:19 pm	10/9/19	6:27 am	11/9/19	0.612	61.2
6:46 pm	29/10/19	6:52 am	30/9/19	0.61	61



NQBP backs grower innovation to safeguard reef



Image: NQBP CEO Nicolas Fertin and Andrew Campbell General Manager, and Ross Neivandt from Project Catalyst

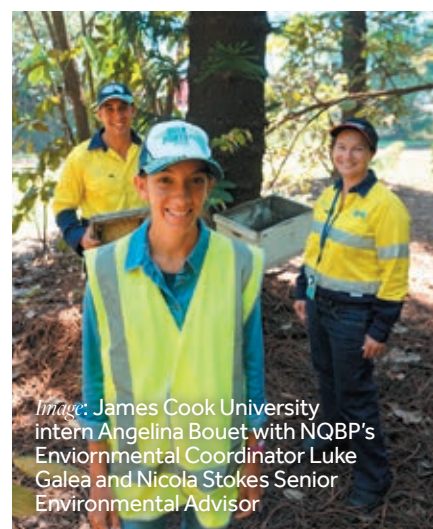


Image: James Cook University intern Angelina Bouet with NQBP's Environmental Coordinator Luke Galea and Nicola Stokes Senior Environmental Advisor

North Queensland Bulk Ports (NQBP) is proud to get behind Project Catalyst cane growers who are revolutionising water quality management for the Great Barrier Reef.

NQBP recognises the far-reaching importance of innovation to help safeguard the future of the Great Barrier Reef.

NQBP CEO Nicolas Fertin said programs such as Project Catalyst are important in strengthening the connections between people from various sectors who all have a vital stake in the Reef.

“With three ports on the doorstep to the Great Barrier Reef, NQBP shares the same goal as Project Catalyst members to manage a sustainable business with high levels of social and environmental integrity,” Mr Fertin said.

“Getting the balance right and taking our environmental and social responsibilities as seriously as our commercial role for the State of Queensland is core to how we do business.

“NQBP is delighted to be associated with this world-renowned partnership, Project Catalyst, which pioneers farm management practice change, leading to improved water quality for the Great Barrier Reef (GBR).”

NQBP is a Government-owned Corporation responsible for the trading ports of Hay Point, Mackay, Abbot Point and Weipa. These ports facilitate \$40bn of trade movements globally. More than half of Queensland’s trade by tonnage passes through our operating ports.

A place of work for more than 1,000 Queenslanders, NQBP’s ports also support a further 28,000 jobs in mining, farming and logistics. More than 900,000 tonnes of raw and refined sugar combined was exported from via the sugar terminal at the Port of Mackay in 2018-19.

A milestone year in NQBP’s environmental chapter, 2019 brought a coveted national award in partnership with James Cook University (JCU).

The long-standing marine monitoring program developed with JCU’s Centre for Tropical Water and Aquatic Ecosystem Research (TropWATER) received the Outstanding Collaboration for National Benefit category at the Business Higher Education Round Table (BHERT) awards.

These awards recognise leading university and business collaborations.

Mr Fertin said the outcomes of the program included a breakthrough in understanding the way coastal marine system function. “This has

improved input for the regulation and definition of key environmental thresholds and training for marine ecology and management,” he said.

JCU and NQBP’s have partnered in marine monitoring programs in Great Barrier Reef World Heritage Area for more than 20 years. This data informs port management activities and is also used in the Mackay-Whitsunday Healthy Rivers to Reef Partnership’s (HR2P) annual waterway health report card, alongside multiple other marine data sets.

NQBP’s reputation as a leader in environmental management has led to appointments to international working groups for PIANC (World Association of Waterborne Transport and Infrastructure). Closer to home, NQBP has representatives on the Mackay Whitsunday Health Rivers to Reef Partnership and various advisory committees.

In support of the next generation of emerging scientists, NQBP has hosted JCU interns for the last three years. “We feel privileged to provide the unique opportunity for students to experience how science can be applied in industry while on the job,” Mr Fertin said.

⋮ Visit our website www.nqbp.com.au





MANUEL MUSCAT

*Improve productivity
and increase nitrogen
use efficiency by tailoring
variety to soil type*

THE CHALLENGE

In the Mackay region, analysis of soil properties indicated more than 20% of the soils have high sodium levels. Sodic soils have poor soil structure which affects water infiltration, percolation, and nutrient availability. High sodicity levels causes clay particles to swell excessively when wet to the point they separate and disperse. This results in structural collapse of the soil profile, and as the soil dries out, the dispersed soils reharden and block soil pores, which causes issues such as water logging, hard crust formation on the surface and a decrease in gaseous exchanges. Typical impacts of sodic soils on sugarcane crops include a reduction in plant population and poor crop yield, which decreases the overall economic viability of the farm.

In blocks with sodic soils, it can be hard to decide which cane variety to plant. Should a hardy variety such as Q138 be planted? This variety performs better in sodic areas but has a lower sugar yield than many other varieties. Alternatively, should a higher yielding variety such as Q183 be planted to take advantage of the non-sodic soil in the block, but sacrifice yield in the sodic areas? It is a problem facing many growers across the region.

This trial has now ended, and it was concluded that mixing Q138 and Q183 together and planting this across the block, yielded the highest cane tonnage.



THE TRIAL

This trial assessed a paddock with distinct sodic (ESP 19.83) and non-sodic (ESP 3.84) areas, and planting varieties that suit accordingly.

The treatments were:

1. Plant Q138 Variety across the block, incorporating sodic and non-sodic areas
2. Plant Q183 Variety across the block, incorporating sodic and non-sodic areas
3. Plant Q138 in sodic area and swap to Q183 for the rest of the row
4. Mix Q138 and Q183 together and plant across the block

TRIAL DETAILS

Trial Crop: Sugar cane

Variety: Q183 & Q138

Trial Block: PCK-305A 12-02

Trial Block Size: 11.9 ha

Soil Type: Sodosol – sandy to loam topsoil over a grey/brown clay

The trial site was electromagnetically mapped with an EM38K mapper to determine the location of soil boundaries. High EM readings (blue & green) are often associated with soils that are heavier in texture, high levels of salt (such as sodium) and can have drainage issues, while lower (red & yellow) EM values often indicate lighter textured soils with better drainage properties. The dark blue zone in the trial paddock is sodic while the yellow is non sodic.

TRIAL STAGES

	Date	Activities
Stage 1	July 2016	EM map and soil sample to assess soil constraints
Stage 2	September 2016	Plant sugarcane according to trial plan
Stage 3	October 2017	Catalyst bus trip
Stage 4	October- November 2017	Harvest
Stage 5	November 2017	Fertilise crop according to 6 easy steps legal rate
Stage 6	January 2018	Canopy leaf cover analysis
Stage 7	September 2018	Trial harvest
Stage 8	October 2018	Fertilise crop according to 6 easy steps legal rate
Stage 9	September 2019	Final trial harvest

Table 1 - Raw Data

	2017	2018	2019	AVERAGE
Q138	55.93145131	55.65447422	64.14455504	58.57682686
Q183	57.37075057	64.15221691	66.48113254	62.66803334
MIXED	70.40042465	68.02946705	70.91892244	69.78293805
Q183/138	60.76600289	61.96215596	67.65282273	63.46032719

Table 2 - Raw Data

	Treatment	Non Sodic	Sodic	n\ Non - sodic		Sodic					
				Max	Min	SE Max	SE Min	Max	Min	SE Max	SE Min
T1	Q138	76.11583333	79.01083333	92.02	54.9	15.90416667	21.21583333	85.96	72.97	6.949166667	6.040833333
T2	Q183	87.2975	84.0375	93.4	76.3	6.1025	10.9975	95.2	75.24	11.1625	8.7975
T3	Q183/ Q138	86.6125	82.49166667	92.46	76.41	5.8475	10.2025	90.82	67.88	8.328333333	14.61166667
T4	Mixed	84.31666667	81.38583333	91.92	69.61	7.603333333	14.70666667	93.54	70.32	12.15416667	11.06583333

RESULTS

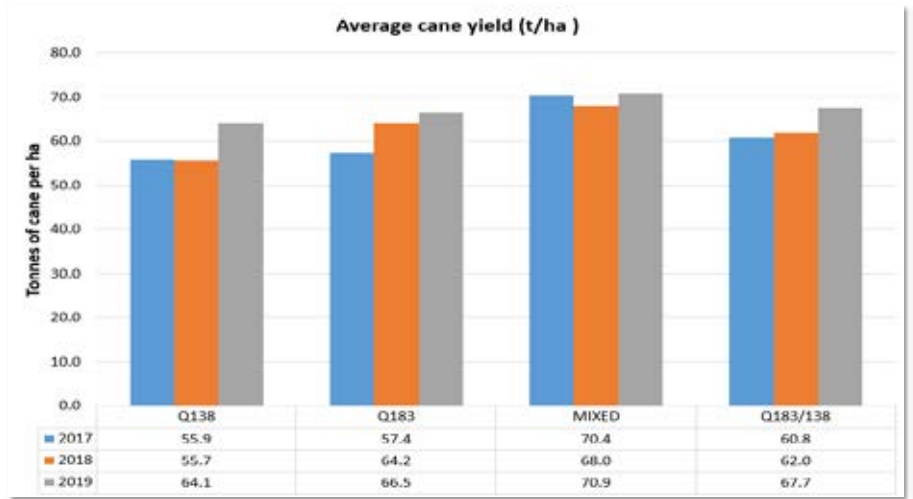
The past three years of cane harvest results indicated that mixing Q138 & Q183 billets together and planting the mix across the paddock, produced the highest yield. The targeted planting of Q138 in the sodic area's and Q183 in the non-sodic areas within rows, yielded more than planting straight Q183. The lowest yielding treatment was straight Q138, which yielded around 5 tC/ha less than the mixed variety treatment.

Vegetation data collected in January 2018 demonstrated that straight Q183 had the largest canopy cover, which is expected as this variety produces a larger biomass than Q138. Biomass was larger for all treatments in the non-sodic areas.

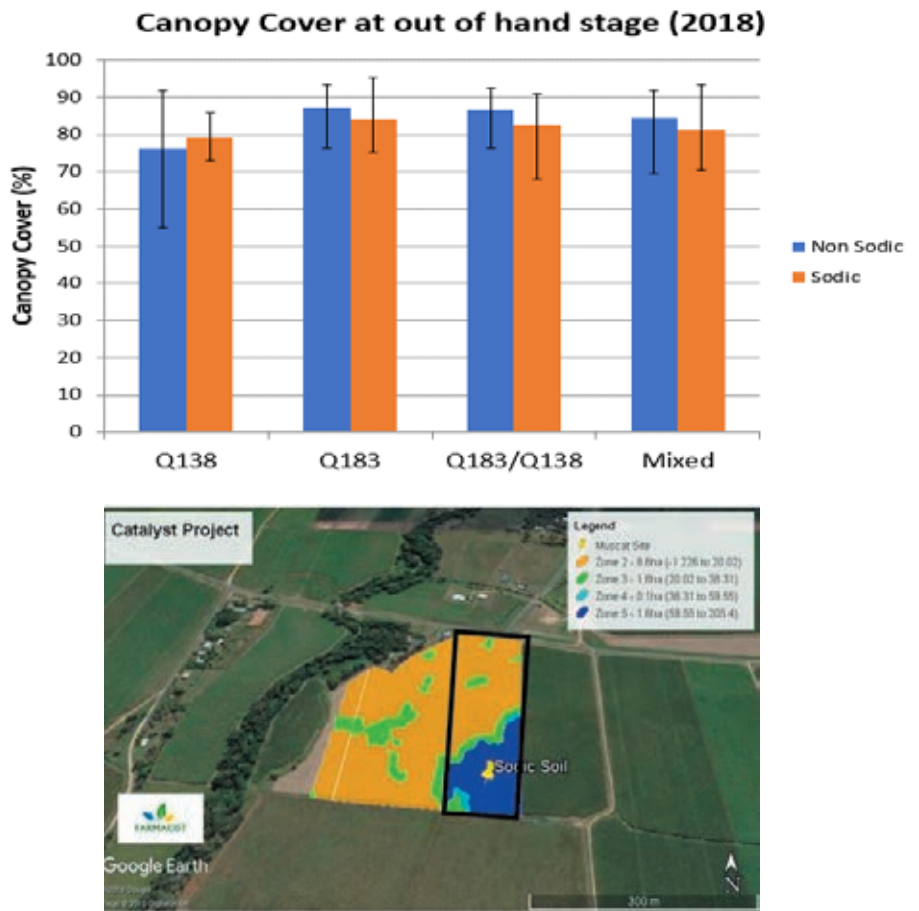
Manuel commented that he wasn't sure why the mixed variety performed as well as it did, however he has been planting other mixed variety paddocks and noted that certain varieties such as Q208, did not respond well to being mixed with another variety. More trials are required to better understand, the potential, mixed variety plantings have in overcoming certain yield constraints.



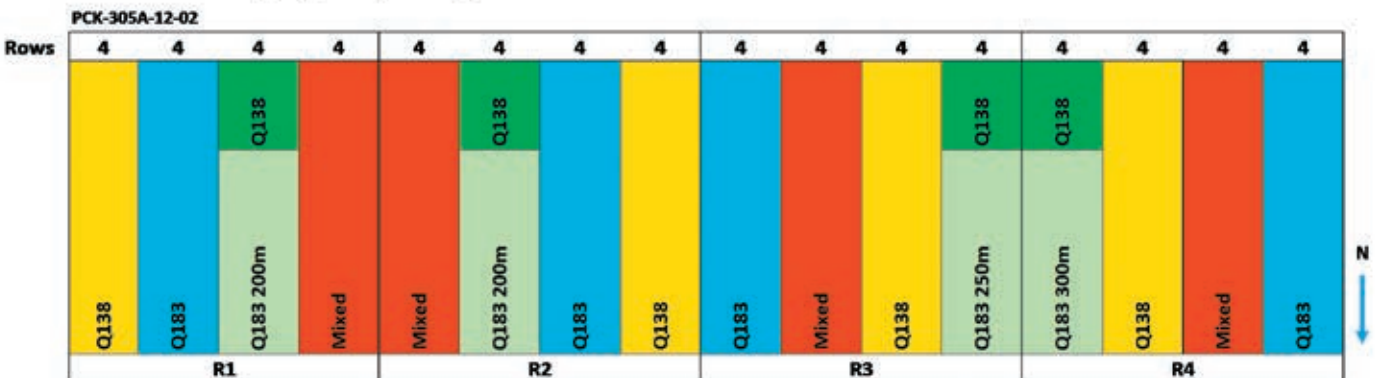
Graph 1 - Average cane yield from 2017 -2019



Graph 2 - 2018 Canopy cover % at OOH



Manuel Muscat - Targeting variety to soil type





Stewardship more important than ever



Bayer has a proud history of supporting the agricultural industry. As a key stakeholder in the sugarcane industry, Bayer has been committed to investing not only in bringing new technologies, but also protecting the key products relied upon to tackle the difficult growing conditions of tropical horticulture. The new decade brings new challenges to the industry at large as well as tropical sugarcane production in North Queensland. Growers, suppliers and industry support staff must continue to work together to improve practices to meet and exceed changing community and regulatory expectations.

Fortunately, organisations like Project Catalyst continue to prove that forward-thinking growers and industry representatives can come together to work through and solve the issues faced by all growers in this rapidly evolving environment. Bayer is proud to continue its support of Project Catalyst and everything it entails. Past work with Catalyst growers has given Bayer and other suppliers the benefit of a connected network of growers through diverse regions and growing systems. Access to such a network helps Bayer to effectively identify and implement targeted solutions to problems at the cutting edge of sugarcane production.

Since starting in the sugarcane industry with Bayer as Territory Business Manager for the dry tropics region, Ben Schofield has focused on

product stewardship in line with Bayer's values. "While new solutions are important, protecting existing tools provides stability to the farming community, knowing there are reliable answers to large problems. We've recently added to its stewardship resources in support of Confidor Guard. With the production of an application best practice video, we hope to remind growers of the importance to apply the product in line with label instructions." By reinforcing their understanding of key requirements such as placement depth and calibration, growers can be certain that not only are ecosystems being kept safe, they are getting the best protection possible out of the product.

Richard Dickmann, Head of government and

public affairs for Bayer, has worked extensively with industry and government bodies on the issue of water quality. "Sharing our knowledge and experience with SRA, DES, Nufarm, ACFA and Canegrowers has allowed us to come together and address water quality in a unified way with practical solutions." Bayer and Nufarm are also working together to produce and distribute a product application depth measurement tool to be freely distributed.

Industry support staff play a key role in how products are used in the field. Bayer plans to update and extend the Confidor Guard stewardship exercise modules required to be completed by product stockists. Nick Matthews, Market Development Agronomist for Bayer in North Queensland, used his extensive experience in the Sugarcane Industry to update and expand the training material available to stakeholders. "Ensuring that the people who deal with our products every day understand how to manage and use them properly is extremely important. It provides growers with the confidence that they can seek up to date advice on best practice when they need it."

Bayer has taken and will continue to take a leadership role in the stewardship of vital sugarcane products. With the support of the sugarcane industry at large, Bayer will continue to carry on in the spirit of innovation and partnership.

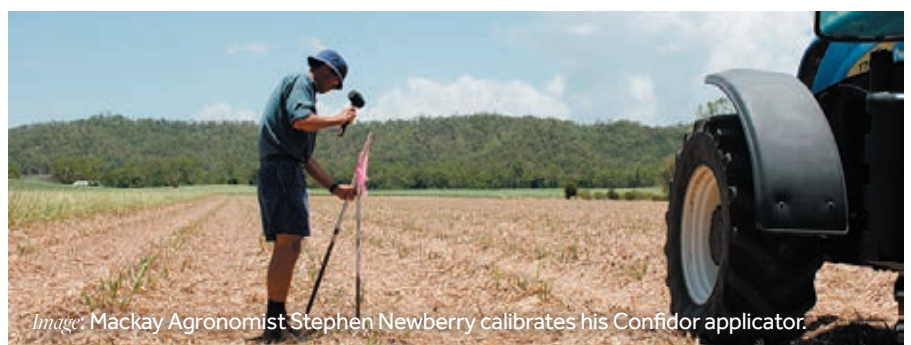


Image: Mackay Agronomist Stephen Newberry calibrates his Confidor applicator.



How to harvest profit

Australian Laboratory Services started as a small geochemistry laboratory in Brisbane in 1976 to service mineral exploration companies expanding into the eastern part of Australia. From that small geochemistry laboratory, the need for environmental analysis was identified by our mining clients and with greater public and regulatory awareness on environmental issues the ALS Environmental division was born. From the early 1990's the ALS Environmental division has worked with government, water authorities, mining and agricultural industries to help assess the environmental impacts of these activities. ALS has now expanded throughout Australia and the world to become one of the largest and most diversified laboratory providers globally.

ALS is committed to maintaining its roots in Queensland, operating two environmental laboratories one situated in Brisbane providing

extensive soil and water capabilities and the other in Townsville which focuses on regional water quality testing. In addition to our Queensland laboratories ALS has regional service offices located in Mackay, Gladstone, Emerald, Roma, Mount Isa and Chinchilla.

... **ALS is proud to be a part of**
 ... **Project Catalyst**

ALS has a long history of working in partnership with consultants on research trials and assessments as well as working directly with farmers to provide laboratory analysis to determine their soil quality and composition. This helps assist farmers with best practice soil management to minimize nutrient, solids and pesticide runoff. This along with providing laboratory testing for samples taken from our regional waterways assists with determining the impacts on the Great Barrier Reef.



The future in fertilising

awards nights. "The most impressive was the Tully Cane Productivity Awards Night where all eight district areas featured growers using our products in the top 10 cane producers for CCS, with three of the districts dominated by LiquaForce growers, who were also represented in the top ten growers for all eight mill districts in the Best Nett \$ Return per Hectare."

The team works hard to offer growers a program of liquid fertilisers that are proven to deliver maximised plant strength, yield and returns while minimising environmental impacts. LiquaForce is supported by decades of experience in the fertiliser space and an intrinsic understanding of the needs and goals of north Queensland's key agricultural industries. Cameron is a third-generation fertiliser expert. "We have been buoyed by how farmers in the growing district have responded to our economical fertiliser options, matched with soil support and plant stimulant properties over recent years, especially in this past season, where nearly 4-million litres of product, has been applied across the Mackay region."

Thinking outside the box and investing heavily in research and development, technology and new

jobs, LiquaForce collaborates globally to continue to build the agriculture sector and offer the best of products, service and knowledge. Something Cameron is passionate about, "We're excited to announce that our next big investment will be a new plant for the Mackay region. We look forward to becoming an even more active part of the local industry, and as proud sponsors of the 2020 Project Catalyst Forum we wish all attendees a great meet."

To discover more about how you can:

- Increase root mass to support ultimate nutrient take up (boost NUE)
- Include additional trace elements to support specific soil and crop requirements
- Slow down nitrogen release and help tillering plants absorb nutrient
- Reduce nitrogen leaching by 24%

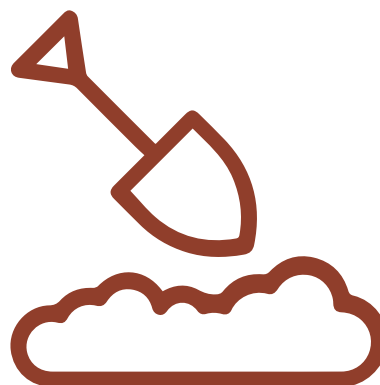
... **Visit our website www.liquaforce.com.au**
 ... **or follow us on Facebook at**
 ... **facebook.com/liquaforce/**

Founded in Ingham by Liddle & Sons, LiquaForce is a family-owned business committed to sustainable coastal farming, and passionate about the success of the sugar cane growers they supply, from Mossman to Sarina.

Managing Director, Cameron Liddle is focused on developing 'complete nutrient management systems', "Our liquid fertiliser products that are backed by quantified, independent data and research, are specifically designed for the sugar cane industry. Proven to save time and money; increase production and decrease environmental impact – namely nitrogen runoff."

Following nearly 15 years in operation, the results are speaking for themselves according to Cameron, with many growers recognised at 2019





ADRIAN DARVENIZA

Minimum and Zero Tillage.

BACKGROUND

In the wet tropics disturbed soil represents a great risk for soil erosion in our paddocks and as a result not many farmers will early plant due to the higher risk of erosion after preplant cultivation. We feel that this is limiting our yields as late plant only allows for a 12month crop at best.

Adrian wanted to see if minimum tillage using a wavy disc cultivator (supplied by MSF Sugar) or zero tillage would allow early plant with a reduced risk of erosion while comparing the yields for the different treatments. Most trial work has been done comparing fallow versus replant but not so much on the timing of planting and this would show the benefits on productivity and water quality from early plant.

THE TRIAL

The Trial was established following a soybean fallow which was direct drilled into the old cane row. The soybeans were terminated in March 2018, with the early plant cane planted on the 15th-16th of May 2018 and the late plant cane planted on the 29th of August 2018.

Following a drier than average year the trial was harvested on the 27th of September 2019.

Treatments:

- T1- Zero Till Early Plant
- T2- Minimum Zonal Till Early Plant
- T3- Minimum Zonal Till Early Plant (2 passes)
- T4- Minimum Till Late Plant

A single replicate of 2 passes using the wavy disc cultivator was included at plant to assess if more tilth was required than that created with one pass.



RESULTS

There was no statistically significant difference between yields of the different treatments in the plant cane harvest and will be monitored through first ratoon to look for any longer-term benefits.

Based on the results of the trial and advice from the MSF agronomist in South Johnstone, Adrian has changed from zonal rotary hoe to wavy disc cultivation prior to planting and planting Early when possible.

Adrian was unable to early plant in 2019 due to poor weather conditions.

A special thanks to Michael Porta from the MSF Sugar agronomy team for his support and advice during this trial and for organising the MSF Sugar wavy disc cultivator.

Table 1 -

tc/ha	R1	R2
Zero Till Early plant	79.65	74.24
Minimum Till Early Plant	88.16	73.25
2 Passes Early Plant	86.05	
Minimum Till Late Plant	66.14	57.41

Table 2 -

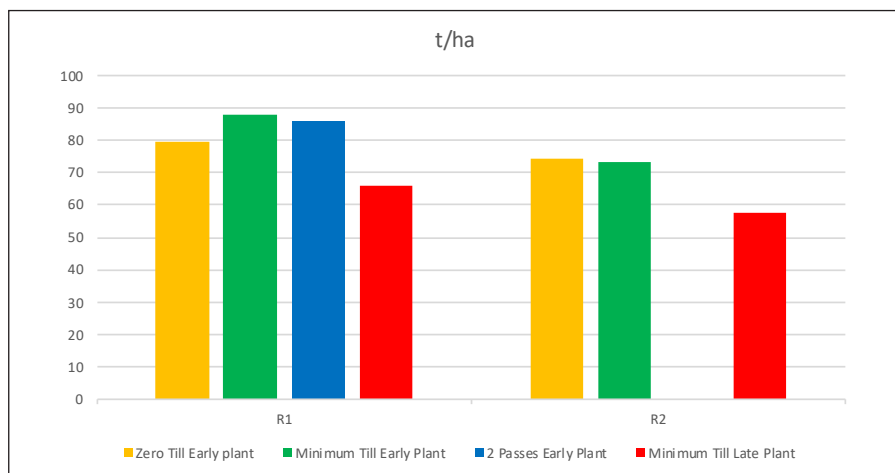
CCS	R1	R2
Zero Till Early plant	11.25	
Minimum Till Early Plant	11.8	12.7
2 Passes Early Plant	11.5	
Minimum Till Late Plant	13.5	13.9

Table 3 -

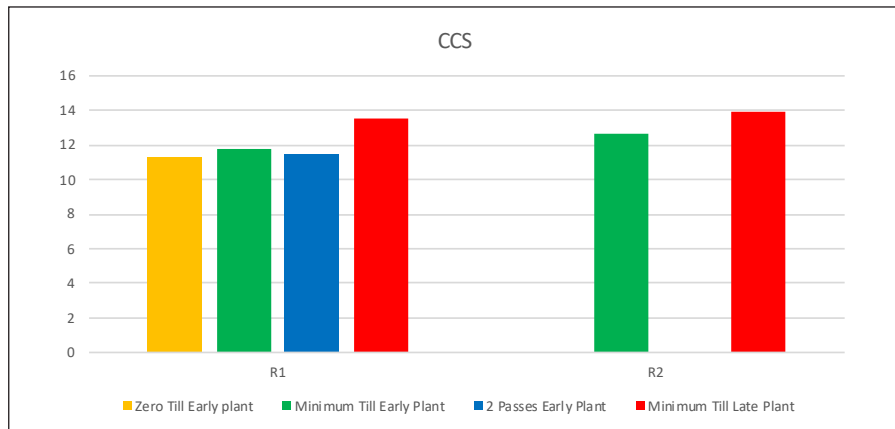
t CCS/ha	R1	R2
Zero Till Early plant	8.96	
Minimum Till Early Plant	10.40	9.30
2 Passes Early Plant	9.90	
Minimum Till Late Plant	8.93	7.98



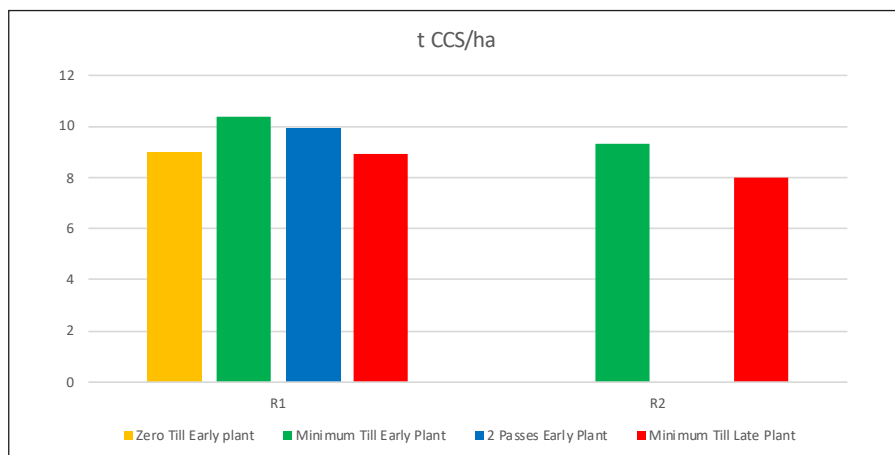
Graph 1 -



Graph 2 -



Graph 3 -





Min-till preplant MSF Wavey Disc 16-5-18



MSF Wavey Disc Cultivator



Looking Across Late Plant to Early Plant 29-8-18



Late-Early comparison 29-8-18

Reef Trust Tender a resounding success

16 participating Burdekin cane farmers were contracted to reduce surplus nitrogen application, using the Six Easy Steps, successfully proven under RP20 trials.

The SIX EASY STEPS™ is an integrated nutrient management tool that enables the adoption of best practice nutrient management on-farm. It consists of:

1. Knowing and understanding your soils.
2. Understanding and managing nutrient processes and losses.
3. Regular soil testing.
4. Adopting soil-specific nutrient management guidelines.
5. Checking on the adequacy of nutrient inputs (e.g. leaf analyses).
6. Keeping good records to modify nutrient inputs when and where necessary.



An innovative three-year project has supported Burdekin cane growers to dramatically reduce fertiliser use whilst maintaining yield.

Between 2016 and 2018, the Reef Trust Tender – Burdekin (pilot project) resulted in 702 tonnes less Nitrogen (N) being applied to 16 farms, covering a total area of 5,890 hectares. This represents on average a 20 per cent reduction in fertiliser applied and cost savings to growers of \$46/ha per year.

Natural resource management group NQ Dry Tropics delivered the \$3.1 million pilot project, funded by the Australian Government and delivered through the Reef Trust.

Under the project, growers proposed trialling ways to reduce fertiliser use, and put a price on the cost of making the change. Trials included matching fertiliser inputs to crop requirements and using technology to only apply fertiliser precisely where it was needed.

Participating growers received grant payments to mitigate the perceived risk of lower cane yields from reducing nitrogen application rates. A number of market-based competitive tenders (reverse auctions) were used to allocate funds to bidders offering the best value for money projects over a number of years.

Reducing nitrogen application helps to minimise the risk of dissolved inorganic nitrogen (DIN) from entering waterways and impacting the Great Barrier Reef. A high level of DIN in water has been linked to outbreaks of crown of thorns starfish on the Reef, and provides ideal conditions for weeds to thrive in rivers and wetlands, which reduces habitat for native fish and migratory birds.

Farmers such as Eric Barbagallo and Jim Richardson had the flexibility to determine which practice changes to implement on their farm to improve nitrogen management. The project provided them with a great opportunity

to increase farm sustainability, reduce costs, and refine their nitrogen use. Eric reduced his rates below the Six Easy Steps regulated rate. “It doesn’t matter that you’re being paid to trial new practices if your yield declines, because you’re just going to lose more money. Six Easy Steps is fine if you follow Best Management Practice, you’ll grow cane as long as your irrigation schedule, weed management and fertiliser placement is managed – you won’t lose yield,” he said.

NQ Dry Tropics Project Officer Shakira Todd said that Eric was an easy grower to work with: “He provided accurate and organised data for analysis. It can be challenging refining fertiliser rates when other factors such as seasonal variability can significantly impact yield. Eric has said he will continue to refine his fertiliser application in years following the project to optimise nutrient use efficiency,” she said.



Eric applied 13 tonnes less N during the 2016-2018 fertilising season, equating to 28 tonnes of Urea, a cost saving of more than \$16,000. This represents a significant cost saving in the current market where all inputs impact profit. Even at \$600 per tonne of urea the savings stack up, but as Eric points out it's not all about the money if you're getting the results. "As farmers we're environmentalists, that's the best way to describe us. It's also about the environment, but if you save money as a farmer it's a win, win, that's the way I did it anyway."

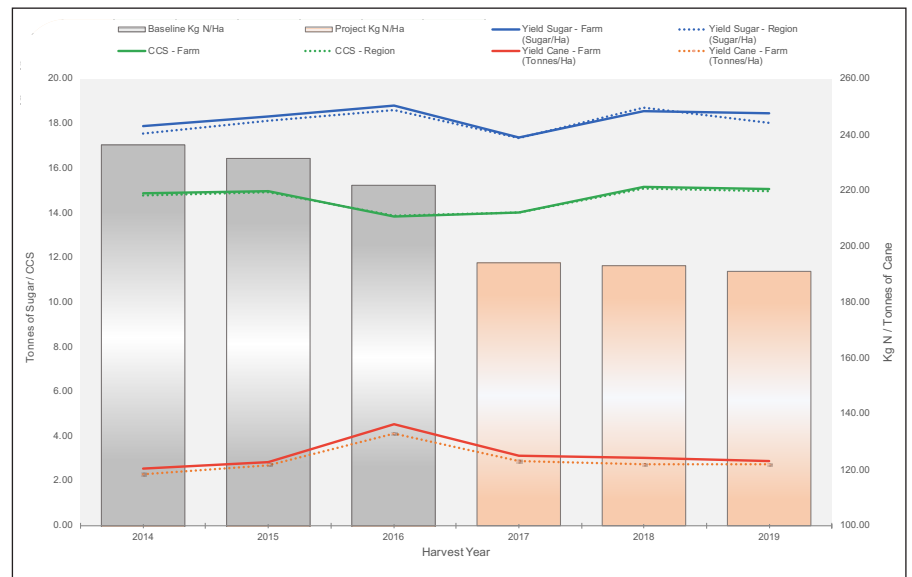
74 year old Jim Richardson, who's been farming since the 1970s, had concerns about yield decline when the government began to regulate fertiliser application to 240kg N/ha. He joined some of the early trials and was surprised by the results: "Where I used my original heavy rates of nitrogen it showed that the extra nitrogen may as well have been dumped on the road somewhere. There was no difference, in fact in some blocks the heavy rates were actually producing less sugar," he said.

As an experienced Project Officer, Shakira feels that Jim's involvement in the project shows that age is no barrier to change. "The project supported Jim to make significant changes to his farming practices, and the confidence that any risks were being well- managed so that there would be no negative impact on his financial circumstances."

Jim saved eight tonnes of N during the 2016-2018 fertilising seasons, with savings of approximately \$9,808. In 2018 the average rate for Jim's farm was 160kg N/ha. "That was a big reduction even on what I was using before. We cut it down previously, following Six Easy Steps and now even further, without any effect on our crop, because with everything considered we've increased our production," he said.

Shakira said growers had been able to reduce their rates on average by 37kg N/ha, with one grower achieving a 74kg N/ha reduction. "Growers were able to not only apply nutrient at the regulated rate using the Six Easy Steps

Graph 1: The final analysis compiles results from 14 project participants (yield data was unavailable for 2 participants).



methodology, but also further refine nutrient applications by implementing a detailed nutrient management plan and improving farming practices. This included discounting nutrient rates for existing fallow legume crops, matching nutrient rates to block yield potential, GPS for precision vehicle control, and enhanced efficiency fertilisers. The results suggest that previously growers were applying N rates above and beyond what the crop could utilise."

In 2017, following one year of successes in the pilot round, the Australian Government invested a further \$7.1 million in three rounds of the Reef Trust Repeated Tenders. An additional 35 growers were contracted to make a further 757 tonnes of N reductions over five years during 2017-2022.

Shakira said she was proud to be involved with the pilot project and was looking forward to seeing the results of the repeated tenders. "The repeated tenders project aims to build on the success of the pilot project where a number of farmers benefited from reducing their input costs and maintaining productivity through whole-of-farm nutrient plans. This has been validated in the data," she said.

Nitrogen (N) is one of six major nutrients required by plants and drives both photosynthesis and sugar production. As one of the main building blocks of protein, it is necessary for growth, green leaf expansion, tiller and sucker production.



Find out more about the individual practice changes undertaken by these farmers.
www.nqdrytropics.com.au

¹David Calcino (SRA), Bernard Schroeder (University of Southern Queensland), John Panitz (SRA), Alan Hurney (Consultant), Danielle Skocaj (SRA), Andrew Wood (Tanglewood Agricultural Services) and Barry Salter (SRA). <https://sugarresearch.com.au/wp-content/uploads/2019/06/Australian-Sugarcane-Nutrition-Manual-June-2019.pdf>





RICHARD HOBBS

Reduced N after Sunn Hemp Trial

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 Hobbs and HCPSL trialled applying reduced Nitrogen (N) rates following sunn hemp as a fallow crop. Economists measured profitability to compare the treatments.

TRIAL DESIGN

A randomised strip trial was established in 2017 on Richard Hobbs' property located in the Herbert. The plant crop was harvested in 2018. To determine the impact of applying reduced N rates following a sunn hemp fallow, the trial compared four different N rate treatments. Each treatment had three replicates.

All treatments received 18 kg N/ha when planting and then additional N was applied later. Table 1 shows the amount of N applied to each treatment at each stage and the total N.

Table 1: Treatment N application rates (kg/ha)

	18N	43N	68N	93N
Plant N rate	18	18	18	18
Side dress N	0	25	50	75
Total N rate	18	43	68	93

KEY FINDINGS

- The highest average gross margin was achieved with the 18N kg/ha treatment but there were no statistically significant differences in yield, CCS or gross margin between treatments.
- The lower N rates performed as well as the higher N rates indicating that the sunn hemp fallow reduced N fertiliser requirements in plant cane.

COSTS

Fallow costs were the same between treatments and amounted to \$195/ha. Figure 1 shows a breakdown of the average variable costs for each treatment in the plant cane. The only plant cane growing cost differences between treatments were due to the amount of N applied. For example, the treatment with the highest N application rate had the highest variable costs. Harvesting costs and levies varied between treatments as these costs were dependent on harvested cane yield. All other costs were the same between treatments.

RESULTS

Table 2 presents the average cane yield and CCS results for each N rate. Differences in cane yield and CCS between treatments were not statistically significant and therefore could not confidently be attributed to the different treatments.

Figure 2 presents the average gross margins for each treatment (revenue less variable costs). The 18 kg N/ha treatment obtained the highest average gross margin. A statistical analysis of the economic results indicated that the differences in gross margin were not statistically significant and therefore could not confidently be attributed to the different treatments.

CONCLUSION

Although soil N levels were not determined during the trial, it was expected that a sunn hemp fallow would maintain cane yields on the subsequent plant crop despite applying a lower rate of N. In this trial, the lower N rates performed as well as the higher N rates indicating that the sunn hemp fallow reduced N fertiliser requirements in plant cane. This requires further validation but suggests that a sunn hemp fallow may help reduce the demand for N in the following plant cane crop and increase returns to the grower. A control treatment with a bare fallow (usual practice) could help validate the effect of a sunn hemp fallow.

Figure 1: Variable cost breakdown – plant cane

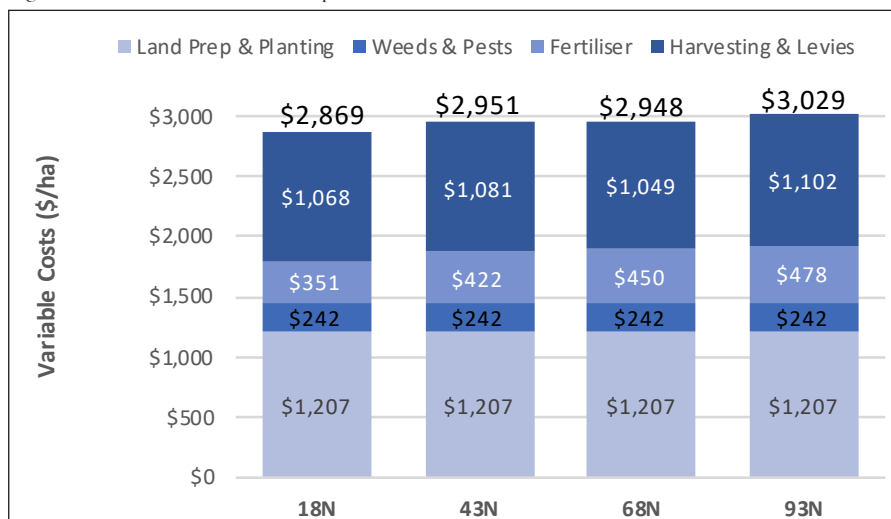


Figure 2: Average gross margin in plant cane – error bars indicate 95% least significant difference (overlapping bars indicate no significant difference).

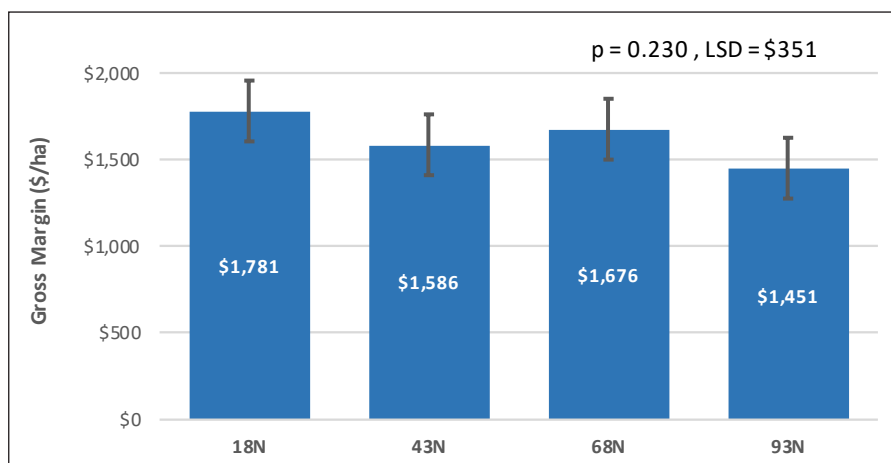


Table 2: Average cane yield and CCS results

	18N	43N	68N	93N	p-value
Cane yield, tc/ha	118	119	116	122	0.105
CCS, units	14.2	13.9	14.3	13.5	0.170
Total N rate, kg/ha	18	43	68	93	

For more information on the economic analysis please contact Tichaona Pfumayaramba
Ph: (07) 3330 4507 Email: Tichaona.Pfumayaramba@daf.qld.gov.au

⋮ **Note: The trial results are specific to this grower, paddock and prevailing conditions**

Water Quality Improvement Program

The \$443.3 million partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation includes \$201 million to contribute to efforts aimed at addressing water quality issues.

Where will the funding be allocated?

A five-year investment plan has been developed which aims to address the three priority pollutants: dissolved inorganic nitrogen (DIN), fine sediments, and pesticides.

1. Water Quality Improvement Grant stage one (\$19.7m)

Eleven projects were awarded to maintain/build on-ground delivery capacity throughout regional Queensland.

2. Regionally focussed on-ground actions (\$141.1m)

Funding will directly reduce the three priority pollutants from priority catchments through a series of regional water quality improvement programs. Funding at the catchment scale is shown in the map on this page.

While all options for on-ground interventions will be considered, investments are expected to focus on practice change related to pesticide, fertilizer and irrigation management in the sugarcane industry, the restoration of the landscape (gullies and streambanks), and improved management of grazing lands.

3. Conservation and protection of less-disturbed catchments (\$10m)

An independent investigation is being carried out to highlight priority areas and interventions of less-disturbed catchments.

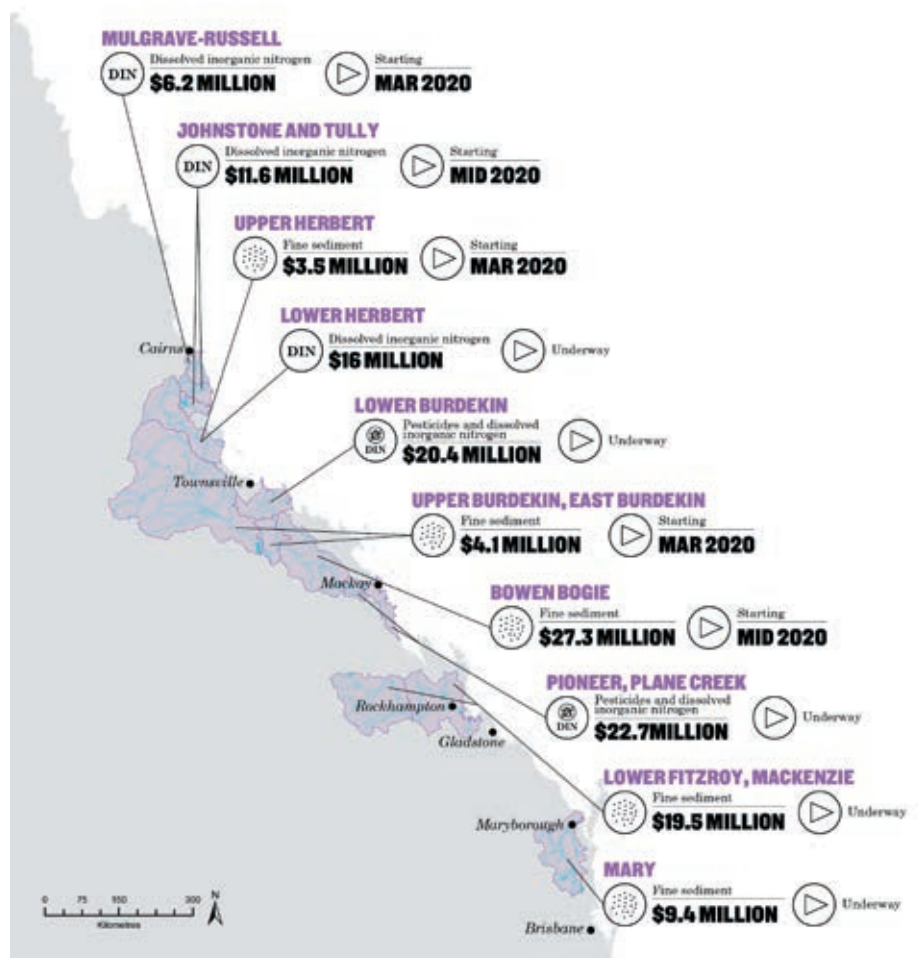
4. Traditional Owner-led protection initiatives (\$20m)

Investment in Traditional Owner-led activities for improved water quality outcomes and capacity building.

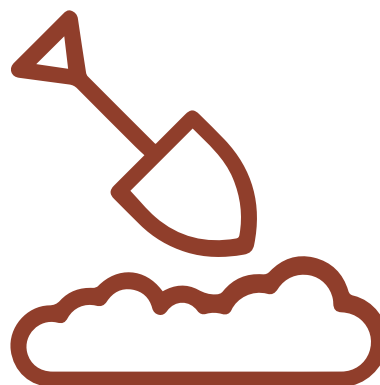
5. Innovation and systems change (\$10m)

Funding is available for transformational change in water quality improvement activities, with a focus on technology transformation, improved data management, planning for water quality investment, and innovative financing.

Subscribe to our e-newsletter via our website to keep up to date with the program and funding opportunities.







ALAN LYNN

Lime Products Trial

OVERVIEW

- Location – Foresthome area, East Ingham.
- Property Size – 200ha under cane
- Number of years farming – 30
- Alan builds most of his own farming implements and equipment.

Alan started changing his farming practices in 2009 when he started changing row spacing to 1.8m.

He started mounding and bean fallow crops in 2011/12 and has fully converted to mixed species fallow crops from 2014/15.

Alan wants to improve overall farm soil health and has a whole farming system approach for future sustainability.

THE CHALLENGE

Alan farms in an area with heavy clays and major waterlogging for at least half the year. His soils have naturally low pH value, low calcium and high aluminium saturation percentages.

Liming his fallow blocks every crop cycle is essential to get the most benefits from his mixed species fallow crops & to maximise cane yields.

This trial came about because Alan was wondering which lime product was going to have the best bang for his buck, to improve overall soil conditions and plant health.



THE TRIAL

Alan has been working with HCPSL's Extension Agronomist Megan Zahmel (Herbert Project Catalyst service provider) to assess different lime products to improve pH, aluminium saturation and overall cane productivity.

The trial was established in July 2017. The first two treatments applied were treatment 1, traditional agricultural lime and treatment 2, a kiln dust/ag lime mix of 20:80 ratio. These were applied to the trial block in July 2017 at a rate of 4t/ha, based upon soil testing data.

The Prilled lime product was applied at the same time as the fertiliser in October 2017, at a rate of 350kg/ha, as advised by the company rep after looking at Alan's soil test results.

The cane was planted in August 2017. pH sampling commenced in Nov 2017 and was repeated intensively during the plant cane crop phase.

The trial is a strip plot trial with 3 reps per treatment. pH testing has been the focus of the trial to date. See Table 1.

THE RESULTS

Assessing pH differences has been the focal point of the trial. pH samples were taken after harvest of the previous ratoon with an average soil pH (H₂O) of 5 being reported.

HCPSL staff collected more pH samples, four months after product application, to find a small shift in pH values compared to our starting value. This indicated to Alan that it took at least four months for the lime products to start influencing soil pH.

This finding pointed out to Alan that he needs to get his lime products onto the block early, if he wants the most benefits for his mixed species fallow crops and subsequent cane crop.

HCPSL have now collected two years of data on soil pH. The results to date show that the traditional use of agricultural lime has shifted the pH the greatest when compared to all treatments. See Table 2.

The project has also undertaken an economic valuation of the treatments over several years. One of the differences between products is that the traditional ag lime products are applied once before planting, whereas the new prilled limes are applied every year.

The question was then raised, "which product works out to be more economically valuable after a full crop cycle?".

Alan & HCPSL will continue this trial for a full crop cycle to compare overall cost between products. Though Alan has stated, he believes its only economical to apply the prilled lime for three years to the cane crop because of the cost of the product.

See Table 3 on comparing cost of product per hectare and cost of calcium per product.

The project is also assessing cane yield and CCS value over the crop cycle. The second ratoon crop will be harvested in 2020.

The project hypothesis is that with a better pH value over a crop cycle, this will lead to better crop nutrient uptake, leading to improvements in cane yield, longer ratoon life and less loss of nutrients to waterways.

See Table 4 for the cane t/ha and sugar t/ha yields for the plant and 1st ratoon crops.

CONCLUSION THUS FAR

The trial will continue to be monitored over the full crop cycle. At this stage, after the second year of the trial, the use of agricultural lime is still the best value for product concerning cost effectiveness and bang for buck.

Table 1 - Trial Design

Sachs Lane	Headland									
	Headland	Rep 3			Rep 2			Rep 1		
		Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9
		T2 R3 5 rows	T1 R3 5 rows	T3 R3 6 rows	T2 R2 5 rows	T1 R2 5 rows	T3 R2 6 rows	T3 R1 6 rows	T2 R1 5 rows	T1 R1 5 rows

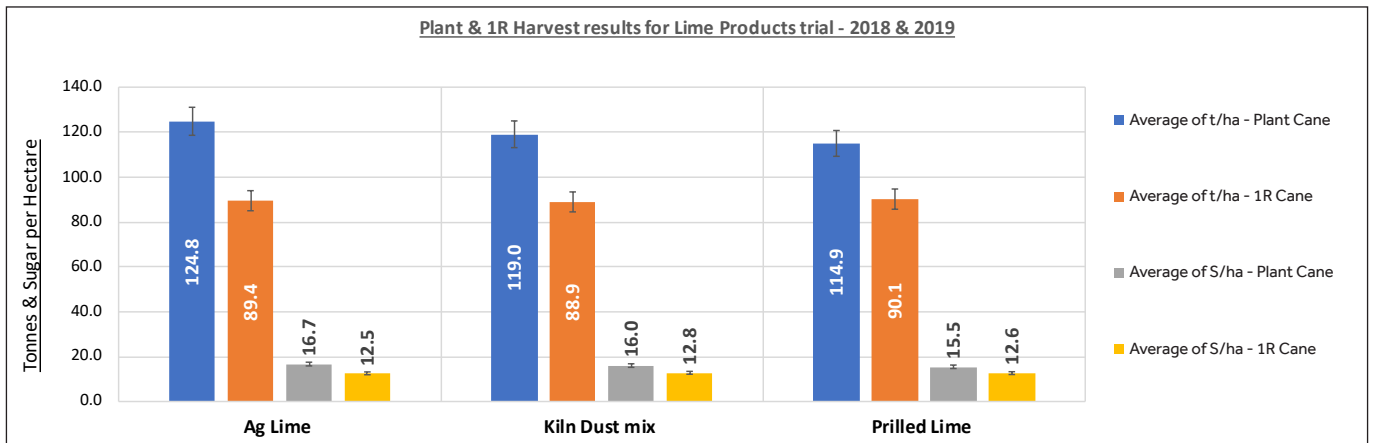
Table 2 - pH

		Lab results	*Note Lime was put down in July 2017				
		Starting pH value @ baseline soil sample 26/12/2016	pH meter reader Average for 13/11/2017	Average for 20/12/2017	Average for 30/01/2018	Average for 30/08/2018 After Harvest	Average for 28/10/2019 After Harvest
Treatment 1	Centre of row for Ag Lime	5	5.62	5.97	6.00	6.35	6.02
Ag Lime	Shoulder of row for Ag Lime	5	5.73	5.78	5.87	6.23	6.40
Treatment 2	Centre of row for Kiln Dust	5	5.32	5.12	5.40	5.58	5.93
Kiln Dust 20% mix	Shoulder of row for Kiln Dust	5	5.28	5.35	5.33	5.66	5.85
Treatment 3	Centre of row for Prilled Lime	5	4.88	4.98	4.83	5.50	5.76
Prilled Lime	Shoulder of row for Prilled Lime	5	4.87	4.92	4.72	5.23	5.75

Table 3 - Products Costing

Product	Cost of Product per Tonne	Cost of product per ha	Ca % per product	kg of Ca per Tonne	Rate in kg of product per ha applied	kg of Ca applied per ha	\$ paid per ha for Ca	Cost Ca per kg/ Tonne	Price of product per ha over 5 years
Ag Lime	\$165.00	\$660.00	40.80	408.00	4,000.00	1632.00	\$4,035.49	\$0.40	\$825.00
Kiln Dust 20% Ag Lime 80%	\$196.92	\$787.68	40.00	400.00	4,000.00	1600.00	\$3,250.05	\$0.49	\$984.60
Prilled Lime	\$560.00	\$196.00	36.00	360.00	350.00	126.00	\$81.00	\$0.64	\$980.00

Table 4 - Plant & 1R Harvest results for Lime Products trial - 2018 & 2019







HESP, STOCKHAM, VILLIS AND MUGICA *Banded Mill Mud*

Facilitating mud applications at greater distances from the mill to lift productivity and reduce environmental risks for the Burdekin region.

BACKGROUND

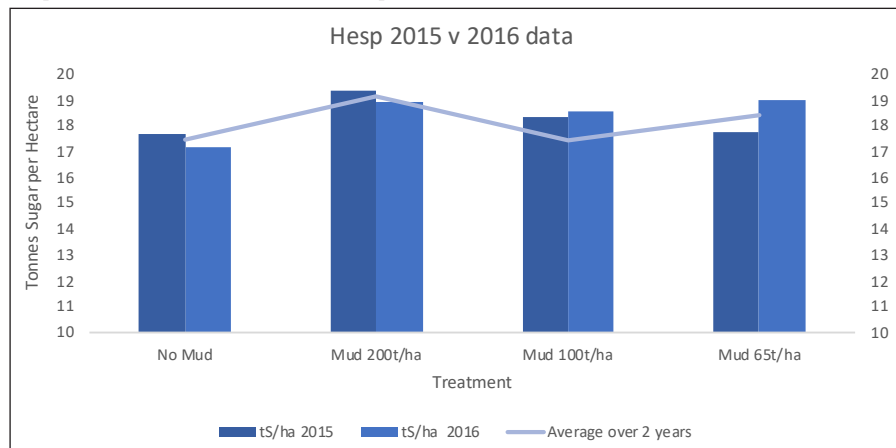
Mill mud is a commonly used ameliorant in the Australian sugarcane industry for a multitude of reasons. Mill mud contains a high percentage of organic carbon, organic nitrogen, phosphorus, potassium and calcium, all of which are essential for plant growth. Mill mud also can improve soil health through better water retention, improving the Cation Exchange Capacity of the soil, soil texture, soil structure and soil biology. Conventionally, mill mud is traditionally applied directly into the irrigation furrow at an application rate of up to 200 wet tonnes per hectare (t/ha), however, due to logistical expenses, distance from the mill can be a barrier to applying mill mud/ash throughout the region due to an increase in haulage costs and the time it would take to complete a paddock at those rates. The ability to facilitate mud applications further from the mill on previously untreated areas would result in improved productivity for the region, and reduce the associated environmental risks resulting from over-application of the product close to the mills.

THE TRIALS

In 2014, four trial sites were established in the region that aimed to investigate various rates and application positions compared to conventional practices. The sites were spread throughout the Burdekin on various soil types and localities. Regions included Clare and Giru, as well one site near the Pioneer mill and the other near the Kalamia mill. On each of the sites, mud was spread conventionally at two different rates, 200t/ha and 100t/ha. Three of the four sites included a 65t/ha banded mill mud treatment where mud was applied on the hill instead of the water furrow, and one site contained banded mill mud at 120t/ha. Every site was compared against a control treatment where mud was not applied. Nitrogen and phosphorus was reduced based on the SIX EASY STEPS methodology. The results for all sites are summarised below.



Graph 1 - 2015 and 2016 data from the Hesp site showing tS/ha



Results showed that in the first year, the higher application rate outperformed all other treatments in tonnes of sugar per hectare. However, in the following year, all of the mud treatments, irrespective of rate and position, outperformed the control.

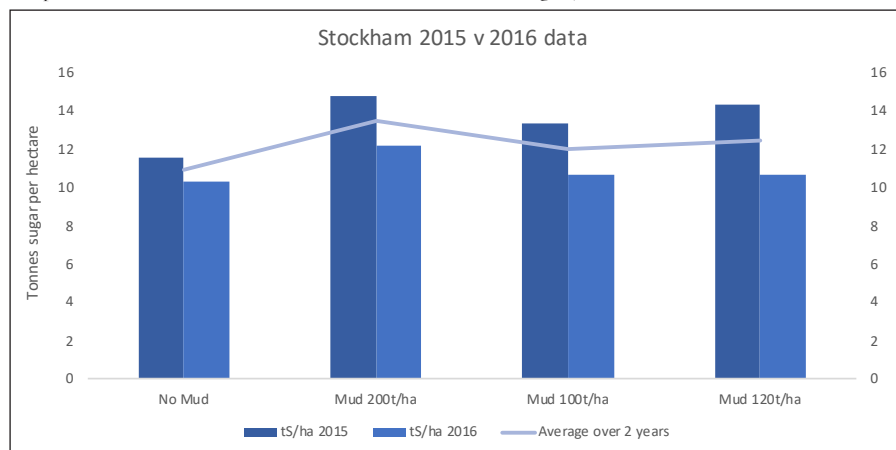
When comparing the results over two years of data at Chris Hesp's results showed that there was no significant difference in sugar production between any of the mud treatments showing that applying lower rates on the hill is a viable option. This also allows significantly reduced cartage costs thereby facilitating the adoption of mud application further from the mill.

Table 1 - 2015 and 2016 data from the Hesp site showing tS/ha

	No Mud	Mud 200t/ha	Mud 100t/ha	Mud 120t/ha
tS/ha 2015	17.71 b	19.35 a	18.33 b	17.74 b
tS/ha 2016	17.2 b	18.92 a	18.53 a	18.99 a
Average over 2 years	17.46 b	19.13 a	17.43 a	18.37 ab



Graph 2 - 2015 and 2016 data from the Stockham site showing tS/ha



In the first year of mud application, all mud treatments, regardless of rate and position, performed better than the control in sugar production. However, in the second year, even though there were trends of better sugar production where mud was applied, due to the variation in replicates, no significant difference could be determined.

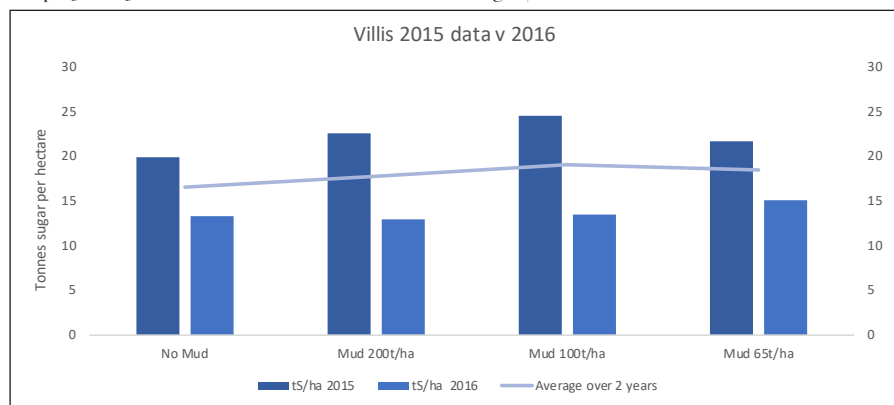
When examining the summary of two years of data on this farm, there was no significant yield difference in any of the treatments due to treatment variability. However all treatments that had mud applied were found to perform on average 2 tS/ha better than the control.

Table 2 - 2015 and 2016 data from the Stockham site showing tS/ha

	No Mud	Mud 200t/ha	Mud 100t/ha	Mud 120t/ha
tS/ha 2015	11.6 b	14.8 a	13.4 a	14.3 a
tS/ha 2016	10.3	12.2	10.7	10.7
Average over 2 years	10.93	13.49	12.05	12.47



Graph 3 - 2015 and 2016 data from the Villis site showing tS/ha



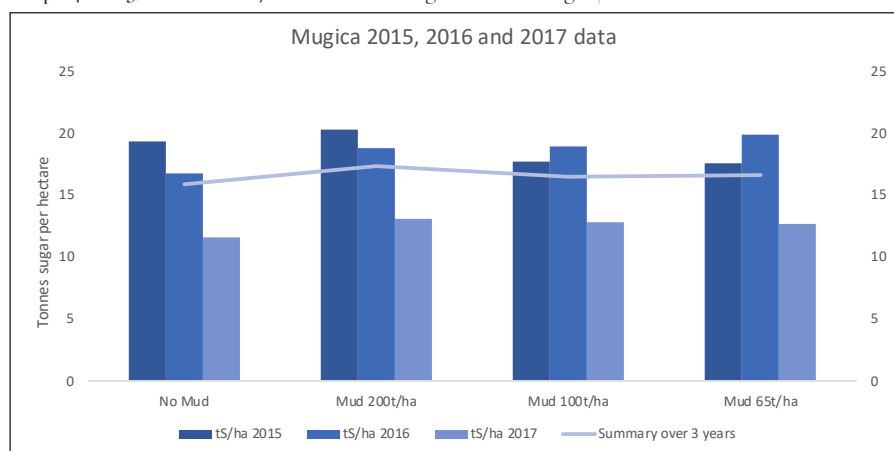
Although improvements in sugar production ranged between 1.9 – 4.8 in 2015, additional tonnes of sugar where the mud was applied, due to treatment variation again, no significant differences could be reported. In 2016 and when we compared the average of the two years combined, no significant difference in sugar production could be determined. Importantly however, the reduced rate of mud applied on top of the hill did not perform differently to the 200 wet tonnes per hectare applied in the interrow.

Table 3 - 2015 and 2016 data from the Villis site showing tS/ha

	No Mud	Mud 200t/ha	Mud 100t/ha	Mud 65t/ha
tS/ha 2015	19.8	22.5	24.6	21.7
tS/ha 2016	13.3	12.9	13.5	15.1
Average over 2 years	16.54	17.71	19.05	18.39



Graph 4 - 2015, 2016 and 2017 data from the Mugica site showing tS/ha



This site was continued for 3 years in comparison to the other sites which were only continued for two years. When looking at the yield data tS/ha, the 2015 data for the 65t/ha shows some anomalies. This low yield result was due to the blocking of the fertiliser applicator during application. Results showed that even after three years after application, all treatments that had mud applied outperformed the control between 8-10t/ha. On average over 3 years of data, there was between 6 and 10tonne increase in tonnes of cane per hectare.

While the sites had variable results throughout the multiple years of the trials, it was found that banding mill mud is a viable option for the application of mill mud in the Burdekin region for

Table 4 - 2015, 2016 and 2017 data from the Mugica site showing

	No Mud	Mud 200t/ha	Mud 100t/ha	Mud 120t/ha
tS/ha 2015	11.6 b	14.8 a	13.4 a	14.3 a
tS/ha 2016	10.3	12.2	10.7	10.7
Average over 2 years	10.93	13.49	12.05	12.47

both sugar production and logistical costs. Since these trials have finished, three contractors in the Burdekin are now set up to apply banded mill mud, with demand increasing more and more every year. Recent communication with contractors found that banded mill mud is being applied most commonly at 100t/ha, which works out to be 45% cheaper than 200t/ha conventionally applied mill mud based off a 10ha paddock that is near the mill. Comment was also made to the fact that it was easier for the drivers to apply consistently, especially when it is applied as dry mud instead of wet mud.

Optimisation of inputs is critical with rising water and electricity costs. Banding mill mud at lower rates can significantly reduce input costs without penalising yields whilst still providing essential nutrients, improved soil benefits and additional water holding capacity for the soil. Newly imposed reef regulations also state that broadcast application of mill mud must only occur during a fallow period where it can be incorporated into the soil and all applications throughout the crop must be banded. Results of these Project Catalyst trials provides confidence that banding mill mud on top of the hill can provide the same benefits as applying within the furrow, especially in marginal soil where nutrients and water holding capacity is low.

Working with growers to reduce pesticide losses



For a number of years, growers in the Sandy Creek catchment have been working closely with industry and Queensland Government to better understand pesticide losses. Sandy Creek is in the Plane Catchment of the Mackay Whitsunday region and has been identified as a high priority to address losses of pesticides and dissolved inorganic nitrogen (DIN). Funding has been provided by the Queensland Government's Department of Environment and Science since 2015 after a group of growers initially sought assistance from the government to identify losses.

Improvement in water quality depends on a better understanding of losses and ensuring growers have the knowledge and equipment to reduce these losses. Water and Waterways Coordinator Chris Dench has been leading projects for Reef Catchments. "While there has been good progress in knowledge and understanding, water quality from the catchment continues to measure high concentrations of pesticides, as measured by the growers themselves."

Trust has been established in the water quality monitoring results and the relationship between on-farm practices and water quality outcomes. Reef Catchments is leading a new phase in the Sandy Creek project. This next phase plans to build on the project's foundation. The primary aim of the new phase of the project is to support landholders in trying to reduce pesticide losses in a relatively small and confined catchment. This is being done through working with Mackay Area Productivity Services (MAPS) and Farmacist within the Brightly sub-catchment of Sandy Creek.

Chris explains, "Brightly was selected not because it had greater water quality issues than any other sub catchment, but because it is a confined catchment with a small number of landholders so we could attempt to work with everyone to bring about that water quality improvement."

Growers are collecting water quality samples and there is also an automatic sampler set up capturing runoff in the south branch of Sandy Creek at Brightly."

Farmacist will offer one on one agronomic support, ideally to all landholders within the Brightly sub-catchment, to try and bring about a measurable water quality improvement for pesticides. The one-on-one extension support will include working with Farmacist to provide access to small equipment upgrades that will assist landholders within the Brightly sub-catchment to be able to reduce pesticide losses. Andrew Vassallo is one such grower; "The reason I wanted to get involved in the project was to monitor chemical runoff from my own farm so I can make decisions that affect me on a farm basis not on the whole area."

Practice adoption will include (but is not limited to) a shift in the chemicals being used towards lower risk chemicals such as knockdowns or non-PSII chemicals, the use of equipment to more accurately apply or reduce the amount of product e.g. banded application, more frequent calibration and use of appropriate nozzles, and better timing and forecasting. Andrew's experience demonstrates the advantages, "The process is quite simple. From the water samples

you can have a clear understanding of the chemicals leaving your farm at certain points in a rainfall event. After last year's sampling I already have made a number of changes to my chemical program."

The program will also look at demonstrating and trialling alternative strategies for application and product type. Farmacist will assist, with support in understanding the right chemical for the right job, knowledge of label restrictions, and assisting landholders to gain an understanding of current pesticide application practice and where they may be able to find areas for improvement. Benefiting farmers like Andrew "If there are fertilisers or chemicals leaving my property, number one is financially I cannot afford to be losing either. And secondly if there is run off, I need to work out why and how I can address these problems, whether it be application or timing etcetera."

While Brightly is the focus for the agronomic support, the project will still engage with other landholders in the Sandy Creek catchment to try and share information. MAPS is supporting the delivery of the project to growers in the wider Sandy Creek area to provide extension support, access to small spray equipment upgrades and can arrange for any interested growers to sample their own runoff to identify any losses and possible solutions.

For more information or to register your interest, please contact Reef Catchments (07) 4968 4200.





Proud supporters of the agricultural sector

Suncorp has a long and proud history supporting the agricultural sector and we're once again delighted to be part of "Project Catalyst" and be involved in the outstanding work its network of cane growers undertakes to support sustainable and productive farming.

We understand the challenges and opportunities the sugar industry is facing, and whether it be in

farming, or everyday life, managing your finances can be hard work. Talking about them also can be even more of a challenge.

Suncorp's Relationship Manager David Harding said that Suncorp Bank has a long history of working with sugar producers and we remain 100 per cent committed to the industry.

"Project Catalyst is an ideal forum for our local industry to come together to share best practice, discuss new ideas and opportunities, and celebrate achievements. We are proud to align ourselves with a group of forward thinking farmers who are committed to preserving the future of the sugar industry, Mr Harding said.

We see the work your group is achieving in improving sustainable and productive farming practices will present the industry with many opportunities for the years ahead.

As Australia's leading regional bank, Suncorp Bank is proud to support initiatives that contribute long-lasting benefits to regional and rural communities.

Suncorp Bank's local agribusiness specialists are dedicated to understanding the needs of their customers. They understand the critical role a bank plays in supporting regional communities and they are committed to building in-depth relationships with customers to support them on their journey.

To find out more about how Suncorp can help your business, have a chat to one of the Suncorp Agribusiness Specialist at the Project Catalyst Conference or give them a call on the number below.

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Leading the way in environmental printing

As Central Queensland's leading printing and design business, BB Print continues to strive to be at the forefront of Australia's environmental initiatives.

Having maintained a 'Level 2 of Sustainable Green Print' certification for 7 years, BB Print's commitment to the environment and environmental printing practices remains unwavering.

BB Print is the only Sustainable Green Print (SGP) accredited business north of the Sunshine Coast and each year exceeds the strictly monitored environmental audit they are required to undertake.

Every aspect of waste is weighed and calculated with the SGP system allowing accredited companies to continually improve and reduce their impact on the environment.

Environmentally sound printing is a long term commitment from the printing industry. Environmental initiatives such as recycling and reducing emissions to water, land, and air place an emphasis on continually improving environmental performance.

To qualify for SGP accreditation each staff member must undertake additional training and the company undergoes a strictly monitored independent environmental audit annually.

BB Print won the Queensland wide 'Environmental Management Award for Printing' in both 2013 and 2015. Presented as part of the renowned PICAs - Printing Industry Craftsmanship Awards, it is highly sought after and acknowledges the state's most proactive environmentally sound business within the printing industry. It was a significant achievement for the company, especially as they

competed against some of the state's largest printing companies.

BB Print Employee, Nicola Kaye said of the awards, "Environmental practices are a very important part of our business. Having won a state-wide competition twice makes us very proud."

BB Print Partner, Gary Bye said "We care about the environment and so do many of our customers."

"It's a great source of pride for us that we are an environmentally responsible company. Another benefit is that by taking responsibility for the impact we have on the environment we can also focus on improving efficiency. We recycle everything possible, even down to the rags we use, utilising greener chemicals and soy-based inks."

"We encourage other businesses to think and reap the benefits of thinking green. Environmentally sound practices are the future of the printing industry and we are excited to be a part of that direction."





DAVID ELLWOOD

Evaluating Nutrient Reduction

THE CHALLENGE

The last several years has seen the extension of harvest seasons so crops are required to ratoon closer to start of wet season. The shorter the period from harvest to wet season will impact negatively on crop potential. Nutrients applied to late harvest can be within Six Easy Steps™ recommendations, but still be over supplying crop requirements due to low crop potential. The amount to reduce nutrients is never easy to answer, as many factors can influence crop performance. A nutrient trial to answer effect of nutrient level for late harvest was established.

THE TRIAL

The trial (Figure 1) was established November 2016 on 2nd ratoon Q208, all herbicide and irrigation actions were growers' standard practice and applied equally to all trial

treatments. The only variable was the nutrient applications, with 3 nutrient application rates with the focus on nitrogen being 110, 130 and 150 kg N/ha (Table 1), the 150 kg N/ha is Six Easy Steps™ recommendation. The trial was conducted for 3 harvest seasons 2017-2019.

TRIAL DETAILS

Trial Crop: Sugarcane
Cane Variety: Q208, 2nd ratoon (2017 harvest)
Trial Farm: 3181A
Trial Block: 2-1 (4.3 ha)
Trial Design: Replicated random strip trial (3 replication x 3 treatment)
Soil Type: Nabilla; Dermosol (Aus Soil Classification). These soils occur on mid-slopes (3-6%), often associated with rock outcrops



TRIAL STAGES

	Date	Activities
Stage 1	Nov 2016	Crop harvested
Stage 2	Dec 2016	Apply nutrients as per trial design
Stage 3	October 2017	Harvest trial
Stage 4	Nov 2017	Apply nutrients as per trial design
Stage 5	Oct 2018	Harvest trial
Stage 6	Nov 2018	Apply nutrients as per trial design
Stage 7	Nov 2019	Harvest Trial – trial completed

Figure 1 - Late harvest reduced nutrients trial plan

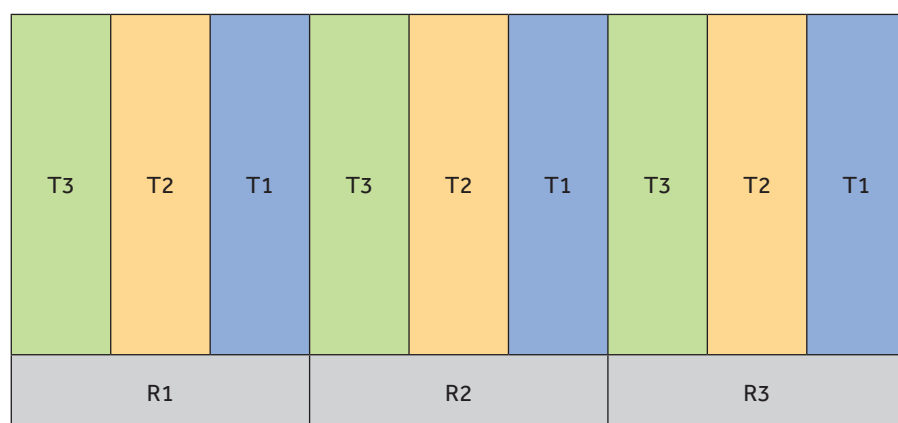
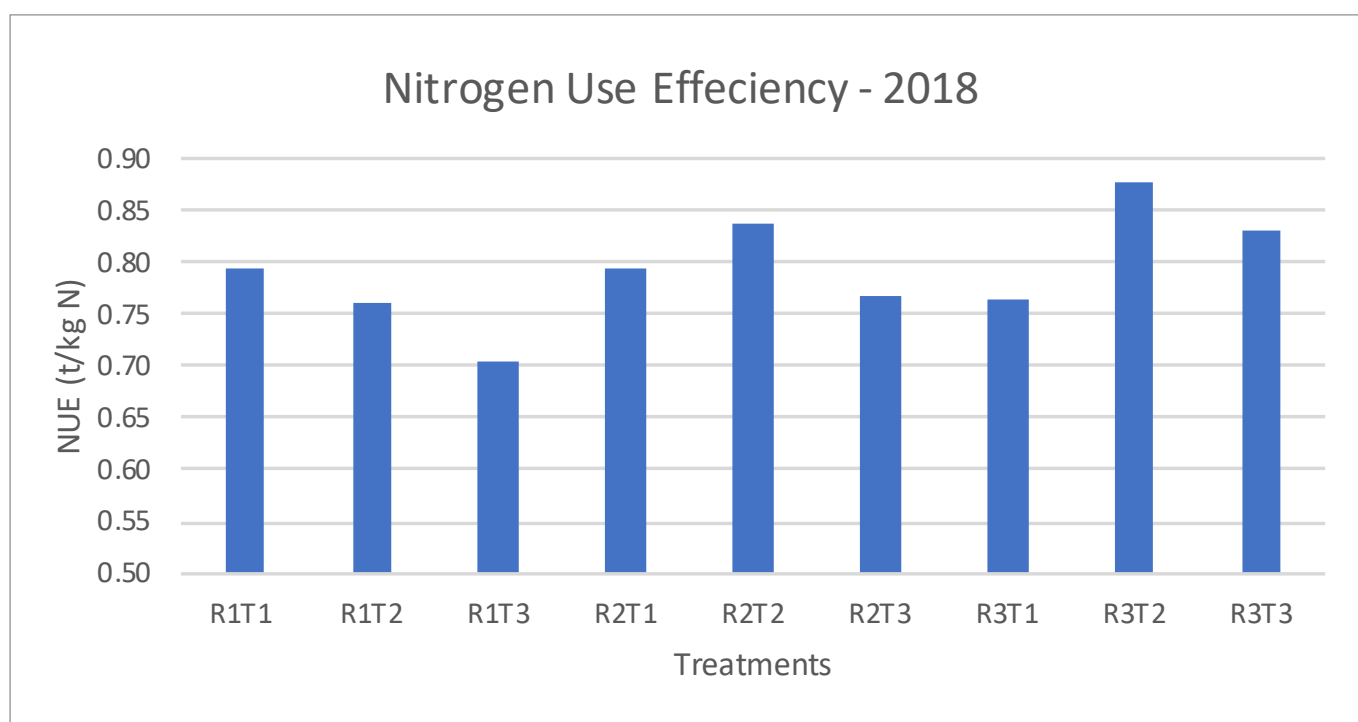


Figure 6 - Sugarcane NUE for 2018



RESULTS

To determine if lower nutrients for late cut ratoons would still yield same as standard application the three rates applied were Six Easy Steps™ rate of 150 kg N/ha, Six Easy Steps™ minus 20 kg N/ha and Six Easy Steps™ minus 40 kg N/ha.

The trial was harvested under good conditions for all three years, trial was irrigated with 2-3 applications each year of 50-60 mm per irrigation. The data used for calculations was mill cane tonnes per treatment with CCS value calculated by SRA juice laboratory.

The nutrients were applied as liquid Dunder on the surface and incorporated by irrigation.

The yield variation between treatments was minimal (Figure 2, 3 & 4) and there was no significant difference between yield or CCS for treatments or years. The higher rate of 150 kg N/ha did yield slightly better across all years (Figure 5).

Sugarcane biomass analysis was conducted for the 2018 crop and nitrogen use efficiency calculated with treatment 130 kg N/ha achieving the highest NUE of 0.88 t/kg N (Figure 6).

The economic weighted comparison (Figure 7) shows very small variation between treatment, however the 2019 season was more favourable, and all treatments show improved performance.

CONCLUSION

The data for all three years consistently demonstrated that variation between treatments was minimal and there was no significant difference between treatments for all years (Figure 2, 5). The seasonal variation was more pronounced with CCS much lower in 2018 (Figure 3) and overall yield higher in 2019 (Figure 2).

The treatment 130 kg N/ha was the lowest or equal lowest performer for all years, however in wetter years one of the 130 kg N/ha would have a spring appear, potentially reducing yield.

In 2018 Nitrogen Use Efficiency (NUE) calculations show no clear trend (Figure 6), other than 130 kg N/ha had the two highest NUE of 0.84 & 0.88 t/kg. The average NUE for each treatment was 0.77 t/kg, 0.83 t/kg & 0.78 t/kg for 150 kg N/ha, 130 kg N/ha & 110 kg N/ha respectively.

The economic analysis is a relative indicator of returns per treatment (Figure 7) and clearly shows only small variation between treatments for a given year and the season is the dominant influence for economic return.

The three years of data for the trial did not clearly demonstrate one nutrient range performed significantly better than any another, however the 150 kg N/ha consistently yielded slightly better (Figure 2). This trial demonstrates nutrient reduction in late cut ratoons did not significantly affect expected yield. However, for the same nutrient application trial had variation between years as high as 26 t/ha.

The grower has adjusted his nutrient program to align closer to the 120-130 kg N/ha and 90-110 kg K/ha in response to trial data and his observation of crop.

Table 1 - Nutrient treatment rates and product details

<p style="text-align: center;">T1 MKY 140P @ 3.0m³/ha 105 N, 9 P, 87 K, 18.5</p>
<p style="text-align: center;">T2 MKY 140P @ 3.7m³/ha 130 N, 11 P, 107 K, 22.5</p>
<p style="text-align: center;">T3 MKY 140P @ 4.3m³/ha 151 N, 12 P, 124 K, 26.5</p>

Figure 2 - Yield tonnes sugar for trial

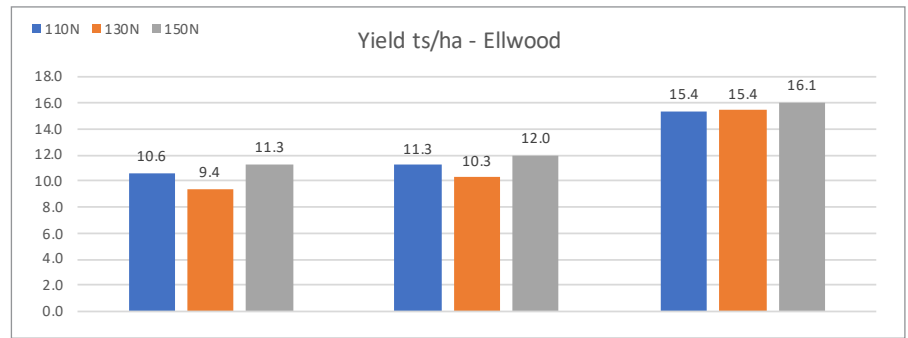


Figure 3 - Yield CCS for trial

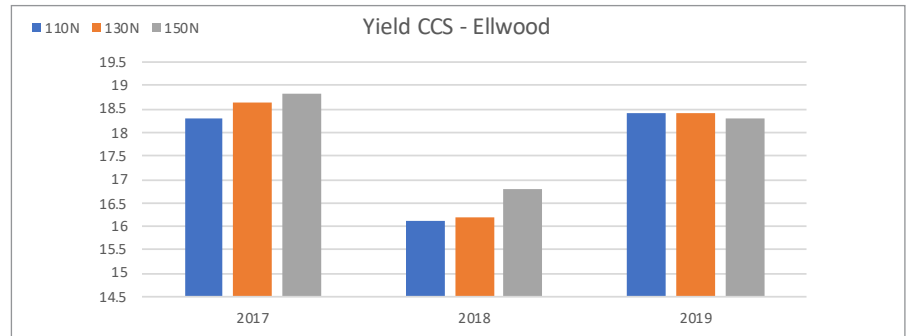


Figure 4 - Yield tonne cane for trial

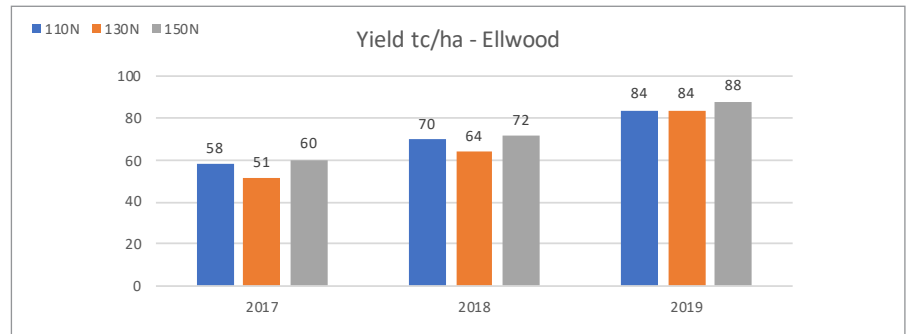


Figure 5 - Yield tonne sugar weighted average for trial

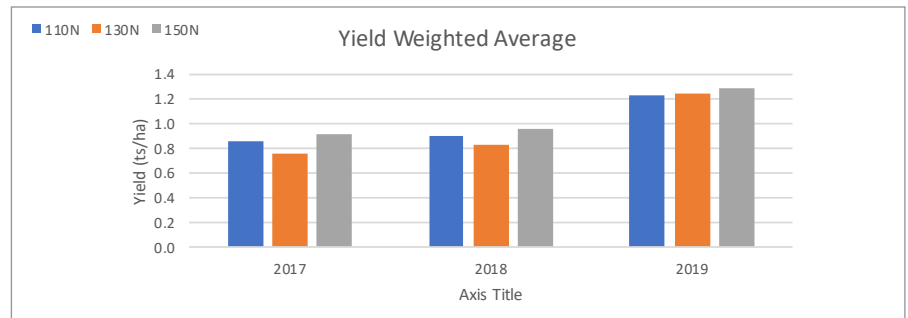
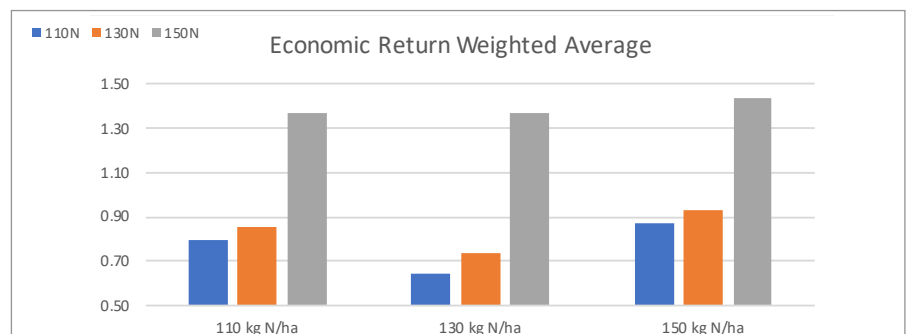


Figure 6 - Weighted economic return for trial



Turning our waste into agricultural compost



Mackay farmers will soon be able to get their hands on a home-grown nutrient rich compost for their crops.

AJK Contracting Pty Ltd was awarded council's Biosolids and Green Waste Management Contract at the end of last year, to process the biosolids generated from council's wastewater treatment plants and green waste and turn it into compost for local agricultural use.

Director Jason Devitt said council undertook a thorough Biosolids Strategy Investigation and found significant environmental and economic benefits for the Mackay region

"We produce about 5000 tonnes of green waste and 8000 tonnes of biosolids each year," Mr Devitt said.

"Before this contract was approved, our green waste and biosolids were processed separately and our biosolids weren't being reused in our local area," he said.



"By mixing together our biosolids and green waste, it will create a very high nutrient rich compost for local farmers to use."

According to the Department of Primary Industries and Regional Development, applying compost to agricultural land improves soil productivity by:

- Increasing soil buffering capacity and moisture holding capacity
- Adding a source of organic matter that stimulates biological activity
- Improving retention of soil fertiliser
- Boosting the pool of nutrients
- Providing a limiting effect on the soil
- Improving soil structure.

Composting also reduces the need for applications of fertiliser, water, herbicide and pesticide, and it reduces soil erosion.

Mr Devitt said council has also achieved significant savings with its new biosolids and green waste contract.

"Council will save over \$600,000 in the first 12 months of the biosolids and green waste contract by using the same contractor," he said.

"A performance Management System has also been included in the agreement and if the contractor fails to meet the agreed key performance indicators, then the payment fee can be adjusted."

It is anticipated the nutrient rich compost, or Humisoil, will be available to Mackay farmers by mid to late July this year.

An update on cane farming practices across the Reef catchments

Expansion of improved nutrient practices continues to net positive results

Over the last four years the RP161 Complete Nutrient Management Planning for Cane Farming project has continued to find success and a home among Queensland cane farmers. The project has expanded from a simple yet effective trial to optimise fertiliser application rates through tailored whole-of-farm nutrient management plans, to an established and trusted service in the Burdekin, Mackay Whitsunday and Herbert. RP161 works in a way that supports and helps to embed improved fertiliser practices, which also positively affect the Great Barrier Reef.

The program will expand into the Cairns and Babinda cane growing regions of the Wet Tropics in 2020, further highlighting how receptive cane farmers have been to the practice change learnings through working with professional agronomists. SRA and Farmacist will deliver the new project expanding on the excellent work of Farmacist, Herbert Cane Productivity Services Ltd and Mackay Area Productivity Services in other regions.

The continued development of the project is due to both grower demand and the exceptional achievements of participating farmers that led to further funding from the Australian and Queensland governments. The project will continue to assist growers to improve their farming practices and adjust fertiliser rates for

their blocks using SIX EASY STEPSTM, while maintaining productivity and profitability. Achievements to date include:

- **Burdekin:** 210 participating farms applied 200 tonnes less nitrogen over four years up to 2019.
- **Mackay Whitsunday:** 57 participating farms applied 98 tonnes less nitrogen in 2018, with an increase to 110 farms in 2019.
- **Herbert:** 53 farms participated in the first year of the project with comparable nitrogen savings predicted.

RP161 is funded through the Queensland Government's Reef Water Quality Program and the Australian Government's Reef Trust.

Soil and nutrients – the economics and health behind the soil

Cane growers participated in a number of highly successful soils and nutrient workshops in 2019. Farmacist presented the workshops with soil scientist Dr Phil Moody, which focused on managing and understanding the dynamics of a property's soil.

The workshops were well attended with local cane farmers bringing soil samples to run tests on. They also involved a soil pit investigation in the paddock and a look at the economics and options behind reducing fertiliser costs. Farmacist will be running more workshops in the Mackay Whitsunday and Burdekin regions in 2020.



Reef protection regulations and what they mean to sugarcane farmers

The Reef protection regulations commenced on 1 December 2019 and will continue to roll out over the next three years. The new regulations address land-based sources of water pollution to the Reef. The minimum practice agricultural standards for sugarcane production focus on retaining nitrogen, phosphorus and sediment on-farm to minimise run-off and improve water quality.

Under the regulations, all sugarcane producers in the Wet Tropics, Burdekin, Mackay Whitsunday, Fitzroy and Burnett Mary regions are required to:

- keep general records from 1 December 2019
- comply with minimum practice agricultural standards as this requirement is applied to each region over the next three years
- implement a farm nitrogen and phosphorus budget as this requirement is applied to each region from 2021
- obtain an environmental authority (permit) if commencing new or expanded cropping or horticulture activities on more than five hectares that do not meet the cropping history test in the Cape York, Wet Tropics, Burdekin, Mackay Whitsunday, Fitzroy and Burnett Mary regions from 1 June 2020.

The Queensland Government will continue to work with farmers, providing programs and tools such as RP161, to help them identify opportunities to improve farming practices.

Further information about the regulations and support programs is available at www.qld.gov.au/ReefRegulations



Image: Farmacist agronomists are helping farmers improve their nutrient management practices through the Complete Nutrient Management Planning for Cane Farming project.





JOHN AND DEAN PASTEGA

Variable Rate SuSCon Trial



Growers participating in Project Catalyst trials provided data for analysis to economists from the Department of Agriculture and Fisheries to identify the cost-benefits and profitability of their trials. In this study, the Pastegas' and Farmacist trialled variable rates of suSCon Maxi Intel® (suSCon).

The objective of the trial was to examine the water quality, production and economic impacts from reducing the application rate of suSCon in a plant cane crop. It was expected that there could be a water quality improvement and economic benefit if sugar yield were maintained at the lower application rate.

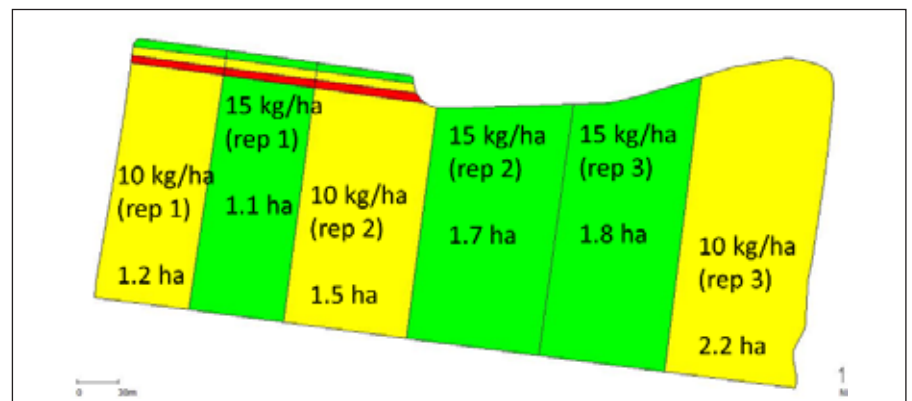
TRIAL DESIGN

Farmacist worked with the Pastega family on their North Eton farm to conduct the trial over the 2017 and 2018 seasons. The Pastegas applied two different rates of suSCon at plant.

The treatments included suSCon applied at the grower standard rate of 15 kg/ha (maximum label rate) and a reduced rate of 10 kg/ha.

The randomised strip trial included three replications for both treatments (see figure 1). The plant cane crop was harvested in 2018. The trial will continue to monitor production and the resultant impact on profitability in follow-up ratoons.

Figure 1: Trial design (source: Farmacist)



KEY FINDINGS

- No evidence of grub activity indicated no grub damage at the time of inspection.
- Cane yields were significantly lower by 8 t/ha where suSCon was applied at a reduced rate.
- The reduced suSCon rate (10 kg/ha) had significantly lower profitability.

COSTS

Figure 2 presents a breakdown of the variable costs for both treatments (excluding harvesting costs). The suSCon chemical cost change was the only major cost difference in the trial. The lower suSCon application rate reduced disease control variable costs by \$122/ha reflecting most of the difference in variable costs.

RESULTS

Figure 3 shows that the standard application rate of suSCon at 15 kg/ha produced 8.2 tonnes of cane per hectare (t/ha) more than the reduced application rate (10 kg/ha). The difference between the two suSCon rates was statistically significant ($p=0.024$).

The average gross margin was \$358/ha lower ($p=0.055$) at the reduced suSCon rate of 10 kg/ha (see figure 4). This was due to the lower application rate obtaining less cane yield than the higher application rate. The least significance difference error bars indicate the variability in the trial. Although there was a significant difference in both cane and sugar yield, there was no conclusive evidence it was due to a greater amount of grub damage.

CONCLUSION

In this trial, the standard application rate of suSCon attained a higher gross margin, due to the reduced application rate producing less yield. However, observed grub activity could not be directly linked to the differences in yield. Further trials need more focus on grub observations, particularly the timing of such observations. Results suggest that label rates of suSCon should be maintained.

For more information on the economic analysis please contact Brendon Nothard
 Ph: (07) 4967 0605
 Email: Brendon.Nothard@daf.qld.gov.au

Figure 2: Variable cost breakdown (average)

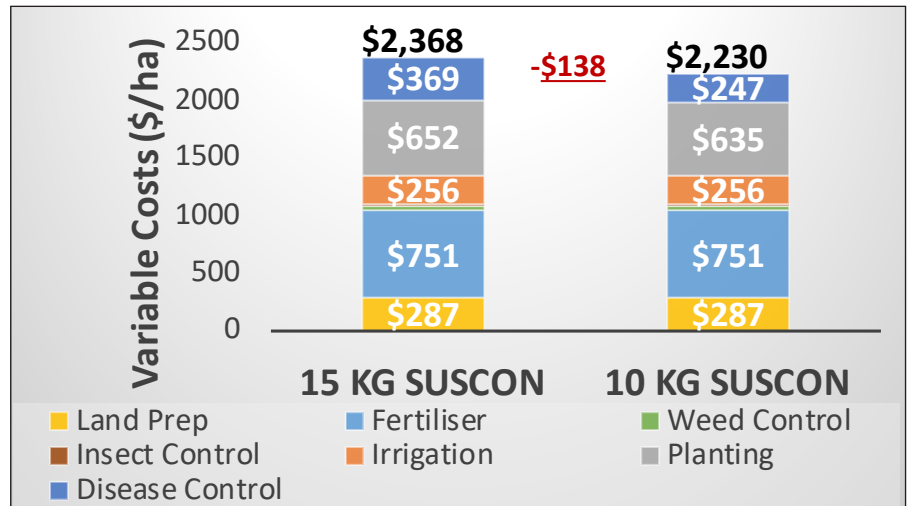


Figure 3: Average cane yields

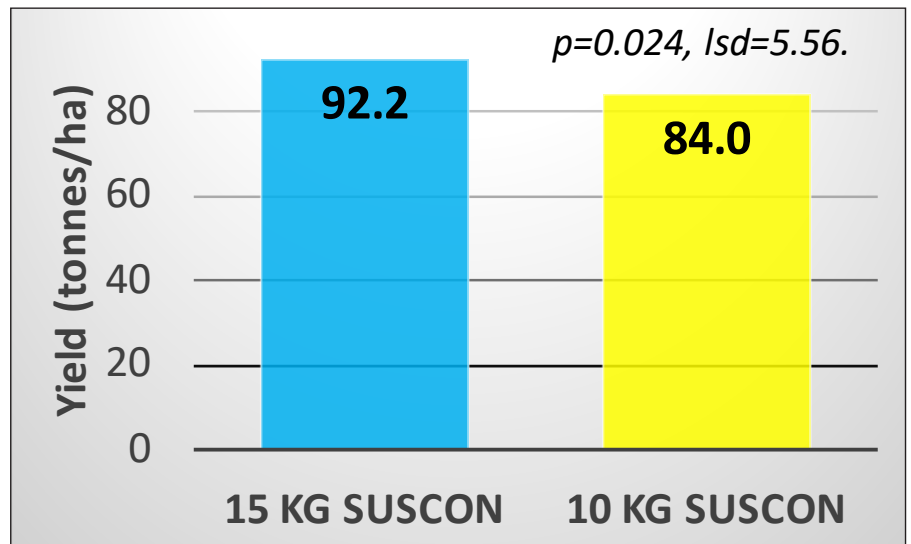
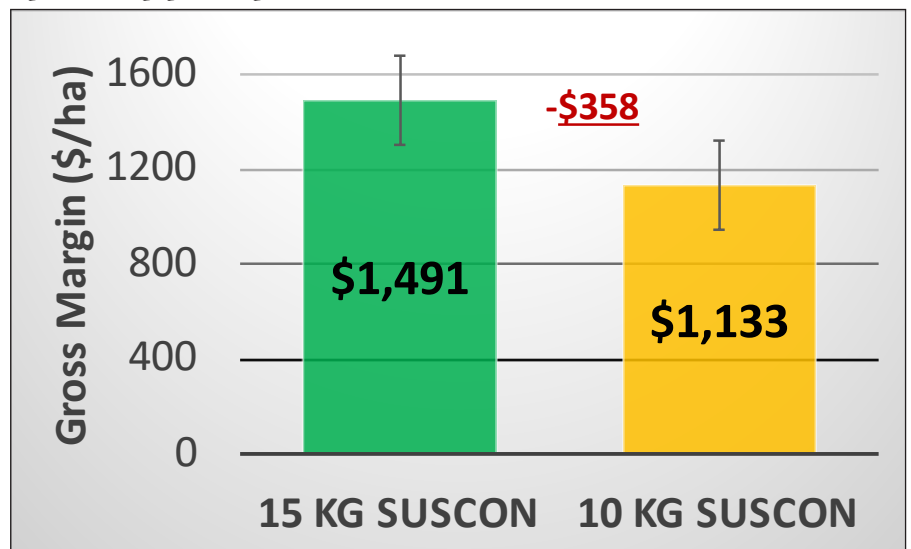


Figure 4: Average gross margins



⋮ Note: The trial results are specific to this grower, paddock and prevailing conditions



Split application fertilising with Bio Dunder® brings benefits



John and Phil Deguara have a long history of using Bio Dunder® liquid fertilisers on their family farm at Brightly, near Eton.

They've also got a long track record of innovation and trialling new approaches to farm management.

In recent years, they adopted a 'follow the harvester' approach to their fertilising regime to get their ratoon crop off to a good start.

Something they've been doing a little differently is splitting the nutrient application on all of the ratoons that are cut in the early part of the season.

After the cane has been harvested, a Bio Dunder® liquid fertiliser product is applied and watered in. This provides the nutrients needed to give the crop a kick-along.

Then, later in the season, the crop is topped up with the required nutrient at the same time the grub control is being applied. It's all done in the same

pass. Importantly, it can be done at a time that's both convenient to the farmer and provides suitable weather conditions.

Using a split application method helps to protect against nutrient losses from heavy rainfall. And, with this added control over the timing of the fertiliser application, the Deguaras have found they are able to reduce their nitrogen rate by 10 per cent. This reduction helps to offset the cost involved in splitting the application.

John and Phil Deguara said the split application approach has not had any adverse impacts on yield. They have also confirmed through leaf sampling that their crop is receiving sufficient levels of nutrient.

Their approach is a great example of how growers are using Bio Dunder® products to maximise productivity on their farm.

Wilmar BioEthanol AgServices is a proud sponsor of Project Catalyst.





STEVE YOUNG

Improve VR Maps

To use low cost sensors to produce cane yield maps to improve the availability and accuracy of VR maps to growers.

BACKGROUND

Using known yield data would greatly improve the accuracy of remote sensing data and give growers the added confidence to apply variable rate nutrients. While the newer model harvesters have made great strides in improving the accuracy of factory fitted harvester yield monitors, the reality is most harvesters used in the industry are not fitted with yield monitors. After market harvester yield monitors have been plagued with false hopes and high expense with very little uptake from the general growing community.

Steve and Maguarite Young farm more than 240 hectares in the Homebush/Sandy Creek and Bakers Creek area in the Mackay region. Steve also operates a harvesting contract business harvesting his and several nearby farms.

Steve's harvester had one of the first GPS tracking devices fitted when introduced by Mackay Sugar in the early 2000's and he has taken a keen interest in understanding yield variations that exist within a farming operation.

This project seeks to explore opportunities to develop low cost and reliable yield data using a combination of GPS and satellite technologies utilising Steve's harvester. Data will be collated and analysed to produce effective yield maps that growers can utilise to develop variable rate nutrient application programs.

THE TRIALS

Sensors and Tracking Device

Air bags are often fitted as an alternative to conventional steel spring suspensions especially on trucks and trailers that travel over rough terrain. Air is pumped into reinforced rubber bellows which raises the trailer chassis from the axle. Tests had indicated that there is a direct correlation between air bag pressure and weight of product in the trailer to which the air bag is fitted.

The sensors fitted to the haulout vehicle were 0-10 bar Pressure transducers with a 4-20mA output (Figure 1) and were installed onto the airbags in September 2016. The output of the pressure transducers feed into a GPS tracking device which integrates GPS signals, GSM modem and data logger (Figure 2).

Figure 1 - 0-10 bar pressure transducer



Table 1 - Example of transmitted data from data logger

ReportTime	Latitude	Longitude	Direction	Input1	Input2
4:04:30 AM	21.26269	149.092093	333	171	304
4:04:32 AM	21.26268	149.09208	335	171	304
4:04:43 AM	21.26238	149.0919958	240	171	316
4:05:33 AM	21.26237	149.091958	240	175	317
4:05:44 AM	21.26251	149.0916928	61	175	317
4:06:34 AM	21.26251	149.0916928	61	175	318
4:06:45 AM	21.26251	149.0916928	61	174	318
4:07:34 AM	21.26251	149.0916928	61	173	318
4:07:45 AM	21.26251	149.0916928	61	173	318
4:08:35 AM	21.26251	149.0916928	61	232	310
4:08:44 AM	21.26251	149.0916928	61	249	295
4:09:34 AM	21.26251	149.0916928	61	279	310

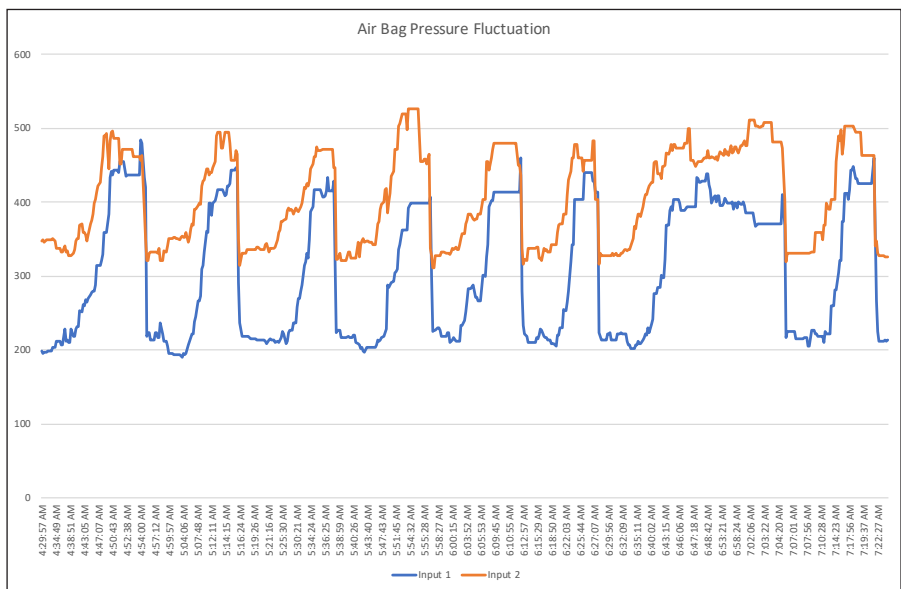
Figure 2 - GPS tracker and Data Logger



Data from the loggers is sent via the mobile phone network to a purpose-built database. An example of the type of data sent is shown in Table 1.

A plot of air bag pressure versus time (Figure 3) clearly shows the pressure within the airbags increasing as the haulout bins are being filled during harvest operations and then rapidly declining when the haulout empties the load into cane bins on the mill rail system.

Figure 3 Fluctuation in airbag pressure over time



Upon closer inspection, there is considerable fluctuations in the sensor values as the bin is being filled. This can be attributed to a variety of reasons but predominately the rough terrain inside a cane paddock causes highly variable pressures in the air bags as the vehicle travels over the ground. These fluctuations are very difficult to assess as either weight increase in cane in the bin or air bags being pressurised from the travel over rough terrain.

A change in direction

In 2018, rather than monitoring the haulout vehicles and airbag sensors, the trial monitored harvest position on a daily basis. GPS tracking devices fitted to the harvester record the positional location of the harvester at regular intervals. This data is then transmitted from the GPS device into a dedicated database where the position reports are analysed and processed to produce maps of the locations where cane has been harvested.

Figure 4 - Daily harvest yield map



The calculated harvest area for each harvest day is then matched to the weight of cane as measured by the mill weighbridge for each harvest dates to create a daily area yield map (Figure 4). Even without further processing these maps show the often extreme variability in cane yields across a farm.

The use of Satellite Imagery

Multi-spectral satellite imagery has been used for several years to assess the health, vigour and yield potential of many agricultural crops with Farmacist being one of the pioneers in developing techniques and algorithms to process satellite data into cane yield. Assessment

of crop yields usually requires the conversion of the satellite data into vegetation indices such as Normalised Difference Vegetation Index (NDVI) or Green Normalised Difference Vegetation Index (GNDVI). Once converted, calibration algorithms are used to convert the indices into cane yields. However, one of the lingering doubts as to the level of accuracy of calculated cane yields is the lack of detailed calibration data to assess the validity of the algorithms when converting from the vegetation index.

This project has produced a method whereby the daily yields as calculated from the harvester and weighbridge data can be used to accurately calibrate satellite data to show actual and detailed cane yield variability.

Prior to the commencement of the 2018 harvest season, a 10 metre Spot multispectral satellite image was acquired and analysed to indicate the variability in vigour using NDVI. The satellite data was overlaid onto the daily harvest map (Figure 4) where daily harvest yields were used to convert the variations in NDVI values from the satellite image into a yield variation map (Figure 5).

2019 DATA

Harvester position reports from early in the 2019 harvest season combined with daily delivery data from the farm were used to create a daily harvest yield map (Figure 6). This shows a wide variation in average cane yields for each harvested area within the 16 hectare block ranging from less than 82 to more than 111 tonnes per hectare.

A satellite image captured in April 2019 was converted to GNDVI and overlaid onto the daily yield map. The variability within the GNDVI values from the satellite imagery were calibrated using the daily yield data producing a detailed yield variation map (Figure 7). The map shows large variation exist in yields within this block ranging from a low of 47 tonnes per hectare to a high of 131 tonnes per hectare. Overall, the block averaged 100 tonnes per hectare (tc/ha).

In July 2019, an upgraded GPS tracking device was fitted to the harvester (Figure 8) that provided similar positional accuracy to the previous device, however the upgraded devices improved installation efficiency by more than 50% as they do not require external antennas to be mounted to the harvester.

Included in the upgrades were changes to processing software that allowed for the automated processing of daily harvesting reports, matching cane harvested for the day to the area harvested for the same day.

VALIDATION OF IMAGE CALIBRATIONS

In November 2019, a cane block within the Young's farm was used to validate the accuracy of the calibrated satellite image. Using the Farmacist weigh truck, plots of 3 rows wide (row width 1.83m) by 30 metres long were harvested and weighed to calculate actual cane yields within each plot (Figure 9).

A comparison of the actual cane yield as derived from the weigh truck to the calibrated yield from the satellite image showed a high degree of correlation achieving an R2 of more the 0.85 (Figure 10).

A yield variability map generated from the calibrated satellite image for this block also showed extreme variability of cane yield (Figure 11) ranging from a low of 26 tc/ha to more than 100 tc/ha.

VARIABILITY WITHIN WHOLE OF FARM

The Young's Baker's creek farm was harvested in mid-October 2019 with average daily harvest yields ranging from 65 to 85 tc/ha (Figure 12).

Once again the creation of the calibrated satellite yield variation map highlighted significant variability of more than 54 tc/ha across the farm and also within paddocks (Figure 13).

Figure 5 - Yield variation map

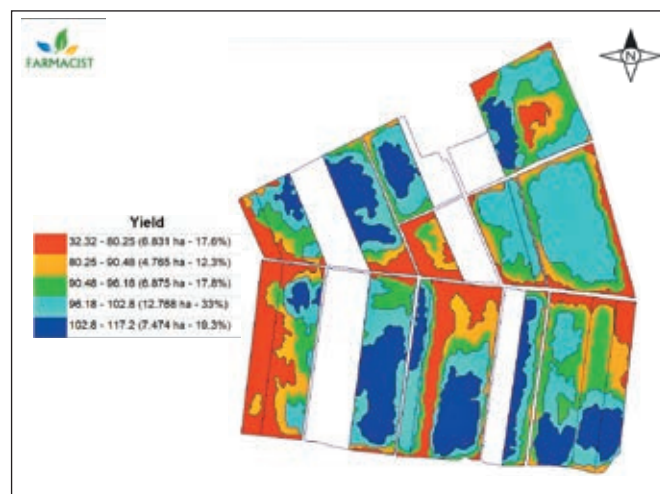


Figure 6 - 2019 harvested area daily yield map

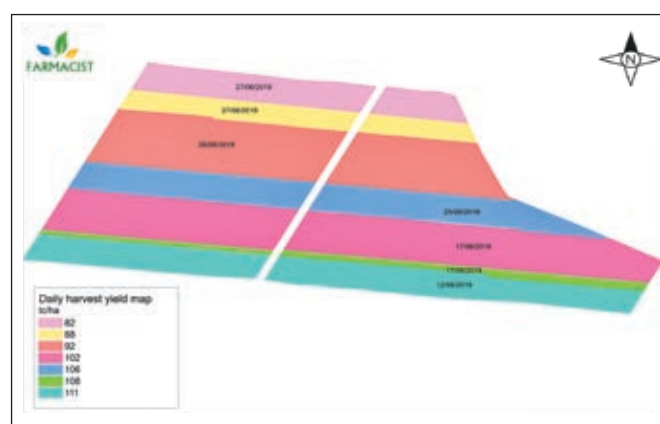


Figure 7 - 2019 yield variation map generated from combination of harvester position and satellite image analysis

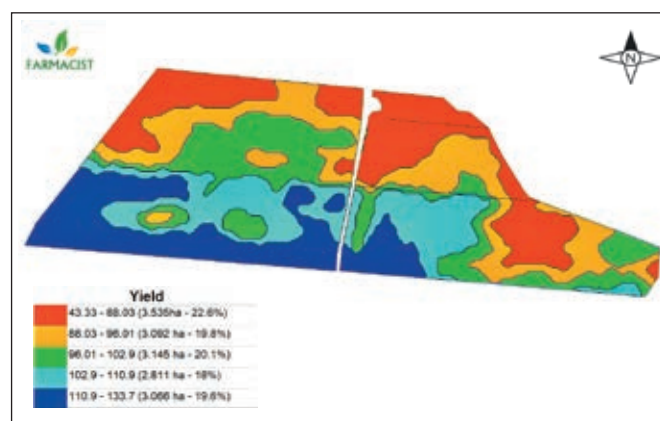


Figure 8 - Upgraded GPS monitor fitted to the harvester for the 2019 harvest season.



Figure 9 - Validation plots



CONCLUSION

Early indications that measuring airbag pressure in a haulout vehicle would provide data that can be used to measure yield variation within a cane paddock were proven unsuccessful due to the extreme fluctuations in pressure caused from travelling over rough terrain. The fluctuations created excessive 'noise' in the data signals making it difficult to process with any great confidence.

A change in direction in 2018 has seen harvester GPS position reports used to create area harvested polygons that can be directly matched to daily farm delivery information. This in turn creates daily yield maps and when overlaid with satellite data acquired in the pre-season creates yield variability maps with a high degree of accuracy.

The development of the satellite calibration process based on daily harvest yields has proven to be reliable, repeatable with a more than acceptable degree of accuracy. The level of accuracy achieved has given confidence to the grower to use the data as the basis for implementing a variable rate fertiliser application program within locations that exhibit high yield variability.

Figure 10 - Comparisons from plot actual cane yields against calibrated satellite image derived cane yields

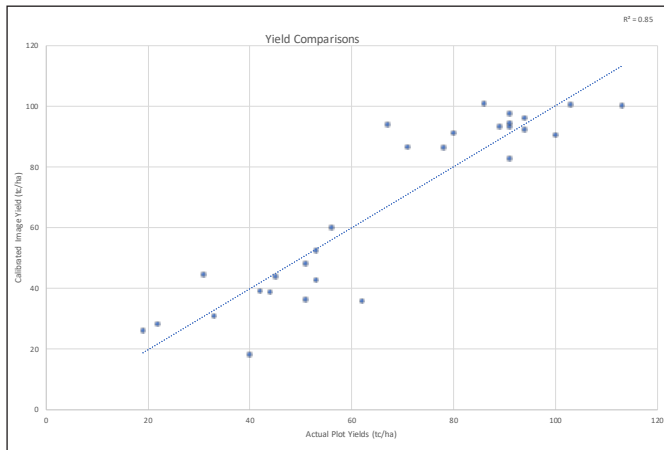


Figure 11 - Within paddock yield variability

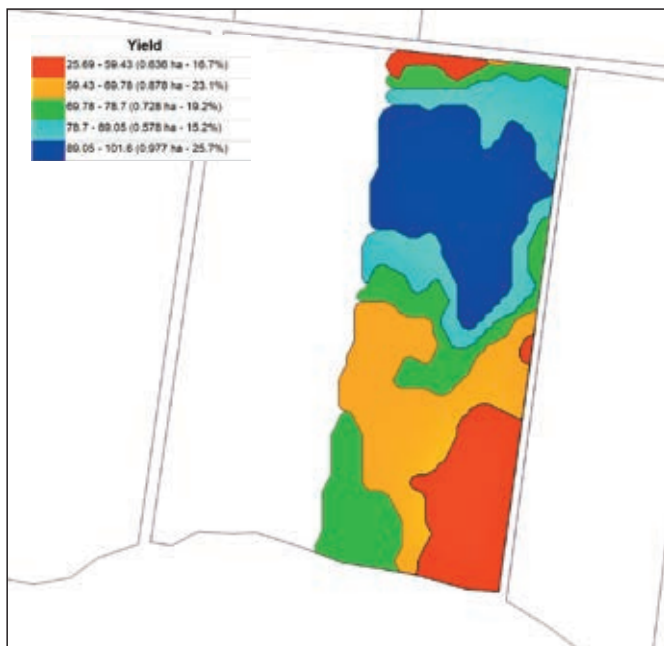
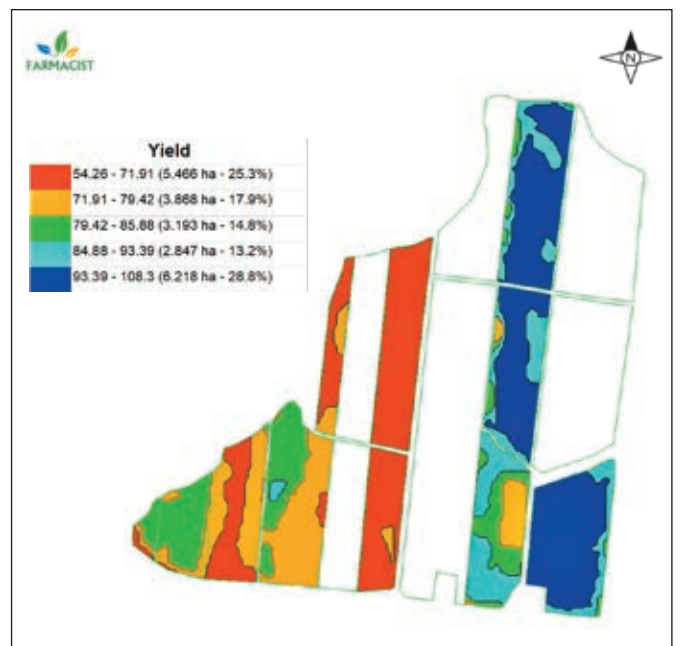


Figure 12 - Daily harvester yield map



Figure 13 - Calibrated satellite yield variation map





Rabobank

Optimism for the Australian Sugar Industry



As we move into 2020, the new year brings a much-needed dose of optimism for the Australian sugar industry. This early part of 2020 has presented some of the best forward-pricing opportunities since 2017, and a much-needed opportunity for growers to delve back into the art of marketing. And, in Rabobank's view, this is not just a temporary swing but a shift in global fundamentals – the world will consume more than 8 million tonnes more sugar this year than it produces. Add some jitters around the weather-hit Thai and Indian harvests and, at least for the duration of 2020, importers will be willing to pay more to secure their sweetener supplies.

As pressures ease on the price side, the reprieve provides a chance to take stock of other industry challenges. Demand is one, with domestic sugar consumption remaining stagnant, or even falling, over the past few seasons. This trend is compounded abroad, where health concerns and sugar taxation pare back global consumption

growth to just 1 per cent year on year (YOY) versus average YOY growth of 2% per cent over the past 15 years. The second is 'social licence to operate', a concept engineered in tall towers but now broadening its grip into agriculture. Social licence refers to ongoing acceptance of an industry's business practice by stakeholders and the general public – a cloudy and unclear concept, but an increasingly important one.

More specifically to agriculture, social licence defines what practices the public is willing to accept and, more importantly, what they won't. This change in expectation is driven partly by a fresh consumer generation called millennials. While opinions on this generation (born between 1981 and 1996) vary, we know that they often value trust and integrity – so when it comes to food, millennials care more about honest and ethical standards in the goods they buy and use. There are numerous examples of how social license has affected agriculture, from

the ban on live cattle exports to the support for drought-stricken dairy farmers for instance. No industry is immune – livestock, cotton, grains and sugar, amongst many, many others – so all must face up to operating under a 'social licence'.

The cane industry also has this obstacle to tackle or, more accurately, this 'licence' to earn. It will be through positive environmental management, reef protection and industry best practice that the sector will be able to do so. An industry which shows evidence of increasing nutrient efficiency, reducing chemical applications and improving water quality to, ultimately, protect the reef will go a long way to appease today's more curious consumer. And while practices will always vary broadly by different cane systems and environment, the outcome ultimately benefits the farm business, the surrounding natural environment and longevity of Australia's cane industry.

Economic insights for 2019

A snapshot from the Department of Agriculture and Fisheries (DAF)
Project Catalyst economist team increase on-farm

Why economics and not just agronomics?

Economic analyses of sugarcane trials can help growers to understand the different variables involved and the overall costs and benefits of making a change in practice. Pursuit of the best sugar yield per hectare may not always have the best economic outcome for growers. For example, while yield or CCS may improve, increased costs could negate the economic benefits. Economics considers the combined effects between all inputs and outputs to optimise the use of farm resources, including the effects of changes in prices received and paid.

Agricultural economists from the Department of Agriculture and Fisheries (DAF) have been working with Project Catalyst service providers and growers since 2011 to conduct economic analyses of selected trials. More recent analyses have focussed on trials with adjusted N rates under various conditions and application methods, different approaches to soil ameliorants, and a multi-species legume fallow.

Results from the following 10 trials will be made available in 2020.

Almost half the trials evaluated by DAF for 2019/20 season had a soil health and nutrient management focus aimed at reducing runoff and losses through practice change. Early results are promising, with findings indicating opportunities to adjust N rates under certain conditions without compromising profitability. Early contributions through the soil mineralisation process are being considered and the longer-term effect will be closely monitored for follow-up ratoons.



Image: DAF economists and agronomists at last year's Forum.
L-R: Brock Dembowski, Tich Pfumayaramba, Brendon Nothard, Daniel Gonzalez.

Nitrogen

Groundwater Nitrate Monitoring & N Rates

Evaluate N Rates on high OC soils (2 sites)

Reduced N&P on Yield Potential

Subsurface Liquid Fertiliser (DunderUnder)

Soil Ameliorants

Different forms of lime

Sub surface mill mud/ash pre-plant

Sub surface mud

Sub surface mill mud/ash

Multi-Species Legumes

Multi-species legume fallow

Bio-Fert

Bio fert to reduce fertiliser inputs

To view any of the economic studies, please visit the Queensland Government website at:
<https://publications.qld.gov.au/dataset/sugarcane-economics>



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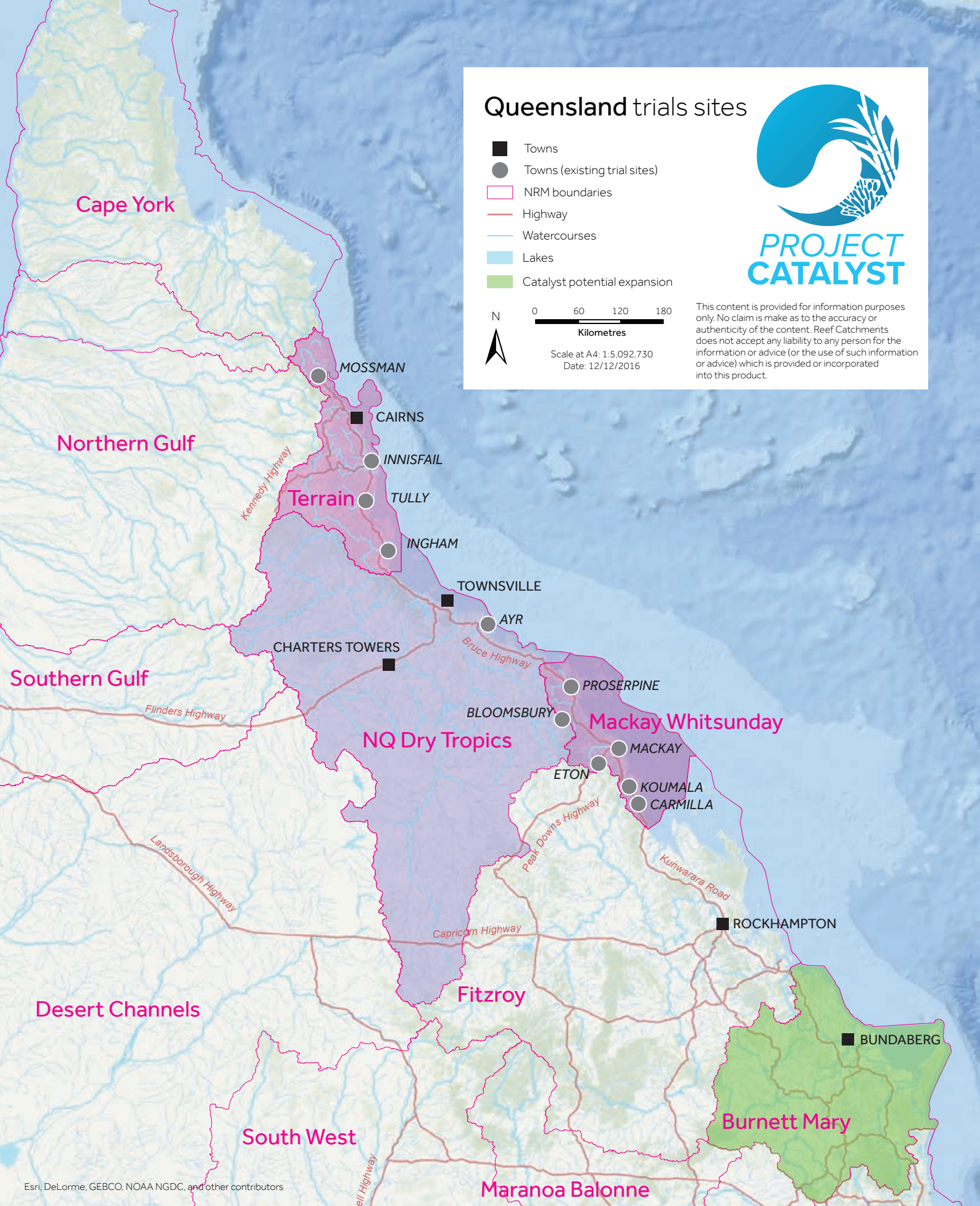


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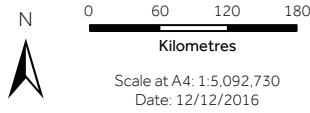




Queensland trials sites



- Towns
- Towns (existing trial sites)
- NRM boundaries
- Highway
- Watercourses
- Lakes
- Catalyst potential expansion



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