

LOWER BURDEKIN WATER QUALITY PROGRAM

Achievements and learnings

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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).



Image courtesy of Farmforest

Lower Burdekin Water Quality Program

The Lower Burdekin Water Quality Program was one of ten regional water quality programs delivered under the Partnership between 2020 and 2024. Through the adoption of improved irrigation, nutrient and pesticide management practices, this \$18 Million program aimed to prevent 48 tonnes of dissolved inorganic nitrogen and 576,809 Risk Units of pesticides that are lost from sugarcane land from entering the Reef's waters every year.

The Lower Burdekin catchment covers 14,500 square kilometres in the Dry Tropics of Queensland, to the south of Townsville. The Burdekin is Queensland's largest sugarcane producing area and is highly reliant on irrigation. The catchment supports an irrigation scheme for tens of thousands of hectares of sugarcane agriculture in the downstream areas of the Burdekin River.

The WQIP identified the reduction of Dissolved Inorganic Nitrogen (DIN) and pesticide as priority for the region. The four-year Lower Burdekin Water Quality Program (the Program) was led by four organisations implementing four on-ground projects, each with its own pollutant reduction target.

Projects tracked their progress to targets using the Paddock to Reef ([P2R](#)) Projector Tool for DIN which estimates water quality improvements based on a reported change in the management practices by farmers.

A [Pesticide Decision Support Tool](#) based on toxicity and mobility was used to assess waterway risk from pesticide use, providing an output in nominal waterway Risk Units (RU) based on the selection of pesticide.

Program activities focused on improved fertiliser, pesticide and irrigation management including demonstration trials, financial incentives, and tailored agronomic extension support, working one-on-one with growers to reduce losses at the end of catchment.

Cross-cutting activities included the development of new tools and technologies, and water quality monitoring technical and communications support, which together strengthened the coherence of the program and contributed to technical, economic, and environmental goals.

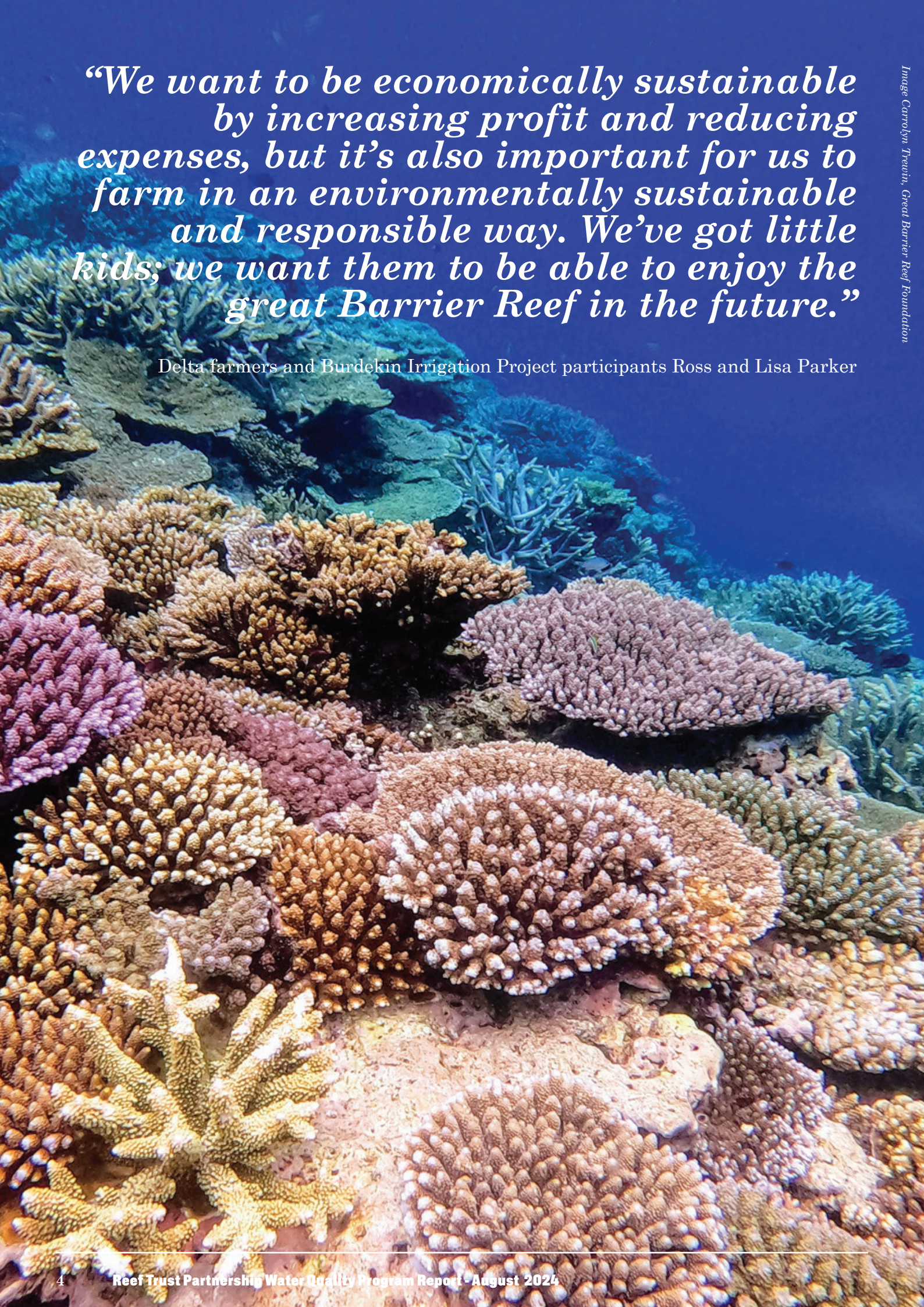
The success of the Program is reflected by the engagement of more than 200 growers over four years who improved nutrient, pesticide, and irrigation management practices, positively impacting 30,569 hectares of land.

This collective effort has achieved reductions of more than 49 tonnes of DIN per year and 1.6 million Risk Units per hectare of pesticides, exceeding the Program targets while maintaining or improving productivity for engaged growers.



“We want to be economically sustainable by increasing profit and reducing expenses, but it’s also important for us to farm in an environmentally sustainable and responsible way. We’ve got little kids; we want them to be able to enjoy the great Barrier Reef in the future.”

Delta farmers and Burdekin Irrigation Project participants Ross and Lisa Parker



Achievements



30,569

hectares of cane under changing management



200+

Growers engaged in improved management practices



280

nutrient management plans and nutrient budgets



200

soil tests to understand variability for management



40+

irrigation management plans for improved efficiency

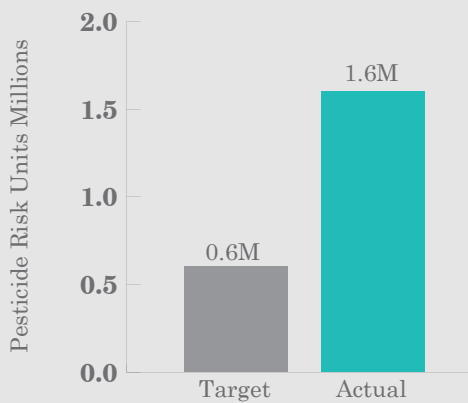


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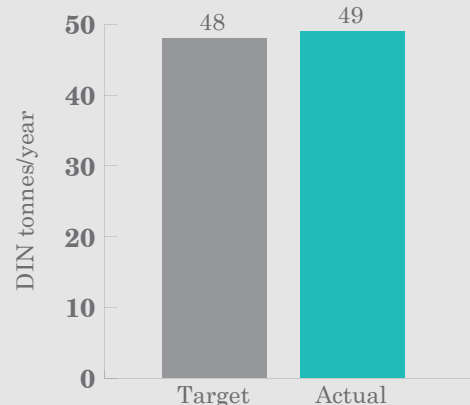
water quality samples to measure impacts of changing practices

PROGRAM IMPACTS ON THE LOWER BURDEKIN CATCHMENT

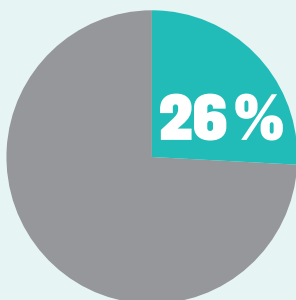
Progress against Pesticide RU reduction targets*



Progress against DIN reduction targets

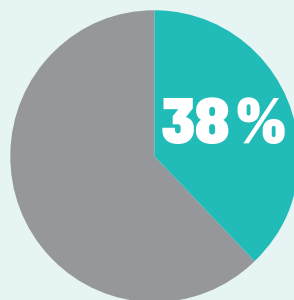


*A pesticide decision support tool, based on toxicity rather than quantity, was developed as a more appropriate method for assessing waterway risk from pesticide use which provides an output in nominal waterways Risk Units (RU).



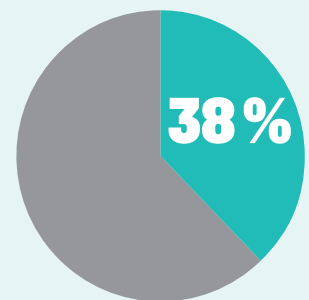
Reduction of Pesticide Risk

Reduced risk recorded by over a quarter of original risk in local waterways



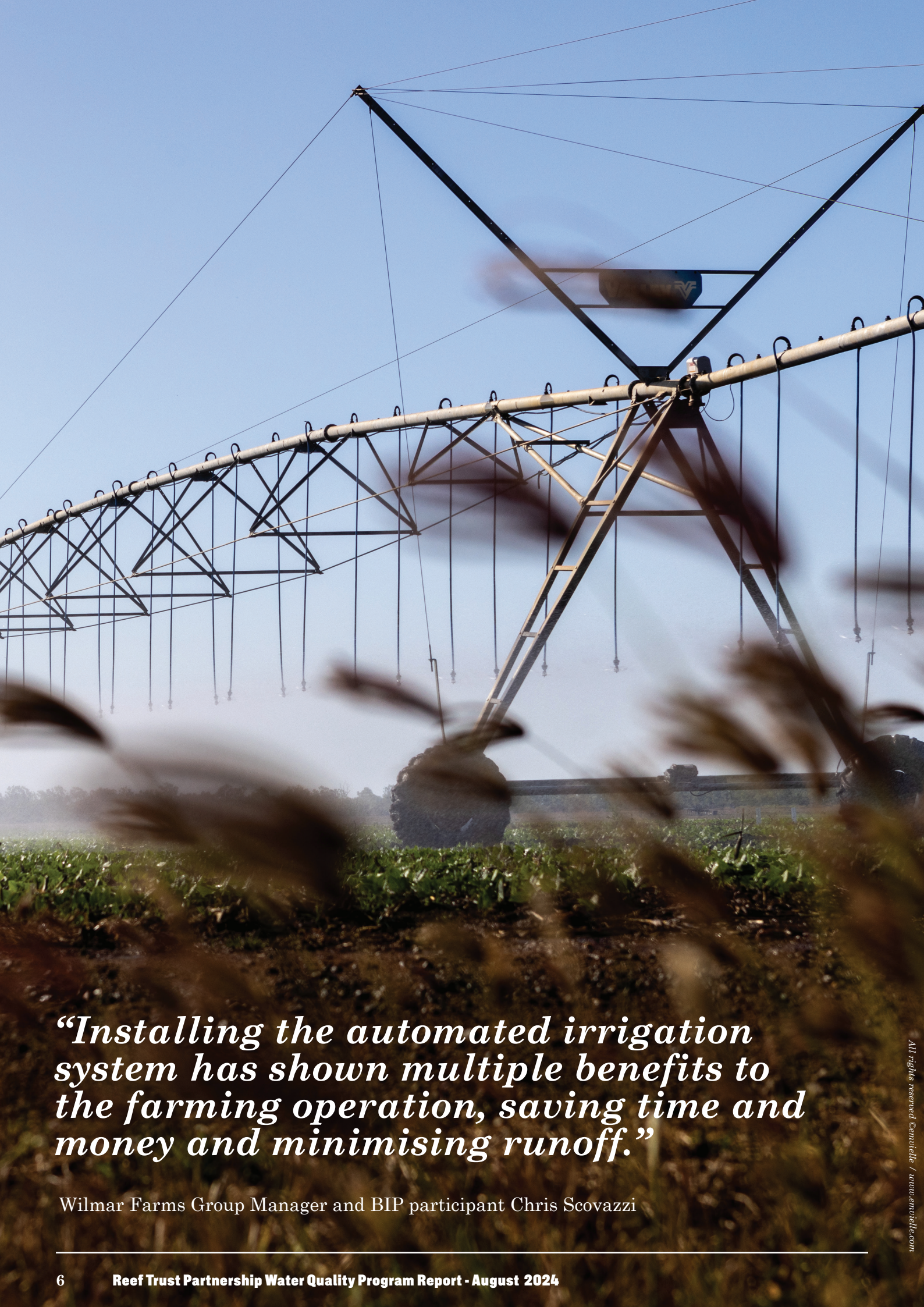
Hectares of improved practices

Improved practices recorded across over one third of the available canefarming land



Growers taking direct action

Improved practices recorded across over one third of all growers in the region

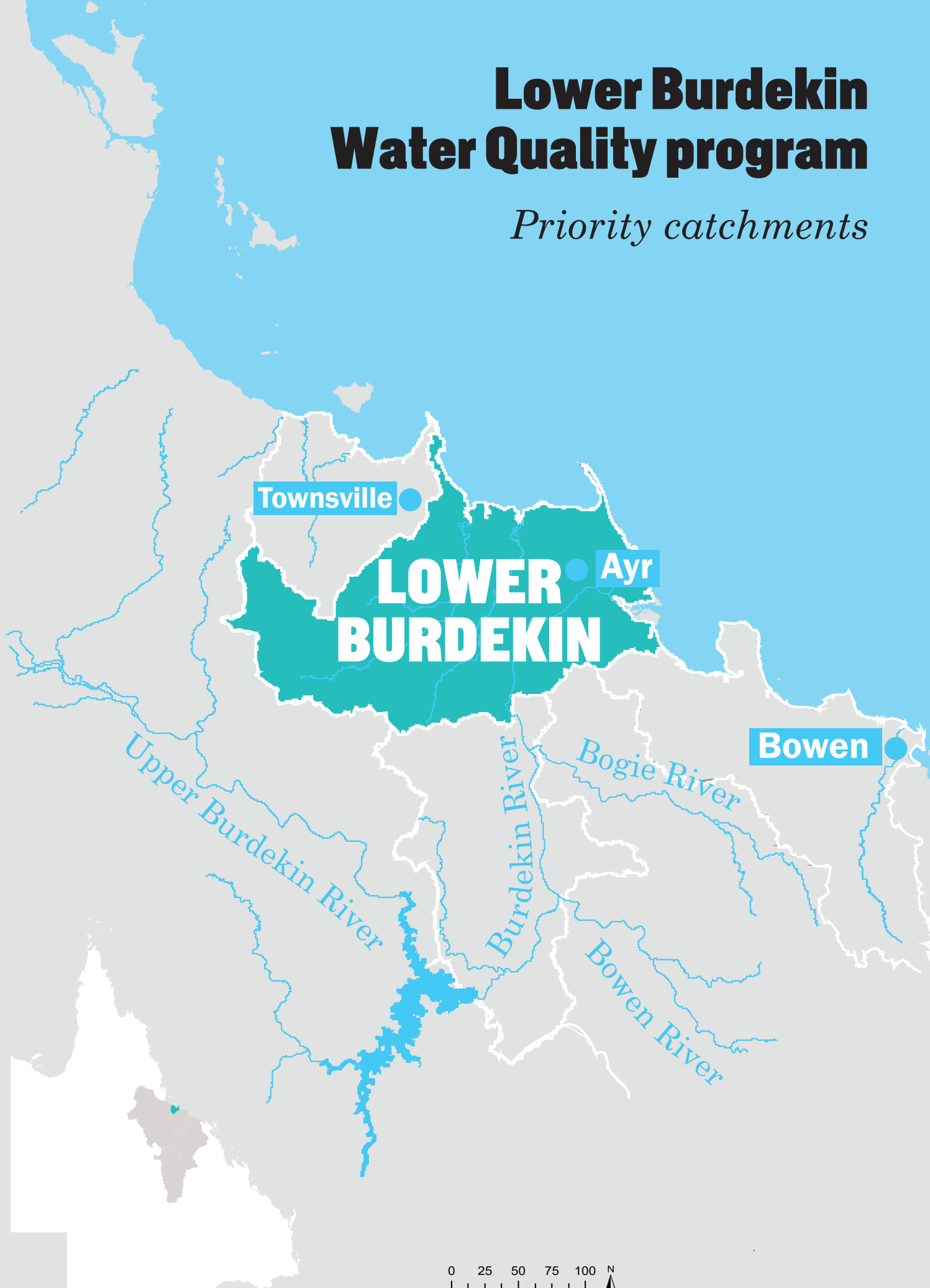


“Installing the automated irrigation system has shown multiple benefits to the farming operation, saving time and money and minimising runoff.”

Wilmar Farms Group Manager and BIP participant Chris Scovazzi

Lower Burdekin 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 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 pollutant reduction targets.

The program manager and partnership coordinator roles were undertaken by the regional NRM Group NQ Dry Tropics who reported directly to a regional steering committee made up of key stakeholders including NQ Dry Tropics, C20 Consulting, 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 RTP 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.

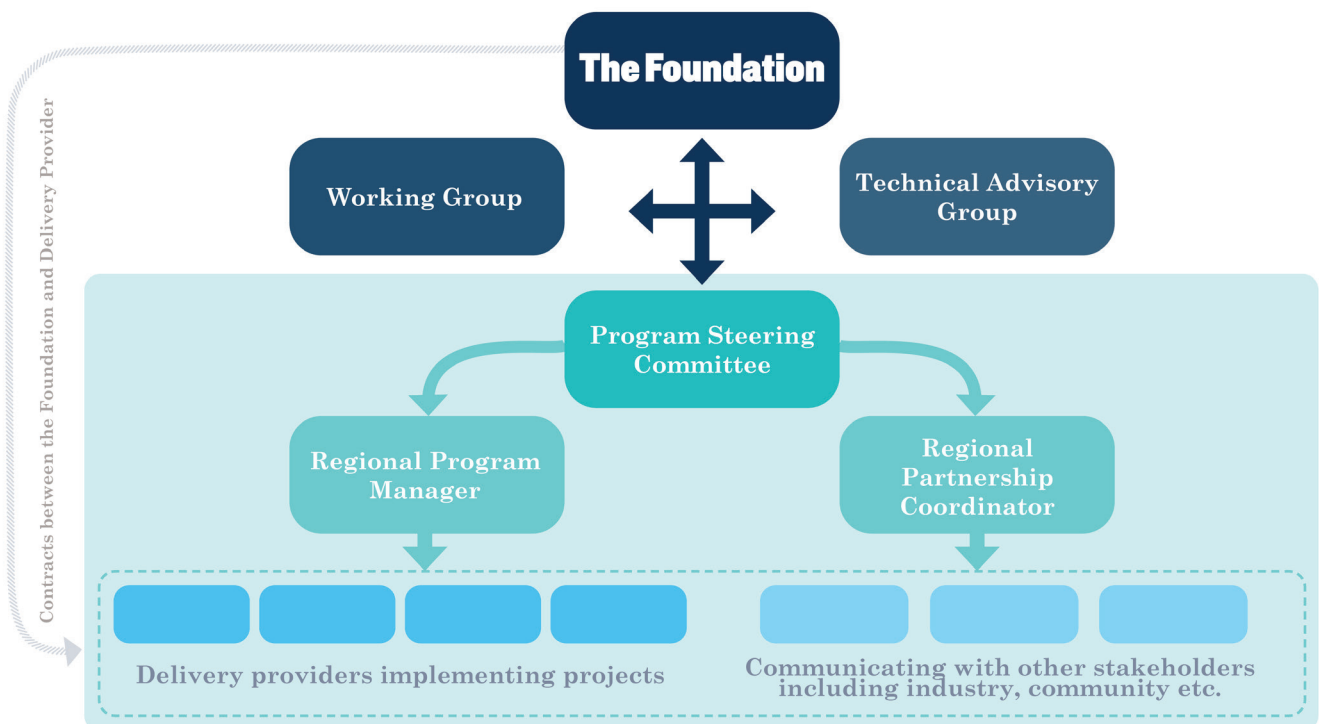
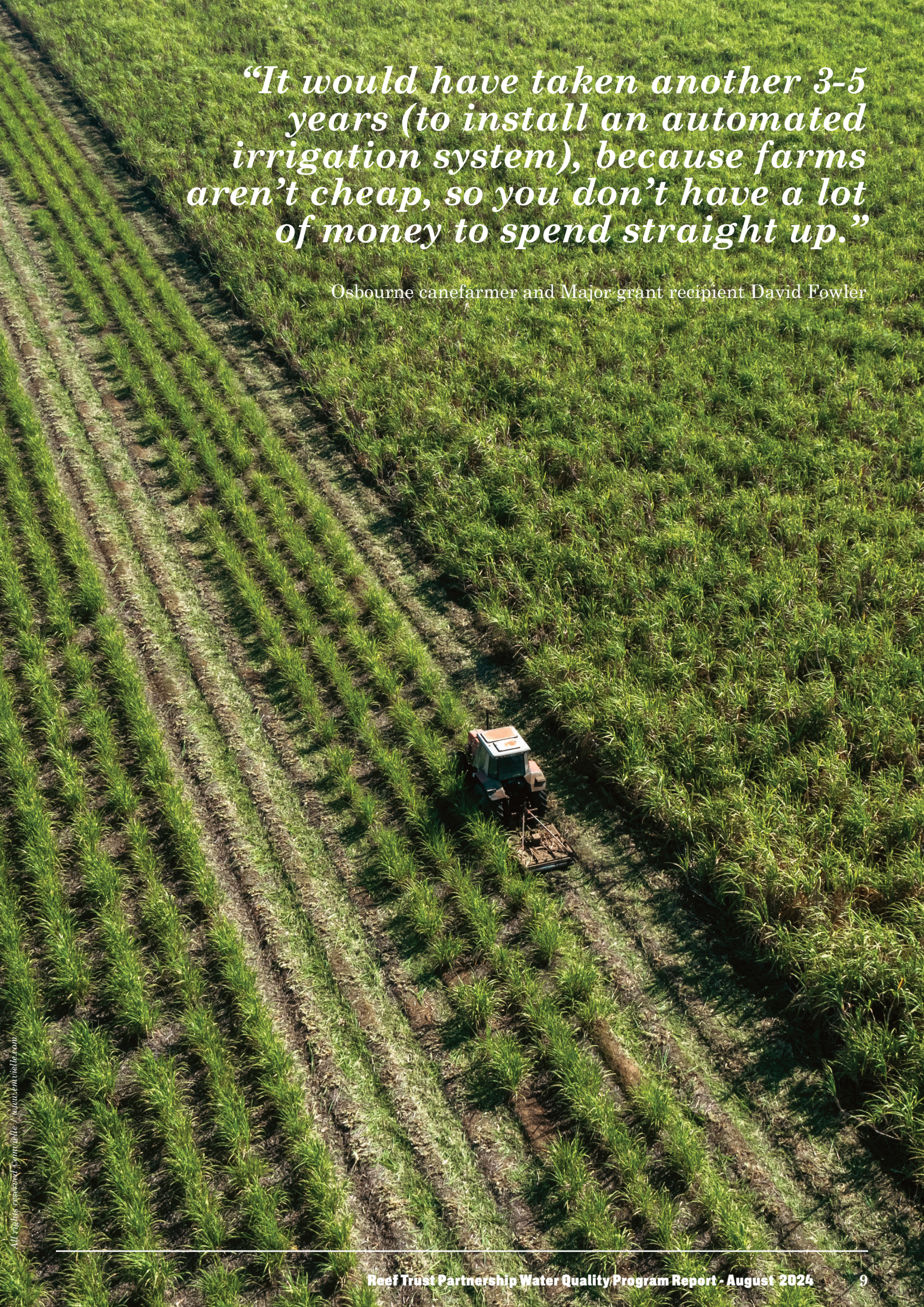


Figure 1. Reef Trust Partnership Lower Burdekin Water Quality Program governance model

An aerial photograph of a vast sugarcane field. The rows of green sugarcane plants are neatly spaced and stretch across the landscape. In the lower-middle section of the field, a small tractor is visible, likely used for maintenance or irrigation. The lighting is bright, casting soft shadows between the rows of plants.

“It would have taken another 3-5 years (to install an automated irrigation system), because farms aren’t cheap, so you don’t have a lot of money to spend straight up.”

Osbourne canefarmer and Major grant recipient David Fowler

Funded Projects



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BURDEKIN IRRIGATION PROJECT

Sugar Research Australia led a consortium (Agritech Solutions, Burdekin Productivity Services, Burdekin Bowen Integrated Floodplain Management Advisory Committee Inc., Queensland Department of Agriculture and Fisheries, Farmacist, and James Cook University) that supported 63 sugarcane farmers to implement improved irrigation technologies, including full automation, across 6,987 hectares of land.

The transition to more efficient irrigation practices saved time, reduced costs, and minimised runoff losses, while improving productivity and profitability. Participating farmers contributed over \$680,000 towards the cost of improved irrigation.

Water quality monitoring validated the impacts of improved irrigation practices at 16 sites. Demonstration sites showcased irrigation technologies and practices used to reduce runoff and deep drainage. Economic case studies demonstrated the benefits to key stakeholders.

MAJOR GRANTS PROJECT

NQ Dry Tropics administered financial incentives for on-ground actions to achieve reductions in nutrients and pesticides, and improve irrigation efficiency.

Supported by Sugar Research Australia, Farmacist and Aglantis, 33 growers improved management practices on their farm. Over \$1 Million was invested in incentive grants and farmers invested over \$1.2 Million of their own money.

Additional improvements in irrigation technology, nutrient management practices and precision agriculture included the use of Stool Zippas to reduce fertiliser and chemical run off, GPS guidance and rate control for more precise application and recording of nutrients and pesticide, modems for accurate and trouble-free data collection and management, and improved water use efficiency through the adoption of automated irrigation technology and infield scheduling tools.



Funded Projects

PROJECT BLUEWATER 2

Farmacist supported 169 Burdekin sugarcane farmers to improve pesticide management practices across 19,415 hectares to reduce the most toxic pesticides from entering the local waterways.

Expert agronomic advice and support was provided to develop 75 tailored pesticide management plans, complete 6 pesticide trials, collect 140 water samples, deliver 100 calibration kits, and rebuild 20 spray booms to improve, efficiency and accuracy of appropriate pesticide application. Participating farmers contributed over \$1 million towards pesticide management activities.



PRECISION TO DECISION

Farmacist supported 60 sugarcane farmers on 103 farms across 13,066 hectares to better understand soil and yield variability, crop limitations and use precision agricultural techniques.

Project outcomes include 280 nutrient management plans and budgets, 58 calibrated fertiliser boxes, 10,413 hectares of electromagnetic soil mapping, 200 soil tests, and 200 water tests and 12 industry events to guide nutrient planning and management to reduce losses through runoff.

Participating farmers contributed over \$670,000 and have the tools and confidence to make informed decisions into the future.



XXXX BURDEKIN SMART IRRIGATION PROJECT


The XXXX Burdekin Smart Irrigation Project is funded through a partnership between Lion Corporate and the Great Barrier Reef Foundation.

Complimenting the Burdekin Irrigation Project, this project is supporting irrigators to adopt smart irrigation technology across over more than 800 hectares. The project is on track to deliver an annual estimated end of paddock reduction of 1,000kg of DIN, and over 7,000 megalitres of water, 250,000 kilowatt-hours of energy and 140 tonnes of carbon dioxide.

Famers are exploring innovative irrigation solutions, maximising benefits to their enterprise and improving water quality.



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“I’m a fifth-generation sugarcane farmer, and I’d like my boys to be the sixth, so we need to make the future a good place for them.”

Osbourne canefarmer and Major grant recipient David Fowler



Cross-cutting activities

Water Quality Monitoring Support and Communication

The JCU TropWATER project 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.

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.

Autoweed

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

The Partnership-funded innovation project conducted trials over 108 hectares, 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.

Pesticide Decision Support Tool

Through Project Bluewater 2, a [Pesticide Decision Support Tool](#), based on toxicity and mobility, rather than quantity, was developed to guide the selection of less environmentally harmful pesticides for the sugarcane industry. The tool will be available for use across Reef catchments to assist canegrowers with the selection and use of pesticides that pose a lower risk to aquatic environments.

Irrigation Rapid Assessment Tool

The I-RAT allows farmers to compare different irrigation scenarios promoting the adoption of scientifically defensible, practical and superior irrigation solutions. Outcomes of improved irrigation practices include increased profitability and productivity, and reduced runoff for better water quality.



Learnings

1. Irrigation is the key driver of water quality risk in the Burdekin; nitrogen management only becomes relevant when irrigation efficiency has been addressed.
2. The demand for automated irrigation technology was much higher than anticipated. There is considerable potential for future large-scale automated irrigation transitions across the region, for continued positive water quality outcomes. Provision of ongoing agronomic and technical support will be critical for this to be successful.
3. Appropriately resourced local-scale water quality monitoring plays an important role in demonstrating to farmers how improved land management practices can benefit water quality. The incorporation of water quality monitoring support and guidance from reputable scientific practitioners is critical, to ensure that monitoring programs provide rigorous and consistent data, with useful outcomes that are effectively communicated to farmers.
4. Contradictory advice to farmers from chemical resellers continues to be a challenge for the sugarcane industry. This has implications for water quality improvement, and continuity of pesticide extension support is critical. Future investment should focus on education and involvement of resellers, subcontractors and the harvesting and planting sector to improve awareness and messaging about best-management practice for chemical products.

Learnings

5. The legacy of water quality programs subsidising growers has impacted the willingness of growers to pay a fee for agronomic support. Future programs should incorporate cost-sharing to encourage the transition to a more sustainable fee-for-service extension approach.
6. The combination of agronomic and technical support together combined with and access to financial incentives through major grants have together promoted rapid adoption of practices and further accelerated progress to water quality targets.
7. 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.
8. 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.





Summary

Over the four years of the Reef Trust Partnership Water Quality Program, more than 200 sugarcane farmers improved irrigation, nutrient and pesticide management practices increasing the productivity and sustainability of over 30,569 hectares of sugarcane growing land in the Lower Burdekin region.

The broad range of delivery providers supported the four projects providing different approaches to suit all growers. Financial incentives removed the financial barriers to the timely adoption of best management practices. Water quality monitoring validated the impacts of improved irrigation practices on water quality. Demonstration sites showcased irrigation technologies and management practices used to reduce runoff and deep drainage. Economic case studies communicated the significant benefits of improved irrigation practices to key stakeholders. Precision agricultural techniques and a better understanding of soil variability within blocks drove better nutrient management practices, and tailored pesticide management plans and advice resulted in a 26 per cent reduction in pesticide risk in local waterways.

A suite of additional cross-cutting activities enhanced the outcomes achieved through the Program, while corporate funding supported complimentary additions to Partnership-funded projects. 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. A robust and independent verification process of on-ground projects has contributed to strengthened regional stewardship and enduring outcomes.

The combination of the above has contributed to the Program exceeding its original pollutant reduction targets with more than 49 tonnes of DIN and more than 1.6 million Risk Units of pesticide per year reduced. This has resulted in a more sustainable Burdekin sugar industry and better water quality in 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 Lower Burdekin 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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