PROJECT CATALYST

PROJECT CATALYST 2017 – ***INNOVATION BEYOND 2020 AND ADOPTING CHANGE.***

ADOPTING CHANGE

A CATALYST VISION
Where to from here

DIGGING IN
Trials inspiring invention

BEING TECH SAVVY
Why internet speed matters

CATALYST VISION

On behalf of the Project Catalyst Partners and Sponsors I am pleased to welcome you all to this showcase of the work being undertaken by the growers across the cane growing regions that adjoin the Great Barrier Reef. The Forum returns to the birthplace of Project Catalyst in the Mackay Whitsunday region this year to explore the topic of "Beyond 2020 – Innovation into the Future" as well as presenting some of the recent and current trials, opportunities for future trials and to broaden the uptake of proven practice changes.

I attended my first Forum in 2015 and since then have met many of the farmers who give freely of their time to work with the on-ground extension providers to trial many of the farm management innovations that offer water quality improvements to the GBR. The support Project Catalyst offers includes testing farm management innovations growers have identified as well as helping to take proven innovations to a broader audience. As the Project Catalyst Coordinator for Catchment Solutions there are opportunities to visit growers and see the trials they are undertaking, host visitors to the region on behalf of the Partners and submit applications for additional funding to help the growers work towards improved environmental, social and economic outcomes for them and their families.

Two key issues highlight why I am passionate about Project Catalyst:

We know that there is a need to improve water quality and environmental outcomes for the GBR – we hear it all the time in the media. We also hear the doom and gloom about sugar and its impacts on the GBR so why would such a high profile program like Project Catalyst exist with growers, WWF, Coca-Cola Foundation, Bayer, NRMs and Australian and Queensland Governments coming together? I believe it is about a willingness to change for mutual benefit to protect the values of environment, community and economy through shared innovation, investment and values. Project Catalyst backs the people who know their craft (the growers) provides support to turn trials into adopted practice change, validates the environmental, economic and social benefits to increase broader adoption and promotes grower to grower knowledge transfer to drive significant benefits for the industry.

And what is it that makes Project Catalyst so successful with more funding partners and farmers wanting to be involved? I have been involved for only a short time but to me it is the understanding and passion of the farmers that management practices can be improved with benefits for the farmer, milling region and

Project Catalyst farmers are happy for their ideas to be shared for mutual benefit without any financial return for their efforts, which means the industry can directly benefit from positive trials and practices.

the environment not at the expense of one or the other. Project Catalyst farmers are happy for their ideas to be shared for mutual benefit without any financial return for their efforts, which means the industry can directly benefit from positive trials and practices.

The growers are the driving force that allows Project Catalyst to continue to expand the number of trials and the adoption of new management practices that results in the environmental benefits that are helping to protect the GBR. The growers take on these trials because they want to leave a positive legacy for the land and the communities in which they live. They enjoy living in these regions, going fishing and living in their communities and want to see these opportunities for their children. They are inventors, citizen scientists, creative thinkers and advocates for change for the better in their industry. But most of all they have a passion for what they do and to a city kid like me that makes Project Catalyst really special as I get to spend my time with these growers helping them pursue their passion.

Enjoy the Forum for 2017

Craig Davenport

FEATURE

REEF CATCHMENTS

Looking after the Mackay Whitsunday Region

TERRAIN

Innovation for the future in the Wet Tropics

NORTH QLD DRY TROPICS

Helping to drive innovation in the sugar industry

GROWER CONTACTS

Stay connected to share knowledge

CASE STUDIES

13 **WATER TRIAL**

Aaron Linton investigates irrigation automation and Telemetry.

20 **SOIL TRIALS**

John and Phil Deguara use subsurface application of mill mud and ash.

39 **NUTRIENT TRIALS**

Charlie Cacciola breaking down barriers to enhanced efficiency fertilizer (EEF) adoption.

65 **CHEMICAL TRIAL**

Dore and Co. developing variable rate herbicide spray.

PROJECT CATALYST

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PROGRAM

Sunday, February 26 Welcome Function	
Venue: Ocean International Hotel – Galleons Courtyard	
17:00 - 19:30	Delegates Check-in (Collect your name tag and delegate pack) Meet and greet – Beer & BBQ
Monday, February 27 Grower Forum DAY 1	
Venue: Ocean International Hotel – Spinnakers Function Room	
08:00 – 08:30	Delegates Check-in (Collect your name tag and delegate pack)
08:30 – 08:35	Housekeeping and Introductions - MC Kym Kruse
08:35 – 08:40	Welcome to Country - Uncle George Tonga
08:40 – 08:50	Welcome address - Greg Williamson, Mayor of Mackay
08:50 – 09:05	Project Catalyst Update - Andrew Rouse WWF
09:05 – 09:25	Economic Opportunities in the Digital Age - Jordan Duffy
09:25 – 09:45	Robots on the Farm – Campbell Newman
09:45 – 10:15	Thinking Beyond 2020 – Panel Discussion
10:15 – 10:45	Morning Tea
10:45 – 10:50	Getting settled – overview of session
10:50 – 11:00	Overview of Trials – John Markley
11:00 – 12:40	Grower presentations – Mackay/Whitsunday
12:40 – 12:50	Farm Safety – Jason Andrews-Reid (RCL)
12:50 – 13:50	Lunch
13:50 – 13:55	Getting settled – overview of session
13:55 – 15:35	Grower presentations – Burdekin
15:35 – 15:55	Innovation to Adoption – Craig Davenport
15:55 – 16:15	Wrap Day 1 – preview Day 2. CLOSE
16:15 – 16:45	Group photo (beachside using a drone)
Forum Dinner *Venue: Ocean International Hotel – Spinnakers Function Room*	
18:00 - 18:45	Pre Dinner drinks in Galleons Courtyard
18:45 - late	A formal dinner to celebrate Project Catalyst Dinner Speaker – David Lamb "Robots, Drones and Sensors" Live music by "Significant Other"
Tuesday, February 28 Grower Forum DAY 2	
Venue: Ocean International Hotel – Spinnakers Function Room	
08:00 – 08:05	Getting settled – overview of session
08:05 – 09:35	Grower presentations – Wet Tropics
09:35 – 09:55	Project Catalyst Launch of Website
09:55 – 10:00	Workshop overview
10:00 – 10:30	Morning Tea
10:30 – 10:35	Getting settled – overview of session
10:35 – 11:20	Workshops: **Group A** - Water Quality **Group B** - Nutrient Sweet Spot
11:20 – 12:05	Workshops: **Group A** - Nutrient Sweet Spot **Group B** – Water Quality
12:05 – 13:05	Lunch
13:05 – 13:10	Getting settled – overview of session
13:10 – 13:55	Workshops: **Group A** – Maintaining Standards **Group B** – Protection vs Productivity
13:55 – 14:40	Workshops: **Group A** – Protection vs Productivity **Group B** – Maintaining Standards
14:40 – 15:10	Afternoon Tea
15:10 – 15:15	Getting settled – overview of session
15:15 – 15:35	Workshop Wrap Panels
15:35 – 15:55	Spreading the Good Sugar Story
15:55 – 16:10	Field Trips, Shed Meetings and Tours in 2017
16:10 – 16:25	Where to next for Project Catalyst
16:25 – 16:30	*Close – heading north in 2018*

Catchment Solutions

Looking to the future

image (left to right): *Fish hotels installation Gooseponds Mackay. Trent Power, Matt Moore, Phil Jeston, Andrew Campbell.*

strive to achieve a balance between sustainable environmental practices and commercially viable business returns? I have never met a grower that wanted to do harm to the land that they live on that supports their family and way of life, and yet, there is increasing pressure from industry, media, government and special interest groups to do more (yields, production, growth) with less (chemicals, fertilisers, water and land) in every agricultural activity we undertake.

Finding ways to make this happen is a challenge that inspires creative thinkers and innovators across every industry.

As an environmental consultancy and service provider we have employed some of the most passionate and dedicated people involved with environmental management that I have come across. Each member of the team brings a particular environmental specialty and interest to the business that provides a real diversity to the types of work we look to take on.

We have the Fisheries specialists, Matt and Trent, who deal in aquatic ecosystems, biology and aquaculture. Fiona and Wendy love playing in the water quality, infrastructure and macroinvertebrate monitoring fields while Craig and Phil look after land rehabilitation and repair, land and water management, agriculture, impact assessments and approvals.

It's hard not to get fired up and interested when you listen to them talk about a particular project they have been working on or even an idea they have had that just might improve the condition of a certain stream or wetland. It's from these ideas that great things happen.

As an example, Catchment Solutions, in collaboration with Reef Catchments (NRM) and Mackay sugar cane farmer Shane Cowley, joined forces in 2014 to construct a treatment train of wetlands. The project team took a holistic approach to wetland design by incorporating both water quality treatment and biodiversity outcomes.

Multiple water quality treatment chambers or ponds were constructed, on-farm, to capture and improve water quality flowing from adjacent sugar cane farms prior to discharging into the Bakers Creek Estuary and eventually the Great Barrier Reef. It was designed to capture the first run off event leading into the wet season, remove sediment, utilise nutrient through planting 3000 endemic riparian plants, provide water back to farm for irrigation and re-oxygenate the water prior to release into the existing wetlands. Fishways were also incorporated to ensure connectivity of waterways for fish communities.

We monitored the water quality over two years and the results have been outstanding with significant reductions in nutrients and herbicides at the outlet compared to the inlet and native fish community abundance increasing beyond expectation.

We believe that this collaborative method in tackling environmental challenges is the best way to successfully deliver on-ground projects and we want to take it to other areas in Australia.

Currently we have projects underway in Mackay, Rockhampton, Gladstone, Bundaberg and Brisbane. Beyond 2018, I would love to see Catchment Solutions offices in a number of locations in Queensland, NSW and the Northern Territory, all building on the successful projects we have completed, what we have learned in the Mackay region, and making it available to other growers, councils and communities.

Andrew Campbell
General Manager, Catchment Solutions

Reef Catchments

Why we're looking forward to the future of agriculture

What do a proud and healthy community, a strong agricultural sector and a thriving Reef and natural resources all have in common? People. People who take ownership of their actions and change what they can to improve their approach to just about everything – their business, their environment and how they operate in work and life.

These people instigate and influence change, even through small things. Rather than say 'that can't be changed' or 'it won't make a difference' they say 'let's try it' and 'I've got this idea...' Ignoring potential short-term inconvenience, they shift and change to ultimately be placed in a better position, one that benefits both their bottom line and the community they reside in.

In the experience of Reef Catchments, landholders are one of the most inspiring instigators of change.

Reef Catchments is a proud and long-term supporter and facilitator of agricultural innovation in the Mackay Whitsunday and Isaac (MWI) region. As the area's leading NRM (Natural Resource Management) group, Reef Catchments founded Project Catalyst in its infancy eight years ago, starting with just a handful of growers from the local Mackay Whitsunday area.

The fact that the project has now grown to encompass more than 70 cane farmers from across Queensland is testament to the hard work of all involved. Primarily though, it is testament to the growers themselves, who are driving the work done with their own ingenuity, energy and interest.

It's always beneficial to look at the motivators behind a successful concept like Catalyst. And it's timely to reflect on the other wide range of programs that support it. Agricultural innovation has also been heavily led by federal and state funding, rolled out through our region to growers under various initiatives.

Over the years, Reef Catchments and the Australian Government have assisted hundreds of farmers by providing a starting point to give practice change a go. Through initiatives like Reef Rescue and Reef Trust, more than 1800 cane projects have been supported, impacting over 85,000 ha. Some ideas worked, some failed, but all have helped give rise to a new environment where innovation is encouraged. Over time – and it does take time – Reef Catchments believes this support has helped transform attitudes and changed perspectives. This is fundamental to now implement a more 'mainstream' and widespread adoption to practice change.

The good work continues with the latest round of funding available for growers being offered via the Australian Government's Reef Trust 3 programme. Reef Trust 3 provides landholders with support and resources to make changes in the areas of nutrient and herbicide efficiencies. If you haven't already, we strongly encourage you to contact your local PPC (Farmacist or MAPS) to find out if you are eligible to take advantage of this new opportunity.

We thank all the forward-thinking growers in our area who have helped our region get this far. We hope to see the good work continue, expand and grow for many years – to 2020 and beyond.

Katrina Dent
Reef Catchments Manager

The Coca-Cola Foundation

For every drop we use,

we give one back.

Working with our bottling partners and organizations across government, civil society and the private sector, Coca-Cola exceeded our goal of giving back to communities and nature the equivalent of all the water we use in our beverages and their production. We achieved this milestone by supporting projects in safe water access, watershed restoration and water for productive use, in addition to treating wastewater from our operations. Third-party assessors confirm we achieved this milestone early, but this is not the end of our journey. In the coming years, we plan to grow our conservation efforts and dedication to communities.

To learn more and see the partners who made this possible, visit **coca-colacompany.com/water**.

The Coca-Cola Company

Image: Roberto Mercadé Coca-Cola South Pacific Business Unit President meets Queensland cane growers in Mackay.

Coca-Cola supports Project Catalyst

Project Catalyst helps Coca-Cola reach global water replenishment goals

Water is a vital resource globally. Ten years ago The Coca-Cola Company set an aspirational goal to return to communities and nature the same amount of water, equal to what is used in its finished beverages and production by 2020.

Last year the company achieved this goal, almost five years ahead of schedule.

This was no accident. Project Catalyst played a significant role in helping reach this milestone water replenishment achievement.

Coca-Cola is extremely proud to be the founding partner of Project Catalyst, a ground-breaking program that has now helped improve the quality of more than 150 billion litres of water each year flowing into the Great Barrier Reef.

The Coca-Cola Company believes balancing the needs of business, communities and nature is imperative in a resource-constrained world. Its ongoing partnership with WWF is helping to address the natural resource challenges that impact fresh water and has dramatically improved the ecological health of some of the world's most important freshwater basins.

Given the complexity of today's environmental issues, Coca-Cola values its partnerships, which connect across business, government and community. Its partnership with WWF in the South Pacific is focused on creating a more water-secure future.

Coca-Cola South Pacific Business Unit President Roberto Mercadé said: "Our partners are key to our success, from government through to the NRM groups and growers who continue to help us find and trial cutting-edge sustainability practices.

"I especially want to call out the growers, who without their drive and commitment we could never have created this world class water conservation program. Responsible water use today and tomorrow remains a key focus for us and this is why we have committed to replacing every drop of water we use.

"We're incredibly proud that Australia was able to contribute so significantly to our incredible global water replenishment milestone. This program is a model of sustainable agriculture that may be replicated in other places to protect the environment and help build more sustainable communities.

"We look forward to continuing this important work with our partners to achieve more world-class outcomes in 2017 and beyond," Mr Mercadé added.

The Coca-Cola Foundation has recently confirmed new funding for Project Catalyst in 2017 and has now contributed more than AUD $5.96 million.

Together with its bottling partners, the Coca-Cola Company is replenishing water via 209 community projects in 61 countries.

Image (left to right): Tony Jeppesen, Queensland Cane Grower, Bea Perez, Chef Sustainability Officer, The Coca-Cola Company and Scott Simpson, Queensland Cane Grower

Images: Roff Smith

SPEAKER PROFILES

Professor David Lamb *(Dinner Speaker)*

Smartfarms

David is a physicist who has worked in the area of 'Precision Agriculture' (PA) for over 20 years. Despite a PhD in high voltage engineering, he is actually passionate about putting technology to work for our farmers. In 2002, he established the University of New England's Precision Agriculture Research Group (UNE-PARG; www.une.edu.au/parg); a multidisciplinary team of 20 academic, research and technical staff working on PA sensors and applications across rain-fed and irrigated cropping (including sugar), livestock and horticulture (including viticulture) enterprises. UNE-PARG R&D is exclusively funded by industry. His first foray into the sugar industry was back in 1996, collecting airborne video imagery to map variability in cane vigour. Since then he has he has been involved in projects using satellite imagery to forecast sugar yield and map N status (led by Andrew Robson) and through his involvement as Science Director of the CRC for Spatial Information, the recent QZSS satellite precision guidance trials in sugar fields in partnership with Hitachi, V-Tol Aerospace and Farmacist. David also leads the university's SMART Farm project (www.une.edu.au/smartfarm); a 2,900 ha sheep farm showcasing contemporary, and future, precision agriculture and intelligence-gathering technologies supporting land use and production sustainability. He believes that high speed internet for all farmers, and having it accessible anywhere on their farms, will be a critical part of our farming future, and in realising the benefits of the internet of things. The sugar industry is no exception.

David believes that high speed internet access is critical to the future of farming in Australia.

Campell Newman

Chairman SwarmFarm Robotics

Campbell Newman, is the Chairman of SwarmFarm Robotics a start- up company in the field of Agricultural Robotics. In the second quarter of 2016 the company commenced delivery of commercial weed control services using robots in broad-acre agriculture in Central Queensland.

He also holds Director's positions with an IOT startup, a commercial property investment management business and is adviser to a start-up phosphate rock mining company.

He previously held the role of Premier of Queensland from 2012 to 2015 leading an ambitious program of reform to restore the State's finances, kick start the economy and revitalise the public service. He also led a highly successful crack down on criminal motorcycle gangs. With the participation of 80,000 Queenslanders, he facilitated the creation of a 30 year vision and plan for the State – The Queensland Plan.

Prior to this, Campbell served as Lord Mayor of Brisbane from 2004 to 2011 and was involved in the conception and delivery of major infrastructure projects such as the multi- billion dollar Brisbane TransApex tunnel network, new bridges and major road upgrades. In 2009 he was awarded the Infrastructure Partnerships Australia Chairman's Award for Infrastructure Leadership.

Before entering politics, Campbell worked for six years as an executive for Grainco Australia in the grain storage, handling and logistics industry and also for four years as a management consultant working with large Australian companies such as BHP Australia Coal, the Hydro Electric Commission in Tasmania, Australian Wheat Board and Telstra.

He also spent 13 years in the Australian Army and served as an officer in the Royal Australian Engineers.

Campbell holds an Honours Degree in Civil Engineering (UNSW) an MBA in Financial Management (UQ) and is a graduate of RMC Duntroon. He is also a Fellow of the Institution of Engineers Australia.

In 2016 SwarmFarm commenced delivery of commercial weed control services using robots in broad-acre agriculture in Central Queensland.

Jordan Duffy

Entrepreneur and technology innovation expert

Jordan Duffy is a millennial serial entrepreneur and technology innovation expert, whom at the age of 22 co-owns Brisbane based firm Buckham and Duffy – an innovation and rapid development firm with 14 employees. B&D consults and partners with some of Australia's largest enterprises. In 2015 B&D were approved by Google to develop "Glass" display technology, which has shown great promise in agricultural and health applications.

Jordan's passion for technology and business began from home assembling computers, and his entrepreneurial journey started at age 14 with business partner Alex Buckham. Alex and Jordan have been growing businesses for 8 years, whilst influencing policy and government with several G20 groups and as a speaker at the 2014 Brisbane G20.

Business aside, Jordan is an avid self-educator and driven change maker. Over his 22 years, Jordan has seen 15 countries, battled cancer and chronic pain, and played drums on the Great Wall of China in the 2008 Olympic Orchestra. Jordan is an adventurer, innovator, mentor and amateur scuba diver!

Jordan's passion for technology and business began from home assembling computers.

Kym Kruse

Managing Director RegenAG

RegenAG® is a community based family enterprise committed to helping regenerate Australia's farms, soils, communities and on-farm livelihoods.

Kym's expertise lies in Biofertiliser Production, Microbe Capture and Reproduction, as well as Chromatography. A consultant and educator working with a wide range of like-minded people, from farmers and natural resource management groups, to government and industry representatives, establishing collaborative partnerships and farmer to farmer networks that support agricultural practice change.

For over eight years, Kym has devoted his time to providing people with transformative education, training and consultancy opportunities, to learn from the world's most innovative and effective regenerative agriculture practitioners in a wide range of fields throughout Australia and in Kenya. He is dedicated to sharing with farmers and land managers, the skills and knowledge required to independently regenerate their farms, soils and livelihoods.

Offering self-empowered, cutting edge and proven regenerative solutions to reduce input costs and build soil health for increased productivity, profitability and improved environmental outcomes.

Kym believes that with the knowledge and skills to implement regenerative land management strategies, we are collectively creating a new farming culture that is economically, environmentally and socially healthy into the future, maintaining viable opportunities in rural and regional communities for our children and future generations to live and farm.

Cutting edge & proven regenerative solutions to reduce input costs & build soil health.

Jason Andrews-Reid

WHS & Quality Assurance Officer Reef Catchments

For most of us it's hard to remember what the world was like without WH&S, not for Jason Andrews-Reid who lives and breathes it – for good reason.

"I used to work in various emergency service sectors. These obviously being a reactive response to what has already occurred. I kept thinking there has to be a way to stop events from happening, an intervention along the line somewhere. I spent 10 years in the underground mining environment where I lost a couple of mates to accidents, 10 odd years in agriculture losing a couple of mates on the way. Coupling onto that was the fact that I have burns to 32% of my body caused by an accident that could have been prevented, I decided to be proactive and really examine work health and safety, people's mind sets when it comes to how they do their jobs and the thought processes of those people."

Jason is responsible for assessing risk and implementing strategies in a diverse range of workplace situations for Reef Catchments and Catchment Solutions, from farms to waterways, and beaches to remote locations – not to mention the office, a boat and a fleet of 4wds. To that end Jason has developed many training strategies that ensure staff and clients are fully informed of hazards and risks in almost any situation, an initiative that he feels has been extremely effective in creating cultural change in the workplace.

Inspired by family and friends, Jason is driven by relationships to ensure a safer environment for all.

Reef Catchments deliver projects and services that foster and support sustainable use of natural resources in the Mackay Whitsunday Isaac (MWI) region. Our region is rich in natural assets that allow us to sustain key industries, including agriculture. Reef Catchments is not-for-profit and is the leading Natural Resource Management (NRM) group for our local area.

WE'RE LOOKING AFTER OUR REGION!

REEF CATCHMENTS AND PROJECT CATALYST

Reef Catchments is the founding NRM Group for Project Catalyst, starting the project and partnerships that have grown to what we see today. Eight years ago, Project Catalyst began with just a handful of passionate growers from the local Mackay Whitsunday area. Today, the program has expanded widely to include all of Queensland's key cane growing areas, but is still coordinated locally.

We are immensely proud of what our growers have achieved, both through initiatives like Project Catalyst and a wide range of far-reaching programs designed to initiate practice change including the Australian Government's Reef Rescue and Reef Trust.

REEF CATCHMENTS' ROLE IN SUSTAINABLE AGRICULTURE

Reef Catchments is a long-term supporter and facilitator of sustainable agriculture and practice change in the MWI region.

Over the years, Reef Catchments and its investors (in particular the Australian and Queensland Governments) have assisted hundreds of farmers and provided a starting point to 'give practice change a go'.

Through initiatives like the Australian Government's Reef Rescue and Reef Trust, more than 1800 cane projects have been supported, impacting over 85,000 ha.

That's a lot of practice change for a small region, proving our growers are punching above their weight.

Reef Catchments believes this support has helped transform attitudes and changed perspectives. This is fundamental to now drive more widespread practice change adoption.

Benefits of adopted practice change are significant – the improvements our farmers make directly impact our community, our waterways and the Great Barrier Reef.

WHAT'S HAPPENING NOW?

REEF TRUST 3

Currently, funding is available for growers to improve nutrient and herbicide management.

Through the Australian Government's Reef Trust 3 (RT3), growers can access support, planning and resources to improve nitrogen use efficiency and reduce off-farm loss of nutrients and herbicides.

Eligible growers can access expert agronomic advice (valued at $6000 p/grower) as well as $1500 for initial upgrades to specific equipment or activities. This includes – EM mapping, soil testing, leaf analysis, G-dot, SIS, spray nozzles, spray tanks and modification of existing spray equipment.

We strongly encourage growers to contact your local PPC (Farmacist or MAPS) to see if you can take advantage of this opportunity.

visit www.reefcatchments.com

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Catchment Solutions

Rural Production Innovation

Water Quality Services

Fisheries and **Aquatic Ecosystems**

Environmental Impact Assessment and Approvals

Environmental Systems Rehabilitation and Repair

Environmental Management Systems

ENVIRONMENTAL CONSULTANCY *SERVICE PROVIDERS*

OVERVIEW

Location
Leichardt Downs, 30 km west of Home Hill

Catchment
Cassidy Creek

Rainfall
882 mm

Property size
100 ha

Landuse
Sugarcane production

Aaron grew up on the family farm and completed a yacht rigging trade before returning to the farm in 2004 to work with his father Joe as farm manager. He also became involved in the family agriculture equipment hire business, Think Pink.

After working for the family enterprise for six years, Aaron took the opportunity to branch out, buying his own 100 ha farm in 2010.

Aaron said he learnt a lot during this period.

'To have the most efficient system, many questions needed to be answered.'

BURDEKIN

AARON LINTON

Irrigation automation & Telemetry trials

Investigating pump running cost efficiencies, optimal tariff options, crop water use and improved components.

THE PROJECT

In 2011, supported by a Reef Water Quality Grant, a 'state of the art' drip irrigation system was installed on 42 ha.

Aaron said he learnt a lot during this period. "To have the most efficient system, many questions needed to be answered."

Pump running cost efficiencies, optimal tariff options, identifying crop water use needs at different times during the growing year and improved components were investigated.

"The trickle system provides the ability to be more precise and there have been major advantages with crop growth, ease of operation and zero runoff," said Aaron.

The remaining irrigation needs are met by a traditional flooded furrow system. All of the furrow irrigation is captured in a recycle pit and reused in drip irrigation.

The farm has been EM mapped, and this information is used to determine variable rate gypsum application.

Aaron is currently trialling 2 ha of PolyNet™ low cost drip irrigation. He'll use this opportunity to identify management issues and the economics of using the system to complement the current drip system.

Future plans for Aaron include exploring cutting sugarcane green and flood irrigation trials. In particular he is interested in looking at different frequencies of flood irrigation to address soakage issues which he would record through the sugarcane crop modelling program IrrigWeb.

CHEMICAL PRACTICES

Aaron has a block specific weed management plan and uses a high clearance tractor equipped with GPS guidance and flow rate monitors for herbicide applications.

Aaron calibrates his equipment bi-annually, and is reassured by the GPS system and flow rate monitors that continually calibrate while in use.

When applying herbicides, Aaron takes into account label rates, agronomic recommendations and experience in planning spray schedules. He uses a shielded sprayer for all ratoon herbicide programs and knockdown herbicides.

Aaron only uses residual herbicides in plant cane and in unforeseen weather circumstances.

SHOWCASING TO BROADER COMMUNITY

Aaron has been involved in Project Catalyst for many years, is an active member of the NQ Dry Tropics Sugar Innovations Program and, along with his father Joe, has been proactive in considering and validating new irrigation technologies.

Aaron and Joe have showcased their state of the art drip irrigation systems through presentations, field tours and publications.

NUTRIENT PRACTICES

Aaron uses a block specific nutrient plan which has been developed based on regular soil testing on all fallow rotational blocks, EM mapping and SIX EASY STEPS recommendations.

He uses two different systems for nutrient applications on the farm.

On the furrow irrigated part of the property (58 ha) - a standard blend granular fertiliser is applied via stool splitter.

In the drip irrigation area - granules are dissolved and made into a liquid fertiliser to be applied through the system on a daily basis. This is calculated on approximate crop requirements by kilogram per day for the first six months.

Overall, Aaron has found that he is using around 20 kg/ha less of nutrients applied to crop in the trickle system (160 N/ha).

REEF PROGRAMME WATER QUALITY GRANTS

When Aaron applied for funding through the Reef Programme Water Quality Grants in 2014, his way of operating was draining time and resources. He recognised there must be more efficient ways.

Aaron received funding to install automated furrow irrigation.

This system uses tailwater sensors, telemetry and automated valves and pump automation, allowing him to switch valves and pumps to control the irrigation flow rates and reduce runoff.

The automation system allows both reduced rates on each set and more frequent application of irrigation aimed at yielding higher irrigation efficiency.

CHALLENGE

Aaron says distance is an issue.

"I live about 35 km away from the farm. So implementing an automated irrigation system not only allows precise management of watering systems, it also delivers lifestyle benefits through remote access and control of the system," he said.

"Development of the system and time to implementation have been the two main challenges."

When designing and implementing the new automation and telemetry system, sourcing suitable base stations, end of row sensors and automatic valves that can handle a high density crop like sugarcane at a cost effective price has been a major hurdle.

While innovative technology companies outside of industry have provided prototypes for the componentry, there are then issues with support and maintenance for the system once established.

The long-term goal is to develop a reliable and cost-effective system that will be commercially available to farmers in the wider sugar industry.

"I want a reliable system so there is no risk when I'm not personally on my farm to monitor my irrigation events," said Aaron.

Aaron and his father have always had an interest in trialling new farming practices.

"It's important for me to make these changes to improve my lifestyle and profitability. The motivation came from Sisco Trials that have shown either need to slow down irrigation or use more frequent irrigation and we have gone with this option," Aaron said.

"Our agriculture hire business Think Pink Hire, provides an avenue to develop new machinery and gives access to new management practices to other farmers in the district."

"The business enables the cost to be shared while evaluating the benefit of the machinery."

"It's important for me to make these changes to improve my lifestyle and profitability. The motivation came from Sisco Trials that have shown either need to slow down irrigation or use more frequent irrigation and we have gone with this option."

TRIAL STATUS AND RESULTS PROJECT INVOLVEMENT

Aaron is hosting one of two replicated Irrigation Automation and Telemetry Trials that are looking at breaking down the barriers to the adoption of Irrigation Automation and Telemetry in the Burdekin, through environmental, economic and social monitoring.

TREATMENTS

T1: Telemetry and Automation
T2: Conventional Irrigation

MONITORING

Benchmarking was carried out using a Sisco model, and pump data on a trial block which provides a baseline for comparisons to a manual furrow irrigated system.

Once the automated system is installed, environmental, economics, production and social outcomes will be measured including, total volume of water used, total power used, yield and labour.

ECONOMIC ANALYSIS

The economic analysis developed by delivery partner DAF will take into account variation in yield and commercial cane sugar across the trial to identify potential efficiencies and improvements.

The initial capital outlay will be subject to an investment analysis to determine the overall viability of the investment.

Economic analysis will compare the profitability of a cane block using irrigation telemetry and automation with a similar block without telemetry and automation.

Analysis will also evaluate the value of investment and investigate the impact of application efficiencies and improved irrigation on yield or CCS between the trial blocks.

RESULTS

The automated irrigation provides better water flow and surge control reducing the water applied, available runoff and reduces nitrates leaching into the underground water systems.

Precision within irrigation will significantly reduce irrigation runoff from the farm, provide better soil soakage for nutrient availability and subsequently reduce nutrient and chemical losses.

Lifestyle improvement is also an important factor which will be highlighted as an outcome from the trial.

In 2016, cane yield, CCS and sugar yield data was collected from one of Aarons blocks where one half was irrigated with drip, and the other half was irrigated via furrow irrigation. Results showed that the drip section yielded more than 30 tonnes more cane, and supplied an extra 2.5 tonnes of sugar per hectare. By utilising drip irrigation on Aaron's farm, he not only increased cane and sugar production but also successfully reduced runoff leaving his farm.

2016 Drip v Furrow	tCane/ha	CCS	tSugar/ha
Drip Irrigated	212.6	13.97	29.7
Furrow Irrigated	180.7	15.03	27.2

Recycled water an asset for farmers

Image below: The recycled water has proven to be a reliable and beneficial source of irrigation for farmers in the Bakers and Sandy Creek areas.

Mackay Regional Council

The Mackay Water Recycling Project (MWRP) is one of the largest regional reuse schemes of its type in Australia.

The project, commissioned almost 10 years ago has had a significant impact on the protection of the Great Barrier Reef. Every year, over 250 tonnes of nutrients and 150 tonnes of suspended solids are saved from flowing into the reef.

Rather than being treated and pumped into the ocean, as it was prior to the 2008 scheme, Mackay's treated wastewater is now pumped via a 22km distribution pipe to local cane farms for use as irrigation.

According to Engineering and Commercial Infrastructure director Jason Devitt, the recycled water has proven to be an asset for farmers in the distribution area between Bakers and Sandy creeks.

"There are a number of benefits for local farmers from this scheme," Mr Devitt said.

"Firstly, it's reliable, as it doesn't depend on rainfall for its supply," he said.

"It also takes considerable pressure off our underground water sources and the farmers are actually reporting that it is their preferred irrigation source as it gives crops a noticeable boost.

"This means the scheme assists in preventing salinity problems by maintaining adequate water table levels.

"It's also cheaper to use as the farmers don't have the electricity costs involved in pumping from the underground supply."

The MWRP recycles the entire city's wastewater from south of Golf Links Road for irrigation purposes.

The project has been nationally recognised for its innovation, clinching the major award at the Infrastructure of Public Works Engineering Australia - Queensland (IPWEAQ) Excellence Awards in 2009, along with the Keep Australia Beautiful award in 2009.

It is a collaboratively funded project between council, the Queensland Government and Australian Government.

OVERVIEW

Trial Farm
MKY-03082A

Mill Area
Mackay Sugar

Property size
240 ha

Number of years farming
More than 40 years
(third and fourth generation)

Trial Subdistrict
Brightley (Mackay region)

Area under Cane
350 ha - all farms combined

Service provider contact
Farmacist

Where did this idea come from?
Grower

MACKAY / WHITSUNDAY

JOHN AND PHIL DEGUARA

Soil health & sugarcane yield

Demonstrating and measuring soil health and sugarcane yield benefits, from sub-surface application of mill mud and ash.

THE PROJECT

The trial aim is to demonstrate and measure soil health and sugarcane yield benefits from deep placement of soil ameliorants including mill mud and mill ash.

BACKGROUND

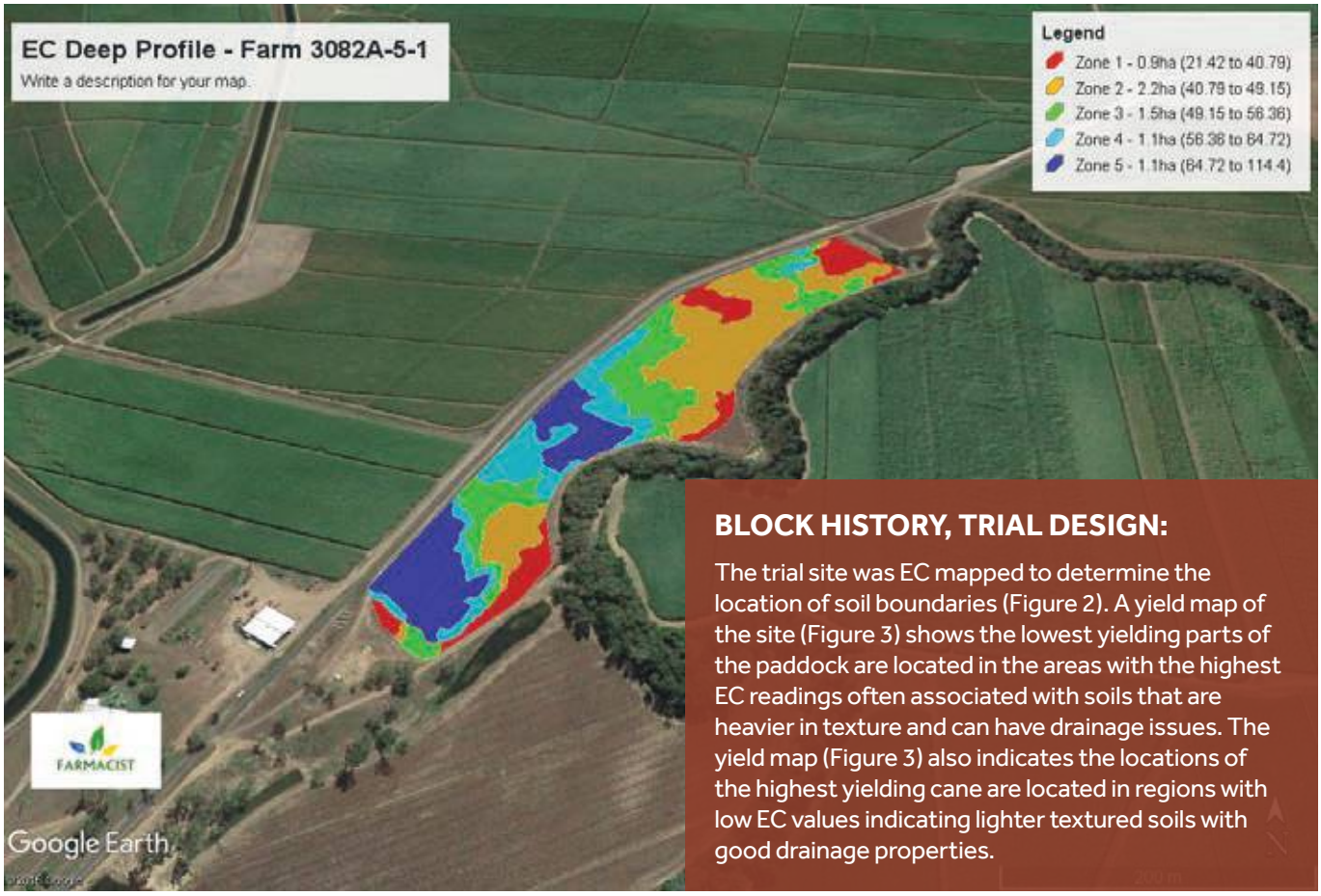
There are a number of soil properties that have been shown to constrain yield, in particular soils with inflated sodium levels and soils that are subject to water logging such as the deep clay soils.

Sodic soils result in poor soil structure which affects water infiltration, percolation, and availability. High sodicity 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 closing-off of soil pores, severely restricting water and air movement throughout the soil. Water logging is also common in sodic soils. Typical impacts of sodic soils on sugarcane crops include reduced plant populations, poorer growth within those populations, and reduced root growth and distribution. A reduction in yields impacts on the overall economic viability of the farm as well as inefficient use of nitrogen.

For soils with poor subsurface drainage characteristics or low lying areas, the subsequent heavy inundation over the three month wet season significantly impacts on the productivity of these water logged areas and is considered a major contributor to within block yield variability in the central region.

John and Phil's deep sub-soil application trial was the first of its kind in the Mackay region. The trial site was established as a further attempt to provide evidence that burying amilorants below the surface of the soil can have the potential to improve soil qualities further down the profile, potentially expanding the top soil and root zone. Deep placement will reduce the risk of nutrient runoff and potentially lead to improved soil structure in the crop root zone and improved Nitrogen use Efficiency (NUE).

Results from a small trial started in 2015 was assessed by hand harvest in maturing cane crop in 2016. As shown in figure 1, the highest crop yield was achieved in treated cane, however this was not consistent across repetitions. Heavy lodging had occurred in the treated treatments, which is likely to have restricted crop growth and final yield in that treatment.



BLOCK HISTORY, TRIAL DESIGN:

The trial site was EC mapped to determine the location of soil boundaries (Figure 2). A yield map of the site (Figure 3) shows the lowest yielding parts of the paddock are located in the areas with the highest EC readings often associated with soils that are heavier in texture and can have drainage issues. The yield map (Figure 3) also indicates the locations of the highest yielding cane are located in regions with low EC values indicating lighter textured soils with good drainage properties.

Image: EC map of the trial site highlighting changes in soil properties.

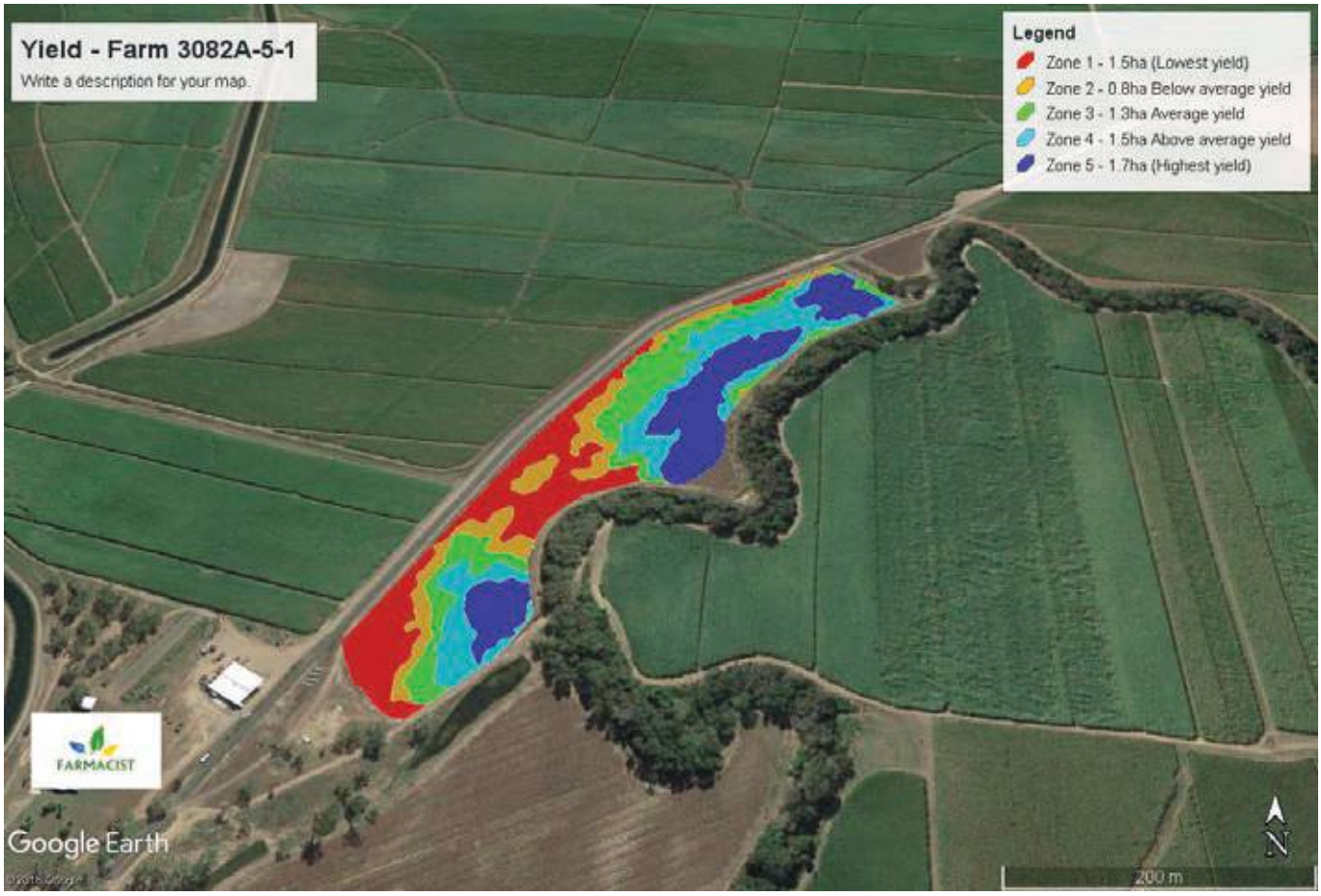


Image: Yield variation map of the site. Map of yields.

POTENTIAL WATER QUALITY BENEFIT

Reduce the risk of nutrient movement off site with improved yields and reduced exposure of nutrients to run-off potential.

EXPECTED OUTCOME OF TRIAL

Improved soil structure and increased yield in treated areas.


OVERTAKE
TURNING VEHICLE

THE PROJECT		
Plan - Project Activities	**Date : (mth/year to be undertaken)**	**Activities :(breakdown of each activity for each stage)**
Stage 1	July 2016	Bury ameliorants into fallow paddock, followed by mung bean and soybean crop
Stage 2	August 2016	Plant cane
Stage 3	September 2017	Harvest production
Stage 4	September 2017	Re-analyse soil through the profile
Stage 5	October 2017	Re-apply nutirents to trial site
Stage 6	August 2018	Harvest production

PROJECT TRIAL SITE DETAILS	
Trial Crop:	Sugar cane
Variety: Rat/Plt:	Q252
Trial Block No/Name:	5-1
Trial Block Size Ha:	6.8
Trial Block Position (GPS):	148.944298, -21.251684
Soil Type:	Victoria Plains - Deep Cracking Clay and Calen – Brown Chromosol

RESULTS					
		Application Contributions (kg/ha)			
Treatment	Applications	N	P	K	S
Mud buried @ 50 t/ha	Soybean	40			
	At Plant APP @ 45l/ha	7	10		
	Mud	30	100	30	8
	Topdress: MKY 50/50 @ 2600m3	72	0	70	10
	Total	149	110	100	18
Ash buried @ 100 t/ha	Soybean	40			
	At Plant APP @ 45l/ha	7	10		
	Topdress: Lucerne @ 3.8m3	86	25	100	29
	Ash	10	80	100	15
	Topdress 2: Urea @ 45 kg/ha	20			
	Total	163	115	200	44
Mud and Ash buried both @ 50 t/ha	Soybean	40			
	At Plant APP @ 45l/ha	7	10		
	Mud and Ash	35	140	80	15
	Topdress: MKY 50/50 @ 2600m3	72	0	70	10
	Total	154	150	150	25
Control	Soybean	40			
	At Plant APP @ 45l/ha	7	10		
	Topdress: Lucerne @ 3.8m3	86	25	100	29
	Topdress 2: Urea @ 45 kg/ha	20			
	Total	153	35	100	29

Whole of paddock has been deep ripped to 600mm. Whole of paddock has had mung bean followed by soy bean (both taken to harvest) and then planted with cane early August 2016. APP liquid starter @ 45 l/ha applied at planting

Integrated technology drives sustainable agriculture at Bayer

Image: Modern Chemical and Beneficial insect can increasing be used in integrated, sustainable systems.

Image: A Variable Herbicide unit being tested in Proserpine.

Melbourne, 19 January 2017

As the global impacts of climate change become more certain, agriculture's core mission to ensure food security for a growing world population – in line with the UN Sustainable Development Goals – seems ever more challenged. A recent boom in agriculture technology and thinking offers the hope that integrating technologies can deliver truly sustainable solutions for farmers around the world.

SDG FOUNDATIONS

The United Nations Sustainable Development Summit in September 2015 adopted the 2030 Agenda for Sustainable Development, including 17 Sustainable Development Goals (SDGs) to fight global challenges facing our society. Agriculture has a critical role play in 5 SDGs; "Zero Hunger, "Clean Water and Sanitation", "Climate Action", "Life Below Water" and "Life on Land"",.

The SDGs are important to all working in agriculture as they provide a common language and roadmap for the public and private sectors to establish initiatives promoting sustainable agricultural measures. Specific actions however will vary for each target market. In some markets the focus may be on smallholder farmers and poverty alleviation, however in developed markets, it is about producing maximimum output in the most sustainable way, using advanced technologies. In short; more food and profitability with less environmental or social impact.

INTEGRATION EVERYWHERE

As a leading technology provider, Bayer has historically focussed on specialised technologies, such as crop protection chemistry. In recent years, however, the focus has shifted to integrating different approaches to create more robust and sustainable packages of technologies to improve efficacy, and limit the development of chemical resistance in target species, which reduce the lifespan of valuable technologies.

At the same time, new science areas have opened up, such as advanced breeding and digital agriculture. This has encouraged much greater focus on open innovation, public private partnerships and inter-company collaboration. Again, integration is the catch-word. Australia is not behind in taking part in these developments.

There is no "one size fits all" solution in modern sustainable agriculture

A wide variety of new technologies and approaches are being integrated into agriculture around the world.

- New generation chemistry working with Biological Control: Modern low impact chemistry is not only more targetted, but can be better integrated with biological control programs. A strategy that combines Bayer's Belt® and Movento® insecticides with the native beneficial insect Diadegma semiclausum provides a truly integrated pest management system for diamondback moth control in head-forming brassia crops.
- Integrated Weed Management: Australia has one of the worst herbicide resistant weed issues in the world. The GRDC "Weed Smart" program (supported by Bayer), and the Bayer "Diversity Can't Wait" weed mapping tool [http://www.diversitycantwait.com.au/iwm/] seeks to directly address this by educating growers on their current risk level and corrective strategies. The world first Bayer GRDC Herbicide Innovation Partnership, is seeking new herbicide modes of action for Australian weeds. Farmer are adopting better, smarter methods of weed control to keep valuable products effective and boosting their profitability.
- Science and Biology working together: Bayer has worked in partnership with leading Australian growers to introduce science based biologics to Australian agriculture. Serenade® Prime is a product based on the beneficial bacteria Bacillus subtilis strain QST713 that colonises plant roots. It creates a win-win relationship with the plant at the soil interface, improving nutrient availability.
- Seeds of the future: Hybrid seeds such as rice, canola and wheat, enable increased yields and returns from the same amount of land. The hybrid vigor of our improved, high quality seeds makes the best use of too much or too little water and nutrients. PodGuard® canola resists shatter and yield loss, and greatly improves yields.
- Digital targets: The satellite, sensor and digital revolution is allowing better targeting of products to soil and climatic types. The Balance® herbicide variable rate trial conducted via Project Catalyst is a demonstration of what may be possible in the future; the right product and rate, at the right time and place. Farmers are able to maximize output while minimizing cost and impact.

"PEOPLE AND PLANET" ARE EQUALLY AS IMPORTANT

While new technologies are more sustainable, social and environmental issues must also be directly addressed to ensure true sustainabiltiy.

As agriculture uses or impacts nearly 70% of the world's fresh water, Bayer has a key focus on stewarding it's technologies throughout their life cycle. Bayer is trialing the Phytobac® agricultural chemical contaminated water bio-treatment system in Australia and hopes to launch it in the near future. Programs such as Project Catalyst also aim to educate farmers to minimise off-site impacts of nutrients, chemicals and soil.

NEW THINKING, NEW YOUNG MINDS

Bayer invests strongly to encourage new entrants to Australian agriculture and together with the CSIRO, runs the Sustainable Futures Program, a primary schools' science program running in more than 300 schools nationally. In 2015, Bayer partnered with the Future Farmers Network (FFN) to host the Global Youth Ag-Summit in Canberra, and is currently preparing for the 2017 summit in Brussels. At least 4 Australians will attend and specifically discuss the UN SDGs, and bring back to Australia global experience and solutions to find better local sustainable solutions to the challenges of modern agriculture.

ABOUT BAYER IN AUSTRALIA WWW.BAYER.COM.AU

Bayer is a world class innovation company with more than 150 years' history and core competencies in the Life Science fields of healthcare and agriculture. Its products and services are designed to benefit humans, animals and plants. It has operated in Australia since 1925 and has a long term commitment to the health of Australians, the agricultural industry and the welfare of animals, large and small. In Australia, Bayer currently employs almost 900 people across the country and is dedicated to servicing the needs of rural Australia and the local community. Bayer is deeply committed to research and development and has a strong tradition of innovation with the development and commercialisation of over 5,000 products and services. The company's focus on people, partnerships and innovation underpins all aspects of its operations, consistent with its mission, "Bayer: Science For A Better Life."

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OVERVIEW

Catchment
Sandy Creek

Mill Region
Mackay Sugar

Farm
Number 3454A, Block/Paddock: 5-1

GERRY DEGUARA

Benefits of extended fallow

Results from the "Yield Decline Joint Venture" indicated that to maximise soil health and sugar cane production benefits, long term breaks from the sugar cane monoculture were required, e.g. – pasture phase.

THE PROJECT

Special project, completed 2013-2014 to 2016

Identifying the benefits of extended fallow in a farming operation.

Results from the "Yield Decline Joint Venture" indicated that to maximise soil health and sugar cane production benefits, long term breaks from the sugar cane monoculture were required, e.g. – pasture phase.

Following on from this project the Plane Creek Sustainable Farmers Inc. undertook a project "Extended fallow cropping options for the Plane Creek district". The project investigated the viability of delaying cane planting by 12 months and growing a series of cash break crops. Results showed increases in cane yields from the subsequent crop planted by up to 30 % in plant cane and eight % in the first ratoon.

This project seeks to not only evaluate the extended break on productivity but to also evaluate the soil's physical, chemical and biological properties. The results will lead to reduced chemical and fertiliser inputs and improved soil health leading to improved water quality.

PROJECT OVERVIEW

PROJECT ACTIVITIES

A strip trial will be established in a fallow field to compare two treatments

- Grower standard practice – ploughout – soybean - plant cane
- Extended fallow option – Ploughout – soybean – chickpea – soybean – plant cane

Prior to implementation the site will be EC mapped, soil samples taken, and analysed, to determine soil biology, chemical and textural information. Nematode sampling will also be undertaken to validate any changes in soil biology.

SPATIAL DATA AND TRIAL DESIGN

The trial site was located on a Marian podzolic soil site, in the North Eton district. The site has a long history of sugarcane production. The site was EM mapped in 2013 and the deep 0-900 cm readings are presented as a thematic map in figure 1.

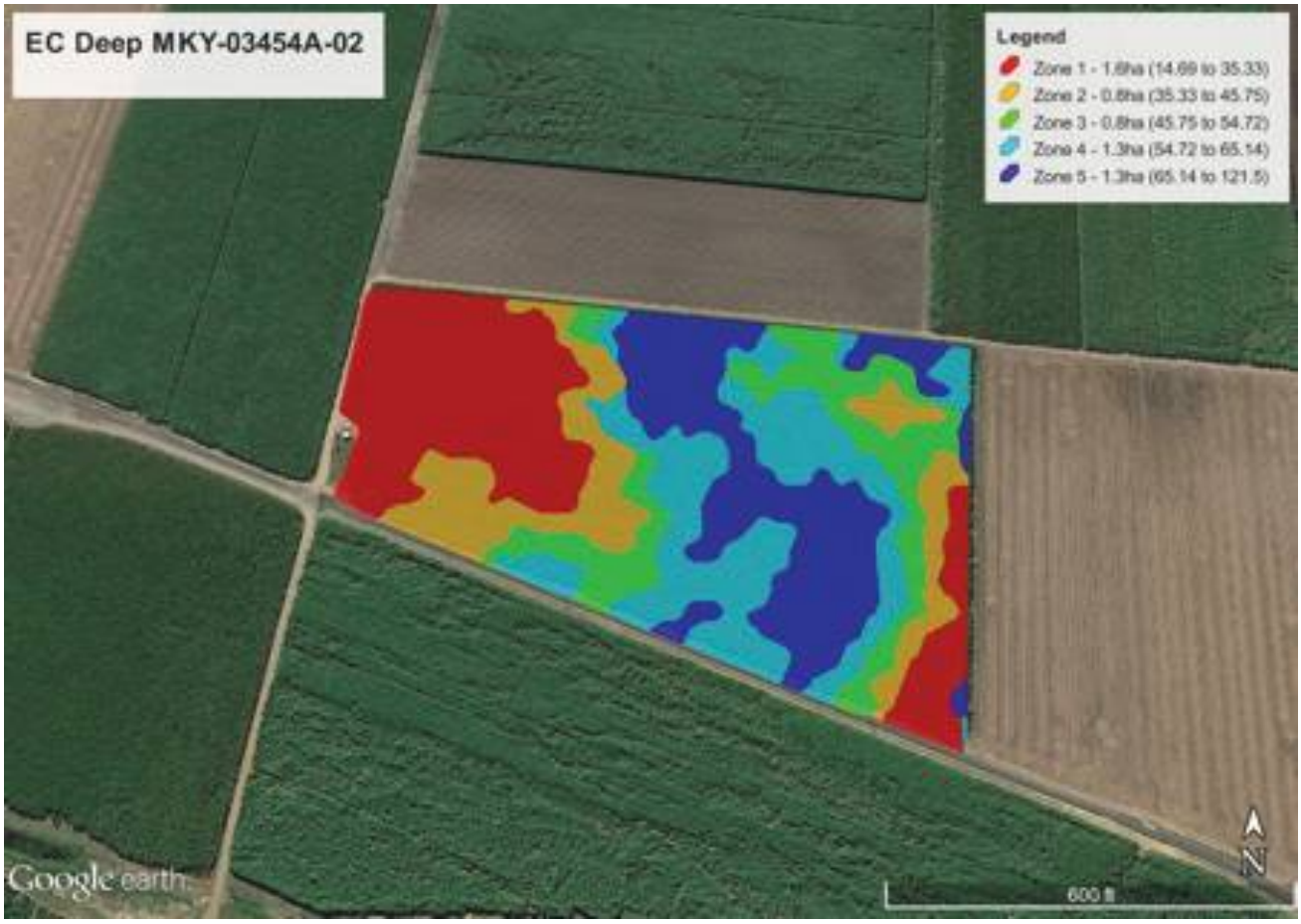


Image: EC map of the trial site highlighting changes in soil properties.

RESULTS 2013-14 CROP CHICKPEA HARVEST

Chickpea Harvest data	
	Yield t/ha
Replicate 1	1.05
Replicate 2	1.25
Replicate 3	1.42
Average	**1.24**

Table 1: Chickpea harvest results 2013

The chickpea crop was harvested on 15 October 2013 and the results are in table 1. The crop yielded an average of 1.24 t/ha from the three replicates, which is an average yield for chickpea in a dry year.

CANE HARVEST 2014

During the plant cane crop of treatment 1 the short fallow was harvested green on 30 September 2014. Individual bin numbers were recorded and weights were collected from the mill for each treatment strip to determine the crop yield. Sugar content was determined from analysis of juice from six whole stalks of cane collected from each strip and sent to the Sugar Research Australia Mackay laboratory for analysis.

The results are presented in table 2 above. The average cane yield was 87.3 t/ha and sugar yield averaged 16.2 t/ha.

	t/ha	CCS	tsugar/ha
Replicate 1	82.3	18.4	15.1
Replicate 2	92.8	18.7	17.4
Replicate 3	86.9	18.4	16.0
Average	**87.3**	**18.5**	**16.2**

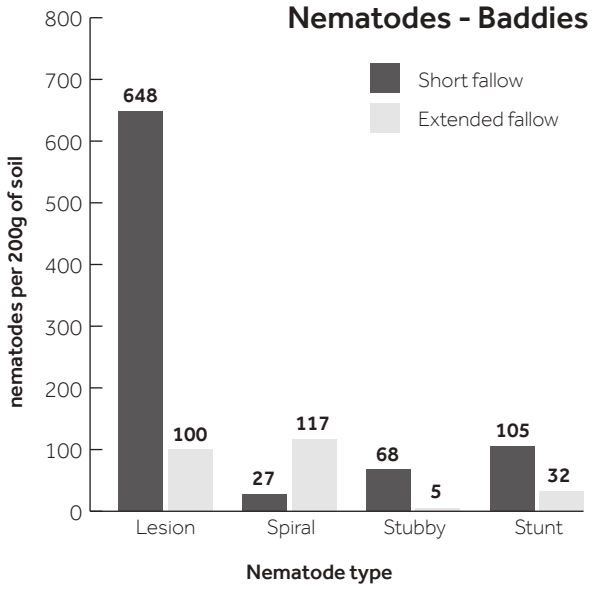
Table 2: Plant cane harvest short fallow 30/09/2014

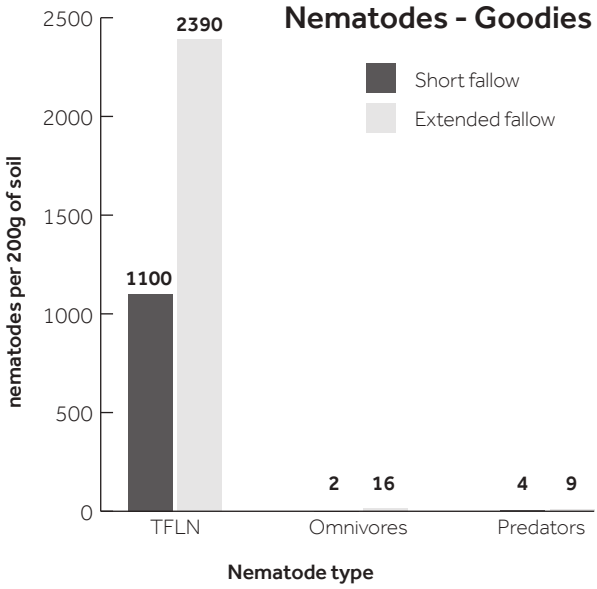
The soybean crop planted in the 2013-14 season failed due to duck pressure so therefore was not harvested.

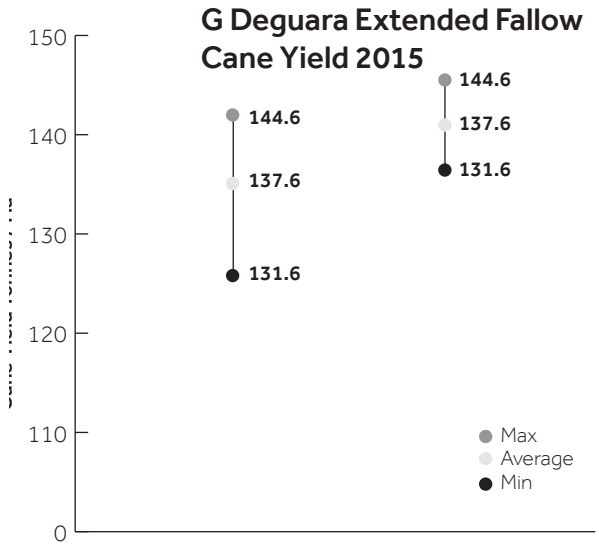
SOIL HEALTH INDICATORS (2014)

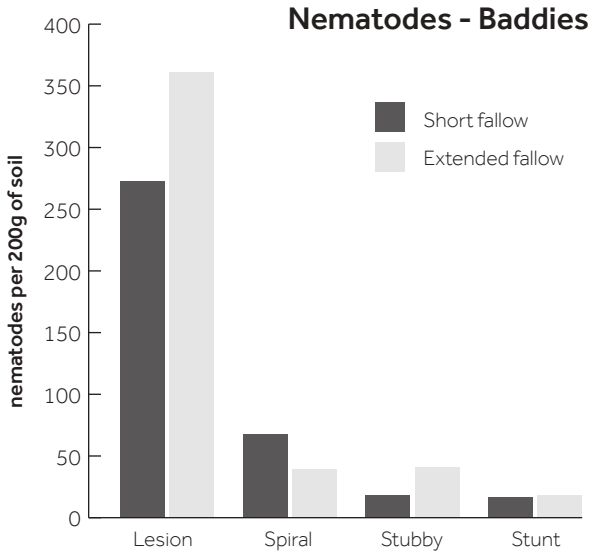
Soil samples for nematode analysis were taken in November 2014 and were analysed by Dr Graham Stirling (Biological Crop Protection). At the time of sampling, treatment 1 was first ratoon having not long been harvested as plant cane and treatment 2 was small plant cane planted in August 2014. The results indicate that the extended fallow treatment 2 had fewer parasitic, and more beneficial, species of nematodes (figures 2 and 3) than the grower practice present at the time of sampling. In all samples from treatment 1 the grower standard root lesion nematode (Pratylenchus zeae) well exceeded the established plant cane thresholds of 300 per 200g soil.

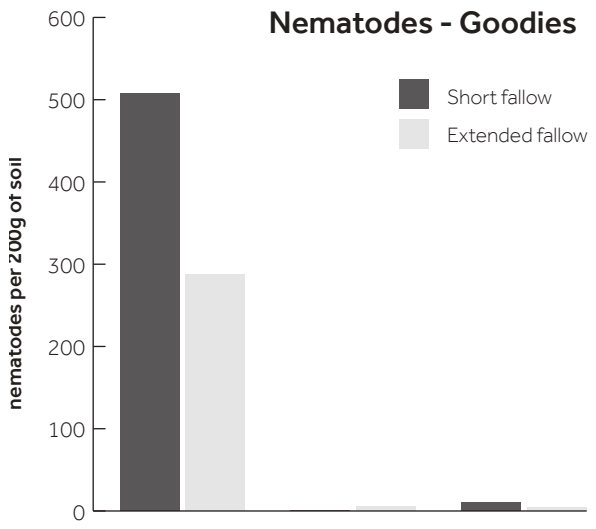
The ratio of plant pathogenic nematodes (PPN) to free living nematodes (FLN) gives a further indication of the health of the soil other than just raw count numbers.

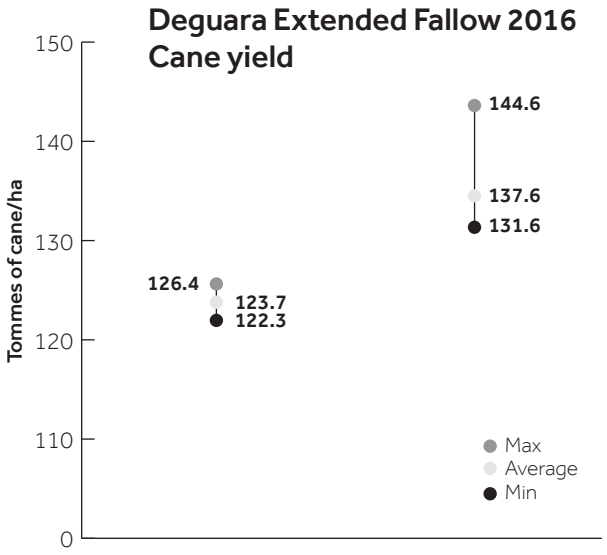

Nematodes - Baddies
Short fallow
Extended fallow
nematodes per 200g of soil
800
700
600
500
400
300
200
100
0
648
100
27
117
68
5
105
32
Lesion
Spiral
Stubby
Stunt
Nematode type


Nematodes - Goodies
Short fallow
Extended fallow
nematodes per 200g of soil
2500
2000
1500
1000
500
0
2390
1100
2
16
4
9
TFLN
Omnivores
Predators
Nematode type


G Deguara Extended Fallow
Cane Yield 2015
150
140
130
120
110
0
144.6
137.6
131.6
144.6
137.6
131.6
Max
Average
Min


Nematodes - Baddies
Short fallow
Extended fallow
nematodes per 200g of soil
400
350
300
250
200
150
100
50
0
Lesion
Spiral
Stubby
Stunt


Nematodes - Goodies
Short fallow
Extended fallow
nematodes per 200g of soil
600
500
400
300
200
100
0


Deguara Extended Fallow 2016
Cane yield
Tommes of cane/ha
150
140
130
120
110
0
144.6
137.6
131.6
126.4
123.7
122.3
Max
Average
Min

RESULTS 2014-2015 CROP

CANE HARVEST 2015

The crop was harvested green on 11 September 2015. Treatment 1 short fallow was harvested as first ratoon and treatment 2 extended fallow was harvested as plant cane. Individual bin numbers were recorded and weights collected from the mill for each treatment strip to determine the crop yield. Sugar content was determined from analysis of juice from six whole stalks of cane collected from each strip and sent to theSugar Research Australia Mackay laboratory for analysis.

Harvest results are presented graphically in figures 6 and 7. The Moses project reported that cane yield would begin to drop five % each ratoon from the first ratoon and that plant cane and first ratoon are almost identical. The extended fallow treatment (Plt) achieved ten % higher average for cane yield and nine point five % higher sugar content (CCS) or sugar yield.

SOIL HEALTH INDICATORS 2015

Soil samples for nematode analysis, taken in November 2015, were analysed by Dr Graham Stirling (Biological Crop Protection). At time of sampling treatment 1 was second ratoons and treatment 2 was first ratoons. Illustrated in figures 8 and 9 all samples have relatively low numbers of both parasitic and beneficial nematodes. The ratio of plant pathogenic nematodes (PPN) to free living nematodes (FLN) gives a further indication of the health of the soil other than just raw count numbers.

CANE HARVEST

The crop was harvested green on 14 November 2016. Treatment 1 grower practice was harvested as second ratoon and treatment 2 extended fallow was harvested as first ratoon. Individual bin numbers were recorded and weights were collected from the mill for each treatment strip to determine the crop yield. Sugar content was determined from analysis of juice from six whole stalks of cane collected from each strip and sent to the Sugar Research Australia Mackay laboratory for analysis.

Harvest results are presented graphically in Figures 11 and 12. The Moses project reported that cane yield would begin to drop five % each ratoon from the first ratoon. The extended fallow first ratoon treatment achieved eight point nine % higher average for cane yield, compared to the second ratoon grower practice treatment. There was no significant difference in sugar yields between the two treatments, though one out of three of the extended fallows sugar yields (CCS) was abnormally low, 13, compared to 20. When this value is removed the extended fallow treatment is significantly more than the grower practice.

DISCUSSION AND CONCLUSION

Over the length of the trial the cane crop in the same year had different crop ages which makes conclusions on cane and sugar yields difficult to compare. The Moses project reported that cane yield would begin to drop five % each ratoon from first ratoon and that plant cane and first ratoon are almost identical. Therefore conclusions have been made on the yield percentage difference between the treatments per year.

Extending the fallow length of the sugar cane crop to 24 months in this trial produced an advantage over the grower standard treatment of 12 months fallow achieving more cane yield per hectare than the grower standard. The extended fallow treatments sugar yield had improved in 2015, with no significant difference in 2016 due to one unusually low sample out of three bringing the average down.

The nematode counts give an indication of the soil health of the treatments. They showed that it doesn't take long for plant parasitic nematodes (PPN) to come back following a fallow. After the extended fallow period a healthy ratio of PPN to free living nematodes (FLN) was achieved with low counts of PPN and high FLN numbers. Though after a year of going back into sugar cane in the extended fallow treatment the nematode communities were not significantly different from the grower practice treatment.

To extend the break fallow length by another 12 months the grower has to recoup the costs of the lost cane crop if the following cane crops do not produce substantially higher sugar yields. This trial grew a chickpea crop as the winter option and soybean in the summer. Crop options are limited in the Mackay region due to its proximity to buyers leading to large transport costs. Also many summer crops that are planted within the region do not produce a harvestable crop because of poor quality or low yields due to the regions rainfall events. Even with a slight yield increase in two years of data the economics of the treatments over the entire crop cycle will need to be evaluated, to conclude that by extending fallow length by another 12 months soil health and sugar yields will be improved.

Farmer Offset Project proving a real success story

Image left: The GPS technology reduces overlap during fallow management spraying, which has seen a 25 per cent reduction in used herbicides and a considerable time saving.

Image below: Thanks to the acquisition of new equipment, like this bed former, Darrell McLennan has been able to drastically reduce the work needed to develop paddocks.

"We now just offset once, hit it with the bed former, then hit it with bed renovator and plant," he said.

Mackay Regional Council

Council, Reef Catchments and a local cane farmer have partnered in a project to reduce pollutants discharged into our waterways.

Council, Reef Catchments and a local cane farmer have partnered in a project to reduce pollutants discharged into our waterways.

The two-year pilot project kicked off last year and involves Darrell McLennan's 150ha cane farm in the Bakers Creek catchment.

According to council's Director of Development Services Gerard Carlyon, our region has undergone rapid expansion and all new developments are required to demonstrate how they will implement storm water management strategies to meet pollutant discharge standards.

"While some development sites have available land that is suitable for constructing storm-water-filtering wetlands, others have site constraints that make it very expensive or completely impractical," Mr Carlyon said.

"So, when directly reducing urban run-off isn't possible, we've had to come up with a solution to offset the run-off," he said.

"We are trialling a number of projects, one of which is improving management practices at neighbouring cane farms."

According to Mr McLennan, the project has greatly benefited his farm.

It has not only reduced run-off and pollutants coming from his farm, but has saved him considerable time and made his farm more economically viable.

"I've always been someone who's tried to do the right thing, but in the past I haven't had the access to knowledge or resources to really implement best management practices," he said.

"Thanks to this project, I now have an agronomist who I can call at any time for advice on projects and, with council meeting me dollar for dollar to upgrade my equipment, I have noticed massive changes on the farm.

"For example, because of new GPS modelling tools, I have been able to change the angles of my rows before planting to considerably slow and reduce run-off from my paddocks.

"The technology allows me to model 10 different paddock angles to find the best, rather than the old way which was pretty much guesswork that you were stuck with for the next five years.

"The technology also reduces overlap during fallow management spraying, which has seen a 25 per cent reduction in used herbicides and a considerable time saving.

"New planting and cultivation equipment has meant that rather than having to work a paddock 11 times before planting, I now have to work it just three times.

"For a 30 acre block of replanting, this saved me 1100 litres of diesel and two and a half days, not to mention all the topsoil you lose to wind and rain while working.

"And the resulting crops have been every bit as good as those worked 11 times.

"It's not just the equipment though, something as simple as changing rows from 1.625m wide to 1.8m equates to a 17 per cent reduction in run-off."

According to Deputy Mayor Amanda Camm, the project looked to be a financial and environmental success and will likely be expanded beyond the pilot.

"Council is 100 per cent behind this project as we are seeing clear environmental benefits as well as economic benefits, both for the farmer and as cost savings in urban development projects," she said.

OVERVIEW

Location
Kalamia

Catchment
Kalamia Creek

Rainfall
957 mm

Property size
400 ha

Landuse
Sugarcane production

Family history

After completing a Bachelor in Applied Science in 1999, Paul worked with sweet corn in Bowen for five years before making the move to Ayr in 2005 to take on the role of manager for Jurgens Farming.

He also has his own business providing services around planting and harvesting legume rotational crops in sugarcane fallow paddocks.

Paul applies subsurface using a stool splitter. The subsurface is two blends of a single shot liquid dunder which helps to maximise the uptake of nutrient by the sugarcane.

BURDEKIN

PAUL VILLIS

Mill mud application trials

Paul manages 360 ha for Jurgens as well as his own 40 ha farm in Kalamia. He uses GPS guidance and follows a zonal tillage system in ratoons and formed beds in fallow blocks.

PRACTICES

He plants a legume rotational crop which is harvested or incorporated as a green manure.

The majority of the farm is flood irrigated, with 17 ha setup with trickle irrigation, and a trial system of solid state irrigation. A water recycle system captures irrigation runoff from 80 ha which is then re-used on the farm.

Working with Jurgens Farming, Paul is also trialling broadcast spreading of mill mud and compost on fallow rotations to improve soil health and to potentially reduce nutrient inputs.

Paul is always keen to take advantage of technology to improve his practices, using EM mapping and soil testing to gather data on soil variation across the farming operation and continuing to improve the minimum tillage system.

CHEMICAL PRACTICES

Paul's weed management plan takes a whole-farm approach targeting specific weed zones and particular species such as guinea grass and sorghum. Rates are based on a combination of experience, label ranges, and agronomist advice.

He uses his high clearance tractor fitted with shielded sprayers and interchangeable dropper configurations.

A knockdown application with shields, after the second irrigation, is followed by a second application using droppers before canopy closure. Paul only uses PSII herbicides in plant cane or problematic areas in ratoons and it is applied on top of the hill.

GPS guidance and flow rate monitors provide the ability to constantly monitor each chemical application. This is backed up with a full calibration annually and recalibration when required.

NUTRIENT PRACTICES

Due to a substantial variance in soil types across the farms, Paul uses a block specific nutrient plan. Rates are determined based on guidance from the local agronomist, SIX EASY

STEPS guidelines and soil testing during fallow rotations.

Paul applies subsurface using a stool splitter. The subsurface is two blends of a single shot liquid dunder which helps to maximise the uptake of nutrient by the sugarcane.

Using GPS guidance also means he can pick up on any nutrient application issues during regular machinery calibration checks. Paul noticed significant improvement in his nutrient practices and yield results by the second year of applying subsurface dunder.

MOTIVATORS FOR CHANGE

Paul is constantly searching for new ways to farm cost-effectively with ultimate aim of reducing the dollar per tonne ratio. He is conscious of the impact of farming practices on the environment which has motivated him to find a solution that has economic benefits as well as water quality outcomes.

Paul sees the benefit of utilising mill mud as an effective method in fallow and ratoon blocks and its potential to further reduce his crops nutrient requirements. However, banded mill mud placement is a new practice in the Burdekin region, so the ability to apply the mud strategically on top of the hill has not been available.

CHALLENGE

Paul recognised that compost has been used successfully to improve soil health through horticulture. "This got me thinking, could the same improvements be made to the soil in sugarcane production?" This idea motivated him to undertake the project work and he has incorporated it into his farm management plan.

Paul recognised that, with no trials undertaken on his farm prior to implementation, the risks for the project were high with additional costs for equipment and a potential drain on time and resources.

TRIAL STATUS AND RESULTS

PROJECT INVOLVEMENT

Paul contacted NQ Dry Tropics and submitted a successful Reef Water Quality Grant application to make this practice change. The purchase of compost machinery has enabled Paul to increase soil health while reducing impacts on his time and resources.

Paul is also hosting a GameChanger Mill Mud Application Trial that is one of four replicated trials designed by Farmacist that are looking at breaking down the barriers to the adoption of banded mill mud application in the Burdekin, through environmental, economic, and social monitoring.

TREATMENTS

T1 - No Mud (Control)

T2 - 200 t/ha (Conventional)

T3 - 100 t/ha (Conventional)

T4 - 65 t/ha (Banded on hill)

MONITORING

The banded Mill Mud Application Trials was designed to identify production differences between different mill by-products (mill mud and mill mud/ash) on different soil types, application rates and application methods.

SHOWCASING TO BROADER COMMUNITY

Paul has been an active advocate for the Burdekin sugar industry. He has shared his work with drip irrigation, solid state irrigation, and a composting system through onsite tours and through presentions to industry groups.

RESULTS

Results from the 2015 harvest indicated higher productivity in all treatments where mud was applied, in comparison to the control, where no mud was applied in a third ratoon Q183.

Results from the Q183 fourth ratoon in 2016 also showed no significant difference between treatments ($p = 0.05$)

The table below summarises the 2015 and 2016 data from Paul's Delta farm on Q183, third and fourth ratoon.

Mud Trial 2015 and 2016 summary	Placement	tCane/ha	CCS	tSugar/ha
No Mud	N/A	118.04 -	13.93 -	16.54 -
200 wt/ha	Furrow	130.55 -	13.33 -	17.71 -
100 wt/ha	Furrow	136.30 -	13.68 -	19.05 -
65 wt/ha	Banded on hill	135.26 -	13.49 -	18.39 -

OVERVIEW

Location
Airville, 14 km north of Ayr

Catchment
Sheep Station and Barratta Creeks

Rainfall
720 mm

Property size
304 ha

Landuse
Sugarcane production

Charlie has been farming for 46 years. After finishing high school he attended Gatton Agricultural College before returning to the Burdekin in 1969 where he ran his own cane harvesting business.

After three successful years, he sold the harvesting business and purchased his first cane farm in Airdmillan. With five years of farming his own land under his belt, Charlie sold the farm and returned to the family farm as manager. In 1983 Charlie bought out the family's 304 ha farm in Airville.

BURDEKIN

"I was able to work with the supplier to get the implement to exactly the way I wanted it. It works perfectly and does everything I need it to do. I am very happy with the results."

CHARLIE CACCIOLA

Enhanced efficiency fertiliser trials

Charlie's farm is planted under GPS guidance using minimum tillage and a controlled traffic system.

Fallow blocks are sprayed out with knockdown herbicides and left bare, with a view of starting to move to an extended 18 month fallow with rotational crops.

PRACTICES

The entire farm is furrow irrigated using underground water and Charlie captures 90 % of runoff in a recycle pit system which he re-uses on 45.6 ha of the farm.

In 2014, Charlie purchased a furrow renovator with support from a Reef Programme Water Quality Improvement Grant which has helped reduce the amount of pesticide and nutrients leaving his farm and reaching the Great Barrier Reef.

Charlie credits this to a custom built implement which has increased irrigation efficiency. It delivers four drills a pass and incorporates two hay rakes per drill on a toolbar to throw residual trash on the 900 mm wide hill.

Charlie said: "I was able to work with the supplier to get the implement to exactly the way I wanted it. It works perfectly and does everything I need it to do. I am very happy with the results."

By shifting the biomass from the furrow, onto the hill, irrigation times and volumes have decreased. The resulting weed suppression has reduced chemical applications.

An added benefit Charlie has noticed is less deep drainage on the farm due to the reduction in dams being created by the residual trash.

The grant has enabled him to implement these practices more efficiently, accurately, and in much less time.

CHEMICAL PRACTICES

Charlie uses a block specific weed management plan which is guided by label rates and local agronomist recommendations. The farm's standard herbicide program uses knockdowns and residuals to control problematic weed pressure, in particular vines.

The majority of herbicide applications are done with a high clearance tractor equipped with GPS guidance and flow rate monitor.

SHOWCASING TO BROADER COMMUNITY

Charlie brings a long history of experience in the Burdekin sugarcane industry to the Sugar Innovations Programme. He's willing to share his ideas within the group and also the broader community, while being receptive to any new concepts that he can potentially apply on farm.

Charlie has reduced his reliance on PSII after purchasing a shielded herbicide sprayer for knockdown applications. All spray equipment is calibrated and continually monitored with every tank.

NUTRIENT PRACTICES

Charlie uses local agronomists to complete soil testing on the farm to calculate nutrient requirements and rates to apply standard blends.

His nutrient plan is block specific, generally a granular mix and applied subsurface using a stool splitter.

Through the Reef Programme Charlie has changed practice, raking trash onto the stool after harvest for moisture retention and weed suppression. This change has caused issues with stool splitting and has prompted Charlie to try a liquid fertliser dunder as an alternative measure.

"I'm quite happy with the use of dunder, the crop has come up nicely," said Charlie. "I'm considering increasing dunder application across the farm."

According to Charlie, he calibrates the fertiliser equipment annually and when it comes to the dunder application, "the contractor monitors everything".

MOTIVATORS FOR CHANGE

Charlie loves a challenge and likes to share or take on new ideas that can help reduce inputs and running costs. He's always been interested in trialling practices that can make positive changes to farming.

Charlie certainly appreciates the environmental aspect of farming and wants to leave a better farm for his family and future generations.

CHALLENGE

There is significant cost to using nitrification inhibitors (ENTEC) and controlled release formulations (AGROCOTE) and uncertainty around their reliability. Further assessment is needed to determine cost versus benefit. Other major challenges to the trials include soil type, matching nutrient requirement and reducing losses from the farm.

PROJECT INVOLVEMENT

Charlie is hosting one of 12 replicated Enhanced Efficiency Fertiliser Trials that are looking at breaking down the barriers to the adoption of enhanced efficiency fertiliser in the Burdekin, through environmental, economic, and social monitoring.

TREATMENTS

T1- Urea @220 N

T2- Urea @180 N

T3- Entec @180 N

T4- Agromaster 25% @180 N

T5-Agromaster 50% @180 N

MONITORING

The Enhanced Efficiency Fertiliser Trials were designed to identify production differences between N formulations and ratios based on different soil types, application rates, and application timings throughout the year.

TRIAL STATUS AND RESULTS

Using these more efficient formulations to target delivery of N has the potential to not only increase production, but also reduce N losses, resulting in improved water quality.

Results from the 2015 harvest season indicate no significant difference in productivity ($p = 0.05$) between all treatments. Treatments T2, T3, T4 and T% had better nitrogen use efficiencies than T1 (control). No productivity was lost through reducing rates from 220 N to 180 N.

Results from the 2016 harvest season also demonstrated that there was no significant difference ($p = 0.05$) in either tonnes of cane, CCS, or tonnes of sugar produced when comparing 220 kg/ha of N applied to any of the treatments applying 180 kgN/ha.

The table below shows a summary of production results of the 2015 and 2016 data combined. Trial site was applied on a Burdekin Clay. Data presented below are results in Q183, first and second ratoon combined. Trial is continued into the 2017 season for a third year.

2015 and 2016 Trial Results Summary	tCane/ha	CCS	tSugar/ha
220 N Urea	136.1 -	15.2 -	20.7 -
180 N Urea	137.1 -	15.1 -	20.7 -
180 N Entec	136.0 -	15.1 -	20.5 -
180 N Agromaster 25%	127.8 -	15.0 -	19.3 -
180 N Agromaster 50%	137.1 -	15.2 -	20.8 -

Image: Coral Reef health supports marine life

Project Catalyst: Good for farmers, good for the reef

"WWF is proud to be working with cane farmers who are leading the way with evaluation and adoption of the next generation of cane growing practices. More efficient farming and environmental improvement go hand in hand, as part of the transition to sustainable agriculture." Dermot O'Gorman, CEO WWF-Australia.

WWF believes in sustainable agriculture. We believe it is both possible and profitable to feed, clothe and fuel a growing global population, without harming wildlife or sensitive ecosystems on which we all depend. That's why WWF supports Project Catalyst.

Sugar cane production generates significant benefits for Australia, but it also affects sensitive ecosystems, like the Great Barrier Reef. Farm run-off contains fertiliser, pesticides and soil, some of which ends up on the Reef. The impact on corals and seagrass, and the species that rely on them for food and shelter, is significant .

Since 1985, total Reef coral cover has halved2 . Over 40 per cent of this loss has been attributed to outbreaks of the coral-eating crown of thorns starfish, which are fuelled by nutrients in run-off from farms.

Many farmers are now acting to change this. By reducing excessive and wasteful rates of fertiliser to levels where the fertiliser matches the nutritional requirements of the crop, growers can reduce input costs, improve their efficiency and reduce nutrients available to become water pollutants.

A CATALYST FOR CHANGE

As part of Project Catalyst, leading cane farmers are working with WWF-Australia, the Coca-Cola Foundation, Natural Resource Management Groups, the Australian Government and others to develop practical, cost-effective solutions to improve water quality on the Reef.

Project Catalyst is trialling a range of approaches aimed at improving the efficient application and use of fertilisers and pesticides. The project also provides extension support to growers to assist them with improving their practices, and the annual Forum allows growers to share their experiences.

WHAT NEXT?

The Australian and Queensland governments have set water quality targets for reef catchments including 'reduce nitrogen run-off by up to 80% in key catchments such as the Wet Tropics and the Burdekin by 2025.' Project Catalyst is one of a number of initiatives seeking to identify the next generation of practices that improve the efficient use of fertiliser in order to reduce nitrogen run-off.

Substantial reductions in nitrogen run-off will require industry-wide change. There are practical steps growers can take now to shift to improve their practices:

- Fertilise to the Block Yield Potential. Most growers will have sufficient farm data and yield history to move to a fertiliser regime that more closely matches fertiliser rates to the yield history of a Block, or in some cases, within a Block. Growers seeking to implement this should seek the advice of their Productivity Service or agronomist;
- Participate in the Smartcane BMP. The BMP enables grower's to be assessed against three tiers (Below, At or Above industry standard) on keys aspects of farm management and production, and provides a structured approach to continual improvement. By tracking the uptake levels, proportion of growers at each tier in the BMP and independent assessment, The industry is able to report on the overall progress it is making towards industry-wide adoption of sustainable practices;
- Seek Bonsucro certification. With growing demand for certified sugar, more QLD sugar mills are considering Bonsucro certification. Talk to your local mill about any plans they may have to be certified.

For more information on WWF's work on sugar, beef and other commodities, visit www.wwf.org.au

REFERENCES:

1. Brodie, J., Waterhouse, J., et al, Land use impacts on Great Barrier Reef water quality and ecosystem condition. Reef Water Quality Protection Plan Secretariat. 2013 Scientific Consensus Statement

2. De'ath, G., Fabricius, K. E., et al, 2012. The 27–year decline of coral cover on the Great Barrier Reef and its causes. Proceedings of the National Academy of Sciences.

OVERVIEW

Location

Trial Farm

No/Name: MKY-04074B - Rosella

Mill area

Mackay Sugar

Property size

82.73 ha

Number of years farming

50 years – three generations

Trial subdistrict

Rosella (Mackay region)

Area under cane

256 ha, all farms combined

Service provider contact

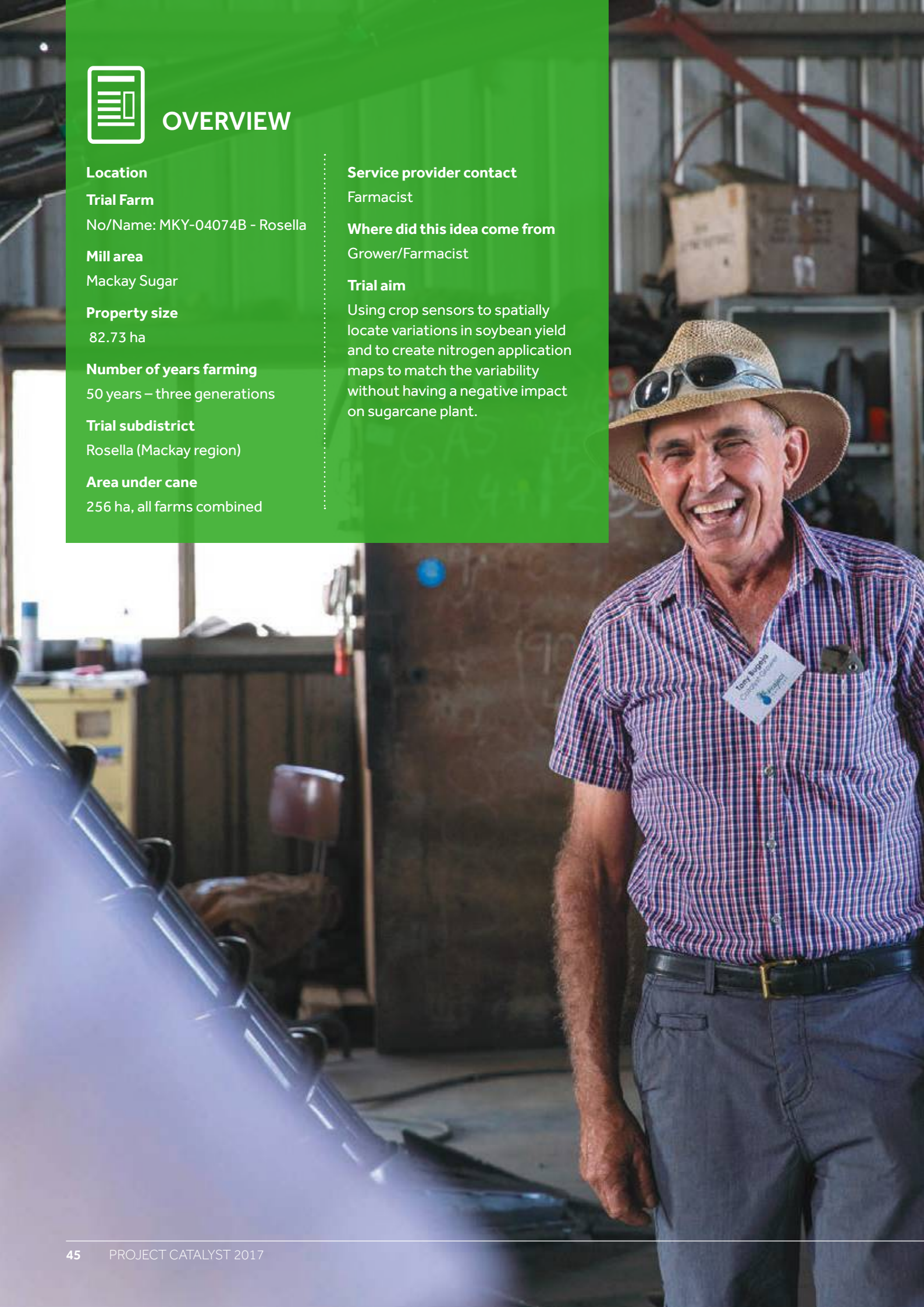
Farmacist

Where did this idea come from

Grower/Farmacist

Trial aim

Using crop sensors to spatially locate variations in soybean yield and to create nitrogen application maps to match the variability without having a negative impact on sugarcane plant.



MACKAY / WHITSUNDAY

TONY, JOHN AND MARK BUGEJA

Crop sensors

Spatially locating variations in soybean yield and creating nitrogen application maps to match variability.

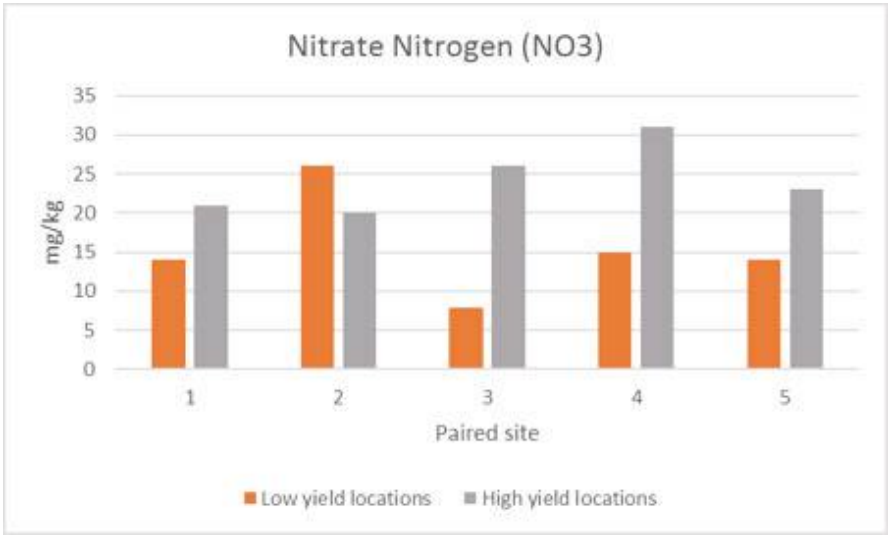
PRACTICES

Soybeans are commonly planted during a fallow season to assist in fixing nitrogen in the soil for the following cane crop. The yield of the soybean crop is a reliable indicator of how much nitrogen the soybean plant will have fixed. As is the case with most agricultural crops, variability in yields often exists in the soybean crops and hence the amount of nitrogen that it fixes. Low yielding crops will fix less nitrogen to the soil than high yielding crops and this needs to be accounted for when calculating the N requirements for the subsequent cane crops.

This trial involves the use of sensors to identify the location and the variability of the soybean crops. The locations of varying soybean yields where varying rates of nitrogen will be fixed will determine the rate of nitrogen required to be added during the topdressing phase.

POTENTIAL WATER QUALITY BENEFIT

Reduction in nitrogen use per hectare and an increase in nitrogen use efficiency.



EXPECTED OUTCOME OF TRIAL

Nutrient application better matching plant and soil requirements.

Plan - Project Activities	Date : (mth/year to be undertaken)	Activities :(breakdown of each activity for each stage)
Stage 1	March 2016	Crop sensor scan
Stage 2	March 2016	Soil sample. Biomass sample soy beans
Stage 3	April 2016	Plant cane
Stage 4	May 2016	Soil sample. Biomass sample cane
Stage 5	May 2016	Fertilise according to poor and good patches
Stage 6	August 2017	Harvest production

PROJECT TRIAL SITE DETAILS

Trial Crop:	Soybeans and sugarcane
Trial Block No/Name:	MKY-04074B-14-6 and 14-7
Trial Block Size Ha:	9.21 ha
Trial Block Position (GPS):	149.132223, -21.239817
Soil Type:	Sandy loam

RESULTS

Soil sample results from the paired sites indicated significant differences in nitrate N results between low and high yielding soybean locations (Figure 2). These results are the basis of the application rates of urea top up within the low yielding soybean locations.

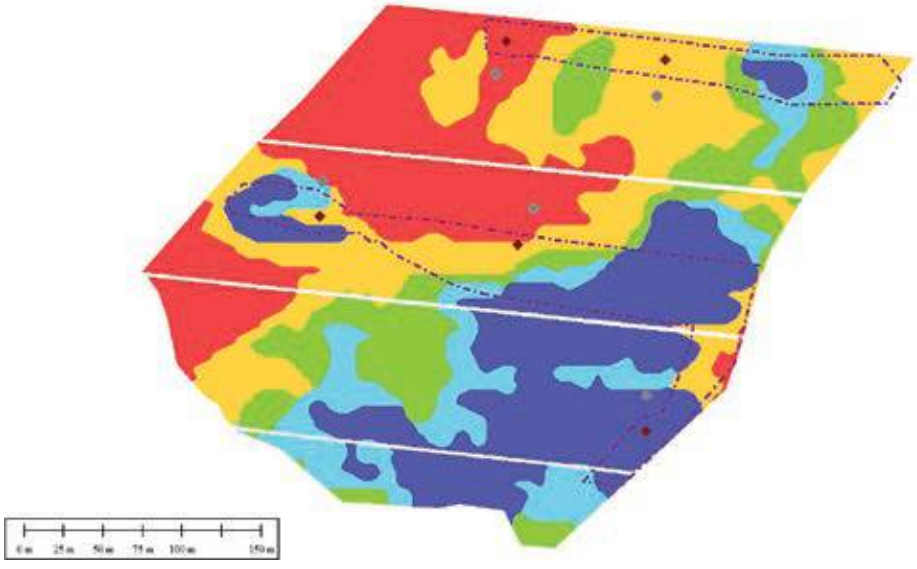
BLOCK HISTORY, TRIAL DESIGN

Electromagnetic induction (EM38) and electrical resistivity technologies for measuring soil and electrical conductivity (EC) are used to spatially define the boundaries of soils with varying properties. The trial site was EC mapped in 2011 which gave an indication of soils within the site where properties may differ.

Following the growing of a soybean crop on the site, the grower proceeded with the rolling and spraying out of the crop prior to the planting of cane in April 2016. Two OptiRx sensors were fitted to the tractor and data was captured during the soybean rolling activity (Figure 1).The OptiRx sensors measures NDVI values which gives an indication of plant health and biomass. RTK GPS position data is captured along with the NDVI readings that enables the locations of soybean yields to be mapped. When compared to the EC soil boundary map the lighter textured soils correspond to lower EC values (red colour), and heavier textured soils such as clays correspond to higher EC values (Blue colours).

Soil leaf samples and biomass samples were taken from the site in paired locations with high and low yielding soybean crops (Figure 3).

Figure 2: Indicator of crop health - paired soil sample locations overlaid on the NDVI map. Blue is strong vegetation and red/ orange is lighter vegetation. The area inside the dashed line indicates the location of poorer soybean yields. This map allows growers to identify the location of varying soybean yields and to adjust their application rates of nitrogen accordingly.



OVERVIEW

Location

Maida Vale, 8 km north of Ayr

Catchment

Sheep Station and Plantation creeks

Rainfall

956 mm

Property size

415 ha

Landuse

Sugarcane production

Family history

Mark was born and bred in the Burdekin, going straight from school to working fulltime on the family's 77 ha farm.

By the time Mark took over full management in 1985, the farm's size had been increasesd by 80 ha to 157 ha. Today the family farms 415 ha.

Mark's son, Andrew, started working on the family farm in 2012 after completing a trade as a fitter and turner and working abroad as a project manager in civil engineering.

Andrew now manages the contract harvesting portion of the family business cutting their own and surrounding neighbours' cane.

Under Mark's guidance, Andrew is now extending his management responsibilities to the cane production side of the enterprise.

"We need to update our current farm structure to become more economical."

BURDEKIN

MARK & SON, ANDREW CASTELANELLI

Enhanced efficiency trials

The farm is irrigated by flood in a furrow system, with a combination of open, underground and recycled water.

PRACTICES

The Castelanelli farm is operated at 1.52 m centres, GPS guided in a single row system.

The farm is irrigated by flood in a furrow system, with a combination of open, underground and recycled water. The farm is designed to utilise and recycle water in natural catchment areas, catching around 80 % of the farm's runoff which is re-used to water approximately 84 ha of the farm.

Mark is looking to further extend the capacity of the recycle system to catch the whole farm's irrigation water.

Mark has also started EM mapping the farm which will be applied to variable rate in block application of gypsum.

Fallow rotation is sprayed with a knockdown herbicide, and a legume crop is planted on any extended fallow.

Mark recently purchased earth moving equipment so that the business now has the capability to restructure block sizes and gradients.

"We need to update our current farm structure to become more economical," said Mark.

As the next step in improving the farm management efficiencies Mark plans to adopt automation within his irrigation management.

CHEMICAL PRACTICES

All Mark's spray equipment is fitted with GPS guidance and flow rate monitors to track all herbicide applications, with full calibration of equipment carried out twice yearly.

Rates and timing for herbicide and pesticide applications are guided by Mark's experience combined with agronomist advice and label ranges. Wild sorghum and guinea grass are specifically targeted in the farm block specific weed management plan.

The farm has three spraying apparatuses all with dual herbicide application ability which includes a standard broad acre boom, Irvin leg booms,

and a high clearance tractor to allow longer access into the cane crop. Mark's herbicide program is generally done in two passes, one application knockdown herbicide, and PSII herbicide dependant on weather.

Mark points out the importance of weed control in plant cane, as this affects ratoon herbicide use. "Good control now, saves hassles down the track," said Mark.

NUTRIENT PRACTICES

Historically Mark has used standard straight fertiliser blends under advice of local agronomists. He has used some special fertiliser blends when required for 'poor paddock' areas identified from soil testing.

Mark continually EM maps the farm during fallow rotations, with accompanying soil tests, using this data to apply fertiliser at a variable rate. This is backed up by a GPS guidance system which allows continuous monitoring of all blends applied on the farm in the four identified soil zones.

A granular fertiliser is applied via subsurface with both a stool splitter and side dresser. Mark has concerns around the effectiveness of using a stool splitter in comparison to side dressing. From his experience he has noticed that different varieties of cane respond differently to placement of fertiliser stool splitting versus side dressing.

MOTIVATORS FOR CHANGE

Mark and Andrew are in the process of restructuring the whole farm to allow efficiencies in irrigation, cultivation, and management. Nutrient application methods and rates is one factor that he has been looking into and the enhanced efficiency fertilisers have the potential to reduce his inputs.

Mark is very interested in the economics, productivity, and water quality results coming out of the trials.

CHALLENGE

There is a significant cost to using nitrification inhibitors (ENTEC) and controlled release formulations (AGROCOTE) and uncertainty around their reliability. Further assessment is needed to determine cost versus benefit. Other major challenges to the trials include soil type, matching nutrient requirement, and reducing losses from the farm.

TRIAL STATUS AND RESULTS

PROJECT INVOLVEMENT

Mark is hosting one of 12 GameChanger replicated Enhanced Efficiency Fertiliser Trials which are looking at breaking down the barriers to the adoption of enhanced efficiency fertiliser in the Burdekin, through environmental, economic, and social monitoring.

TREATMENTS

T1- Urea @220 N

T2- Urea @180 N

T3- Entec @180 N

T4- Agromaster 25% @180 N

T5- Agromaster 50% @180 N

MONITORING

The Enhanced Nitrogen Efficiency Trials were designed by Farmacist to identify production differences between N formulations and ratios based on different soil types, application rates, and application timings throughout the year.

SHOWCASING TO BROADER COMMUNITY

Born and bred in the Burdekin, Mark is an integral member of the local sugar industry and brings a wealth of knowledge to the NQ Dry Tropics Sugar Innovations Programme .

He was a member on the Pioneer Canegrowers committee for ten years, the North Burdekin Water Board for over 22 years, and continues to serve on the newly amalgamated Lower Burdekin Water Board. He was also a member of the South Burdekin Water Board as a community representative.

In previous years, Mark has been a councillor on the Burdekin Shire Council and was a member of the Ayr Pest and Productivity Board for six years.

RESULTS

Using these more efficient formulations to target delivery of N has the potential to not only increase production but also reduce N losses, resulting in improved water quality. Trials were implemented on Mark's clay soil

Results from the 2015 harvest season showed no significant difference in productivity between all treatments ($p = 0.05$). Treatments T2, T3, T4 and T5 had better nitrogen use efficiencies than T1 (control). No productivity was lost through reducing rates from 220 N to 180 N.

Results from the 2016 harvest season also demonstrated there was no significant difference ($p = 0.05$) in either tonnes of cane, CCS, or tonnes of sugar produced when comparing 220 kg/ha of N applied to any of the treatments applying 180 kgN/ha.

The table below shows a summary of production results of the 2015 and 2016 data combined. Trial site was placed on a clay soil. Data presented below are results based off Q183, first and second ratoon combined. Trial is continued into the 2017 season for a third year.

2015 and 2016 Trial Results Summary	tCane/ha	CCS	tSugar/ha
220 N Urea	154.8 -	13.6 -	21.0 -
180 N Urea	152.2 -	13.9 -	21.2 -
180 N Entec	156.5 -	14.0 -	21.9 -
180 N Agromaster 25%	154.5 -	14.0 -	21.5 -
180 N Agromaster 50%	155.6 -	13.7 -	21.4 -

OVERVIEW

Location
Murray Upper and Riversdale

Property Size
1400 ha

Land use
Sugarcane production

Chris became involved with Project Catalyst after discussions about the Game Changer program. He expects that profitability can be improved whilst reducing impact on the environment, all without reducing crop yield.

"These kinds of trials are so important because they're often the only way to get into new technology and practices ... If you're not innovating, you're going backwards."

CHRIS CONDON

Reduced nitogen on late cut final ratoon block

A final ratoon sugarcane crop has a yield potential of between 70 and 80 t/ha, and can be harvested late in the season.

PRACTICES

Trial crop: sugarcane

Crop type: fallow

Trial block size: 102.52 ha

Soil type: lugger soil series

Number of replicates: 3

Potential water quality benefit

A final ratoon sugarcane crop has a yield potential of between 70 and 80 t/ha, and can be harvested late in the season. Chris was aware he may not need to apply the same amount of nitrogen to this crop, as he would to a higher yielding ratoon crop.

If nitrogen inputs and nitrogen requirements were better matched it would mean less nitrogen being lost to the environment.

CHALLENGES

Chris says that one possible disadvantage to this practice change is if there was uncertainty about a block's final ratoon status.

If a block was originally designated as a final ratoon, and lower nitrogen rates were used, he wondered would there be a yield penalty in the next ratoon crop if it was not fallowed as originally planned?

TRIAL STATUS AND RESULTS

In the 2014/2015 season, results from three trial practice treatments showed there was no difference between the three treatments.

This indicated that in this situation, a final ratoon crop yielding between 70 and 75 tonnes of cane per ha would not suffer any yield loss if 75 - 100 kg/ha of nitrogen was applied instead of the farm standard of 150 kg/ha.

Again, 2015/2016 results showed that there was no significant difference in cane or sugar yield, or CCS when the nitrogen application rate was reduced from 143 kg/ha to 95.6 kg/ha.

Five trials over two years in Tully and Ingham have shown that there was no loss with reduced nutrients on final ratoons.

Chris says he is confident using this practice on all future last ratoon blocks.

Drip feeding crops proving beneficial to productivity

Drip irrigation is a method of precisely delivering water and nutrients to a crop. Netafim established the concept of drip irrigation in a Kibbutz in Israel in the 1960's. At the time, this was to make best use of the limited water that was available in the Israeli desert. Legend tells the story of a tree on the Kibbutz that was growing much faster than others around it. Investigation by the farmer found a small leak in a pipe adjacent to this tree, 'drip' feeding it small quantities of water. This gave the farmer the idea of creating a product that could achieve this in a controlled way and the concept of drip irrigation was born.

The concept works for precise application of fertilisers also and this is perhaps the driving force behind the sugar industry in Queensland looking to utilise drip. The ability to apply small doses of fertiliser in a highly efficient manner enables higher productivity and a reduction in the losses of nutrients from the crop via runoff and drainage etc. For example, by applying small amounts of nitrogen through the growing life of the crop, there should be close to zero nitrogen losses from a farm and all should be used by the crop.

Project Catalyst farmers have implemented drip systems and are proactively reducing their nutrient losses as well as improving their productivity. Netafim is passionate and has founded its business on the concept of enabling growers to achieve greater profitability, while using less resources - 'Grow More with Less'. The Project Catalyst growers are demonstrating that this is possible.

The bottom line: evaluating the profitability of management practice change

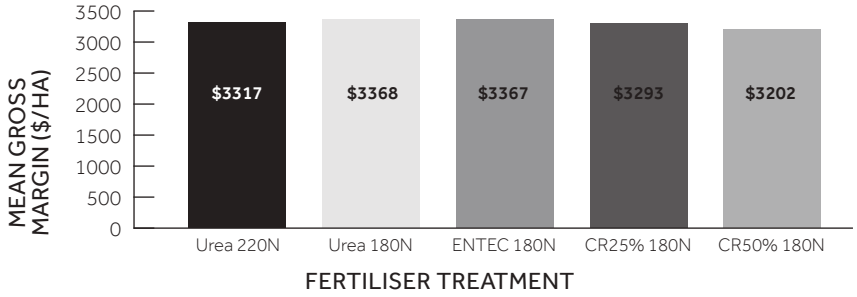
PROVIDING ECONOMIC SUPPORT TO PROJECT CATALYST

The Department of Agriculture and Fisheries is a collaborative partner in Project Catalyst and provides support through the expertise of agricultural economists. DAF economists have been working with Project Catalyst growers for a number of years, helping growers develop a better understanding of the costs and benefits of the new farming innovations they are trialling, and giving them further insights into the impact of management practice change on farm profitability and business risk.

The value of this partnership is exemplified by the Enhanced Efficiency Fertiliser trials in the Burdekin. The trials compared the performance of controlled release and nitrification inhibiting fertilisers with conventional fertiliser management on twelve commercial sugarcane farms in the Burdekin. The economists calculated the costs to apply the fertilisers and drew upon 2015 production results to evaluate the profitability of each fertiliser treatment at the twelve trial sites. Figure 1 shows the combined economic results from nine sites that had the same products and rates applied (group A). These results will soon be updated with results from the 2016 harvest.

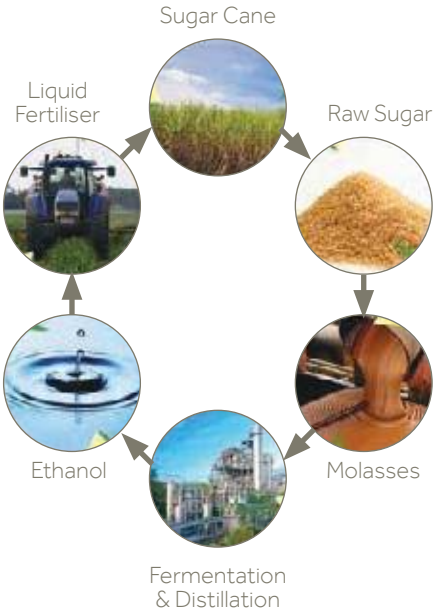
In the Wet Tropics, DAF collaborated with a sugarcane grower who trialled an innovative variable herbicide spray system that would enable them to lower their use of pre-emergent spray on ratoon crops, reducing both their costs and their impact on the environment. In this case study, DAF economists calculated that the cost reductions would more than offset the initial investment, and the variable spray system should be paid off in five years. In addition, a sensitivity analysis revealed what percentage of ratoons would need to receive the reduced spray rate for the new system to break even, and how large the farm size would need to be for the investment to be worthwhile.

To view these and other case studies, visit the Queensland Government website at: https://publications.qld.gov.au/dataset/best-management-practices-for-sugarcane



Wilmar BioEthanol Agservices has been a long-time supporter of the Project Catalyst Forum with values aligned around improving grower efficiency and sustainability.

Manufacturing Cycle



Bio Dunder® customers see value in that we provide a renewable and sustainable product that recycles nutrients back onto their farm via a precision application service. The way that the product is applied and the equipment that is used in the application has come about through years of development both internally as a company and externally through collaboration with numerous growers that have been willing to participate in the trial work that has helped to get us to where we are today.

Although this is not where it stops as we have a number of truly innovative growers that have developed various other ways of using and applying our products to enhance their farming efficiencies. Examples of this are the use of our products in pre-plant applications, sub-surface applications, split applications and through trickle tape applications.

As a company we support these innovations and also offer grower support via our R&D program, our soil testing service and through providing agronomic support by working with growers to develop nutrition plans based around the 6 Easy Steps.

We are very fortunate and appreciate the fact that we have growers as our customers who are regularly involved in trial work to continually explore ways to enhance their farm efficiency and to assess how it stacks up against their current practises.

This in turn is good for the whole of the industry as these learnings can then be communicated out to other growers who may be inspired to adopt a new practise or create a new way of thinking around a common problem.

Over the past couple of seasons we have been developing an enhanced efficiency fertiliser range that involves the addition of a nitrogen stabiliser to allow our customers under suitable conditions to be able to maximise the efficiency of their nitrogen inputs.

This makes sense both economically and environmentally as increasing efficiency leads to positive outcomes in both of these areas

At the end of the day we are very appreciative of the growers that are willing to explore new ways to enhance the efficiency of their farming practises.

Wilmar BioEthanol AgServices is proud to support the continued innovative and sustainable farming practices of the Project Catalyst Farmers.

OVERVIEW

Location
Near Mossman

Property size
400 ha

Land use
Sugarcane production

Glen has over 25 years farming experience. Heavy rainfall in the wet tropics region means much of the applied nitrogen could be lost through pathways like denitrification and leeching.

"There is a lot of interest in up and coming products and we need to see first hand evidence to be confident in applying them. The important thing about doing trials of this kind is that unless you collect and analyse all the data, and do the trial correctly, it doesn't mean anything."

GLEN FASANO

Enhanced efficiency fertilisers

Given the importance of reducing nitrogen loss in the critical period after fertilisation, Glen became interested in enhanced efficiency fertiliser trials being conducted in other regions and saw value in trialling products for himself.

THE PROJECT

PROJECT SITE TRIAL DETAILS

Trial crop: sugarcane

Trial block size: 7.4 ha

Soil type: Mission

No. of replicates: 3

POTENTIAL WATER QUALITY BENEFIT

Increased nitrogen use efficiency reduces nitrogen run off. If trials support the hypothesis of less nitrogen loss and higher yields, then there would be increased uptake of these products and in turn the quality of water coming off the farm would be improved.

TRIAL STATUS AND RESULTS

The trials have been conducted in 2014-15 and 2015-16 on two different first ratoon blocks. The 2014-15 trial was established on a 5.6 hectare block in Mowbray, and compared three products, a standard fertiliser blend (CK140S), a controlled release (CR) product, and an ENTEC treated blend. All three products had the same NPKS ratios, and were applied at rates of 150 kilograms and 130 kilograms of nitrogen per hectare, making a total of six treatments. Each treatment was replicated three times.

The Mowbray trial was harvested in late July and early August 2015. While yield results were obtained for each replicate from bin weights, limited CCS data is available as the trial bins were combined when they were sent to the mill. As a result, the impact of the trial treatments on revenue and gross margin1 could not be calculated.

The trial was continued in 2015 on 6.6 hectare block in Newell Beach. The treatments were the same as the Mowbray trial, however a fourth product was added, the same fertiliser blend treated with eNtrench, a nitrification inhibitor similar to ENTEC. Fertiliser was applied in October 2015. See graph for yield results.

Image: ***trial results***

An economic analysis of the 2015 trial*, provided the following key findings

- The enhanced efficiency fertilisers would need to generate a yield increase between one and five tonnes per hectare to break even with the standard fertiliser blend applied at the same rate.
- Applying the standard fertiliser product at a reduced rate (20 kg of nitrogen per hectare lower) would provide a yield buffer of up to four tonnes per hectare compared to the standard fertiliser at the higher rate.
- eNtrench at the lower rate could see a yield decrease of almost two tonnes per hectare before becoming less profitable than the standard fertiliser at the higher rate.

Both 2015 and 2016 results show little difference between the different treatments and rates.

Four similar trials were conducted on farms in Mossman, with similar outcomes as on Glen Fasano's farm.

It is believed that very dry weather in the wet tropics in 2015 and 2016 was the reason there was no benefit seen in enhanced efficiency fertilisers. The dry weather may have meant nitrogen was not lost in heavy rain events.

Glen will continue to trial the product on small trial plots.

*Holligan, E. (2016), Enhanced efficiency fertiliser trials – Glen Fasano: Economic analysis. Department of Agriculture and Fisheries (DAF), Queensland.

FARMACIST

Farmacist is an agronomic solutions provider based in Mackay and the Burdekin, North Queensland. Our team has developed into Queensland's leading provider of agronomic services, geo-spatial data collection and research, development and extension in the sugarcane industry.

We've been working with Project Catalyst growers and partners since 2009, providing agronomic support and trial data. Our dedicated staff continue to encourage the many innovative and likeminded growers who have helped make Project Catalyst the leading program it is today.

John Markley has witnessed the expansion from Mackay Whitsunday through the Burdekin and into the Wet Tropics "We have been proud to expand our role, working with the visionary sugar industry growers, through some of the best sugar growing regions in the state".

To remain viable, innovation in production techniques to improve yield, reduce costs and improve environmental sustainability, is essential.

"You only have to look back over the last few years to see how invested these growers are in their future. Farmacist have provided support for trials like developing Variable rate programs using EC soil maps and yield maps, investigating the use of banded mud applicators, extensive investigations into the effect of Enhanced Efficiency fertilisers as well investigating sub-surface application of ameliorants and the effect it has in soil health and cane production"

John was also excited to see an Australian first trial for the sugar industry of an autonomous tractor in Mackay recently.

Thanks to a joint initiative between Japan's Hokkaido University and Japanese firm Hitachi, growers may find they have a lot less to do in the future. Farmacist Director Tony Crowley believes it's the next big thing. "The tractor can do anything that a normal tractor can do. It can level the land, it can fertilise, it can weed spray, it can water and, not this tractor but future tractors, with the right inference, can also harvest."

The tractor is also fitted with the latest collision avoidance technology to assist with obstacles.

Project Catalyst has provided the necessary investment, knowledge sharing and extension to foster ideas, develop skills and innovative practices. With over 150 years of combined agronomic experience, Farmacist specialises in practical precision agronomy solutions, tailored to suit your individual needs.

John Markley
Project Manager
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OVERVIEW

Location

South of Tully

Mario farms in one of the wettest parts of Australia.

Concerned that the continued rise of fertiliser costs was likely to see farming become unsustainable, along with the desire to adopt practices that improve water quality leaving the farm, Mario decided to undertake trials involving the use of Bio-Fert.

He secured funding from Terrain's Reef Rescue Innovation Funding program to purchase equipment and employ RegenAG's Kym Cruise to teach Bio-Fert principles and techniques to himself and other growers.

Mario then established a trial in first ratoons to test how much he could reduce his fertiliser inputs. Recognising that this would not be an instant fix, Mario committed to continue the trial for at least three years.

"I want to focus on biological soil health and be less reliant on artificial inputs. The current profit/loss of sugarcane production is becoming increasingly challenging. The most practical way to improve the bottom line is to reduce input costs. The more we can reduce artificial inputs the more likely we can reduce any form of run off."

WET TROPICS

MARIO RACCANELLO

Using bio-fertiliser to reduce reliance on fertiliser

Concerned by the rising cost of fertilizer and decline in soil health, Mario is trialling Bio-Fertiliser.

THE PROJECT

Using bio-fertiliser to reduce reliance on fertiliser

PROJECT SITE TRIAL DETAILS

Trial crop: sugarcane

Trial block size: 11.24 ha

Trial block history: bananas five years, plant cane one year, trial established in first ratoon crop

Soil type: Tully series

Mario remembers his father growing rich, highly productive banana crops on straight cow manure and small amounts of urea.

Conscious that his own soils had been depleted over the years by using artificial fertilisers, Mario hoped that he could minimise use of chemical fertilisers and rejuvenate soil, thereby helping to reduce fertiliser run-off into waterways, whilst maintaining productivity and farm viability.

POTENTIAL WATER QUALITY BENEFIT

The trial is focused on reducing the application of inorganic N, and improving nutrient and mineral cycling.

It is expected there will be a decrease in bulk density (compaction) and an increase in soil carbon, both of which will result in less N runoff because of the increased porosity and water holding capacity.

The process must meet the plant's nitrogen requirements, whilst still maintaining yield.

"A system that enables us to reduce the application of inorganic N by up to 50 % could be a game changer for water quality and the reef".

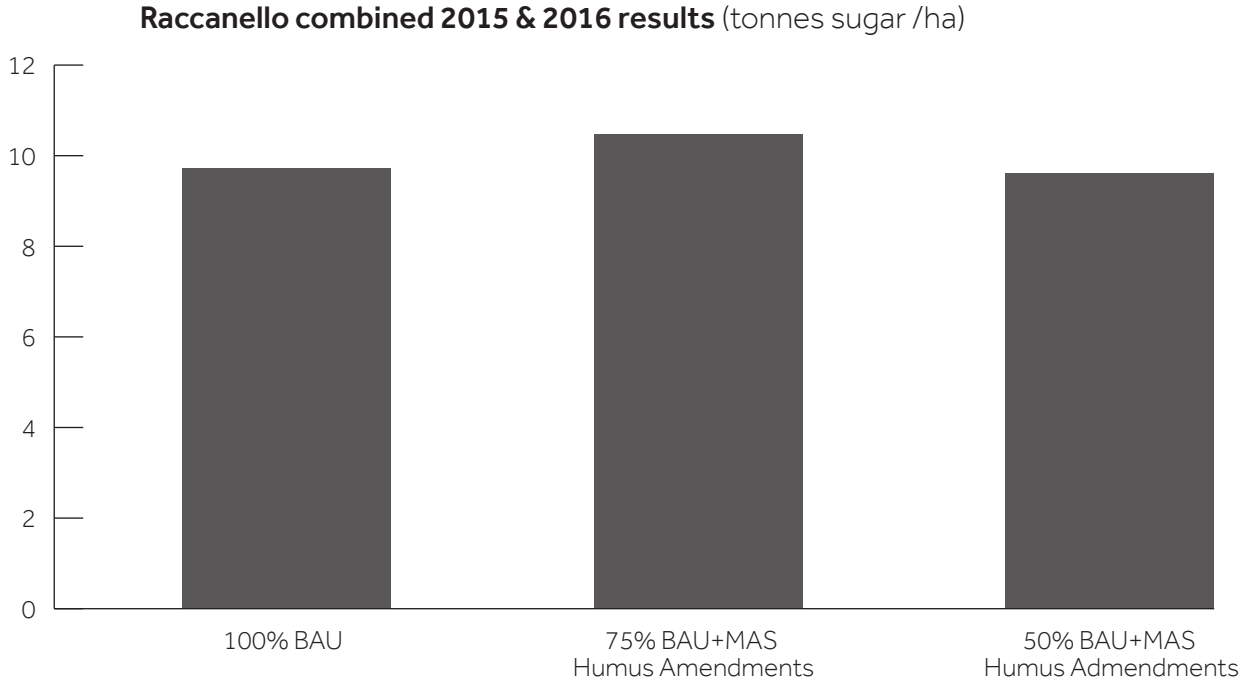

Image: XX

CHALLENGES

The time spent investigating, designing, and fine tuning the system was time consuming.

Large enough quantities were needed so as not to take up Mario's time in busy periods. By trialing different sized tanks and mixing equipment, Mario was continually learning how to speed up the production process.

TRIAL STATUS AND RESULTS

Mario constructed a system to manufacture and store his Bio-Fert ready for future use. Bio-Fert can be stored for up to 100 years.

An applicator has been constructed to cover seven 1.9 m rows with a 5000 litre tank allowing for quick application.

The trial was planted and treated in 2014 and due to the long crushing season in 2015 wasn't harvested until late November 2015. The results of of 2015 and 2016 are both promising. There was no yield decline, with a 50 % reduction in chemical fertiliser in conjunction with bio-fert application, and Mario notes there was a build-up of soil biology.

Mario says that with ongoing modifications, the potential cost savings and water quality and soil improvement mean he will continue to use this practice into the future.

terrain
NATURAL RESOURCE MANAGEMENT

Terrain NRM plays a pivotal role in connecting farmers to each other and to experts, scientists, researchers and specialists who can assist farmers in making real change to industry and environmental outcomes. This is critical to driving innovation in the agricultural sector.

Property size
Approx. 180,000 Ha

Land use
Producing 12 Million Tonnes annually from 1400 Growers

INNOVATION FOR THE FUTURE

The Wet Tropics agriculture innovation program, which includes Project Catalyst, supports a network of farmers who are leading the way in the use of cutting-edge management practices for a more sustainable and profitable farming future. We now support 39 Catalyst growers in Herbert, Tully, Innisfail, Cairns and Mossman.

CEO Carole Sweatman said that it is encouraging to see Wet Tropics landholders contribute to the development and wider adoption of improved farm management practices in the sugar industry.

"Project Catalyst reduces the time it takes for a great innovative idea to become a proven practice."

"There's a lot of innovation investment in the Wet Tropics, and partnerships, linkages and knowledge sharing are an important framework that we can use to make sure we're delivering targeted support to growers to accelerate the rate of change."

Project Catalyst Coordinator, Michael Waring says there has been some inspiring results in water quality benefits over the past two years. Standout trials have included nitrogen reduction on late cut final ratoon blocks, increased nitrogen use efficiency through enhanced efficiency fertilisers, bio-fertiliser trials, and reduction of herbicide application through variable rate spray.

"Innovation support is an essential service. If you're not innovating, you're going backwards," said Michael.

Whilst Terrain continues to concentrate on innovation, over the last two years there has also been a focus on developing partnerships across the region to more effectively deliver reef water quality outcomes, and ensure agriculture stays productive and profitable.

The recently developed Wet Tropics Sugar Industry Partnership (WTSIP) is a unique partnership of all Wet Tropics cane industry organisations and Terrain NRM with the goal to work together to deliver water quality, productivity and profitability outcomes.

WTSIP has established a team of nine extension officers with an Extension Coordinator based in Herbert CANEGROWERS. The team also includes an Innovation Extension Officer who will be overseeing the Reef Trust III Innovation Grants Program and providing extension support for Innovative projects. She will be working closely with Project Catalyst.

For more information about Project Catalyst and to find out what other opportunities are available for cane farmers in the Wet Tropics go to www.terrain.org.au

OVERVIEW

Location
Euramo and Bilyana, south of Tully

Property size
590 ha

The Dore brothers crop is predominantly sugarcane. Guinea grass is a major weed on the Dore farm, and a significant issue in the wider industry as it reduces productivity and increases herbicide costs.

"Guinea grass is a major issue within the industry. If this trial strategy works it has the potential to reduce the amount of pre-emergent herbicide being used in the immediate crop and in the future ratoons."

DORE & CO.

Recording spot spraying points to develop variable rate herbicide spray

If successful, the practice change has the potential to be used across 100 % of the Dores' farm.

THE PROJECT

Trial block details:

Crop: sugarcane

Trial block size: 4.19 ha

Soil type: Bulgun soil series

If successful, the practice change has the potential to be used across 100 % of the Dores' farm.

An economic analysis* of the trial provided the following key findings:

- Results indicate that the variable spray would achieve a cost saving of $4.29 per hectare.
- Capital costs would be repaid in six years, and would result in an annualised equivalent benefit of $1.85 per hectare.
- The results were sensitive to the ratio of high weed pressure zones to low weed pressure zones, and the variable spray system would only be worthwhile if the low spray rate is applied to at least 67.5 % of ratoons on average.

The Dores' herbicide rates were informed by their impression of the weed status, whether it was 'clean', or 'dirty'.

Standard practice for dirty blocks, or those with a reasonable quantity of guinea grass infestation has been to use a high rate of pre-emergent herbicide across the entire block, which meant that more herbicide than necessary was being applied to the majority of the field.

Clean blocks had a lower rate used, which meant small areas with guinea grass had the potential to expand and in later ratoons the block would gain 'dirty' status.

TRIAL STATUS AND RESULTS

The Dores trialled a variable rate of herbicide application based on weed pressure maps that were created using a modified spot sprayer. The aim was to reduce the amount of pre-emergent herbicide usage, without compromising weed control.

On the 4.2 hectare trial block, a modified spot sprayer was used to record a GPS location point (with a 20 metre radius buffering zone) from

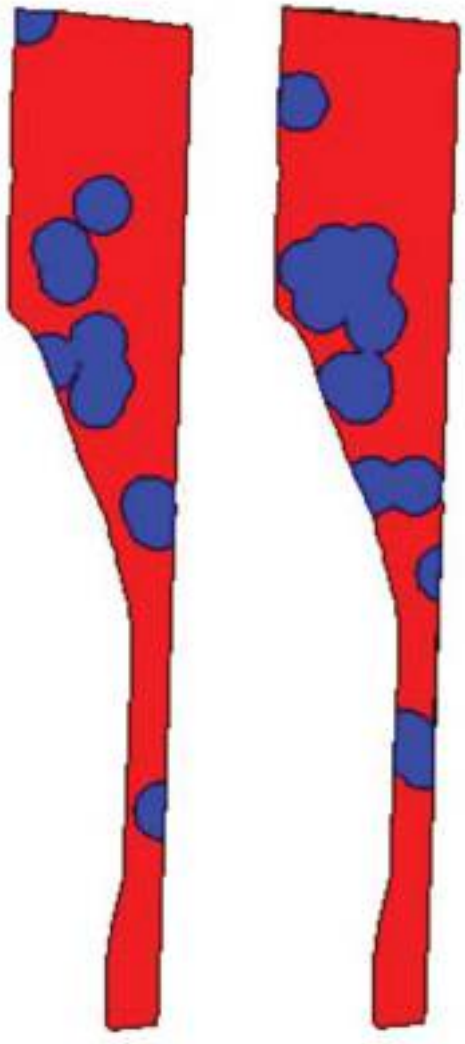

Image: 2015: 3.75 ha (Red) 0.95 ha (Blue). 2016: 3.45 ha (Red) 1.25 ha (Blue).

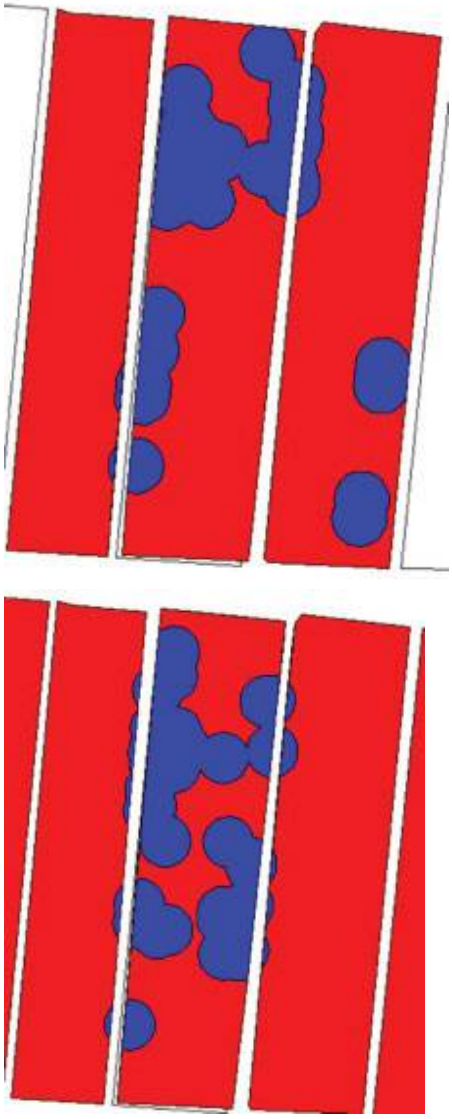

Image: 2015: (Red 2.38 ha, Blue 1.29 ha). 2016: (Red 2.00 ha, Blue 1.68 ha)

which was developed a variable rate prescription for herbicide application.

Having the ability to map weed distribution will assist with farm planning, and herbicide usage – a strategy that not only assists with maintaining productivity and increasing profitability, but has potential water quality benefits.

Weed distribution can also influence farm planning and crop rotation. Blocks with major infestations may be fallowed earlier than planned so that weed control measures can be used in the fallow, such as using knockdown herbicides rather than pre-emergent.

Initial spray maps will be compared with further spray maps to evaluate the benefits of the technology. The Dores expect that infestation areas will, at least, be stable and that the amount of pre-emergent herbicide used on the farm will reduce.

2015 (LEFT) and 2016 (RIGHT) Spot Spray Map of Block 10.

The blue area represents the spot sprayer points buffered by a 20 m radius. This is where ideally the higher rate of pre-emergent herbicides would be used as this is the high pressure area. This paddock had the standard low rate across the entire paddock.

The 2016 Spot Spray Map shows an increase in the buffered area of the spot spray points. Due to some issues with the prescriptions, and then with the sprayer, no variable rate applications were made.

Block 8 was spot sprayed in 2015 (LEFT) and 2016 (RIGHT), both show centre tram with lots of blue.

Images like this has led the Dores to consider fallowing this block earlier than anticipated so products like glyphosate and verdict in the fallows can be used to control the Guinea grass problem, rather than relying on pre-emergent herbicides and spot spraying alone.

* Holligan, E. (2016), Variable rate herbicide spray – Dore & Co.: Economic analysis. Department of Agriculture and Fisheries (DAF), Queensland.

Stoller's Innovation in Sugarcane Nutrient Management

Consistent yield increases have the Werner family impressed. Since 2009 they've been using Stoller's liquid fertiliser on their property.

"Stoller's liquid fertiliser program, includes ClearStart 15KZ+N, Action 5 and Bio-forge containing unique Stoller technology, has had a major impact on our sugarcane profitability and sustainability."

"We find that there's more crop vigour with the Stoller program when compared to our standard practice when applied at planting direct on the billet, with three options in ratoons - applied after harvest as a foliar spray, streamed over the row or sub-surface," says John Werner, Mackay canegrower.

"We've have increased our productivity with the Stoller program and that's been continuing every year. It has a huge impact on our dollars per hectare."

"On top of this" John says "our long-term goal to improve our farms soil health is being achieved, larger roots systems down to a metre in depth and changes in nematodes."

"When we started the trials with Stoller, we were 31st in our District Productivity Zone of 66 farmers, now in 2015, we are 15th. Our yields continue to show improvement."

"We have tried many things over the years, including Composting, alternate crops, also our own subsurface Mill-mud applications, however Stoller's liquid program has become the cornerstone of our fertiliser program."

Werner's now use Stoller's Sugarcane planting program and Stoller's Trace elements in combination with granular fertiliser to maximise production and minimise their risk.

"The re-treatment of our Ratoons each year with the program is guaranteeing our crop vigour and quality."

"We have changed our farm management to suit, with the goal of more profit and sustainable farming" says John Werner

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With our long and proud history supporting the agricultural sector, Suncorp Bank is delighted to be part of Project Catalyst and involved in the outstanding work its network of cane growers under-take in sustainable and productive farming.

Suncorp's North Queensland Relationship Manager David Harding said sugar was one of the best performing commodities in 2016, with the industry presenting many opportunities for the year ahead.

"The outlook for global demand and supply fundamentals remains positive, with sugar consumption expected to outweigh production in 2016/17," Mr Harding said.

"Global supply experienced a dip in 2015/16 due to production and weather related issues. However, higher prices are likely to encourage greater production levels going forward, with Brazilian producers expected to add to global supplies as production pivots toward sugar refining over ethanol.

"While the industry will continue to have exposure to weather events, much depends on policy decisions by industry heavyweights including China, India and Brazil. The impact of the US decision to withdraw from the Trans-Pacific Partnership may also have some impact.

"There is certainly a growing global market though, and ample opportunity for the promotion of our quality local sugar producers.

"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.

"Suncorp is committed to delivering value for our agriculture customers and supporting sugarcane growers to develop optimum farm management practices to ensure the future of the industry."

Since its beginnings in 1902 as the Queensland Agriculture Bank, Suncorp has been an integral part of the Queensland banking landscape. Today, Suncorp Bank is one of Australia's leading banks serving one million personal, small to medium enterprise (SME) and agribusiness customers nationally.

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

Blueshark Merchandising

Promotional merchandising is one of the key strategies utilised by companies to promote their products and services, and effectively raise brand awareness. Today there is no end to the variety of items you can create with your logo. Rob Hubsch travels to China, sourcing the latest innovation in promotional merchandise for clients.

"I want our clients to stand out from their competitors with custom original equipment manufacturer (OEM) products. Some of the most original designs are available in China, at the best price."

Whilst items like apparel, headwear, drinkware, bags and gifts, remain popular, technology advancement in recent years has seen custom branded fridges and even metal eskies made to resemble tool chests, create unique and memorable items.

"The decoration technology has increased the product range, which can be branded – thus opening up promotional merchandise opportunities to those who want something more unique."

Statistics from the Australian Promotional Products Association reveal how beneficial this can be...

- 52% say their impression of a company is more positive after receiving a promotional product.
- 76% recall the name advertised on the product.
- 55% keep the item for more than one year.
- Nearly 50% of recipients use them daily.
- 52% of people do business with a company after receiving a promotional product
- Spend less, achieve more and remind people about the benefit of doing business with you.

By creating the right product mix of merchandise, BlueShark can help you to help your business. Let our experienced team work with you to reinforce your branding & positioning in the market place, from Gift with Purchase concepts to Uniforming and general brand awareness items.

Rob: 0400 34 9197
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NQ Dry Tropics works closely with land managers in the Burdekin Dry Tropics region to encourage best management practices that improve water quality, increase production, and benefit the environment. With 15 years' experience as the region's leading natural resource management body, we know how crucial innovation is to the future of the agriculture sector.

NQ DRY TROPICS - HELPING TO DRIVE INNOVATION IN THE SUGAR INDUSTRY

The Burdekin is the largest sugar producing region in Australia, with over 100 000 hectares of land dedicated to sugar cane growing. The region produces in excess of eight million tonnes of sugar cane, and about 1.3 million tonnes of raw sugar.

Our Sugarcane Innovations Programme (SIP), delivered through our Sustainable Agriculture Programme, supports innovative farmers to investigate, identify and trial their ideas, assisted by technical experts. A key component of our SIP is Project Catalyst, which we have been delivering in the Burdekin since 2010.

All of these these projects have contributed to a significant shift in management practices, helping to reduce nutrient, sediment and pesticide losses off farm – and helping to protect the Great Barrier Reef.

NQ Dry Tropics CEO, Dr Scott Crawford, said that there are many forward thinking farmers in the region who actively trial innovative practices:

"With a thriving cane industry and more than 650 Burdekin canegrowers, we see innovation as key to enabling large-scale, high-impact, positive change," he said.

"Project Catalyst offers these innovators the opportunity to collaborate with like-minded farmers across regions, share ideas and experiences and, most importantly, effect change.

"Project Catalyst also gives landholders access to technical advice and guidance, allowing trials to be a measured and replicated in order to drive innovation beyond individual farms. This benefits the entire industry.

"We have seen some outstanding results over the past year in the Burdekin. Our Catalyst growers implemented trials aimed at minimising nitrogen losses by matching nitrogen use to crop requirements, and improving irrigation efficiency to significantly reduce run-off leaving farms.

"These outcomes wouldn't have been possible without the commitment of our farmers, and project partners Farmacist and the Queensland Department of Agriculture and Fisheries", Scott said.

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