

MULGRAVE-RUSSELL WATER QUALITY PROGRAM

Achievements and learnings

August 2024



Australian Government

REEF TRUST



Great Barrier
Reef Foundation

Introduction

The Great Barrier Reef is globally renowned for its intrinsic beauty, immense spatial scale, outstanding biodiversity as well as its natural, social, economic, and cultural values. A healthy and resilient Great Barrier Reef is critical to protect the vast array of ecological communities and species that inhabit coastal, marine, and terrestrial ecosystems. However, the health of the Reef is at risk from a range of factors including climate change, expanding coastal development, direct human use and poor water quality from land-based runoff.

In a bid to significantly improve the health of the Great Barrier Reef, the Reef Trust Partnership (the Partnership) – a landmark collaboration between the Australian Government’s Reef Trust and the Great Barrier Reef Foundation (the Foundation) – was awarded \$443 million to elevate and amplify efforts to build Reef resilience. As part of the Partnership, the Water Quality Program received \$199 million to address poor water quality from land-based runoff and respond to the priorities of the Reef 2050 Water Quality Improvement Plan (WQIP).

The information contained in this report is current as at 30 August 2024. A final version of the report will be developed in July 2025 when the Program is complete.

Mulgrave-Russell Water Quality Program

The Mulgrave-Russell Water Quality Program was one of ten regional water quality programs delivered under the Partnership between 2021 and 2024. Through the adoption of improved land management practices, this \$6 Million program aimed to prevent 72 tonnes of dissolved inorganic nitrogen lost from sugarcane land from entering the Reef's waters every year.

The Mulgrave and Russell catchments make up more than nine percent of the Wet Tropics region and discharges more than 4,000 gegalitres of fresh water into the Great Barrier Reef each year. The 1,983 square kilometre region has relied strongly on sugarcane production since it was introduced in the late 1800s.

The WQIP identified the reduction of Dissolved Inorganic Nitrogen (DIN) as a priority for the Mulgrave and Russell catchments.

The three-year Mulgrave-Russell Water Quality Program (the Program) was delivered by four organisations implementing two on-ground projects, each with its own pollutant reduction target.

Projects tracked their progress to targets using the Paddock to Reef [Projector Tool](#) which estimates water quality improvements based on a reported change in the management practices by farmers involved in the program, and through a monitoring program to estimate DIN removal and the effectiveness of drainage intervention.

Tailored agronomic extension support was provided to 38 per cent of regional sugarcane growers. Extension staff worked one-on-one with growers to reduce nutrient losses at the end of catchment. Growers accessed new decision-making tools and data to improve their nutrient management and soil health for increased productivity, profitability, and sustainability.

Key cross-cutting activities included demonstration trials, water quality monitoring technical support, which together strengthened the coherence of the program and contributed to critical behavioural, technical, economic, and environmental goals.

The success of the Program is reflected by the over 82 sugarcane farmers who improved nutrient management practices, positively impacting over 11,000 hectares of sugarcane production land.

Thanks to this collective effort, the program achieved reductions of more than 9 tonnes of DIN improving catchment water quality, and environmental sustainability outcomes.



Great Barrier
Reef Foundation



CANEGROWERS
CAIRNS REGION



“Technology is helping farmers to be more precise and get a better understanding of what is happening on their farm.”

Farmacist Extension Leader Belinda Billing



Achievements



800

soil samples to better understand local variability



3,500

ha of electromagnetic (EM) mapping



82

canegrowers making management practice changes



5

drainage intervention sites across 3,000ha



8

realtime water quality monitoring sites

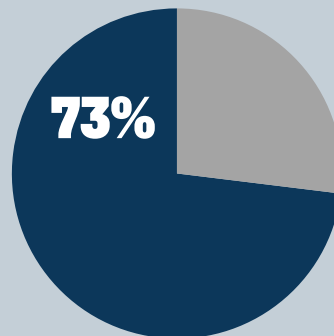
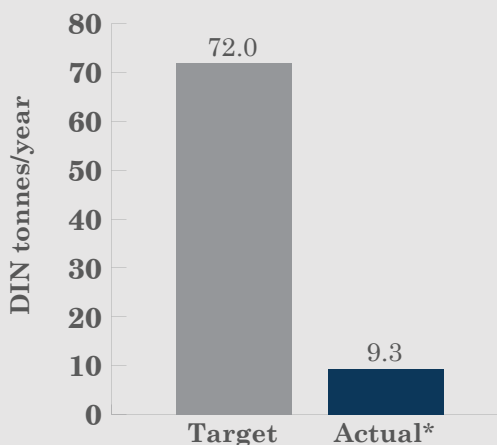


11,000

ha of cane under changing management practices

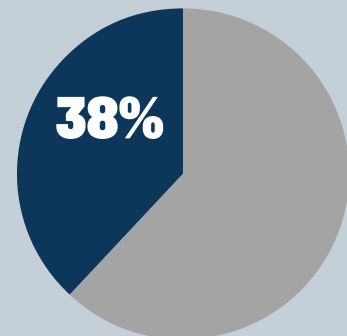
PROGRAM IMPACTS ON THE MULGRAVE-RUSSELL

Progress against DIN reduction targets



Ha of improved practices

Improved practices recorded across nearly three quarters of the cane production area



Growers taking direct action

Improved practices recorded across more than one third of all regional cane growers

*It was identified early that there would be a significant short-fall in the regional-level DIN target set by the [Alluvium Report](#) due to limitations with the original investment scenario and the P2R projector tool when estimating DIN associated with precision agriculture practices and nitrogen use efficiency.



“We are reclaiming a drained lagoon system to catch the first flush diverting off-farm water and sediment into the lagoon.”

FNQ canegrower Barry Stubbs

Mulgrave-Russell Water Quality program

*Priority
catchments*



Program Model

Governance arrangements for the program ensured projects delivering on the ground reported directly to the Foundation while also being supported by a regional program manager and partnership coordinator.

This model has increased transparency of outcomes and agility to manage contractual commitments while providing access to local support to manage risk, coordinate activities, identify synergies, and promote the program to the wider regional audience.

A key role of the regional program manager and partnership coordinator was to oversee the program's spatial reporting dashboard, which allowed checking for historical overlaps, vetting of farm-level projects to ensure adoption of practices not previously funded, and tracking of progress towards targets.

The program manager and partnership coordinator reported directly to a regional steering committee made up of key stakeholders including CANEGROWERS Cairns, the Reef and Rainforest Research Centre, the Queensland Government's Office of the Great Barrier Reef, and the Foundation.

The steering committee was supported by a Technical Advisory Group and the Water Quality Working Group, which provided technical and strategic advice across the whole of the Partnership Water Quality Program.

The design of the governance model recognised the importance of independent local leadership and oversight, as well as strategic and technical guidance and collaboration.

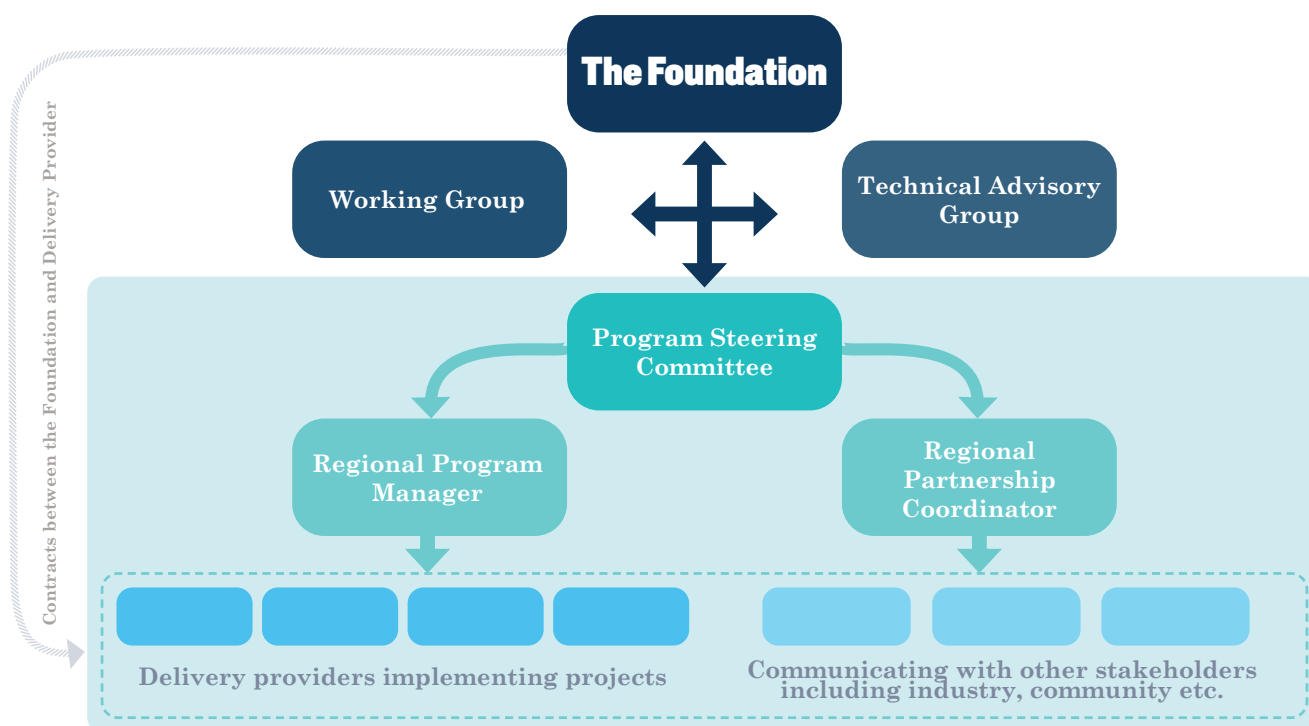
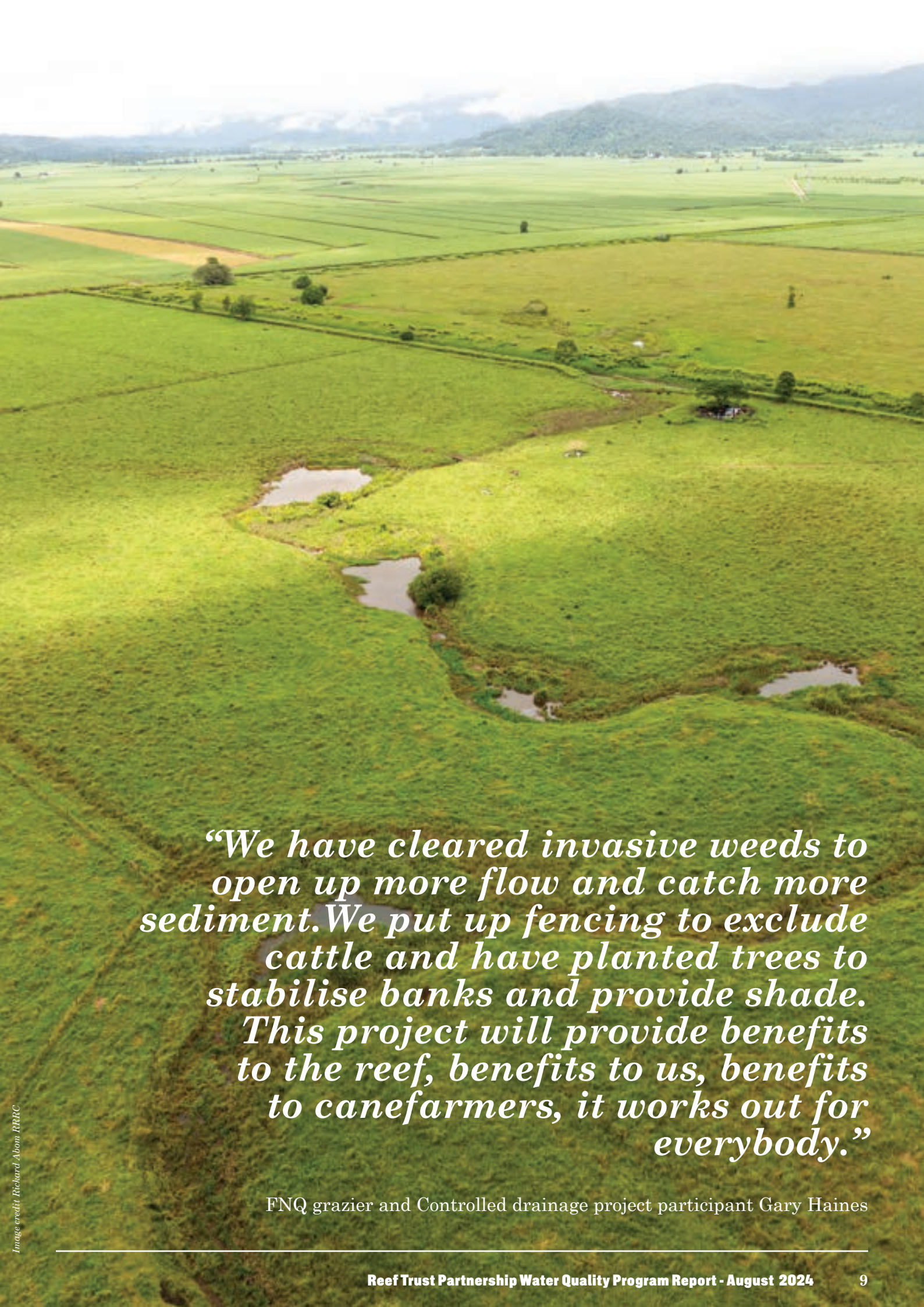


Figure 1 Reef Trust Partnership Mulgrave-Russell Water Quality Program governance model

An aerial photograph of a lush green landscape. A winding waterway, possibly a stream or a series of small ponds, flows through the center of the image. The surrounding land is covered in vibrant green vegetation, likely grass or low-lying plants. In the background, there are rolling hills and mountains under a cloudy sky. The overall scene depicts a natural, undisturbed environment.

“We have cleared invasive weeds to open up more flow and catch more sediment. We put up fencing to exclude cattle and have planted trees to stabilise banks and provide shade. This project will provide benefits to the reef, benefits to us, benefits to canefarmers, it works out for everybody.”

FNQ grazier and Controlled drainage project participant Gary Haines

Funded Projects

PRECISION TO DECISION NUTRIENT MANAGEMENT



Farmacist's Precision to Decision Nutrient Management project provided farmers with agronomic support and increased access to the critical data required for precision agriculture.

Satellite yield analysis was undertaken by the University of New England to identify variability in crop performance. Agronomists worked with growers to understand the source of the yield variance between and within blocks. Electromagnetic (EM) soil mapping was completed on 3,500 hectares, and yield variability maps with supporting soil and tissue sampling were developed. Nine nitrogen rate trials tested and validated the precision application of nitrogen.

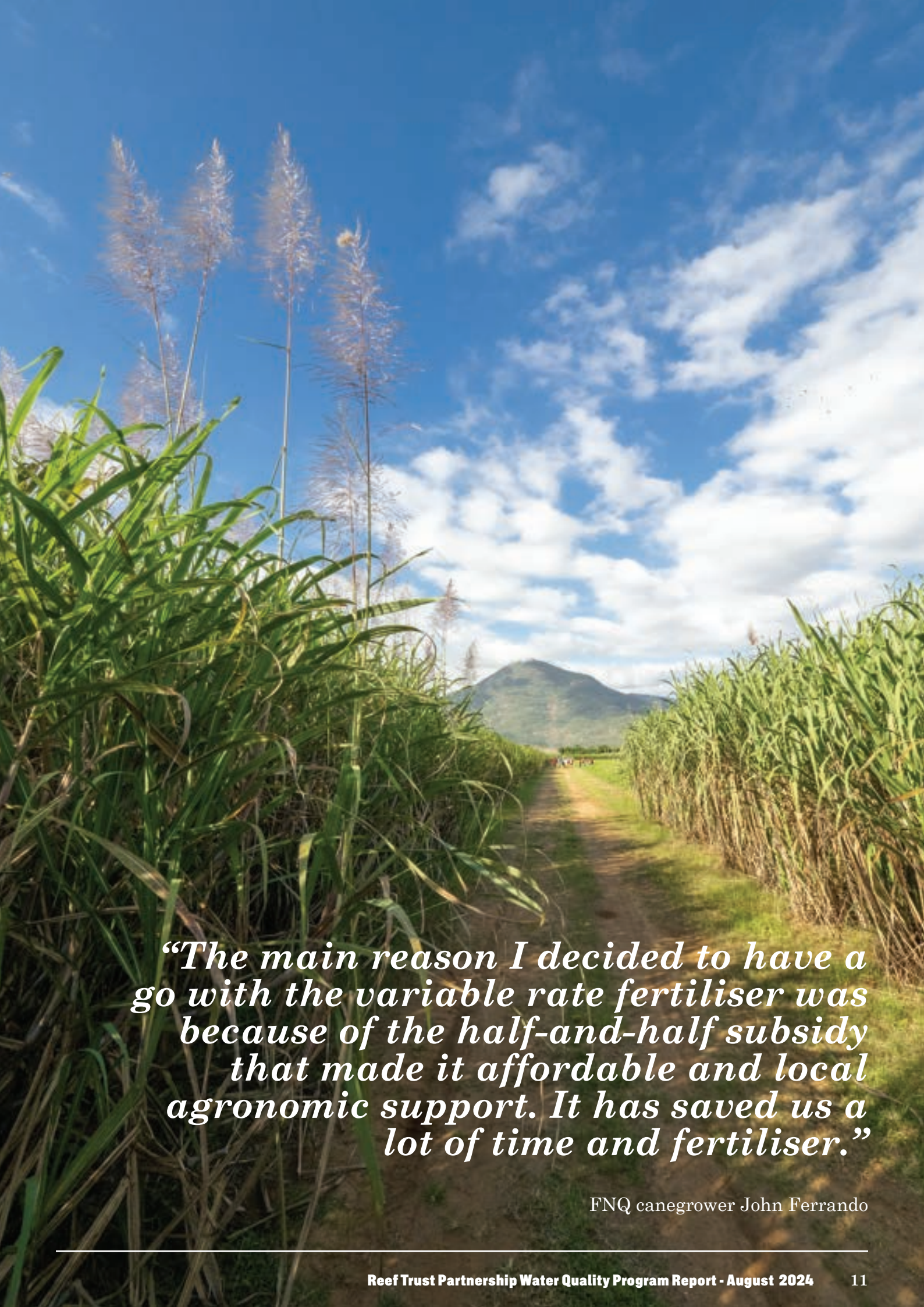
Between 2021 and 2024, 82 farmers worked with agronomists to develop and implement sophisticated precision nutrient management plans across 11,000 hectares that contributed to reduced costs, increased productivity, and improved the quality of the water running off their farms.

WATER QUALITY MONITORING AND CONTROLLED DRAINAGE

The James Cook University Centre for Tropical Water and Aquatic Ecosystem Research (JCU TropWATER) project delivered a dynamic, interactive water quality monitoring and extension program at the paddock and catchment-scale. Farmers were empowered to engage in participatory monitoring and make positive changes to reduce runoff on their land. This has led to improved rapport, credibility and mutual understanding between scientists, farmers, and agronomists.

Water quality monitoring of upper catchment rainforest areas and those of intensive agriculture has demonstrated linkages with elevated nitrate-N concentrations from farm runoff, and shown how the first major wet season rainfall events are a key driver of DIN loss from sugarcane farms. DIN hot spots were identified and targeted drainage systems have been constructed to retain, divert and treat runoff.





“The main reason I decided to have a go with the variable rate fertiliser was because of the half-and-half subsidy that made it affordable and local agronomic support. It has saved us a lot of time and fertiliser.”

FNQ canegrower John Ferrando



Variable rate application

Cane grower David Lauridsen is trialing variable rate nutrient application across different soil types on his Far North Queensland farm. He said, “It is good that Farmacist helped us set the nutrient rates and calibrate our nitrogen application. We will be happy to see at what level we get good sugar cane production, where we are not putting on too much or not enough (nitrogen).”

Farmacist’s Will Higham said the purpose of David’s trial was to understand if sugarcane responds differently in different soil types and with different nitrogen rates. “Is the sugarcane growing bigger in one soil type compared to others?”

David reflected that significant progress that has been made in the Russell-Mulgrave catchment over the years, “Farmers today are aware of the place where they are farming (close to the coast), many have some sort of silt trap to catch water before it leaves the farm. There is a lot cleaner water leaving sugar cane farms today,” he said.

Keeping water on the farm

Aloomba canegrower Paul Rossi was keen to make sure that any money he invested in things like gypsum and dolomite to improve his soil health stayed on the paddock and did not make its way into local waterways.

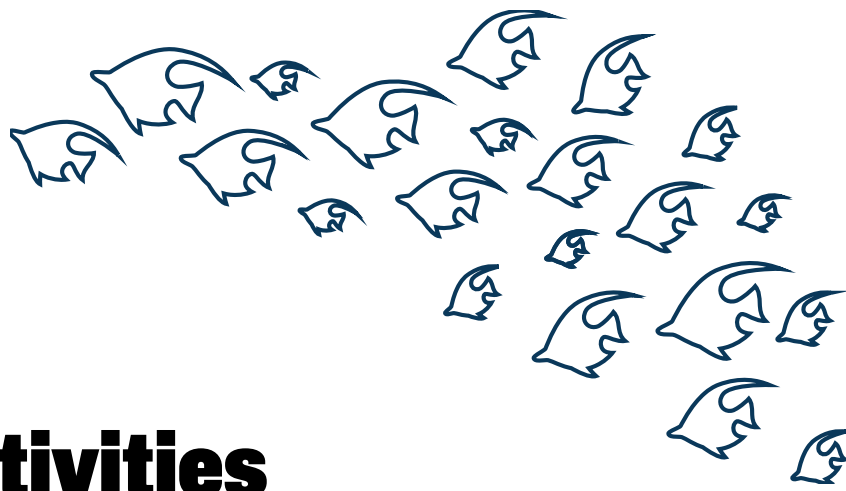
“We could see a problem where we have slight gradients on lighter soil types. During the fallows we typically grow peanuts which provide good cover but in the following plant cane crop we have bare soil and there is a risk of sediment moving off those paddocks with heavy rainfall events, even though these soils have high water holding capacity,” said Paul.

Paul modified his headland and installed a bund wall to contain potential runoff and better manage his nutrients and sediment. “Giving the water time to settle allows the nutrients and sediment to settle and fall out of suspension. When the water is full, it will trickle over slowly. Most of the storm water is now pretty much contained in the ≈40-acre paddock area,” he said.



“Farmers today are aware of the place where they are farming (close to the coast), many have some sort of silt trap to catch water before it leaves the farm. There is a lot cleaner water leaving sugar cane farms today.”

Cane grower David Lauridsen



Cross-cutting activities

Independent verification and engagement

On-ground projects were independently verified to ensure the extent, quality, and accuracy of reporting in the spatial dashboard. The process provided the unique opportunity for growers to share their experiences participating in the program first-hand, while facilitating communication between growers, delivery providers and funders. This included discussion on communication and engagement, effectiveness and extent of practice change and legacy outcomes relating to the program.

Innovative Technology

AutoWeed is an innovative technology, developed for herbicide application on sugarcane farms, that uses robotic spot spraying to directly target weeds rather than the current-best-practice blanket spraying method.

The Partnership-funded innovation project conducted trials over 108 hectares in Reef catchments, demonstrated that AutoWeed is 96 per cent as effective as traditional methods in weed knockdown while reducing herbicide usage by an average of 44 per cent. [Read more about AutoWeed.](#)

Water Quality Monitoring Support and Communication

The JCU TropWATER team supported delivery providers to improve the design and implementation of paddock-scale water quality monitoring, to ensure activities were consistent and fit-for-purpose.

Scientific expertise from leading water quality researchers was combined with strategies from science communication specialists. Key messages around common water quality questions were developed to improve understanding and knowledge for growers and extension staff. Support and training were provided across regions for the interpretation and communication of water quality results to growers.

“Re-connecting floodplain lagoons, capturing, and treating first flushes from agricultural areas, revegetating historically cleared riparian zones, and better managing stock access and use of waterways provides a range of water quality, biodiversity, and cultural benefits.”

TropWATER Principal Research Scientist Aaron Davis



Learnings

1. Building on the foundation of previous programs and collaboration between regional providers to leverage existing networks was critical to effective grower engagement across the Mulgrave and Russell catchments.
2. Bringing together small groups of growers enabled sub catchment-specific peer-to-peer learning which benefited young growers and those new to the industry.
3. A functional governance structure tailored to the program provided transparency and accountability of the on-ground delivery by effectively tracking progress as well as tangible support to delivery providers by swiftly addressing any risks or issues identified during the delivery of the program.
4. Maintaining a real-time spatial data platform coupled with on-ground verification provided transparency of on-ground actions and allowed effective and real-time reporting of water quality improvements to stakeholders, including funders, industry, and the community, over the duration of the program.
5. The localised water quality monitoring program delivered a substantial improvement in grower's trust in science. Real-time water quality and quantity monitoring data enabled timely discussions between scientists and farmers for the adoption of management practices that save money and reduce DIN losses.

Learnings

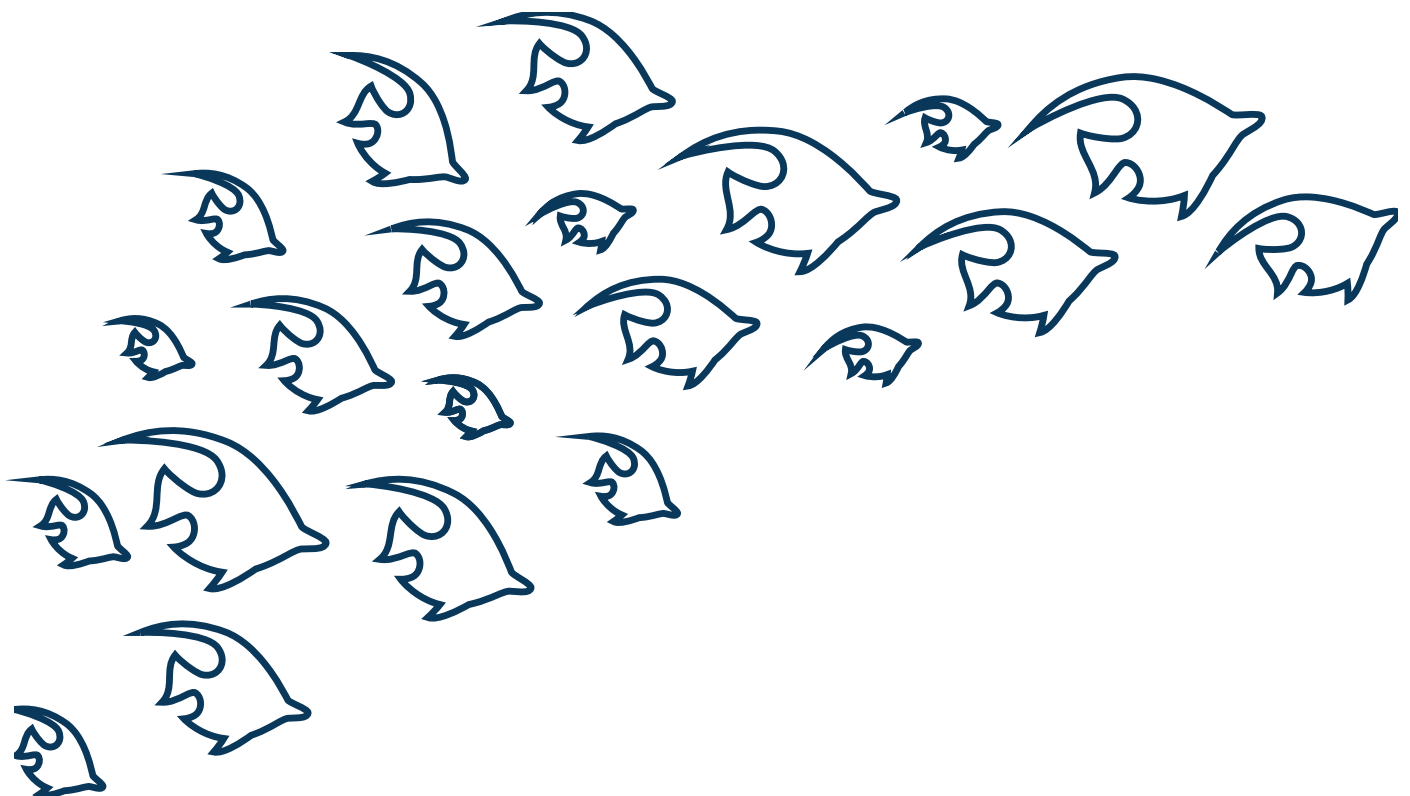
6. Water quality monitoring as an engagement tool must be designed to fit the purpose and communicated back to growers in a meaningful way. Technical expertise has been critical to ensure water quality data empowers collective action to meet both environmental and productivity needs. Specific training for increased knowledge across the variety of fertiliser products available will support growers to evaluate their necessity in their farming system. Growers need to be empowered to effectively communicate their fertiliser preferences to resellers.
7. Decision support system access and the ability to store farm soil, and production data for easy long-term monitoring of performance has increased digital literacy and grower confidence in decision making.
8. The combination of agronomic and technical support has together promoted rapid adoption of practices and further accelerated progress to water quality targets.
9. The provision of support can create the ‘lightbulb’ moment that drives the win-win outcomes for farmers and the Reef. Farmers who established drainage interventions through the Program quickly saw the benefits and have since explored further interventions on their farms. One collaborating farmer has now installed two separate, and quite functionally different, drainage interventions on different farms in the Mulgrave-Behana area.
10. There is a strong regional demand for ongoing technical support for drainage management intervention. Word-of-mouth has driven unsolicited approaches from canefarmers requesting appraisal and advice for appropriate controlled drainage interventions suitable for individual properties.

Summary

Over the three years of the RTP Water Quality Program, 82 sugarcane farmers improved nutrient management practices increasing the productivity and sustainability of over 11,000 hectares of sugarcane growing land in the Mulgrave-Russell region. The combination of agronomic extension, water quality monitoring and drainage intervention support with a suite of additional cross-cutting activities enhanced the outcomes achieved through the Program.

Grower engagement was driven by leveraging regional connections and networks to address sub catchment-specific challenges. Transparency and accountability were delivered through a regional-specific governance model. Real-time data of on-ground actions provided timely and public progress towards pollutant reduction targets. Water quality monitoring and timely communication enabled practice change adoption. Technical support accelerated on-ground management changes. Digital literacy increased through the use of new data platforms for nutrient planning and management. Drainage intervention sites delivered a strong demand for technical support across the region.

The combination of all the above has contributed to the Program achieving a reduction of more than 9 tonnes of DIN per year. This has resulted in a more sustainable sugar industry and a better water quality in the local waterways and the Great Barrier Reef lagoon.





Acknowledgements

Reef Traditional Owners have been caring for land and sea Country for more than 60,000 years, using Traditional Knowledge passed down through ancestral lines for millennia.

The Great Barrier Reef Foundation extends its deepest respect and recognition to all Traditional Owners of the Great Barrier Reef and its Catchments, as First Nations People, holding the hopes, dreams, traditions, and cultures of the Reef.

The Mulgrave Russell Regional Water Quality Program was funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation.



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