Sugar Research Australia

Cane Matters

Spring 2024

CONTENTS

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(Cover page) Senior Plant Breeding Technician Far North, Vivien Dunne at SRA's Meringa Station, south of Cairns using binoculars to choose flowers of sugarcane parents that are ready to be crossed with another complementary parent. Seeds created from this crossing process will be used to hopefully create a new sugarcane variety that will be developed and approved – generally a 13 year process - as part of SRA's Variety Development program.

Editorial contributions by Sonia Campbell (Editor), Christine Walker, Alisa Cork and Mike Ebner. Design by Eli Lin.

Acknowledgements: *SRA acknowledges and thanks its investors, including levy payers (sugarcane growers and millers), the Commonwealth Government and the Queensland Government.*

Queensland Government

Australian Government
Department of Agriculture, Fisheries and Forestry

A MESSAGE *from **Acting CEO, Hywel Cook***

As we enter the final quarter of 2024, our industry, whilst on the precipice of amazing discoveries, continues to face significant challenges.

The harvest season has been anything but smooth, with unseasonal rainfall across the industry and industrial action at several mills creating persistent planting, harvesting and crushing delays.

Another issue facing the industry is the Australian Pesticides and Veterinary Medicines Authority's (APVMA) proposed restriction on paraquat herbicide use in sugarcane. These changes could have a profound impact on growers, and in collaboration with industry, we are gathering feedback. Please complete the survey emailed to all growers to help shape our response during the consultation phase (you can read more about SRA's response on Page 5).

The 10th Anniversary Research funding call will be finalised by the end of September and recipients notified in October. The projects awarded represent an exciting and wide range of solutions and potential impacts for decades to come for the sugarcane industry.

In other exciting news, construction has commenced on the new home of Brisbane's Research Laboratory which is relocating to Acacia Ridge in late September. A farewell to the Indooroopilly lab that has been home since 1962 was held on 30 August. Thank you to all staff involved in the transition to the new facility.

Your vote is encouraged at our Annual General Meeting in Brisbane on Tuesday, 26 November. Invitations will be mailed to all members with details on how you can participate and vote (online or in person). If you're a grower but not yet a member, I encourage you to register—it's free and ensures your voice is heard. More information can be found on our website.

If your details have changed, please email sra@sugarresearch.com.au.

And finally, the SRA Annual Report will be released in time for the AGM, and made available to all members, levy payers, and industry stakeholders.

Wishing you all well for the remainder of the season.

Hywel Cook
Acting Chief Executive Officer

SRA'S AGM

SRA's 2024 Annual General Meeting (AGM) will be held on 26 November.

The AGM is an opportunity for members to participate, ask questions and vote on new Board of Directors' positions.

This year's AGM will see the appointment of a new Chair, with Rowena McNally stepping down. Two non-executive directors will also be voted in.

When: 10:00am (AEST) Tues 26 November 2024.

Where: The AGM will again be held as a 'hybrid' meeting, which means members will be able to attend in person at SRA's Head Office in Brisbane, or virtually through an online platform.

Voting before the AGM

If you are an SRA member or member representative you will receive voting forms prior to the AGM. All SRA members are eligible to vote but, please note, your completed voting form must be received at least 48 hours prior to the AGM. Any voting form received after that time will be invalid.

You can lodge your completed voting form by either email, post or in person at the following addresses:

By email:
members@sugarresearch.com.au

By mail:
Sugar Research Australia Limited
Attention: Membership
GPO Box 133, Brisbane QLD 4001

In person
Sugar Research Australia Limited
Level 10, 300 Queen Street, Brisbane QLD 4000

SRA's new CEO Mr Mick Bartlett.

NEW CEO TO STEER NEW ERA **FOR SRA**

Sugar Research Australia (SRA) will enter a new chapter on 14 October when it welcomes its new Chief Executive Officer, Mr Mick Bartlett.

SRA Chair Rowena McNally announced Mr Bartlett's appointment in late July.

He will join SRA as the outgoing CEO of the Biosecurity Authority of Fiji, a role in which he was responsible for the strategic direction and reform of the Authority which facilitates $4.1 billion (AUD) worth of international import and export trade annually.

Mr Bartlett brings a wealth of experience and expertise to the role, having spent more than two decades in senior leadership positions within the commercial agricultural and research sectors across four continents.

With extensive significant achievements in driving innovation and sustainability within the agricultural industry, his leadership has been characterised by a strong commitment to research and development.

In his experience as Global Director of Operations at the International Rice Research Institute, based in the Philippines, Mr Bartlett was responsible for providing governance, due diligence, resource allocation, monitoring and control of research and operational initiatives in 21 countries.

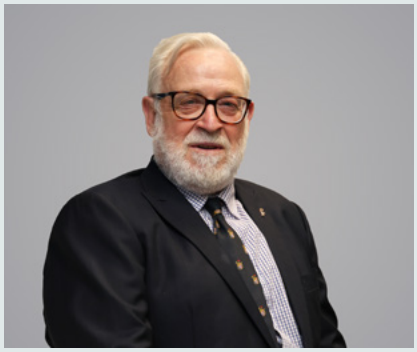
Mr Bartlett said his aim in joining SRA was to enhance productivity, sustainability and profitability for sugar producers, millers and associated stakeholders within the Australian sugarcane community. His appointment marks a new era for SRA as it continues to support the industry through cutting-edge research and practical solutions.

"Research for industry development is predicated on identifying and developing innovative solutions to known and emerging impediments to business growth and sustainability," Mr Bartlett said.

"Stakeholder, staff and broader industry engagement is paramount in achieving success. I feel fortunate to be joining SRA's dedicated and competent team and look forward to helping drive the Board's strategic initiatives."

Mr Bartlett's appointment follows a comprehensive international search process conducted by the SRA Board, aimed at finding a leader with the vision, experience, and passion to steer the company towards continued success.

UPCOMING LEADERSHIP TRANSITION FOR SRA



Outgoing Interim CEO Shaun Coffey.

SRA's Interim CEO, Shaun Coffey, will depart the role in September, making way for Mr Mick Bartlett's commencement in the executive position in October.

This transition is part of SRA's strategic plan to ensure continuity and maintain momentum as the organisation prepares for its next phase in supporting the Australian sugarcane industry.

On behalf of the Board, Chair Rowena McNally extended her sincere thanks to Mr Coffey for his invaluable contribution during his tenure as

PROPOSED PARAQUAT RESTRICTIONS

Most of industry is now aware of proposed restrictions on the use of paraquat herbicide announced by the Australian Pesticides and Veterinary Medicines Authority (APVMA) in late July.

These regulatory restrictions are of great concern to sugarcane growers and Sugar Research Australia (SRA), as they will have a significant impact on growers.

Since the announcement, SRA has been working with CANEGROWERS, along with other organisations, to review the justification for the restrictions put forward by the regulator.

All parties will be communicating to the APVMA the consequences of such a decision, including impacts on productivity, farm costs, soil management (a return to more tillage), and the environment.

There is a three-month public consultation period for industry to provide submissions to the regulator by 29 October 2024, before a Final Regulatory Decision is made. This decision will be publicly released on 28 February 2025.

Grower input needed

The proposed changes would mean that paraquat cannot be applied in sugarcane.

The recommendations resulted from a health and safety assessment, and an environment risk assessment, by the APVMA. It is their environmental risk assessment, which indicated potential impacts on wildlife, that is behind the significant restriction proposed.

In light of the proposed changes, SRA is seeking growers' input on the use of paraquat herbicide on cane farms via a short survey.

Your feedback is crucial to understanding the implications of the proposed changes for the sugar industry, and will help formulate our response to the APVMA's proposed restrictions during the consultation phase.

If you haven't already done so, we ask that you take a few minutes to complete the survey, which closes Friday 27 September 2024.

All survey responses will remain confidential, and only information aggregated from all growers will be used in our submission.

Please click here for the survey.

Interim CEO, saying his leadership had been instrumental in navigating SRA through a crucial period of transition.

Mrs McNally said that the past year had seen a period of change for SRA but also significant strides under Mr Coffey's leadership, including the following key developments:

- A research portfolio that continues to deliver tangible benefits focused on enhancing productivity, improving disease resistance, and developing sustainable practices.
- Driving proactive initiatives that reduce the environmental impact of sugarcane production, in line with global sustainability objectives.
- Prioritisation of engagement with SRA members and other key stakeholders to ensure that research priorities and strategic direction aligns with industry needs.
- Re-alignment of business units to better support regional service delivery, and significant investment in capital works programs to secure future research and trial work.

In October, Mr Bartlett will officially commence his role as SRA's new CEO. This transition will allow SRA to continue its critical work without disruption, ensuring that we remain at the forefront of industry advancements and provide unwavering support to stakeholders.

SRA Board, staff and stakeholders congratulate Mr Coffey on his work, acknowledging his efforts in setting a solid foundation for the new leadership.

FOUR NEW MILLING PROJECTS FOR 2024/25

SRA 's Small Milling Research Projects scheme each year funds projects to solve industry-identified issues in sugar milling to benefit both millers and growers. Projects are expected to be completed within 12 months.

RESEARCH MISSION 1 **Profitable and Productive**

IMPROVED ENERGY EFFICIENCY WITHOUT SUGAR DEGRADATION

Project 2024/201
Hybrid pH control strategies to reduce sucrose losses and control corrosion in sugar factory evaporators

Chief investigator: *Aaron Baker, Sunshine Sugar, collaborating with Hakan Bakir and Darryn Rackemann at the Queensland University of Technology (QUT)*

A major sugar milling challenge is to become more energy efficient. Typically, energy efficiency upgrades are expensive for processes such as cogeneration where the organic waste from sugarcane milling – bagasse – is used not only to fire the boilers to make steam to run the mill but also to make and feed surplus electricity to the grid as an additional income stream.

To achieve the high level of energy efficiency required, the usual process has been to bleed vapour extensively from the evaporator station to reduce the amount of steam consumed in the factory. However, this change in operation typically leads to the cane juice being exposed to higher temperatures for a longer time period, increasing sucrose degradation levels. It also contributes to the formation of acidic condensates that cause corrosion, and with that the premature failure of piping, valves and fittings.

A previous SRA project, 2017-007, found a strategy where tighter control and optimisation of the pH of sugarcane juice could mitigate this issue.

The aim of the new project is to progress this research and ultimately bring about commercial implementation.

The benefits are estimated to result in additional sugar yield worth more than $300,000 per year for a 0.2 percent reduction in degradation (based on a raw sugar price of $450/tonne and the factory crushing 1.5 Mt cane). Another is a 10 percent reduction in maintenance costs, estimated to be worth more than $50,000 per annum.

DEMONSTRATING THE SUPERIORITY OF MICROWAVE DS TRANSDUCERS

Project 2024/202
Demonstrate the use of a microwave dry substance transducer for controlling high grade boilings

Chief investigator: *Senior Technologist Mackay Sugar, Bryan Lavarack, Mackay Sugar, collaborating with Research Fellow, Centre for Agriculture and the Bioeconomy QUT, Dr Gabriel Fraga*

As reported in the Winter 2024 issue of *Cane Matters*, an alternative method for measuring the massecuite concentration (massecuite dry substance) in a pan is being investigated in order to increase automation and cut costs.

These microwave transducers are already used in several refineries and factories overseas and require less manual interaction than when conductivity control is used.

Increased automation is needed by the milling sector because of the high turnover of staff and the difficulty in recruiting suitable operational staff the number of experienced personnel declines.

In previous research at Farleigh Mill using a Berthold microwave transducer an accurate correlation between the transducer's DS output and samples measured in the factory was established. However, the result was achieved at the end of the season.

It was therefore not possible to complete trials to demonstrate the superior effectiveness of the transducer for controlling high grade boilings when compared with conductivity control.

WORKING TOWARDS NET ZERO

Project 2024/203
Greenhouse gas emissions from sugar factory boilers

Chief investigator: *Wilmar Sugar's Production & Environment Technologist, Line Jenssen (pictured below) in collaboration with Anthony Mann at QUT*

Net Zero is a priority research goal for Australian sugar mills. Two reportable greenhouse gases produced by the industry are nitrous oxide (N_2O) and methane (CH_4). These are emitted from the boiler stacks during the combustion of bagasse to run the mill.

This project seeks to accurately measure the amount of N_2O and CH_4 being emitted from the various boiler designs used in the mills. The effect of wet scrubbers and various boiler operation (combustion) conditions will also be examined to determine techniques which lessen N_2O and CH_4 emissions.

Wilmar Sugar Production and Environment Technologist Line Jenssen.

Project 2024/204
Thermo-digester for Rapid Conversion of Mill Mud into Green Fertiliser

Chief investigator: *Plant Ecologist Professor Chengyuan (Stephen) Xu from Charles Darwin University in collaboration with Isis Central Sugar Mill*

Australian sugar mills produce two million tonnes of mill mud a year as a byproduct from processing sugarcane. This is mostly sent to local farmers to provide a soil ameliorant and partial substitute for commercial fertilisers.

Using mill mud for green gardening products such as compost or growing bags (replacing imported coir) is another option. However, the conventional composting process is slow, typically taking between 90 and 180 days.

This project will look at developing a pilot thermo-digester to validate a faster method of breaking down mill mud into compost and other products. It will involve testing a range of microbe products that include thermophilic microbes to identify suitable products which will reduce the time needed, ideally to 24 hours, and produce an optimised and consistent quality product.

A methodology will be developed detailing the reaction procedure and temperature needed from the waste steam in the mill to enable upscaled commercial thermo-digesters to work within sugar mills' normal operations.

The research will be undertaken at Isis Central Sugar Mill (ICSM) and shared with industry.

The conversion of mill mud into high-value garden products including locally-produced planting bags is estimated to provide an alternative income stream for ICSM of millions of dollars per year (based on a 50 percent conversion rate of 100,000 tonnes of mill mud at $100 per tonne).

This project's objective is to demonstrate the reliability and accuracy of the microwave DS transducer to control high grade boilings using a pre-defined DS profile under a range of circumstances and changed cane supply conditions during the 2024 season.

The project hopes to show tighter control of individual pans with greater consistency in the production of well exhausted massecuites, potentially shorter cycle times, reduced incidence of fine grain forming and much reduced manual input from pan stage operators.

A follow-on project will still be needed to install massecuite DS transducers onto different pans in the industry (e.g. B and C massecuite pans and unstirred pans) and operate them to pre-set massecuite DS profiles in fully automated control.

Results will be shared with other mills in the industry.

Senior Technologist, Mackay Sugar Bryan Lavarack, with Research Fellow, Centre for Agriculture and the Bioeconomy, QUT, Dr Gabriel Fraga.

MERGING ONTO THE BIOECONOMY SUPERHIGHWAY

The potential for the Australian sugarcane industry to diversify into the growing, global bioeconomy continues to be explored under an SRA-funded project, led by Queensland University of Technology researcher Madeline Smith.

Under the project, Ms Smith began by mapping existing research investment and partnerships which could help to support the sugar industry to generate future diversification pathways.

This has now progressed to connecting key industry stakeholders – including farmers, millers, researchers, start-ups and investors – to explore the industry's bioeconomy options and potential.

Ms Smith said the aim of the network was to help industry to connect with businesses in this emerging supply chain and create new partnerships.

"Over the past five years the Australian Government has invested more than $385 million in research to convert sugarcane into sustainable aviation fuels (SAF), food ingredients, such as proteins and lipid (fats) and sustainable plastics," she said.

"This is a sign that the Australian Government recognises the potential to leverage the current industry's capabilities and resources to build a nationally significant biomanufacturing hub in Queensland."

Current bioeconomy research in Australia includes work to genetically engineer sugarcane to optimise the production of renewable carbon products from fibre; partnerships to develop novel ingredients such as plant-based proteins and fats, and sustainable food packaging from bioplastics and biocomposite products; and enhancing Australia's industry capabilities to meet growing global demand for bio-derived products.

The future is here

Ms Smith said much of the current research was focused on new technologies in the early development phase which were not yet commercially ready.

However, she said demand for carbon neutral products was growing, and highlighted Jet Zero Australia's partnership with LanzaJet, Qantas, Airbus and the Queensland Government (announced in 2023) to progress towards a commercial SAF plant in Townsville.

"Production is planned to commence in 2026 and the operation will require 200 million litres of ethanol per year from sustainable agricultural origins to produce 102 million litres of sustainable aviation fuel each year. This is equivalent to about three and a half Sarina distilleries."

Collaboration is key

Speaking as part of the second Bioeconomy in Focus webinar – *'Let's discuss bioproducts and biopolymers for the Australian sugar industry'* – CANEGROWERS CEO Dan Galligan said he believed there was significant opportunity for diversification into the bioeconomy for the industry, and collaboration would be key to ensure the benefits were maximised and shared.

"We want to manage the transition to these new supply chains. While we want to see diversification, we would ideally like to see new industries like SAF and others work in a way that is complementary to our existing successful sugar supply chain that has supported our communities to date, " Mr Galligan said.

"To deliver that we must see greater collaboration both with the existing industry players and with new investors to make sure we get a good policy framework, good strategy and meaningful outcomes for growers and communities."

Maintaining Milling Supply

SRA's Head of Research Strategy and Investment, Jane Trindall, believes there are fundamentals to get right for growers and millers to benefit from the potential for diversification within the sugarcane industry.

"By working together, we can bridge the gap between research and its commercial application," Ms Trindall said.

"Firstly our priority is to invest in research, and new skills to develop knowledge and technologies which can be applied in mills to optimise efficiency and reliability.

"Secondly there is an opportunity to capitalise on existing bioeconomy research efforts to reduce the technical risks for new products, processes, and even new companies entering the market to satisfy this growing demand, ultimately ensuring a more diversified and sustainable future for sugarcane and the regional communities in which we are based.

"Importantly though, any transition to new industries and opportunities needs to be additional to and complementary to the existing sugar supply chain."

"So SRA is focused on improving the quality and impact of research to continue to improve our sugar industry while working with others and encouraging collaboration and coinvestment to bring economic benefits to both growers and mills, along with environmental sustainability through diversified revenue streams."

Bringing concepts to commercial reality

In Feburary, the Queensland University of Technology (QUT) announced an additional $16 million upgrade to its Renewable Biocommodities Pilot Plant in Mackay.

The purpose-built fermentation facility will allow researchers and industry to take promising concepts through to pilot trials, accelerating the commercialisation of new bio-based products and processes.

This includes creating future foods, biofuels, green chemicals and other bioproducts using sugarcane-based feedstocks, and other agricultural products like cotton, grains and horticultural wastes.

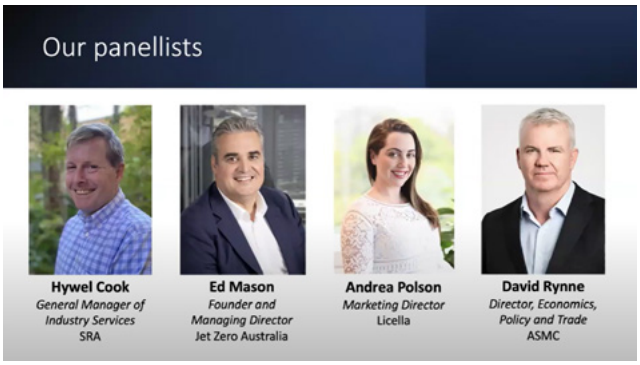
BIOECONOMY IN FOCUS WEBINAR SERIES

Earlier this year, QUT researcher Madeline Smith presented three webinars which followed the key areas identified by the industry's bioeconomy roadmap *Sugar Plus – Fuelling the Future of Food, Energy and Fabrication*.

The *Bioeconomy in Focus* webinar series featured discussions from key players across SAF, future plant-based ingredients, and biopolymers (used for sustainable packaging) talking about research to industry to understand the potential value of these markets for the sugar industry.

Each webinar featured a panel of experts discussing potential diversification opportunities for the sugarcane industry.

The webinar recordings can be found here: https://sugarresearch.com.au/resources-and-media/media/



WEBINAR 1: POSITIONING THE SUGAR INDUSTRY TO BENEFIT FROM THE RISE OF SUSTAINABLE AVIATION FUELS (SAF)

The first webinar in the *Bioeconomy in Focus* series looked at the production of Sustainable Aviation Fuels (SAF) in Australia and how the sugar industry could benefit from this diversified product stream.

SRA's General Manager Industry Services, Hywel Cook, set the scene, suggesting that much of the current commercial discussion around the new green economy focussed on the "end product" instead of the process.

"I think we need to turn this discussion around and start talking about how the raw (sugarcane) material can be used in making products such as SAF," Mr Cook said.

(Continues Page 10)

(Bioeconomy in Focus Webinar series continued)

"(Through SRA's cane breeding program) we grow sugarcane to have high levels of sucrose to make raw sugar, and the right amount of fibre to allow the cane to be milled efficiently and to supply energy to run the sugar mill. But I don't think this is the only product we could make, using the existing infrastructure we already have in place."

Mr Cook highlighted two ways he believed industry could position itself to benefit from diversification into SAF, which could potentially be processed through existing sugar mills, with some modifications.

"Should we as an industry be asking if we could improve on what we do to enable all current sectors of our industry – growing through to milling – to benefit from the SAF industry?

"What is the best use of cane trash and bagasse? Can we use it both as a trash blanket and as a feedstock for SAF? Do we change to a whole-of-crop harvesting system and separate the trash from the cane at the mill, before milling?

"This has been tried before, but the market and financial drivers have changed. Maybe things that we have tried in the past are now relevant for the future as the market for the different parts of the sugarcane have different and higher commercial values."

Mr Cook also noted that research investment into new varieties of 'energy' canes could be considered by industry, as a means of satisfying demand for both sugar production and SAF.

"Current varieties have good quantities of fibre, and if the economics makes sense, then the sugar mills can be reconfigured to improve energy efficiency to make more bagasse available for other reasons, other than supplying energy to run the sugar mill.

"Do we look at something new? The term energy cane is used to describe sugar cane which has a higher biomass, but lower sugar content than traditional sugarcane varieties. As an industry, should we be investing research to develop (energy) sugar cane which would fit into both a sugar and SAF model? Is it even possible? We think it is."

His confidence stems from existing SRA breeding program outcomes which have seen improved genetic gains leading to the release of more productive new commercial varieties.

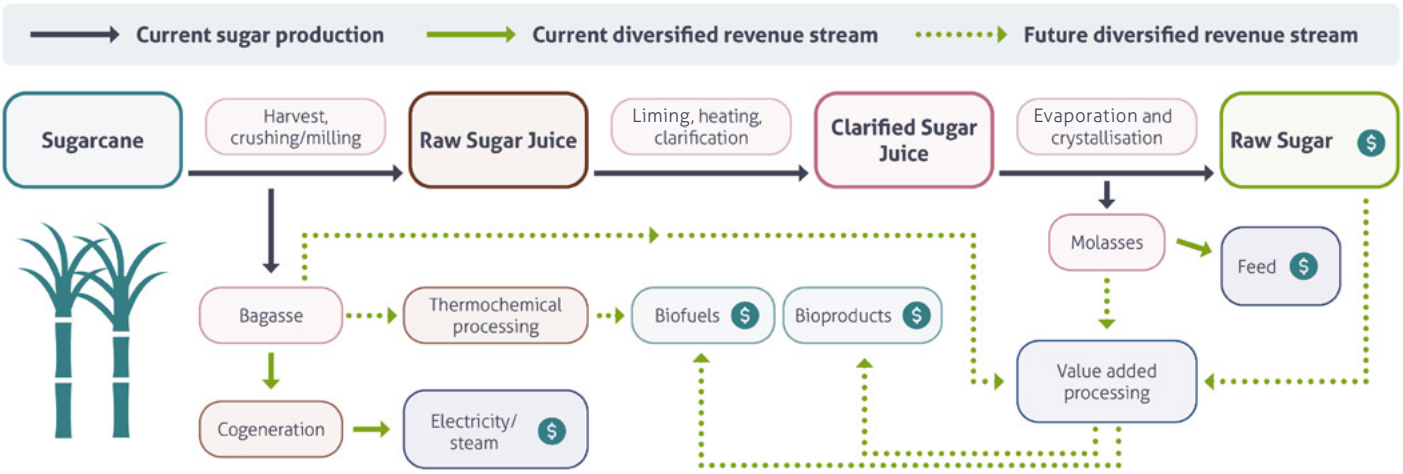
"These clones are higher in biomass, higher in fibre, but lower in sugar content. At this stage they are being used as parents for breeding purposes, so they have not yet progressed through to the final stages of the breeding program, as we are not currently breeding for commercial energy canes.

"(However) we have very strong ideas on how to progress this further, but it generally does need general industry support. Industry has the raw material available from growing sugar cane to be a feedstock for a SAF industry, however, some targeted research may allow industry the ability to increase the available supply of sustainable sugarcane that may be able to produce both raw sugar and SAF from our current farmers and mills."

Co-moderator, Professor Ian O'Hara from QUT said that international aviation was responsible for more than two percent of the world's carbon dioxide emissions and that SAF could reduce these emissions by up to 80 percent compared to fossil fuels.

"There are seven certified pathways for producing SAF, and three or four of these are highly relevant to sugarcane-derived feedstocks," Prof. O'Hara said.

Panellist Ed Mason from JetZero said major airlines across the globe were committed to ambitious carbon reduction goals and were investing in SAF incentives to make these a reality, ensuring a guaranteed and growing SAF market.



WEBINAR 2: BIOPRODUCTS AND BIOPOLYMERS

The potential for bioplastics and other biopolymers to be made from sugarcane, offering new commercial opportunities for Australian cane growers, was featured in the *Bioeconomy in Focus* webinar series.

Research is underway across a number of Queensland universities – including the Queensland University of Technology (QUT) and University of Queensland (UQ) – which is demonstrating the capability (expertise and pilot infrastructure) available in Queensland to enhance the sugar industry's capabilities of diversifying into bio-derived and biodegradable products.

This includes turning sugar and bagasse into highly sought after products such as sustainable packaging.

Australia's 2025 national packaging targets are calling for 100 percent reusable, recyclable or compostable packaging and 50 percent of average recycled content included in packaging by 2025.

By tapping into the growing market for sustainable and biodegradable plastics, the industry could enhance its economic resilience and contribute to environmental sustainability, according to University of Queensland Professor Bronwyn Laycock.

Prof. Laycock is the Deputy Director of the $13 million Australian Research Council (ARC) Industrial Transformation Training Centre for Bioplastics and Biocomposites, based at UQ.

"Biopolymers represent a significant diversification opportunity for the sugar industry," Prof. Laycock said.

"They provide an environmentally friendly alternative to conventional plastics and open up new revenue streams for growers and millers."

The commercial readiness of bioplastics in Australia is progressing rapidly, with pilot projects and facilities in development. One notable initiative is a pilot plant for converting sugar or PHA, or polyhydroxyalkanoates, a biodegradable polymer. PHAs are very versatile and can be used to produce compostable bioplastics including bottles, bags and even cosmetics. This project aims to produce enough PHAs for testing and product development.

Don Coyne, CEO of Australia New Zealand Biochar Industry Group (ANZBIG), spoke about the potential applications of biochar such as for soil remediators, feeds and fertilisers, and in non-soil uses such as bioplastics and concrete.

Professor Bernadette McCabe, Director of the Centre for Agricultural Engineering (CAE) at the University of Southern Queensland (USQ), discussed the benefits and potential of various technology pathways for converting sugar industry residues into valuable products, such biogas for application as vehicle fuel, electricity, or upgraded to biomethane.

Watch the webinar here: https://sugarresearch.com.au/webinar/webinar-lets-discuss-bioproducts-and-biopolymers-for-the-australian-sugar-industry/

WEBINAR 3: FUTURE FOODS

The future of food and the potential of precision fermentation was the focus of the second webinar presented in the *Bioeconomy in Focus* series.

The webinar highlighted how precision fermentation could change food production and benefit the Australian sugar industry.

Raw sugar will continue to play an important role in the global food supply in the long term, but sugarcane also has the potential to act as a feedstock for a new generation of food ingredients beyond sugar, creating new revenue streams for growers and millers, while advancing environmental sustainability.

The market for future food ingredients has been growing in recent years. This includes in areas such as plant-based protein foods and beverages and protein ingredients such as flour. With growing concerns around meeting future global food demands, precision fermentation could offer a viable and environmentally friendly way to produce more food.

Professor Ian O'Hara, Deputy Dean of Engineering at QUT, explained the science behind precision fermentation.

"Precision fermentation uses microorganisms such as yeast or fungi to create new proteins and ingredients, similar to brewing beer but with advanced technology," Prof. O'Hara said.

The webinar highlighted the market for future foods and potential of precision fermentation for the Australian sugar industry. Participants heard that this new emerging sector is looking for an abundant feedstock source in a very consistent format, which sugarcane has the potential to offer. By using new technologies and working together with research and industry partners, Australia and the sugar industry could lead production of sustainable, high-quality food ingredients.

Watch the webinar here: https://sugarresearch.com.au/webinar/webinar-lets-discuss-future-foods-and-precision-fermentation-for-the-australian-sugar-industry/

Tully cane grower Alf Nucifora in a second ratoon crop of SRA28ф.

EARLY PROMISE IN SRA28ф IN THE NORTH

Far North Queensland cane grower, Alf Nucifora, first noticed SRA28ф when harvesting a clean seed cane crop as a planting contractor in the Murray Upper, south of Tully, in 2020.

He thought he'd start by dabbling with a small block of SRA28ф, planting less than half a hectare that year.

"What attracted me to it (SRA28ф) was the soil didn't really have to be that good for it to grow," Mr Nucifora said.

"When I was cutting it in the seed plot, it was growing on a sand ridge and I thought, this cane might be bloody good for my farm.

"But I can't speak for all farmers. There's various soil types and weather patterns across Tully, and while I think it's promising for my farm, it may not be the same for others, as it's still in the early commercial stages."

Mr Nucifora grows cane on 142 hectares of well-draining soil that runs into the foothills of the Murray Valley. He's just finished planting just over 18 hectares of SRA28Φ, and will cut second ratoon blocks this year.

He's been growing cane in the Murray Upper for the past 30 years and has been active in improving new variety adoption in the district through the establishment of, and his participation in, the Variety Management Group previously run by Tully Cane Productivity Services Ltd (TCPSL).

The group was formed in 2007 to assist growers to decide what varieties to plant by trialling new varieties at a sub-district level. This work is now conducted by the Tully Variety Management Group (TVMG) formed in 2012 to build on TCPSL's work.

"When I judge a cane, I like to make sure it's got good productivity, good CCS, and it's going to give me good ratoon life. Because I try and grow cane to fifth and sixth ratoon.

"At the moment SRA28Φ looks promising. It's a bit early to say, because I've only had a small amount in, but I'll know a lot more when I cut it next year.

"It's got thick sticks that you can clean pretty easily. I think if you present it good to the harvester it will clean up pretty good. I think it's a bit more free-trashing than SRA26Φ, even though I've got about 18 hectares of (SRA) 26Φ."

Apart from SRA28Φ and SRA26Φ, Mr Nucifora also grows KQ228Φ, a large amount of, Q208Φ and plans to start propagating SRA6Φ next year.

For now he remains upbeat that SRA28Φ's commercial yield and CCS performance will continue as well as it has in pre-commercial trials conducted by SRA, and for other growers who have it planted across the Herbert and the North.

"It's got good sugar. I think it might complement my second and third round cut. The only worry I had was it is slow to strike. But I've just planted new blocks and the strike has been very good."

VARIETY	DISEASE RATINGS						APPEARANCE AT HARVEST		
	Smut	Pachymetra	Leaf scald	Orange rust	Brown rust	Yellow spot	Arrow	Lodging	Suckering
Q208Φ	I-R	I	R	R	R	R	Mod-heavy	Average	Light-mod
SRA26Φ	R	R	R	R	P*	R	V. sparse	Average	Light
SRA28Φ	I-R	R	R	R	P*	R	Moderate	Good	Moderate

RESISTANT (R) RESISTANT-INTERMEDIATE (I-R) INTERMEDIATE (I)
INTERMEDIATE-SUSCEPTIBLE (I-S) SUSCEPTIBLE (S) *PROVISIONAL RATING (P)

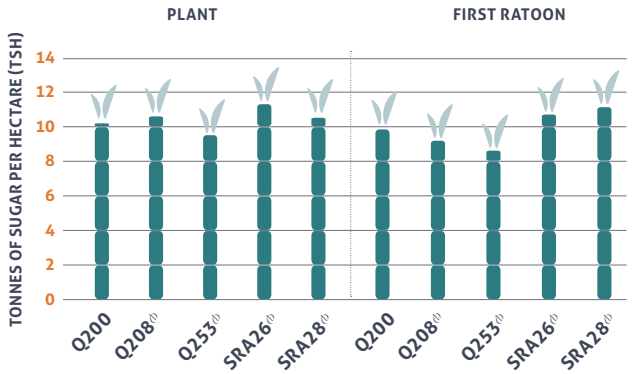


Figure 1 *- 2023 productivity results from MSF Sugar's South Johnstone mill which highlights SRA28's sugar yield advantage over their three major varieties, Q200, Q208 and Q253, when considering individual crop class performance.*

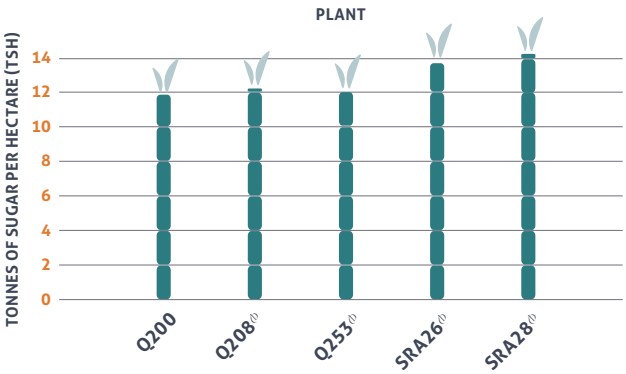


Figure 2 *- 2023 productivity results from MSF Sugar's Mulgrave mill which highlights SRA28's sugar yield advantage over their three major varieties, Q200, Q208 and Q253, when considering individual crop class performance. *Only plant crop results shown here as there was less than 5,000 tonnes of SRA28 delivered in first ratoon.*

Data supplied by MSF Sugar Limited.

Second ratoon crop of SRA28Φ progressing well on Alf Nucifora's Murray Valley farm, planted in mid-July.

SRA28Φ PROVING TO BE A GOOD ALL ROUND CANE

SRA28Φ might be relatively new on the commercial scene, but it's quickly building a reputation as a good all-round variety, for northern growing regions of Queensland.

Approved and released in the North in 2020, and approved in the Herbert in 2020 and released the following year, SRA28Φ has shown good yield and sugar content (CCS) in both SRA trials and commercially.

Across the Herbert and the North it's proven to have a broad adaptability across diverse growing environments.

SRA District Manager North Phil Patane said another positive trait of SRA28Φ was its good resistance to Pachymetra root rot and leaf scald.

"It's got good overall disease resistance to the major diseases in the Herbert and Northern districts. Combine that with its good Northern CCS and tonnes of cane per hectare, and it's a good all-rounder for sure," Mr Patane said.

"I'd be mindful of harvesting SRA28Φ late in the drier subdistricts, due to the cane becoming pithy and potentially piping, ultimately impacting on weight and CCS.

"But what we are experiencing for the CCS maturity curve is that SRA28Φ is performing well, and we're getting optimal CCS harvesting it early to mid-season."

Mr Patane said there was promising optimism amongst Herbert growers that SRA28Φ's performance in field trials was being replicated commercially, in the right productivity environment. A sign of this confidence is clean seed sales through Herbert Cane Productivity Services Limited (HCPSL).

"After discussing with HCPSL Manager Adam Royle I can confirm that all pre-season orders for SRA28Φ have been allocated by HCPSL. So that is a definite sign of the optimism our growers have in SRA28Φ," he said.

SRA28Φ in the Herbert

In the Herbert, SRA28Φ has shown a sugar yield advantage over the district's standards Q232Φ (5%) and Q240Φ (3%) and is comparable to Q200 and Q208Φ in SRA field trials in the district.

Here, its cane yield is also similar to Q200, Q208Φ and Q240Φ, and slightly lower than Q232Φ, but has shown a CCS advantage of 10 percent over Q232Φ, while it's similar to that of Q200, Q208Φ and Q240Φ.

Its CCS advantage has been consistent across crop classes and trial locations which have represented the main soils and growing environments of the Herbert.

SRA28Φ in the North

In the North, SRA28Φ has achieved a 13 percent sugar yield advantage over Q208Φ throughout its extensive trialling by SRA's Northern Variety Development team. Northern trial data also suggests suckering of SRA28Φ is variable with similar levels to Q240Φ, Q250Φ and Q253Φ in years where conditions are ideal for suckering. Arrowing is also similar to Q200 in the North in an average year, but it can be profuse in favourable conditions.

Similar to Q253Φ, SRA28Φ has shown rapid growth response after rainfall, so maturity testing or avoiding harvest after heavy rain is recommended to maximise CCS. It also has exhibited stronger ratooning ability to Q200 and Q208Φ in the Northern region.

While SRA28$^{\phi}$ is a reliable germinator, problems have been observed when mature or older source material was planted, so planting material 11 months of age or younger is advised.

SRA District Manager Far North Gavin Rodman suggests that tissue culture may be an option for SRA28$^{\phi}$ when establishing on-farm clean seed.

"If growers are concerned about germination after hot water treatment, or are likely to have seed sources getting older than twelve months of age, ordering SRA28$^{\phi}$ as tissue culture may assist the establishment of this promising variety," Mr Rodman said.

Profitable variety

Northern Variety Development Manager, Dr Felicity Atkin said throughout extensive pre-commercial trials of SRA28$^{\phi}$ in both the Herbert and the North, the variety proved to be a profitable alternative to current major varieties. It has proved to be a reliable germinator, but is sensitive to hot water treatment.

While it visually appears to sucker quite heavily due to its obvious purple suckers, evaluation of suckering in both districts have indicated suckering levels similar to Q240$^{\phi}$ and Q253$^{\phi}$.

"Its initial germination is slower than some commercial varieties, but it soon catches up by canopy closure stage. It has better canopy closure than Q208$^{\phi}$ for good weed control. And it stands erect for good presentation to the harvester," Dr Atkin said.

"It is also proving to be a profitable variety for those growers with high Pachymetra spore counts. We have seen initial commercial results from across the northern mills show SRA28$^{\phi}$ has a sugar yield advantage over our major commercial varieties which was also demonstrated in our SRA trials."

SRA28$^{\phi}$ FACTS

Has a compact stool with an erect habit providing good presentation for harvesting.

Has a clean green canopy with good closure for weed competition.

Has a moderate stalk population with a good diameter, a distinctive purple leaf sheath and has moderate trashing.

Is a profitable alternative for growers with high Pachymetra spore counts.

Arrowing in the North has been reported as similar to Q200 in an average year, but profuse in favourable conditions.

Initial growth and tillering can be slow, but is a reliable germinator if seed sources are sound.

Observations in the North and Herbert indicate that germination problems may occur with the use of mature planting material, thus the use of young seed cane is advised.

Good disease resistance to the three major diseases: leaf scald, Pachymetra and smut, in the North and Herbert.

SRA FIELD TRIAL - IMPROVING EFFICACY OF RATTOFF®

SRA District Delivery Officer Herbert Glen Park presented his trial work during a poster session at the 19th Australasian Vertebrate Pest Conference in Sydney in August.

Each year Australian sugarcane growers suffer significant crop losses from destructive rats.

In 2023, the Herbert region in North Queensland experienced an unprecedented invasion of eruptive rodents, including the canefield rat (*Rattus sordidus*) – otherwise known as the ground rat – and the climbing rat (*Melomys burtoni*).

Severe weather events, including an extended wet season, led to an increase in rat populations in the area, with local growers reporting economic losses of approximately $19 million across 54,500 hectares of damaged cane land in Ingham alone.

In the wake of the outbreak, in November 2023, the Australian Pesticides and Veterinary Medicines Authority (APVMA) approved an emergency use permit for RATTOFF® use in ratooning sugarcane (PER94189), with distribution by helicopter or drone.

However, growers observed a low uptake of the zinc phosphide baits, prompting SRA to imbed in the Herbert District Productivity Plan a blind field trial to improve the efficacy of RATTOFF® baits, led by District Delivery Officer Glen Park.

"While RATTOFF® zinc phosphide bait sachets already have vegetable oil attractants in the grain bait, which is contained within the edible cellulose rain-protection sachets, we tested whether uptake of RATTOFF® could be further enhanced by applying a second attractant to the outside coating of the sachets," Mr Park explained.

The trial was conducted across five separate cane fields in the Ingham area, using four different attractants, which were coated on bait sachets and tested against untreated 'control' sachets.

Mr Park identified 200 active ground rat holes across the five trial sites. Using a randomised placement pattern, he positioned one of each of the labelled sachets around each active rat hole in a 1.2 metre radius, approximately 1.4 metres apart.

"Results from observed bait acceptance activity, indicated that three of the putative coatings increased visitation and opening rates of the sachet, compared with the control or the fourth attractant," he said.

24-hour trail cameras monitored rat activity during the trial.

The project method

High tension wire pin tags, labelled A, B, C, D and E, were used to mark the randomly allocated position of each sachet around the active ground rat holes. Sachets were placed adjacent to and in contact with the tags.

At all five trial sites, baits were assessed for visitation and acceptance one day and four days after application. At sites numbered four and five an additional assessment for visitation and acceptance was conducted eight days after application.

Baits were rated as 'accepted' if they were opened or completely removed from their allocated tag (could not be found). Sachets that had been moved a small distance from their tag but not opened were assessed as 'not accepted'.

SRA remained 'blind' to the identification of the five treatments. Only after rating bait acceptance activity at all 200 ground rat holes was it revealed by Animal Control Technologies Australia (ACTA), that treatment E was the control.

At the conclusion of the blind field study, baits with their associated tags, were placed in newly identified, active ground rat sites. These were monitored with 33 trail cameras to assess for non-target activity.

Results

Combined analysis of bait acceptance for all five sites, four days after bait application, showed that three of the putative coatings increased visitation and opening of sachets compared with the control or the fourth attractant.

Only sites four and five were assessed eight days after bait application. Combined analysis of bait acceptance for sites four and five, recorded eight days after bait application, showed that three of the putative coatings increased visitation and opening of sachets compared with the control or the fourth attractant.

Trial crops

The five sites chosen for the field study varied in crop age, sugarcane variety and date of application. They were subject to differing weather patterns. No on-site climate data was collected.

Crop age ranged from 22 to 141 days after harvest. Sites one and two were ratooning crops of Q208(1), and sites three, four and five were ratooning crops of Q200.

Bait application dates progressed from 20 November 2023 to 11 December 2023.

Bait acceptance rates varied at the different sites. Crop age may have been a factor. Further investigation would be required to determine if rats are more "nervous" when scavenging in younger ratoon crops compared to crops with more biomass. Earlier work with RATTOFF® by other researchers, showed excellent rat control in older cane crops, despite always finding some sachets left unopened.

Conclusion

The blind field study demonstrated that the efficacy of RATTOFF® can be enhanced with an external attractant coating.

SRA has provided the manufacturer of RATTOFF®, ACTA, with the trial findings to incorporate into a submission as part of an application to the APVMA for approval of a variant to RATTOFF®.

Acknowledgements

This field study would not have been possible without the cooperation of sugarcane farmers from the Ingham district and Animal Control Technologies Australia (ACTA). SRA sincerely thanks these growers, ACTA and the Herbert Cane Productivity Services for their assistance in the trial.

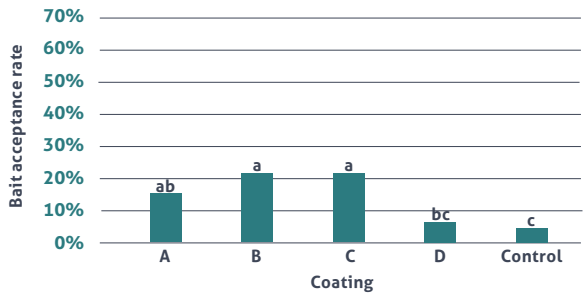


Figure 1: *Five sites combined analysis (Cochran's Q test) of bait acceptance rate, one day after application (n = 200). Means with the same letter are not significantly different.*

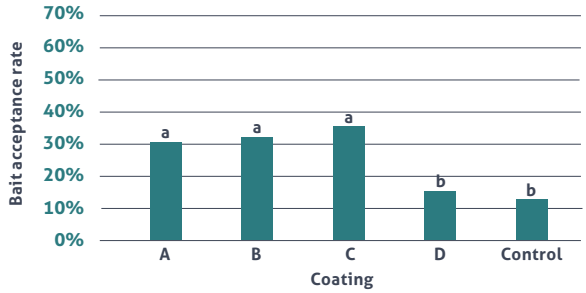


Figure 2: *Five sites combined analysis (Cochran's Q test) of bait acceptance rate, four days after application (n = 200). Means with the same letter are not significantly different..*

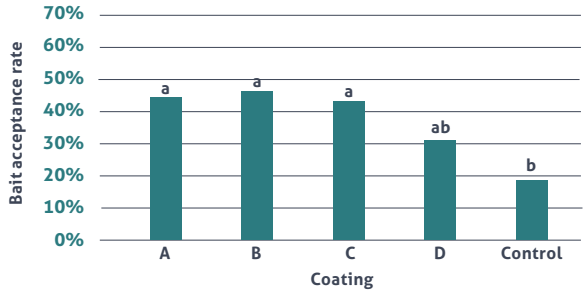


Figure 3: *Sites four and five combined analysis (Cochran's Q test) of bait acceptance rate, eight days after application (n = 70). Means with the same letter are not significantly different.*

UNCOVERING PRE-EMERGENT CONTROL STRATEGIES FOR BALSAM PEAR

Assisting cane growers to develop an integrated and effective management program to control Balsam pear was the focus of pre-emergent and post-emergent treatment trials conducted by SRA Weed Scientist Emilie Fillols over the past two years.

After performing post-emergent (or knock down) herbicide pot trials in 2022/23, Ms Fillols has completed pre-emergent trials, with results from both studies now available to help growers to develop an efficacious management plan for the invasive vine.

The full results of the post-emergent treatment trials can be found on Pages 30-31 of *Cane Matters*' Summer edition 2023/24.

Here we present the results of the pre-emergent treatment trials conducted in trays at SRA's Meringa Station from October 2023 to February 2024.

The method

Balsam pear (*Momordica charantia*) seeds were collected in October 2023 from one Balsam pear plant that produced a large number of fruits. The seeds were kept in dry cold storage until 19 January 2024, when they were soaked in water for 66 hours.

After soaking, 960 seeds were planted in trays filled with red loam soil, classified as Mission.

Twenty seeds were planted per tray and covered with 5mm of soil. Trays were then sprayed with the pre-emergent treatments.

Five millimetres of irrigation was added, to incorporate the treatments. Trays were then placed in a germination chamber set at 27.5°C for three days then transferred back to the greenhouse and covered with insect mesh. Two millimetres of irrigation was scheduled daily and modulated depending on weather conditions.

Eleven herbicide treatments were compared to an untreated control. They are described in Table 1.

Each treatment per tray was applied in 42 mL of water (equivalent to 1 mm of irrigation – or 10,000L water /ha).

Treatment	Commercial name	Active ingredient	Rate product g or mL/ha
T1	Mentor® WG	metribuzin	2000
T2	Balance® 750 WG	isoxaflutole	200
T3	Valor®	flumioxazin	700
T4	Adama Diuron® WG 900	diuron	1900
T5	Amitron® 700	amicarbazone	1000
T6	Spark®	imazapic	400
T7	Ametrex®	ametryn	2800
T8	Bobcat® i-MAXX	Imazapic / hexazinone	630
T9	Barrage®	diuron / hexazinone	4000
T10	Amitron® 700 (1/2) + Mentor® WG (1/2)	metribuzin	500
		atrazine	1000
T11	Gesaprim®	atrazine	3300
T12	control		

Table 1: *Herbicide treatments in trial 1.*

(Left) *Effect of treatments on Balsam pear germination and growth four weeks after spraying.*

(Right) *Fourteen days after the first product application on Balsam pear seedlings.*

Monitoring and data collection

The trial was monitored every two to four days for four weeks. Various assessments were carried out, including plant counts in each tray, visual assessments of emerged plants and final biomass measurement.

Results

Figure 2 shows the effect of the treatments on plant emergence. Up to 13 days after planting and spraying, plants started to emerge with up to 81 percent emergence in the control.

Most treatments did not affect the number of plants emerging, except for Valor whose emergence was only 40 percent on the seventh day.

After 13 days, several treatments resulted in the death of the emerged seedlings, which is also illustrated in Figure 2 as a significant drop in the number of emerged living plants.

Two treatments were particularly ineffective in reducing the number of living seedlings: imazapic (Spark®) and diuron.

Visual damage

Ten days after spraying, severe symptoms started to be visible on emerged seedlings for most treatments except diuron (Fig. 2). By the end of the experiment, severe symptoms (bleaching, necrosis or yellowing) were recorded for most treatments, except atrazine (Gesaprim®), diuron and flumioxazin (Valor®).

Dry biomass

The dry biomass of the emerged and living seedling was monitored and recorded.

Several treatments were highly efficient and reduced by nearly 100 percent the amount of produced biomass. They were: amicarbazone (Amitron®), isoxaflutole (Balance®), diuron + hexazinone (Barrage®), amicarbazone + metribuzin, metribuzin (Mentor®), and imazapic + hexazinone (Bobcat® i-MAXX SG).

Three treatments reduced more than 95 percent of the produced biomass. They were: flumioxazin (Valor®), ametryn (Ametrex®) and atrazine. Two treatments – diuron and imazapic – only reduced the biomass by 79 percent.

Trial conclusions

Ms Fillols said the trial results showed several pre-emergent treatments were effective to control Balsam pear seedlings as they emerged.

"The active ingredients amicarbazone, metribuzin, hexazinone and isoxaflutole are particularly effective and can be used in rotation and in combination to control Balsam pear," Ms Fillols said.

"Amicarbazone and metribuzin can also be used as an early post-emergent.

"Balsam pear can germinate over a long period of time. The pre-emergence herbicides usually only persist for four to six weeks. It means that when pre-emergent herbicide persistence has worn off, new germination of Balsam pear is likely.

"Therefore, subsequent application of pre-emergent herbicides or knockdowns would be necessary to control late germinators.

"But, in general, a combination of pre and post-emergent herbicide applications is the most effective method to control Balsam pear. So growers who have a Balsam pear problem should use both strategically."

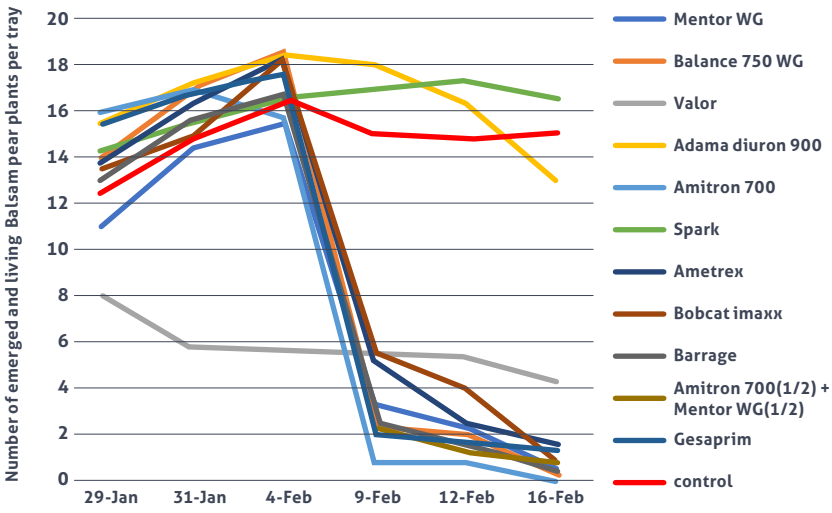


Figure 2: *Number of emerged living plants.*

Kepler Atkinson, pictured left, with SRA Project Officer Agronomy Hector Fleury, is a local cane grower who recently partnered with the Burnett Mary Agronomy Project (BMAP), delivered by Sugar Research Australia (SRA), to address a productivity challenge in one of his fields. After a five-year rotation of cane, cotton, barley, wheat, and soybeans, Mr Atkinson sought to return his land to cane cultivation.
To identify the underlying issue, BMAP conducted a comprehensive soil analysis and enlisted the expertise of Tony McDermott, a Productivity Officer from Maryborough Cane Productivity Services. Mr McDermott's guidance will be instrumental in developing tailored solutions to optimise crop yield and health.

PROJECTS AIM TO OVERCOME PRODUCTIVITY CONSTRAINTS

Growers have signed up for two new projects now underway in sugarcane growing regions of the Wet Tropics and the Burnett Mary. The aim is to help growers identify and overcome constraints on their farms which are holding back productivity, profitability and sustainability.

As part of both projects, one-on-one tailored agronomic extension services are provided to participating growers to improve cane and sugar yields while ensuring optimal inputs and environmental benefits on their farms.

The projects are part of the $4.38 million Sugarcane Practice Change Program funded through the Queensland Government's Queensland Reef Water Quality Program.

Sugar Research Australia (SRA) and Herbert Cane Productivity Services Limited (HCPSL) are working together to roll out the project in the Herbert Region over the next 24 months.

Titled *Targeting balanced nutrition and productivity constraints in the Herbert*, the project's organising team has already found interested growers to take part.

"The emphasis of the project is on one-on-one extension with the grower, taking place on farm," said SRA District Manager Northern Phil Patane.

"This is a great opportunity for a grower to get down to the nitty-gritty with a researcher and extension officer about what could be impacting yield," Mr Patane said.

"Growers have committed to being involved in the project for the next two years and have paid an initial upfront fee of $500, redeemable for customised soil, leaf and disease assays and electromagnetic (EM) soil surveys," Mr Patane said.

A similar project got underway in June in the southern sugarcane regions of Maryborough and Isis.

The Burnett Mary Agronomy Project (BMAP) offers a nutrient management opportunity for participating growers.

The Project Officer Agronomy is Hector Fleury.

"Our target is to have 40 growers participate. We have already had a lot of interest from growers in the Maryborough region, however, there is still room for interested growers to take part, particularly in the Isis region," SRA District Manager Southern Lisa Devereaux said.

"Growers pay $500 for one-on-one extension advice, agreed improvement plan, nutrient management plan and nitrogen and phosphorus (N&P) budget with an annual review," she said.

For more information on these projects contact:

Northern

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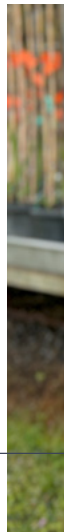
Targeting balanced nutrition and productivity constraints in the Herbert is delivered by Sugar Research Australia (SRA) and Herbert Cane Productivity Services Limited (HCPSL), and the Burnett Mary Agronomy Project (BMAP) is delivered by SRA, as part of the $4.38 million Sugarcane Practice Change Program funded through the Queensland Government's Queensland Reef Water Quality Program.

Queensland Government



Plant Breeding Technician Danielle Simcock (left) and Northern Variety Development Manager, Dr Felicity Atkin assess the quality of sugarcane flowers for collection during the cross-pollination process at SRA Meringa Station, south of Cairns.

CUPID STRIKES IN SRA'S VARIETY DEVELOPMENT PROGRAM

While the rest of the Variety Development teams across SRA are all busy during the harvest season assessing experimental clones as possible future commercial varieties, Variety Development staff at Meringa have been playing Cupid.

With sugarcane flowers plentiful – and 'love' in the air - it begs the question: Have you ever wondered where your commercial sugarcane varieties come from? Or how they are made?

Almost every commercial variety currently grown across the Australian sugar industry has started its journey at SRA Meringa, south of Cairns. It's the main breeding station for SRA's Variety Development program and here 'Cupid' is actually three, highly dedicated Variety Development staff, Vivien Dunne, Danielle Simcock and Dr Felicity Atkin.

Each year SRA Plant Breeders assess sugarcane parents grown at Meringa for their breeding potential, and only the best parents are selected to cross together. This cross-pollination process reshuffles the plant's genes, with the hope that the seed produced retains the best traits of each parent, whether it be their high cane yield, sugar content, or good disease resistance (or ideally all three).

The seed from these crosses are then sent across the state and germinated to produce starting populations for each regional selection program, where they are planted to the field as sugarcane seedlings and begin their 12-year journey through SRA's rigorous selection process.

Stay tuned for our Summer edition of *Cane Matters* where we dive deeper into the fascinating life of sugarcane, how SRA breeds new varieties, and what an average day is like for Meringa's Variety Development team.

Senior Plant Breeding Technician Far North, Vivien Dunne inspects the flower of a sugarcane parent selected to cross with another complementary parent to create seed from which a new variety will hopefully be developed and approved for release in 13 years' time with improved cane yield, CCS and good disease resistance.

Where the magic happens – the best sugarcane parents are cross-pollinated at SRA Meringa's crossing facility (aka the "honeymoon suite")

IS IT TIME TO LIME?

BY DR BARRY SALTER, SRA MANAGER TRANSLATION RESEARCH

With the harvest season advancing in all regions, and hopefully the end not being too far out of sight, it is time to start thinking about which blocks to fallow and what needs to be done to successfully establish the next crop cycle.

In some cases, soil ameliorants will be required, and applying these products as early as possible provides time for reactions to occur in the soil prior to the next crop. One of the main soil ameliorants is lime, which is used to manage soil acidity (low pH), and as a source of calcium.

Soil acidity (pH)

Four major reasons cause soils to become acidic: the type of soil parent material, rainfall and subsequent leaching of nutrients from the soil, the decay of organic matter, and the harvest of crops resulting in the removal of nutrients.

Acidity is a result of excessive hydrogen ions in the soil, and it can cause aluminium to become soluble in toxic quantities. Aluminium toxicity in very acidic soils results in stunted root growth.

Depending on the level of acidity, acid soils can also lower the availability of essential plant macronutrients and reduce soil microbial activity.

The ideal soil pH range for sugarcane is between 5.5 and 7.0. This optimises the availability of nutrients and minimises concentrations of soluble aluminium.

Lime (calcium carbonate) is used to ameliorate soil acidity (raise soil pH). Carbonate from the lime reacts with and neutralises the hydrogen ions in the soil, forming carbon dioxide and water. This increases soil pH and causes soluble aluminum to form aluminum hydroxide which is not toxic to plants.

Lime recommendations for acidic soils in the SIX EASY STEPS® differ between sugarcane regions. As an example, the guidelines in the Central region are shown in Table 1.

Table 1. *SIX EASY STEPS® lime guidelines for acid soils (when pH water < 5.5) in the Central region.*

CEC (meq/100g)	Lime application (tonnes/ha)
< 2.0	1.25
2.0 - 4.0	2.5
4.1 - 8.0	4
> 8.0	5

**Lime guidelines for other regions can be found on the SRA website in the SIX EASY STEPS NUTRIENT GUIDELINES section (https://sugarresearch.com.au/growers-and-millers/nutrient-management/).*

The amount of lime required increases with cation exchange capacity (CEC), which is an indicator of the soil's capacity to resist pH change. In some soil tests a lime requirement (t/ha) is provided, to achieve a soil pH of 5.5, 6.0 or 6.5. These recommendations are more specific than the SIX EASY STEPS® guidelines and should be considered.

Soil acidity is rarely encountered in the Burdekin region which tends to have soils with pH greater than 7 (alkaline). In the Wet Tropics (Mossman to Tully), lime is currently recommended when soil exchangeable calcium levels are low as crop response to adjusting soil pH has previously proven to be unreliable.

The SIX EASY STEPS® guidelines do not recommend lime when soil pH is above 5.5. This is due to limited evidence of an economic benefit from liming when soil pH is above this value.

However, some growers are trying to maintain soil pH above 6.0 to improve soil health, nutrient availability and the successful growth of break crops. However, further evaluation is needed because much of the work investigating the effects of lime on soil pH in sugarcane farming systems was conducted decades ago. One potential issue with high lime rates is it can reduce CCS.

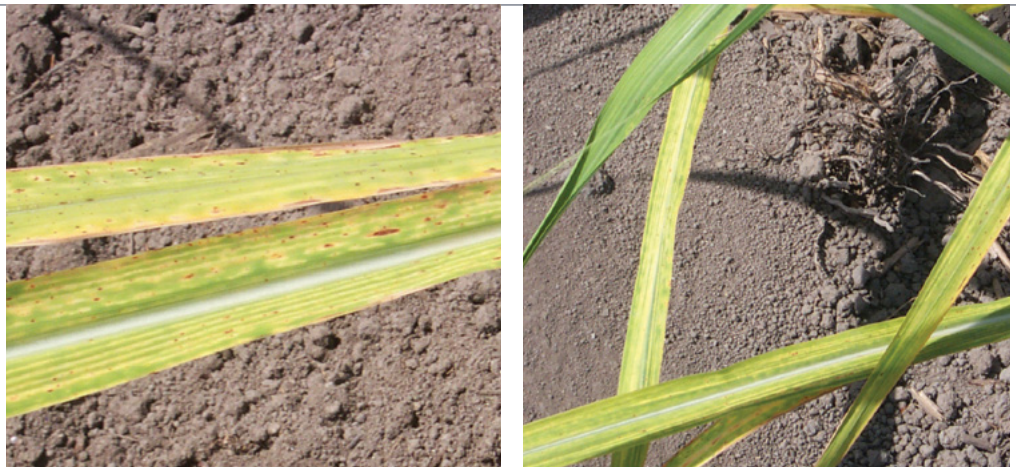


Figure 1: *Calcium deficiency symptoms.*

Calcium

Agricultural lime contains 30-40 percent calcium. Calcium is a macro-nutrient essential for growth and development of the spindle, leaves and roots. It comprises parts of the cell wall, thus strengthening the plant, and plays an important role in nitrogen metabolism. Calcium deficiency symptoms (Figure 1) are exhibited in the older leaves before young leaves and they will appear pale green with yellow mottling or have a rusty appearance. Stalks are also thinner and taper towards the growing point resulting in poor top growth and a spiky appearance.

Calcium rate recommendations are derived from calcium response curves (Figure 2). The critical value for exchangeable soil calcium is 0.65 milliequivalents percent (meq%). Below this value, a yield response to calcium is almost certain. The marginal value is 2.0 meq%. Between these two figures, a maintenance calcium application is recommended to ensure yields are not being limited (Table 2).

Recent analysis of soil test datasets has identified that many sugarcane blocks are low in calcium. In the Wet Tropics regions nearly 50 percent of the crops would benefit from calcium application (Source: Dr Danielle Skocaj 2023). It was also suggested that if extending crop cycles beyond fourth ratoon it may be necessary to reapply calcium-based soil amendments, especially if the last application occurred prior to planting (Source: Dr Danielle Skocaj 2023).

Soil sampling

Soil sampling is the key tool to understanding whether your blocks require lime. The optimum time to soil sample is straight after a crop's final harvest at the end of the crop cycle. Trash should be gently brushed aside, and the samples taken prior to any tillage or land preparation.

Soil sampling at this time means results and recommendations come back to you early, improving your ability to apply soil ameliorants prior to the wet season.

References

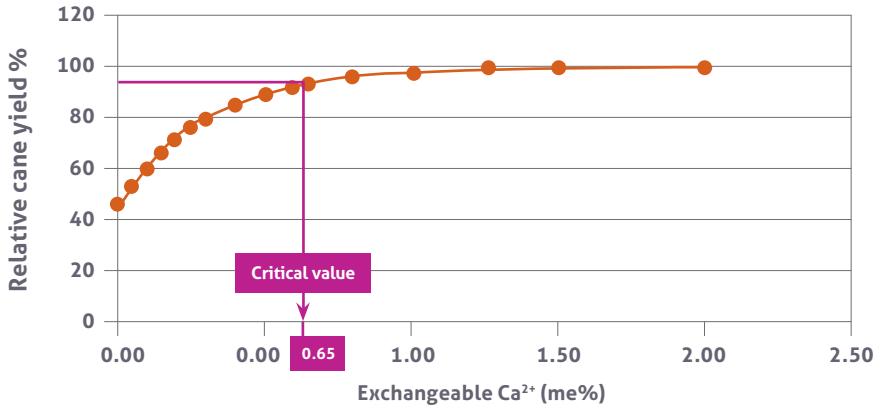
Calcino D; Schroeder B; Panitz J; Hurney A; Skocaj D; Wood A; Salter B (2018) *Australian sugarcane nutrition manual.* Sugar Research Australia, Brisbane.

Skocaj DM (2023) *Reviewing the results of soil tests identifies opportunities to improve nutrient management in the Wet Tropics. Proceedings of the Australian Society of Sugar Cane Technologists.* 44: 192-198.

Table 2. *SIX EASY STEPS® lime requirements based on exchangeable soil calcium (Ca).*

CEC (meq/100g)	Lime application (tonnes/ha)
< 0.20	4
0.21-0.40	3.5
0.41-0.60	3
0.61-0.80	2.5
0.81-1.20	2
1.21-1.60	1.5
1.61-2.00	1
> 2.00	0

Figure 2: *Yield response and soil calcium level.*



STRONG UPTAKE OF HARVEST MATE

Since the launch of Harvest Mate almost 18 months ago, the online harvesting support tool now has more than 200 users, including growers and harvesting contractors.

It's a good indicator of the value industry has placed on the free online platform and smartphone app which took more than five years to develop, from concept to trial, to its official release early last year.

Harvest Mate was designed to assist sugarcane growers and harvesting contractors to make more profitable decisions by capturing additional sugar yield during harvest whilst understanding harvesting cost constraints.

SRA Northern District Manager and agricultural machinery specialist, Phil Patane, was a driving force behind the development of the innovative program.

So far, he's worked with 11 harvesting groups who are now using Harvest Mate in the field, equating to just over one million tonnes of cane.

"These are contractors and growers that I've been able to get out into the field with to assist in their set up and utilisation of Harvest Mate, which I'm really pleased to be able to do," Mr Patane said.

"The support for the program has been amazing. Right now, the total number of registered users of the program is just over 200, including growers and harvesting contractors, located from South Johnstone through to Mackay.

"I guess the beauty of this program is that industry came to us (SRA) with a concern, about harvesting operations changing, and the cost impact on industry. And, we've been able to respond by partnering with the Department of Agriculture and Fisheries Queensland (DAF) to collect extensive trial data and use it to design a support tool that

Tully harvesting contractor Ian Ghidella.

has been able to demonstrate the economic benefits of practice change."

In 2019, SRA asked growers and harvesting contractors about their harvesting practices through a survey. Of the 148 responses, the vast majority said they did not know the cost of harvesting versus the yield benefits when changing from their current practices, including fan speed and ground speed.

SRA ran trials on farms from Mossman in Far North Queensland through to Harwood in New South Wales, surveying hundreds of growers and contractors on their harvesting practices.

Data was collected on a range of different operating scenarios, field conditions and machine types, including variety, crop presentation, machine setup and farm layout.

"With the valuable feedback from people who have used Harvest Mate, we've been able to refine the program and submit a funding application in partnership with DAF to automate the system, allowing for live transfer of data. We also intend to add additional features such as burnt cane and dual row harvesting," Mr Patane said.

Proof in the pudding

Tully harvesting contractor Ian Ghidella *(left)* is a big proponent of Harvest Mate having used it throughout the 2023 season and now in 2024.

He has more than 30 years of contracting experience in the Far North and says the system creates mutual economic benefits for both contractors and growers.

"It's all about return on investment. The money that farmers spend growing a crop, they don't want to see it getting wasted," Mr Ghidella said.

"I've done trials over the years – such as harvester speed versus fan speed - but Harvest Mate has allowed me to tweak things that little bit more, to get the most value out of what I'm doing.

"I can get the farmer in the harvester with me and if I'm cutting a paddock of cane, I know what my fan speed should be roughly. But the grower can say, 'Ok, you're cutting this at 6km an hour, let's try it at 5.8km/hr'.

"Now 0.2 of a kilometre per hour is nothing really, but my fan speed might be sitting on 640rpm, and the grower might say, 'Let's try it at 620rpm'. It might look a little bit trashier, but I'm probably saving that one or two per cent (loss in cane).

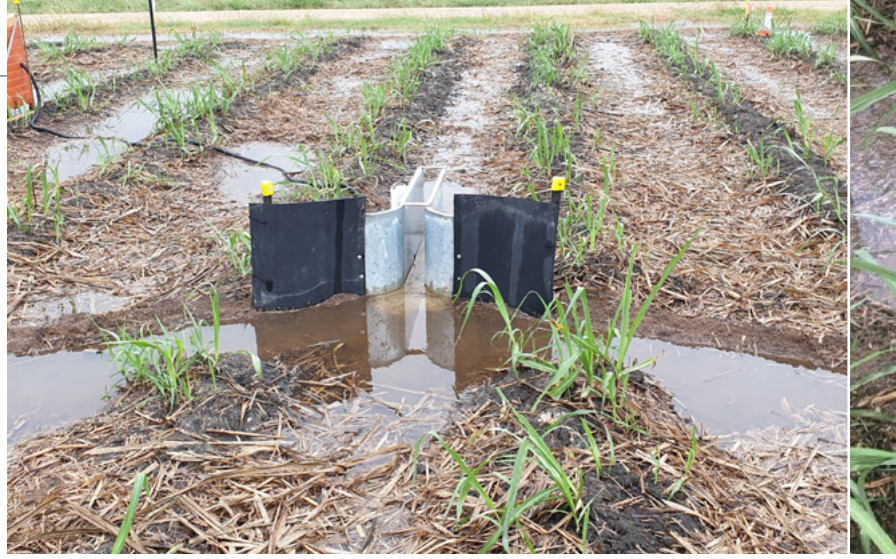
"So, the dollar value that you are going to get per hectare out of that, you're going to save a lot of money."

Mr Ghidella believes Harvest Mate allows for a better working relationship between harvesting contractors and growers by demonstrating optimal settings.

Cane growers and harvesting contractors can register to use Harvest Mate by setting up their user profile online at ***harvestmate.au***. They can then download and use the free app from the Google Play Store or Apple Store.

SRA acknowledges the invaluable research contribution by economists from the Queensland Department of Agriculture and Fisheries (DAF) for the development of this tool, as well as funding from DAF for its delivery.

Queensland Government



Water sampling equipment.

SRA CENTRAL - WATER QUALITY PROJECT

BY DR MATT SCHEMBRI, SUGAR RESEARCH AUSTRALIA

SRA recently completed a four-year project aimed at reducing nutrient and pesticide losses from Central cane farms in the Pioneer and Plane Creek Basins.

This project investigated farming practices and their impact on water quality and on production. The water quality knowledge gained from the project can be used by growers to select farming practices that are beneficial for the environment and assist in reducing losses of nutrients, herbicides and imidacloprid to the Great Barrier Reef lagoon.

In the four years of the project, 11 paddock trial sites were established, and run-off waters monitored throughout the respective growing seasons. Each trial site consisted of six strips (each strip six rows wide) with water monitoring equipment which gathered flow-paced, composite samples from the strips' run-off water during a rainfall event.

Sub-samples from the composite samples were sent to laboratories for analysis of nutrients, imidacloprid and herbicides. A range of farming practices were investigated in the trial sites.

What was learnt from the trials?

From trial measurements, it was found that a percentage of the applied nutrients, herbicides and imidacloprid leave the paddock in run-off events. Whilst in general only limited percentages of the applied chemicals are washed out of the paddock, the amount washed out will be detected in waterways.

Therefore, growers have a direct role to play regarding environmental sustainability. For all the chemicals used by growers there are guidelines for the amount of the chemicals which are acceptable in waterways.

The guidelines commonly used are for the protection of 95 percent of aquatic species in freshwater streams and it is those guidelines by which the industry is measured. Note - the guidelines are Australia wide and are not specific to Queensland or sugarcane farming.

The message? There are guidelines for the chemical levels in waterways, and the industry's aim is to keep below those guidelines.

Industry knowledge

Many of the project trials involved farming practices where the water quality outcomes were known, and as such, data was gathered to support established industry knowledge. For example:

- Importance of correct depth placement (100-125 mm) of liquid imidacloprid in ratoons to minimise run-off losses.
- Most surface herbicide losses occur in the first flush run-off event.
  - Aim to apply herbicides away from high rainfall events.
  - In periods of storms/heavy rains, consider herbicides with less mobile actives.
  - Herbicides are highly vulnerable to run-off in the first 48 hrs following application.

Water sampling.

Trial paddock with six strips.

- There are similar nutrient run-off results for surface-applied liquid dunder and sub-surface applied granular fertiliser.
- Lower nutrient run-off is achieved by accounting for the N in banded mill mud when calculating the amount of N to apply.

For growers this industry knowledge is available in Best Management Practice (BMP). For example, BMP requires chemical application training which involves following the chemical labels, using correct rates, and ensuring application equipment is in good order and calibrated, which are practices that help minimise chemical losses to waterways.

Issues to be addressed

An unintended outcome of the project was that researchers found some farming practices were not as environmentally beneficial as had been assumed by the industry. For example:

- **Banded mill mud in ratoons** – there were higher residual herbicide run-off losses compared to where no mill mud had been applied. This result had not been previously measured or reported to industry. Further work is currently being undertaken.
- **SIX EASY STEPS® (6ES) Toolbox recommendation to reduce applied N where there is banded mill mud** – the research showed nutrient run-off was lower where N rate was reduced but nutrient losses were still higher than where no mill mud was applied.
- **Enhanced Efficiency Fertiliser (EEF)** – the specific timing of rainfall and loss events may result in some situations where a nitrification inhibitor fertiliser does not result in reduced nutrient losses to the environment, as compared to a non-nitrification inhibitor product.
- **Liquid imidacloprid applied at best practice in ratoons** – in 60 percent of our trial sites high concentration levels of imidacloprid were recorded in run-off water; our data suggests such high levels would result in exceedances of the 95 percent species protection freshwater guideline for imidacloprid in local waterways.
- **Spot spraying using diuron** – this can lead to very high diuron concentrations in run-off water.

Our trial data confirmed existing industry understanding of the productivity outcomes associated with the farming practices mentioned above. However, the trial work has highlighted limitations in current industry knowledge about water quality. The project provided evidence that farming practices need to be checked for water quality outcomes rather than assumed, otherwise the industry could be supporting and promoting farming practices which have little or no impact on reducing nutrient and pesticide loads to the Great Barrier Reef lagoon.

SRA Central project Cane to Creek Mackay Whitsunday was fully funded by the Great Barrier Reef Foundation in partnership with the Australian Government's Reef Trust.

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GROWERS CONTINUE TO ENDORSE ONLINE NUTRIENT MANAGEMENT PROGRAM

Herbert River sugarcane grower, Richard Gherardi, is one of 157 farmers to have graduated from SRA's Online Sugarcane Nutrient Management (OSNM) program in the past year.

He is keen to recommend the OSNM course to other growers – particularly younger growers coming through.

"The OSNM course is all about learning what you need to do to understand the soils on your own farm and what these soils need to produce really good cane and sugar yields.

"That is very powerful stuff and quite liberating," Mr Gherardi said.

"Every grower's soils are different from their neighbours' and they are different from the next district's.

"Your soils cannot be understood at the counter of the local rural merchant. They cannot be understood by talking to a farmer who has done the same thing for three generations. Your soils must be learnt by you yourself through careful soil testing of all blocks and through understanding what those soil tests are telling you.

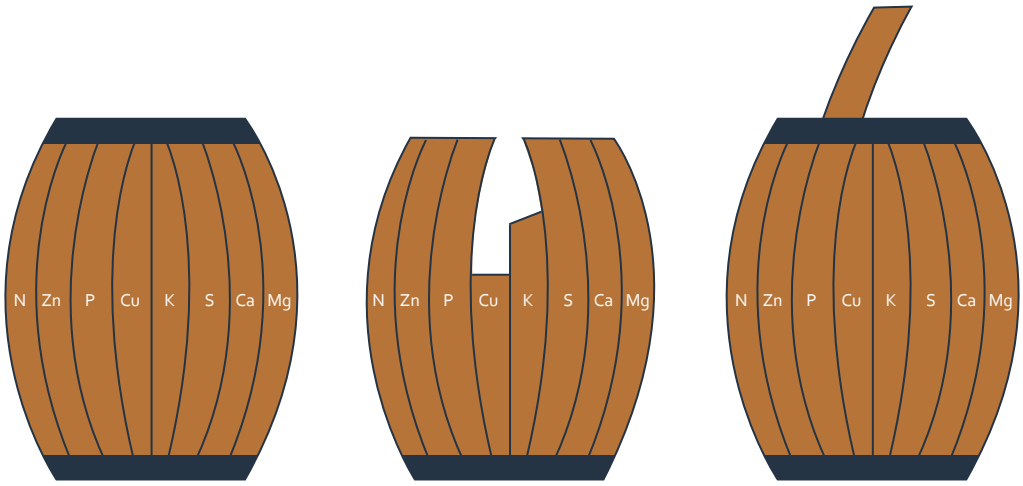
"The OSNM course is based on decades of independent scientific research. This has nothing to do with regulators or regulations. It is about really knowing your soils based on the simple facts that science can reveal to us.

"If I can convince more growers to do the course and adopt what they've learnt on farm, I think they'll be really impressed with the results," he said.

Mr Gherardi has farmed in the Herbert for more than 30 years, running a 110 ha cane farm with his brother, Robert, at Lily Pond near Ingham.

He has always been interested in soils and owns a well-thumbed copy of the BSES Soil Test Interpretation Guide.

Herbert River sugarcane grower, Richard Gherardi.



(a) Balanced nutrition *(full production possible)*

(b) Some nutrients under-supplied *(production lost)*

(c) Excess nutrient *(no extra production)*

He was one of the original test group of a dozen or so Herbert farmers who did the forerunner of the SIX EASY STEPS® course. This was conducted by BSES Ingham through the Australian College of Tropical Agriculture.

Mr Gherardi received a Certificate III in Agricultural Sugarcane Production Applying Sustainable Sugarcane Production Practices on 19 April 2001.

"I found the procedures taught by the program very easy to implement on my own farm. The whole concept of learning about your own farm's soil types and their nutrient requirements is brilliant."

He subsequently completed a wide range of soil courses. He enjoys the face-to-face contact with the researchers and other growers. However, when a friend of his started doing the Online Sugarcane Nutrient Management course Mr Gherardi thought he'd give it a go.

"I powered through the online course because I thought, 'oh, this is great, I love reading about this again'.

"A lot of the stuff I had learned before and was using already so it was a basic refresher for me.

"I think it is really well set out. There are a lot of videos in it that are good and it's easy to use.

"It's all about following each step and getting the right balance of nutrients for each of your soil types. You've probably seen the illustration of the barrel with all the staves (pictured above). That drawing really hit home with me.

"Then the leaf tests step lets you check what you have been doing. I find that especially for P, K and S, I can really finetune to get exactly what the soil needs."

By doing the course, growers can prepare their own farm Nitrogen and Phosphorus (N&P) Budgets as an 'appropriate person' under the Queensland Government's Reef regulations.

"From doing the SRA online course, I found it easier to move amounts of N&P around from field to field across my farm. That saves me time. It also enables me to use my knowledge of my own soils' requirements to full capacity while also meeting the government regulations."

Through the use of a blend of different fallow crops and on older ratoons Mr Gherardi has been able to cut nitrogen rates back to allow higher rates elsewhere.

"I definitely don't want to put more on where it's not going to give me any demonstrable yield increase. It's all about managing the amounts placed to which field. There's no point in putting it all on one field. The concept of just throwing on more bags doesn't work for cane yield or sugar and wastes a lot of coin.

"It's good to go back and see what we were doing when we started farming in 1992 to what we're doing now after learning proper soil science."

The next step could be the free electromagnetic (EM) mapping for paddock zoning according to soil type which is currently on offer for Herbert growers from Herbert Cane Productivity Services Ltd.

"I'd like to do my whole farm," Mr Gherardi said.

"I think it is important for growers to do EM zonal maps as I don't think we're there yet with variable rate fertilising applications. It's all about saving money and working to prove that that patch over there is where the nutrients are needed, instead of dumping it on good areas that don't."

Click here to get started with the Online Sugarcane Nutrient Management program.

SRA Central Variety Officer Chris Tom is about to begin a PhD looking at expanding existing initiatives on developing nematode-resistant sugarcane.

PROGRESSING IMPORTANT SUGARCANE RESEARCH THROUGH ARC FUNDING

Three of SRA's Variety Development team staff are progressing important sugarcane research work as part of a newly funded Australian Research Council (ARC) Centre.

The ARC Training Centre in Predictive Breeding for Agricultural Futures, which is led by The University of Queensland (UQ) got underway in August.

This centre aims to provide elite level training to a group of students who will become the next generation of leaders in plant breeding.

SRA Northern Variety Officer Andrew Rigby will undertake a PhD in a project using genomics to predict the performance of sugarcane parents and cross combinations.

Two PhDs will soon begin through the Centre. SRA Northern Variety Officer Andrew Rigby will be supervised by Dr Seema Yadav (UQ), Dr Felicity Atkin, SRA Variety Development Manager North, and Dr Xianming Wei, SRA Variety Development Manager Burdekin, in a project using genomics to predict the performance of sugarcane parents and cross combinations. He will use historic and current SRA progeny performance data as the basis for investigating genetic determinants of parental performance in sugarcane breeding to help optimise future crossing strategies.

SRA Central Variety Officer Chris Tom will be supervised by Dr Eric Dinglasan (UQ), Dr George Piperidis, SRA Variety Development Manager Central, and SRA Cytogeneticist Dr Nathalie Piperidis, in a project to expand existing initiatives on developing nematode-resistant sugarcane.

Parasitic nematodes are estimated to cost the sugarcane industry $80 million per annum in production losses. All sugarcane varieties are susceptible, and growers have no cost-effective control measure.

The technical excellence of the Centre will be supported by a series of Industry Research Fellows, including Dr Sijesh Natarajan who was recently appointed SRA Breeding Technology Lead. Based at SRA he will work on integrating DNA-based genomics in predictive breeding and drone-based predictions for cane yield (phenomics) for enhanced sugarcane breeding.

The Centre will also develop and deliver plant breeding training modules to support the professional development of SRA technical staff.

SRA Variety Development Manager for the Burdekin, Dr Xianming Wei, has interim overall responsibility for SRA's Centre-related involvement supported by SRA Research Mission Manager Muyiwa Olayemi and SRA Head of Partnerships and Project Management, Bronwyn Venus.

This research will be conducted by the Australian Research Council Training Centre in Predictive Breeding for Agricultural Futures (project number IC230100016).

The views expressed herein are those of the authors and are not necessarily those of the Australian Government or Australian Research Council.

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Australian Research Council

Dr Sijesh Natarajan is the new SRA Breeding Technology Lead and an Industry Research Fellow at the ARC Training Centre for Predictive Breeding for Agricultural Futures.

Peter Solomon joins the discussion at the Research Showcase.

CALL FOR EOI IN PHD PROJECTS BENEFITTING THE SUGAR INDUSTRY

A second ARC Training Centre, this one in Plant Biosecurity, got underway in July.

Led by the Australian National University (ANU) in Canberra, this Centre will train future biosecurity researchers and increase capability in the Australian biosecurity system. The result will be reduced production losses from pests, diseases and weeds in Australia.

This investment by SRA will support an Early Career Researcher and two PhD students who will work on sugarcane biosecurity projects and spend time working at SRA stations.

Centre Director, Professor Peter Solomon, gave an overview of this new Centre at the Research Showcase earlier this year, saying its purpose was to train future capability, leadership and innovation in plant biosecurity across agriculture.

"The Centre will boost capacity to prevent, respond to and recover from pests and diseases," Prof. Solomon said.

He explained that the plan came about because of the concerns about succession issues in agriculture, citing an example in the Australian citrus industry where there is only one plant pathologist who can recognise citrus diseases. Many industries are in the same situation, being forced to rely on very small numbers of experts.

Prof. Solomon said the aim was to embed the PhD students and Early Career Researchers into industry early on, so that they feel ready to start plant biosecurity careers in the sector.

Launched in July, the ARC Training Centre in Plant Biosecurity has been funded for five years with a grant from the Australian Research Council and 28 university-based and industry research partners including Herbert Cane Productivity Services Ltd and Burdekin Productivity Services.

The first round of opportunities has recently been advertised, including the first of the three SRA-based projects, entitled *Molecular Characterisation of Rust Pathogens.* PhD students with an interest in biosecurity in the sugarcane industry now have the opportunity to submit expressions of interest to the new ARC Training Centre in Plant Biosecurity.

For further information visit: PhD Opportunities – ARC Training Centre in Plant Biosecurity, visit plantbiosecuritycentre.edu.au. The rust pathogens project is being led by SRA's field pathologist Dr Seona Casonato (scasonato@sugarresearch.com.au), and supported by SRA Research Mission Manager Dr Stephen Mudge (smudge@sugarresearch.com.au).

The three new projects in this Centre will be added to the *Cane Matters* Research Project Investments Table as they are developed.

This research will be conducted by the Australian Research Council Training Centre in Plant Biosecurity (project number IC230100027).

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FRONTLINE BIOSECURITY AT MERINGA

SRA's Meringa Station, south of Cairns, had some special guests at the facility recently, ensuring the station's biosecurity status was in top shape.

At the time, the station's Variety Development team had been preparing to send pregerminated one-eye-setts of elite experimental clones from Meringa to Mackay to establish in sugar quality trials. The Meringa team was checking for the presence of electric ants at the site before sending the material across the state as electric ants are found in the Cairns region.

They enlisted the help of odour detection dogs and their handlers from the National Electric Ant Eradication Program which is managed by Biosecurity Queensland. The team scouted high and low throughout the facility to detect any presence of the invasive ant.

The good news is the station got the all-clear. SRA takes its general biosecurity obligations extremely seriously to protect the sugarcane industry and the community that relies on its economic viability.

The sugar industry has a long history of working with state and federal governments to prevent the spread of serious pests and diseases, and to manage incursions or outbreaks.

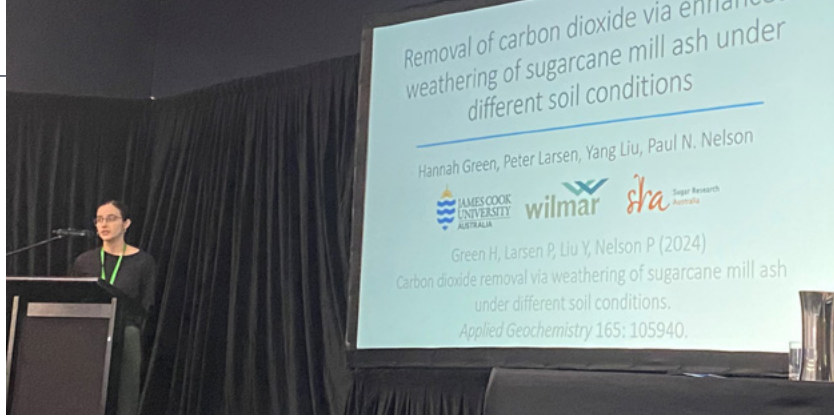
SRA moves a lot of material around for field trial work and destructive sampling, where it has Biosecurity Instrument Permits (BIP) issued by BQ for these movements.

It has special permission under the Biosecurity Regulation 2016 for safe movement of planting material that is part of the "SRA plant breeding and tissue culture scheme".

If industry or other research providers are moving planting material, plant parts or machinery across any of the Sugarcane Biosecurity Zones (SBZ), an application for a BIP permit must be completed, especially if the area falls into one of the key pest zones for electric ants, fire ants and red witch weed.

DAF dog handler Carla Liebersbach with golden labrador Ziggy on the job sniffing out any signs of electric ants as a precautionary biosecurity check at Meringa.

DAF dog handler Aidan Hugger with highly-trained odour detection dog Spencer surveying the Meringa Research Station for electric ants.



Hanna Green presenting her research at the Australian Society of Sugar Cane Technologists (ASSCT) Conference in Townsville earlier this year.

MILL ASH OFFERS TWIN BENEFITS

Using mill ash to improve soil health at the same time as sequestering carbon, has been the focus of James Cook University (JCU) student, Hannah Green's work for the past three years.

As part of her PhD in soil chemistry, Ms Green's work has been supported by SRA through a post graduate research scholarship.

One promising process Ms Green is exploring is called Enhanced Weathering (EW).

"Some rocks and industrial by-products like mill ash contain cations, silicates, and oxides," Ms Green said. "When these break down or weather, they convert carbon dioxide gas into dissolved bicarbonate or carbonate forms of carbon, which can then be effectively locked away for hundreds to thousands of years in the groundwater or ocean."

To speed up these reactions, which happen slowly in nature, Ms Green used materials with the right chemical composition, small particle size and high reaction surface areas (mill ash), applied in an ideal environment for rapid weathering to occur.

Tropical soils are ideal because of their high biological activity and moisture content, warm conditions and frequent acidity, resulting in higher carbon dioxide concentrations and weathering rates.

Proving sugar mill ash useful for carbon sequestration benefits the sugarcane industry by:

- Increasing the value of mill ash
- Improving the management and redistribution of soil nutrients
- Partially offsetting carbon emissions, and
- Potentially earning carbon credits for growers.

In her project, Ms Green used five different samples of mill ash from NQ mills, measuring their chemical and physical properties and using a geochemical model to simulate an application of 100 tonnes per hectare in the upper 25cm of the soil profile – as is commonly used in the paddock. She simulated 15 years of weathering under various soil conditions to assess the mill ash's rate of removal of carbon dioxide.

This was compared with a simulation of an application of 100 tonnes per hectare of mined basalt. The model simulated the breakdown of the materials, the release of cations and bicarbonate into the soil water and transportation of those materials to a depth of 50cm into the profile.

The effects of different soil pHs, and different carbon dioxide concentrations on the rate of carbon dioxide removal were tested, together with other parameters.

The highest CO_2 removal was after five years of enhanced weathering using a single application of mill ash, under high soil pH (6.5) and high soil carbon dioxide concentrations – four tonnes of CO_2 removed per hectare.

"As carbon dioxide concentrations in the soil increase, the carbon dioxide removal also increases; the carbon dioxide concentrations could be further increased by incorporating more organic matter into the soil," Ms Green said.

"Minimal carbon dioxide removal occurred when the soil pH was less than 5.5, which does happen in many places in the tropics.

"The different mill ashes achieved roughly similar results, and these compared quite well with other studied materials and other field trial data, apart from modelled basalt which achieved better results."

The major benefits of mill ash over other materials such as mined rock, are that the product is already on hand and it lowers transport distance from the mill to the field.

Ms Green is now focused on validating the modelled results in the field at a trial at Helens Hill near Ingham. The treatments are mill ash, mill mud, mud and ash and a control.

With advisors, Peter Larsen, Yang Liu and Paul Nelson from JCU, Ms Green has published her research to date in the publication *Applied Geochemistry*, available here: https://doi.org/10.1016/j.apgeochem.2024.105940.

Ms Green thanked SRA, Wilmar Sugar Australia and the Australian Government for their support for the project.

Australian Government

DETECTING HIDDEN MACRO AND MICRONUTRIENT CONSTRAINTS

BY SRA MANAGER TRANSLATION RESEARCH, DR BARRY SALTER

An SRA project led by SRA Manager Translation Research, Dr Barry Salter, investigated hidden and emerging macro and micronutrient constraints that could potentially be negatively affecting productivity and profitability within the sugarcane industry.

Here, Dr Salter presents the main outcomes of Project 2022/010, which involved the collection and analysis of almost 300 leaf and soil samples from more than 100 Queensland and New South Wales sugarcane farms.

Over the past 20 years, nutrient management research and development in the Australian sugarcane industry has largely focussed on nitrogen, due to its impact on reef water quality.

Other macro and micronutrients have received little attention in that time. While there hasn't been significant reporting of the expression of nutrient deficiency symptoms, the industry has little knowledge of the development of hidden issues that may be emerging and currently having an impact on productivity.

To address this, a widespread soil and leaf analysis survey was conducted across six sugarcane growing districts of Queensland. In total, 293 samples were collected from 101 sugarcane farms between 22 February 2023 and 9 May 2023 with the following regional breakdown: Southern 40, Central 40, Burdekin 39, Herbert 30, Tully 100, Far North 44.

High sample numbers from Tully were associated with other project work in the region. Within each region, an even number of samples from sand, loam and clay soils were targeted. Samples were collected from two ratoon ages, young (First ratoon crops) and old ratoons (Third ratoon+). Blocks that had varieties Q208$^{\phi}$, Q240$^{\phi}$ and Q253$^{\phi}$ were included, as these varieties are grown across the majority of the industry.

Chemical analysis of soil samples included: pH; electrical conductivity; organic carbon; total organic carbon; phosphorus; sulphate sulphur; calcium, magnesium, potassium; sodium, aluminium; cation exchange capacity; copper; zinc; iron; manganese; silicon. Calculations were also performed to determine exchangeable sodium percentage; effective cation exchange capacity (sum of cations); and calcium/magnesium ratio.

Leaf analyses included: nitrogen; carbon; phosphorus; potassium; calcium; magnesium; sulphur; copper; zinc; manganese; boron; iron; sodium and silicon.

Soil and leaf analyses were performed at the SRA laboratory at Indooroopilly with a small sub-set of samples also analysed at a commercial laboratory to cross-check results. Soil and leaf data were compared to known critical and marginal values and/or guidelines utilised in the SIX EASY STEPS® nutrient management program.

Some of the interesting results and observations are summarised.

Organic carbon

Soil organic carbon (Walkley Black) data was arranged according to the SIX EASY STEPS® soil mineralisation potential ranges (Table 1). These values can be compared to those in the Australian Sugarcane Nutrition Manual (Calcino et al., 2018) which were from samples processed at the Nutrient Advantage Laboratory (Incitec-Pivot) between 1990-2002.

In a number of regions, a higher percentage of samples were in the <0.8 percent range in this survey. For example, in the Herbert region 43.3 percent of samples were below 0.8 percent in this dataset in comparison to 16 percent reported previously. Similarly, the values for the Central region were 55 percent versus 26 percent previously and in the Southern region 37.5 percent versus 14 percent previously. This outcome potentially highlights a trend of declining soil organic carbon across the industry and/or a shift in soils that are being used for sugarcane production, with sugarcane being grown in more marginal soil environments than previously. While this is potentially a significant factor in the Southern region where sugarcane has been displaced by increasing horticultural production, other regions have experienced lower levels of displacement. Assuming that this survey has identified a declining trend in soil organic carbon across industry, farming practices that promote soil organic carbon retention/stabilisation are critical.

TABLE 1. PERCENTAGE OF SAMPLES WITHIN SIX EASY STEPS® SOIL ORGANIC CARBON/NITROGEN-MINERALISATION POTENTIAL RANGES BY REGION.

Region	Organic carbon (WB) %						
	< 0.4	0.4-0.8	0.8-1.2	1.2-1.6	1.6-2.0	2.0-2.4	>2.4
Far North	2.3	27.3	34.1	20.5	4.5	6.8	4.5
Tully	0.0	9.0	28.0	25.0	10.0	13.0	15.0
Herbert	3.3	40.0	26.7	23.3	3.3	3.3	0.0
Burdekin	0.0	23.1	61.5	15.4	0.0	0.0	0.0
Central	2.5	52.5	25.0	12.5	2.5	5.0	0.0
Southern	2.5	35.0	27.5	15.0	17.5	2.5	0.0

Calcium, Magnesium and Potassium

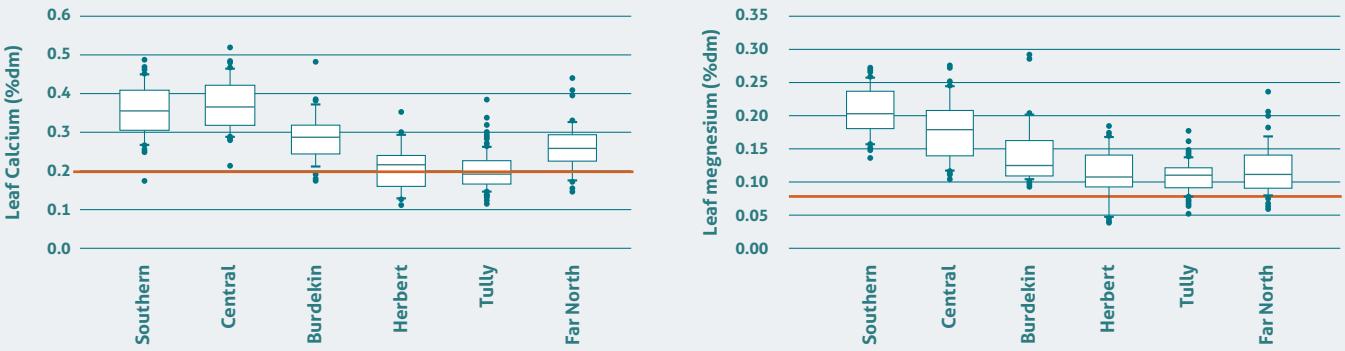
Low soil calcium levels were evident in the Tully and Far North regions and to a lesser extent in the Central region (Table 2). In Tully 49 percent of soil samples were in the marginal range (0.65 – 0.2 ME%) whereas 15 milli-equivalents (ME%) were below the critical value of 0.65 ME%. In the Far North, these values were 54.5 persent of samples in the marginal range and 11.4 percent below the critical value. Where soil calcium is less than 0.65 ME%, a productivity impact of 10 percent + could be expected. Similarly, a high percentage of samples in the Wet Tropics regions were also shown to be low to marginal for magnesium. This was particularly the case in Tully and the Far North and to a lesser extent in the Herbert (Table 2). Where soil magnesium is below 0.1 ME%, a productivity impact of 15 percent + could be expected.

TABLE 2. PERCENTAGE OF SOIL SAMPLES WITHIN SPECIFIC RANGES FOR EXCHANGEABLE CALCIUM (CA), MAGNESIUM (MG) AND POTASSIUM (K), AND POTASSIUM RESERVES (NITRIC K) BY REGION.

Region	Exchangeable Ca ME%		Exchangeable Mg ME%		Exchangeable K ME%		Exch. K and Nitric K ME%
	< 0.65	0.65-2.0	< 0.1	0.1-0.25	< 0.1	0.1-0.2	Both < 0.2
Far North	11.4	54.5	9.1	34.1	27.3	54.5	2.3
Tully	15.0	49.0	7.0	38.0	46.0	46.0	8.0
Herbert	3.3	6.7	6.7	10.0	33.3	43.3	0.0
Burdekin	0.0	0.0	0.0	0.0	0.0	33.3	0.0
Central	5.0	35.0	0.0	7.5	35.0	62.5	15.0
Southern	7.5	12.5	5.0	2.5	40.0	30.0	42.5

Leaf analysis also showed that 58 percent of samples in Tully, 40 percent of samples in the Herbert and 16 percent in the Far North were below the critical value for calcium. For magnesium, 20 percent of samples in the Herbert, 13 percent in Tully and 9 percent of samples in the Far North were below the critical value. This data is represented in boxplots (Figure 1) which show how the data is distributed. While some leaf samples were collected following very wet conditions (and this may have affected results) the similarity between the soil and leaf data in the Wet Tropics regions for calcium and magnesium suggests that both nutrients are limiting yields. While this is not new information for these regions, growers should pay close attention to the calcium and magnesium recommendations on their soil tests and follow guidelines in the SIX EASY STEPS®.

FIGURE 1. BOXPLOTS OF LEAF CALCIUM (LEFT) AND MAGNESIUM (RIGHT) ACROSS SUGARCANE REGIONS. RED LINES INDICATE CRITICAL VALUE.



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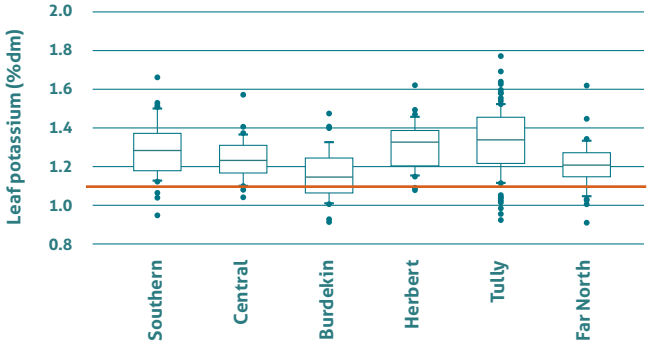
DETECTING HIDDEN MACRO AND MICRONUTRIENT CONSTRAINTS (CONTINUES)

Available soil potassium (exchangeable potassium) was low in all regions, although less so in the Burdekin (Table 2). Most regions showed more than 70 percent of samples with values less than 0.2 ME% with 30 percent + of these being below 0.1 ME%. Potassium reserves (Nitric K) are also taken into account in the SIX EASY STEPS®. When looked at in combination, only the Southern region, and to a lesser extent the Central and Tully regions, had a high percentage of samples with both low available potassium (<0.2 ME%) and low Nitric K (<0.2 ME%). Leaf analysis showed some (often less than 10 percent) samples below the critical value across all regions (Figure 2). Interestingly, the Burdekin region had the highest percentage of leaf samples below the critical value despite having no soil samples with very low exchangeable potassium levels (<0.1 ME%).

Since 80-120 kg K/ha is usually applied annually as fertiliser, low soil potassium availability may not be having a large effect on current productivity. However, given potassium exported in harvested material can exceed potassium fertiliser inputs, low soil potassium availability is a potential issue that needs to be monitored. Another factor worth considering is that applying very high rates of potassium fertiliser can result in luxury consumption by the crop, and reduce sucrose recovery at the mill. A well-considered strategy for increasing available potassium in the soil would need to be developed.

FIGURE 2. BOXPLOTS OF LEAF POTASSIUM ACROSS SUGARCANE REGIONS. RED LINE INDICATES CRITICAL VALUE.



Silicon

A very high percentage of leaf samples were found to be below the critical value for silicon in the Wet Tropics and Southern regions (Figure 3). This was despite relatively few soil samples meeting the SIX EASY STEPS® guideline requirements for silicon application (Table 3). Reports of silicon deficiency symptoms ('Sunnyside up' freckling) in crops in the Wet Tropics have also increased in the past few years. Based on this information, further investigation into this issue has been recommended.

FIGURE 3. BOXPLOTS OF LEAF SILICON ACROSS SUGARCANE REGIONS. RED LINE INDICATES CRITICAL VALUE.

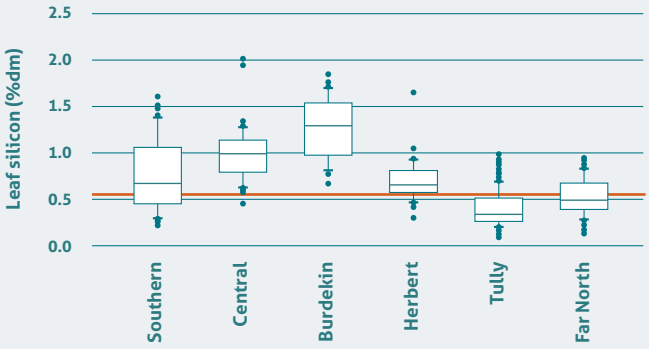


TABLE 3. PERCENTAGE OF SOIL SAMPLES WITHIN SPECIFIC SOIL SILICON RANGES (BSES AND CACL2 TESTS) BY REGION.

Region	Si (BSES) mg/kg and Si (CaCl2) mg/kg	
	*BSES<70 and CaCl2<10	BSES>70 and CaCl2>10
Far North	16.3	53.5
Tully	4.0	55.0
Herbert	0.0	93.3
Burdekin	0.0	100.0
Central	0.0	90.0
Southern	10.0	72.5

**SIX EASY STEPS® guideline for silicon application*

Overall, the project has allowed the establishment of a database as a reference point/benchmark to which future soil and leaf data can be compared. This will assist with identifying trends in nutrient availability and the assessment of the industry's nutrient management practices over time.

Key recommendations from the project include:

- Project funding to investigate the extent to which silicon is limiting productivity in the Wet Tropics including a re-assessment of the silicon BSES and $CaCl_2$ thresholds used within SIX EASY STEPS® for recommending silicon application.
- Re-establishment of the SIX EASY STEPS® Advisory Committee (SESAC) and discussion of project outputs and data by the committee.
- Following discussion by SESAC, determine appropriate research, development and adoption (RD&A) approach for addressing low levels of some soil chemical properties, with an initial emphasis on potassium.
- Utilise the soil and leaf analysis database to further explore relationships and interactions between nutrients.
- Conduct a leaf and soil survey across the industry every five years.

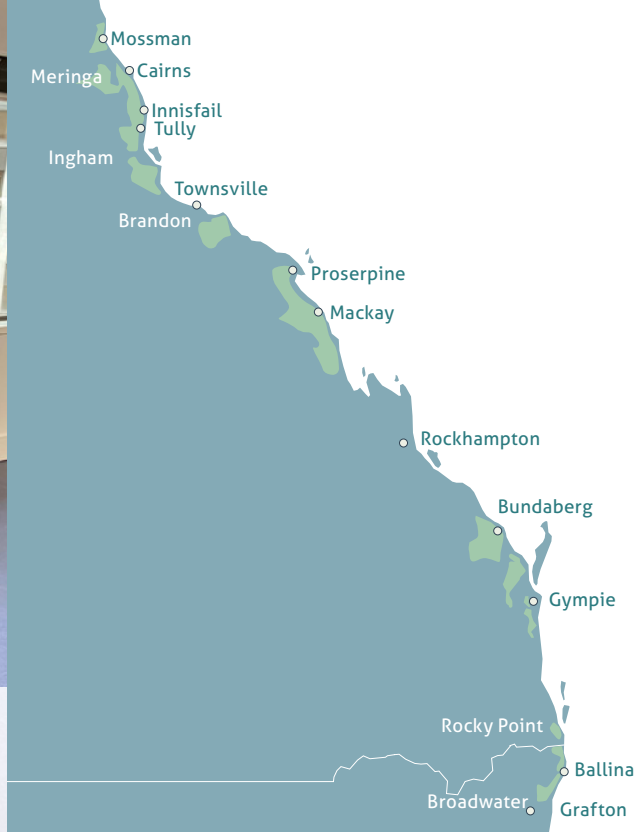
Acknowledgement

Growers are thanked for allowing access to blocks on their farms and for patience associated with the availability of the data. The work was funded by Sugar Research Australia project 2022/010.

Snapshot of project outcomes

- Almost 300 soil and leaf samples collected from more than 100 sugarcane farms
- In a number of regions, soil organic carbon data showed a higher percentage of samples in the <0.8 percent range in this survey. This outcome potentially highlights a trend of declining soil organic carbon across the industry and/or a shift in soils that are being used for sugarcane production, with sugarcane being grown in more marginal soil environments than previously
- Evidence of low soil and low leaf calcium and magnesium levels in the Wet Tropics regions suggests these nutrients are constraining yields
- Available soil potassium found to be low in all regions, however potassium reserves only low in Southern region and to a lesser extent Central and Tully
- Commonly applied rates of potassium fertiliser likely to be mitigating impact of low soil potassium availability
- Very high percentage of leaf samples found to be below the critical value for silicon in the Wet Tropics and Southern regions, despite relatively few soil samples meeting the SIX EASY STEPS® guideline requirements for silicon application
- Database now established from the project as a reference point/benchmark to which future soil and leaf data can be compared.
- Database will assist in tracking trends in nutrient availability and assessment of industry's nutrient management practices over time.

Ready to help you: SRA District Managers Gavin Rodman (Far North), Dylan Wedel (Central), Terry Granshaw (Burdekin), Lisa Devereaux (Southern), Phil Patane (Northern), with Hywel Cook (Head of Industry Services).



DO YOU NEED HELP TO COMPLETE THE SRA WEED DISTRIBUTION SURVEY?

SRA DISTRICT MANAGERS CAN LEND A HAND

Crop loss due to weed competition is estimated to cost the sugar industry $36 million a year, based on a three percent yield loss. SRA is undertaking a weed distribution study which has never been attempted at this scale before.

As a grower, you may already know that Navua sedge has been infesting cane farms in North Queensland for decades, but it is now spreading further south. Wild sorghum is a big issue in the Burdekin and itch grass is starting to spread into areas that the industry hasn't seen in the past, such as on the Atherton Tablelands. Many other weeds are affecting cane farms and spreading. These are serious biosecurity issues for the industry.

Control strategies for many of these invasive threats need improvement and to be able to optimise them, SRA Weed Specialist Emilie Fillols needs to know a lot more about the weeds' biology and the environment they thrive in. In other words, the industry needs a weed map.

Ms Fillols has asked growers across the sugarcane industry to complete an online weed distribution survey to map the weeds that grow on their farms.

SRA would like to assist you with this survey one-on-one at a time and date convenient to you. It can be quicker and easier with someone beside you who is more familiar with the technology.

SRA District Manager – Far North
Gavin Rodman 0476 807 355

SRA District Manager – Northern
Phil Patane 0431 818 482

SRA District Manager – Burdekin
Terry Granshaw 0457 650 181

SRA District Manager – Central
Dylan Wedel 0490 029 387

SRA District Manager – Southern
Lisa Deveraux 0456 590 497

Please get in touch with your SRA District Manager to set a time and date convenient to you to complete the SRA Weed Distribution Survey.

10 drums already won
40 more to give away

Complete the survey for your chance to **WIN a drum of** Nufarm DROPZONE

**See SRA website for Giveaway Terms and Conditions.*

www.sugarresearch.com.au/research/sra-weed-survey

WEED ROADSHOW ROLLS INTO AYR

Burdekin cane growers and advisors joined SRA's Weed Scientist, Emilie Fillols for an advanced pre-emergent herbicide workshop in Ayr on 22 August.

Ms Fillols has focused on optimising pre-emergent and post-emergent weed management strategies in sugarcane for more than a decade. Over the past two years she has presented her work to industry at a number of weed management workshops across Queensland and New South Wales.

Emilie's recent project work includes identifying alternatives for effective weed and pest management options that are less costly and have less impact on water quality to benefit the environment.

In the customised, advanced workshop in Ayr, Burdekin growers were shown how to take control of weeds, before they take control of their farms, including how to utilise digital tools and choose herbicides while being mindful of weed pressures, their farming systems and using alternative chemical groups to lessen the risk of weed resistance.

Burdekin cane growers and advisors in attendance at an advanced pre-emergent herbicide workshop held by SRA Weed Scientist Emilie Fillols in Ayr in August.

***Far right:** A pot of Blackberry nightshade weed on display.*

Growers and industry partners at the TVMG annual field walk at Tully.

Tully Sugar Limited's Cane Productivity and Development Manager Greg Shannon (pictured centre) taking growers through the TVMG annual field walk.

TULLY TVMG FARM WALK

The Tully Variety Management Group (TVMG) held its annual farm walk on 15 August, giving growers a tour of one of the main variety trial sites in the district and providing an update on local industry issues.

The TVMG was established in 2012 by Tully Sugar Ltd (TSL) with assistance from local growers, Tully Cane Productivity Services Ltd (TCPSL) and SRA, and builds on work by a similar group formed through TCPSL in 2007.

The aim of the TVMG's work is to trial new varieties as they come through the SRA breeding programme and the RVC review process to the sub-district level, and results in a voluntary variety recommended list for Tully and a local variety guide which goes to the sub district level and is designed to be a supplement to the SRA Northern Variety Guide.

Tully Sugar Limited's Cane Productivity and Development Manager Greg Shannon said the group's work assists in predicting how a new variety approved by the Northern Regional Variety Committee (RVC) will fit into the district's commercial mix of varieties over a 2-3 year timeframe.

"This is the third year we have done this mid-season tour of this particular trial plot," Mr Shannon said.

"It's been a good turnout. It's particularly interesting having growers from other districts come along. We've had more from other districts this year than we normally do.

"We always have a few from the Herbert, because we swap canes (between districts) and we cooperate well with the Herbert Productivity Board and Herbert SRA as well."

The trial site where the walk was conducted is owned by Tully Sugar and trials on the property are run over plant, first and second ratoon and if possible will go longer. There are 11 plots throughout Tully, one for each major sub district plus a few smaller plots.

The trial plots are aimed to establish; germination monitoring (up to 70 days after planting); CCS curve trend analysis 9-14 months of crop age; ratoonability monitoring (up to 70 days after harvest); field observations including stalk weight and diameter, lodging, flowering and free trashing; and once a variety is fully recommended locally commercial analysis is carried out on a weekly basis during harvest. All of this work is designed to provide local knowledge quickly to facilitate the best adoption of a new variety plus maintain the high value older ones.

"The property where this particular site is gets a lot of water through it, it's very wet. It's a tough place to grow cane and you want your trials on your hardest bit of ground. You don't really want trials in good soil because everything grows in good soil.

"Each variety in the site is treated the same. It's harvested the same time, it has the same weed control, the same fertiliser, and the monitoring is all done at the same time."

The success of this work hinges on the use of a mobile mill which enables the 11 sites to be monitored as everything is done in the field.

Other industry issues were also discussed during the farm walk, including local management of ratoon stunting disease (RSD) with TCPSL and new DNA technology available to test for RSD.

SRA's District Manager North Phil Patane also gave an update on activities happening under the District Productivity Plan including RSD harvester sterilization trials, SRA's efficacy trials of RATTOFF® baits, and a small milling research project to develop an automated extraneous matter (EM) and billet length measurement system in cane consignments at Tully mill.

BEST IN SHOW AT INGHAM

Staff from SRA and Herbert Cane Productivity Services Limited (HCPSL) hosted a successful cane competition and display at the Ingham Show in July.

It was the 141st year of the show and SRA and HCPSL helped to keep up with tradition by holding the annual cane competition over the two days.

Almost 200 entries were received across 37 different classes, including Best three Stalks of Q208^{Φ} (for under 18 year olds and Field Condition open class), Best six Heavy Stalks of Q240^{Φ} (U18s and Field Condition open class) and Best Stool of Plant Cane grown in field conditions.

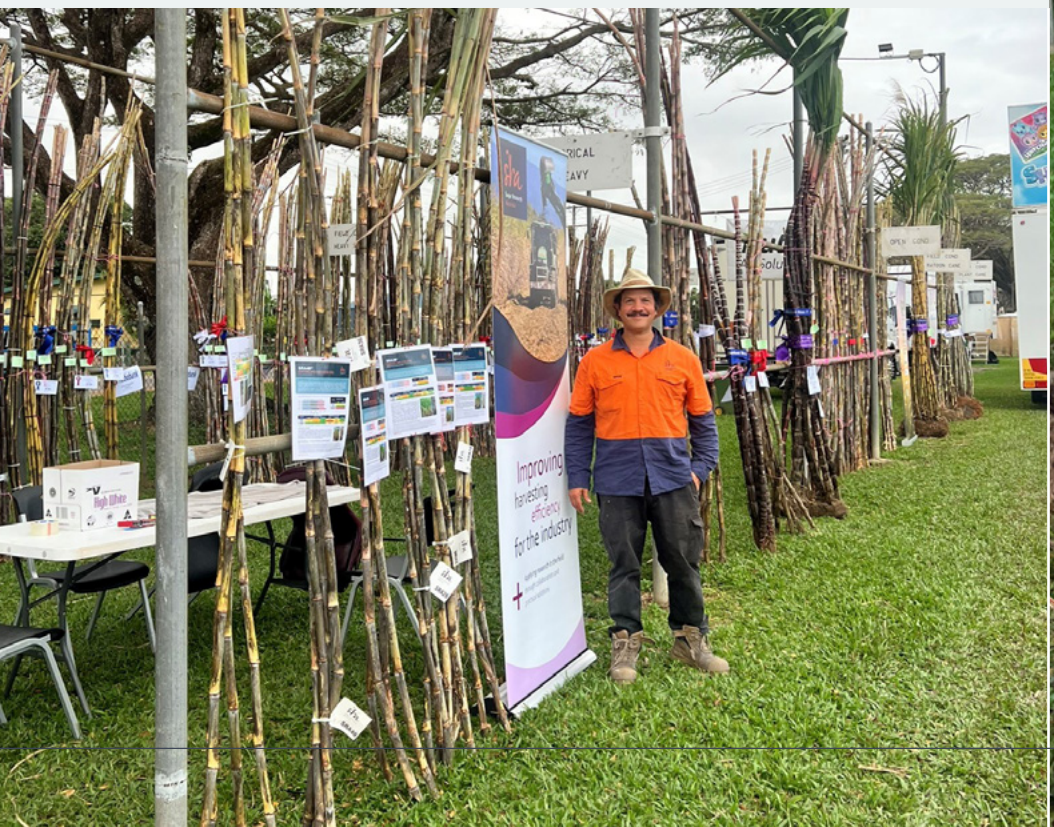
The participation of children and schools in the competition is an important part of the show each year, with Under 18 entrants actively participating and receiving awards for the cane they display.

The judging panel believed the standard of entries had increased this year in all categories, noting that the cane in general looked better with longer stalks and a greater selection of different varieties.

The voluntary work of display judges, marshals and other helpers makes the event possible and assists SRA to engage with the local community.

SRA staff also presented a display of newer varieties and recent releases, including SRA26^{Φ}, SRA28^{Φ}, SRA36^{Φ}, SRA40^{Φ}, SRA43^{Φ}, and SRA6^{Φ}.

SRA Variety Officer Herbert Juan Briceno was one of the dedicated volunteers at the cane display at the Ingham Show.



SOUTHERN DISTRICT BUS TRIPS **PROVE A SUCCESS WITH GROWERS**

SRA held two popular 'mobile' field days for southern growers earlier this year, organised by District Manager Southern Lisa Devereaux, in a departure from previous field days hosted at Bundaberg Station.

SRA partnered with the Department of Agriculture and Fisheries (DAF) and Bundaberg Sugar Services to hold the first Southern District Bus Trip on 14 May. This was followed a week later by the second tour where SRA partnered with Isis Productivity Limited.

First item on the agenda was a shed meeting in Farnsfield where DAF Principal Farming Systems Agronomist Neil Halpin demonstrated to growers a quick test that he is developing to determine soil mineral N and how they can test and adjust their plant cane nitrogen fertiliser requirements after a legume crop using DAF's Soil Post Legume Nitrogen Application Tool (SPLAT).

Participants next visited a neighbouring farm where they were shown a DAF trial looking at the benefits of using reduced tillage in alternating from cane to soybean crops and back again. Aggressive tillage destroys soil structure and consumes fuel and time. Reduced tillage improves soil health, retains soil cover and assists to preserve the nitrogen in the legume residue until the cane crop requires it.

It was then on to the bus to travel to Bundaberg Sugar/DAF's minimum tillage trial site showcasing sugarcane planted into sprayed out soybean as a green manure.

Next, the bus travelled to SRA Bundaberg Station and participants enjoyed a walking tour with Variety Development Manager Southern and NSW Roy Parfitt to inspect the new variety SRAW44.

Growers also had the opportunity to discuss the progress of on-farm soldier fly surveys conducted by SRA Entomology Technician Jennifer Parry as part of a project managed by SRA Entomologist Dr Kevin Powell.

SRA Manager Industry Services Operations Heidi du Clou was also on hand to demonstrate brix results achieved from fresh cane stalks using a Micro NIR instrument which may some day be available for use by growers or their advisors on their own farms.

The group next travelled to view Bundaberg Sugar Services' One-eye-sett propagation program where Mike Turner discussed the success rate from planting this form of seedling.

On the second tour, the agenda included a visit to the Isis Productivity Limited's clean seed plot. SRA33 will be the new variety released to the district this spring.

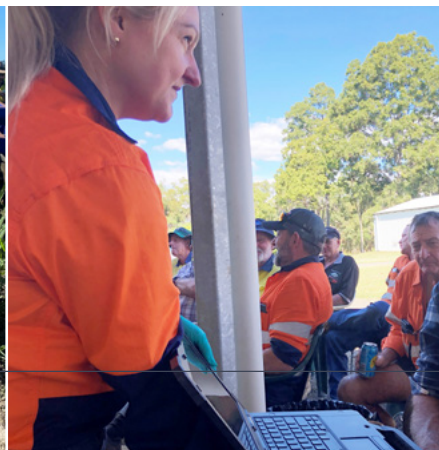
Another highlight was a visit to the Bundaberg Bulk Sugar Terminal to see the new export infrastructure and systems.

The bus tours were well received and enjoyed by those who attended.

DAF Principal Farming Systems Agronomist Neil Halpin discusses the SPLAT tool for adjusting nitrogen fertiliser requirements after a legume crop.

Growers examine a Hodge Bed Renovator on the tour.

SRA Manager Industry Services Operations Heidi du Clou shows growers brix readings from a cane sample using a handheld Micro Near Infrared (NIR) spectrometer.



Gordonvale sugarcane growers (Far North Queensland) John and Desley Ferrando brought along their grand daughters (L-R) Emily and Charlotte O'Connor to the EKKA and popped into the sugar industry display.

The Virtual Reality tours were a big hit with participants of all ages.

Dr Nathalie Piperidis inspires a young student to think about a career in cytogenetics.

HOW SWEET IT IS: THE SUGAR INDUSTRY ON SHOW AT THE EKKA

A collaboration of industry partners – CANEGROWERS, Sunshine Sugar, SRA and the Queensland Farmers' Federation – were the backbone of the sugar industry display in the Agricultural Education Hall at the Brisbane Exhibition again this year.

SRA Acting CEO Hywel Cook said it was important that industry partners stand together to show the Australian public how the sugarcane industry is innovating and progressing to ensure it remained productive, profitable and sustainable into the future.

He thanked CANEGROWERS for inviting SRA to be a part of the sugarcane industry Ekka exhibit since it began in 2022.

Despite showers, visitors came in a constant stream to the stand throughout the eight days. Adults and children were keen to take one of two free Virtual Reality tours of the industry 'from paddock to plate' produced by CANEGROWERS and Sunshine Sugar, and to receive an industry Show bag featuring a 32-page magazine highlighting *Sugarcane – One Plant, Many Products.*

SRA celebrated the cracking of the genetic code of sugarcane variety R570 this year with a special guest, SRA Cytogeneticist Dr Nathalie Piperidis, from Mackay, on hand for three days to speak to visitors about the research breakthrough and what it could mean for the industry and the world.

Sunshine Sugar included a display of low Glycaemic Index (GI) sugar which is made at the Condong Sugar Mill in New South Wales. The GI index is the way that carbohydrates in foods and drinks are ranked according to how quickly they raise blood sugar level and visitors were very interested in the product.

Sixteen SRA volunteers took the opportunity to work on the stand this year to provide information about the research work the organisation does for the industry. This year there were nine trays of cane seedlings and tissue culture on the stand grown by Quarantine Senior Technician Liz Wilson at the Indooroopilly laboratory to show visitors how varieties are grown for the industry and how 'clean seed' free of pests and disease is made available for growers. These displays were supplemented by mature cane in pots provided by Rocky Point cane growers.

Volunteers had the chance to chat to visitors who ranged from people with no background at all in the industry who were interested to learn, students who were looking for research careers, and growers, mill workers, and their descendants who had affectionate reminiscences to share.

DISTRICT PRODUCTIVITY PLANS - CURRENT PRIORITIES

INITIATIVE	COLLABORATORS	PROPOSED OUTCOME	STATUS – September 2024
Far North District Manager: Gavin Rodman E: grodman@sugarresearch.com.au M: 0476 807 355.			
Mulgrave CCS Improvement Project	CANEGROWERS Cairns Region, MSF Sugar and Mulgrave growers.	Improve CCS through monitoring and measuring crop indicators. Development of new datasets. Identification of management strategies. Identify the impact of current practices on CCS, including those impacting upon extraneous matter.	The Mulgrave CCS Improvement Project has recently shared with the industry in the Mulgrave and Babinda areas initial insights on potential CCS impacts. These include; crop age at harvest, increasing ash %, timing of planting and harvest scheduling, use of growth regulators/ripeners, topping practices, row profile and crop presentation, and Pachymetra root rot. The project has developed a suckering estimation tool and also produced templates to support appropriate row profiles. Current activities include a planting practice survey, involving planting rate and seed quality assessments, planting depth and soil cover measurements, germination counts and post-planting cultivation practices. As an extension of the findings of the project a row profile survey has been completed for the Tableland, with a Pachymetra survey planned for late-2024.
Development of maturity calibration for MicroNIR	Far Northern growers.	Develop a calibration for the MicroNIR unit to support rapid infield maturity measurements.	A preliminary calibration has been developed for sugarcane maturity. Calibration and validation activities are ongoing throughout the 2024 harvest season.
Strategies for emerging weeds	Queensland Department of Agriculture and Fisheries, Federation University and Far Northern growers.	Develop management strategies for control of navua sedge in sugarcane.	A third navua sedge trial has been established with treatments applied in the fallow period in May 2024, followed by treatments to similate a plant cane scenario in August 2024.
North District Manager: Phil Patane E: ppatane@sugarresearch.com.au M: 0431 818 482			
Local Expert Analysis (LEA) South Johnstone	Innisfail Babinda Cane Productivity Services, CANEGROWERS Innisfail, local growers, MSF Sugar, Cassowary Coast Reef Smart Farming Project and local industry organisations.	In mid-2021 a Local Expert Analysis (LEA) was initiated in the South Johnstone District. A general LEA industry reference group was formed for the area which included local industry scientists from agronomy, pathology, machinery, variety development and Near Infrared (NIR). The group objectively considered local constraints influencing yield and milling operations. The LEA is embedded in the South Johnstone District Productivity Plan.	The initial LEA analysis suggested that the most significant constraints affecting productivity were poor nutrition in older ratoon crops, severe Pachymetra root rot, widespread incidence of RSD, low uptake of Pachymetra resistant varieties, poor adoption of highly productive new varieties, less than ideal extension materials and insufficient quantities of approved seed. There is also opportunity to adopt tools, such as Harvest Mate, to optimise economic returns for industry. Targeted actions have now been assembled to address the known constraints. Recent activities have included reviewing the results of a district wide soil and leaf survey (which has been supported by the Cassowary Coast Reef Smart Farming project), increasing the availability of Pachymetra resistant varieties through tissue culture, implementation of a Regional Variety Trial (assessing clones, standard varieties, and newly released varieties on marginal soil) and the installation of an RSD sterilisation prototype unit on a commercial harvester.
Local Expert Analysis (LEA) Tully	Tully Cane Productivity Services Ltd (TCPSL), Tully CANEGROWERS, COFCO Tully Sugar Limited.	Improved profitability through balanced crop nutrition, targeted use of mill by-products, automated mill alerts for poor yielding crops, better disease management, improved use of NIR to indicate crop status, and validation of Harvest Mate for optimising harvesting economic outcomes.	The initial LEA analysis suggested the most significant constraints affecting profitability. Current projects including a new project led by TCPSL (funded by the Office of the Great Barrier Reef) are providing tailored advice on achieving balanced nutrition, identifying and managing some of the productivity constraints identified through the Tully LEA.
Variety observation plot and CCS maturity profiling	SRA Plant Breeding.	Variety demonstration plot and CCS maturity profiling.	Completion of CCS curves for the 2023 season data analysed and added to the 2022 season dataset. Results were presented to local industry and added to the 2024/2025 Herbert Variety Guide. Sample collection for the 2024 CCS curves has begun.
Sterilisation unit for harvesting	Fire Suppression Services Qld Pty Ltd.	Prototype automatic spray unit to clean a commercial harvester to minimise RSD transmission.	From the improvements made to the original units commissioned, additional units have been installed during the 2024 offseason in the Burdekin, Tully and South Johnstone regions. The installations have targeted different harvester brands and models. The 2024 season will also include the installation of a Herbert machine. Testing has now commenced on the prototypes.
Refining nutrient recommendations for ratoon crops following application of surface banded mill by-products to manage the effect on yield and CCS	Wilmar Sugar Australia, Reinaudo Farming Company.	Improved understanding of nutrient requirements following application of surface banded mill mud to manage effects on yield and CCS.	Two trials implemented. Both sites are located in the Orient - mill mud was surface banded at 80 t/ha on first ratoon cane.
Rat Management Program	Animal Control Technologies Australia, Herbert Cane Productivity Services Limited, CANEGROWERS Queensland, CANEGROWERS Herbert River, QCAR and ACFA.	Management of increase in ground rat population.	Five trial sites to assess five different types of attractants on sachets of RATOFF® product were established. Statistical analysis of bait acceptance rates identified suitable attractants. Poster paper presented at the Australasian Vertebrate Pest Conference. Permit for approval from APVMA to use attractants has not been granted as of yet.
Burdekin District Manager Terry Granshaw E: tgranshaw@sugarresearch.com.au M: 0457 650 181			
Burdekin Irrigation Project (BIP)	Burdekin Productivity Service (BPS), Agritech Solutions, Farmacist, Burdekin Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC), James Cook University, Department of Agriculture and Fisheries, North Queensland Dry Tropics, Wilmar Sugar and growers. In-kind from Sunwater and Lower Burdekin water board.	Reduce energy costs, improve water costs and irrigation efficiencies. Measure water quality benefits. Modernisation of farming systems e.g. smart farming technology. Improve productivity/ profitability which has a direct effect on environmental outcomes.	BIP project has now ended. The district plan is currently continuing activities on all 3 demonstration sites. They are now in dry down in preparation for harvest. Lower Burdekin Smart Irrigation Project demonstration sites have now been harvested. Harvest of the legume (soybean) irrigation site was successful. An average of 4.7 tonnes/ha across plots. All seed quality was food grade. Sugarcane has now been planted to this site. The N Drip site was also harvested, and yield results and irrigation use data are now being interpreted.

INITIATIVE	COLLABORATORS	PROPOSED OUTCOME	STATUS – September 2024
Reducing herbicide usage on farm with precise weed control	Autoweed, James Cook University, Queensland Department of Agriculture and Fisheries.	Reduce herbicide use by comparing efficacy of weed control and evaluate economic savings.	Autoweed project is now completed. Discussions with commercial companies has now begun between Autoweed, JCU and interested parties.
Burdekin phosphorus response trial (SRA project 2022/011)	Wilmar, Burdekin Productivity Services and field experimental site grower hosts.	Improved understanding of phosphorus requirements for sugarcane crops growing in alkaline soils.	Harvested 1R crop at Site 1 (BRIA) and trial re-established in 2R. Plant crop sampling activities commenced at Site 2 (BRIA) and Site 3 (Delta). Identified and commenced collection of suitable soils for inclusion in the pot experiments. SIX EASY STEPS® hybrid workshop delivered to 27 growers and advisors. Generated awareness of factors impacting phosphorus nutrition.
Sterilization unit for harvesting	Fire Suppression Services Qld Pty Ltd	Prototype automatic spray unit to clean a commercial harvester to minimise RSD transmission.	Unit has been installed on a commercial harvester in the Burdekin. System is robust for conditions and working well. Will be tested for efficacy throughout the year.
Imidacloprid trials	Burdekin Productivity Services and field experimental site grower hosts.	Investigate liquid vs granular imidacloprid in early plant cane crop.	Established and implemented random replicated strip trials with liquid and granular imidacloprid products at maximum label rates in a high grub pressure site.
Appointment of Burdekin District delivery Officer	All Burdekin stakeholders and growers.	Support the implementation activities contained within the district plan and provide technical assistance to deliver research projects.	Calibrated imidacloprid equipment for trials. Biomass sampling and calibration of fertiliser equipment for phosphorous trials. Collect soil for pot trials across the district. Actively involved in Burdekin Sweetest Schools visits. Helping growers complete SRA weed surveys. Has been organising and participating in industry training events.
Central District Manager Dylan Wedel E: dwedel@sugarresearch.com.au M: 0490 029 387			
Increasing variety adoption	Productivity services companies and growers.	Increase adoption of new varieties by making additional information available to growers to make variety management decisions.	During productivity board shed meetings earlier in the year, variety selection for challenging soils was a common concern raised by growers. To bridge this information gap, four demonstration sites will be established on these soil types across the district (3x heavy cracking clay, 1x sodic). The plant source for these demonstration sites is currently being planted out, with the demonstration sites to be commercially billet planted in 2025 and for annual commercial harvest/ individual rake data to be collected in 2026 onwards. The demonstration sites will host two promising varieties and a released standard for comparison. The information collected from these demonstration plots will complement what is already being collected from observation plots managed by productivity services companies.
Increasing irrigation utilization	Productivity services companies and growers, Mackay Canegrowers, Greater Whitsunday AgTech Hub.	Increase utilisation of irrigation to increase profitability and productivity.	The Greater Whitsunday Alliance is supporting the development of multiple irrigation demonstration sites across the district. An expression of interest for growers to host an irrigation demo site has been circulated. These demonstration sites will be established over the coming months and field walks will be held in early 2025. Mackay Canegrowers have recently received funding from Advance Queensland's Regional Futures – Collaborative Projects fund to improve a free online irrigation scheduling tool, IrriSAT, for sugar cane. Mackay Canegrowers and SRA have run workshops for growers and productivity services companies. We are looking for growers to host further workshops across the district later in the year.
Soldier fly diagnostics, distribution, and development of an artificial diet	Productivity services companies and growers.	Increase knowledge of soldier fly to undertake further research to reduce the productivity impact.	Soldier fly larvae and pupae have been collected from across the district to contribute to the research project. Researchers will develop diagnostic tests for key species and an artificial diet to enable researchers to better evaluate what control agents can be used to control soldier flies.
Southern District Manager Lisa Devereaux E: ldevereaux@sugarresearch.com.au M: 0456 590 497			
Bundaberg/Wide Bay	Bundaberg Sugar Services, Isis Productivity Ltd, CANEGROWERS Maryborough	Identification of industry constraints.	Soldier Fly project (2022/004) project underway. Soldier fly surveys have been completed for this season and samples taken. Next steps are identification to species level and an artificial diet bioassay developed for selected economically damaging species. Burnett Mary Agronomy Project (2023/802) is underway in the Maryborough and Isis region. Project engagement is progressing well, with field work led by the new SRA Southern Agronomist. Monthly Steering Committee Meetings have been established. Twenty growers signed up by the first key milestone. The next phase involves completing the baseline NiLRI from the P2R project for each farm.
Rocky Point Pest and Disease Management Surveys	CANEGROWERS Rocky Point	To deliver district-based activities that improve productivity, profitability and sustainability outcomes for the Rocky Point district.	Rock Point focus on RSD management with two complementary projects commencing: the installation of sterilization units on harvesters and a new PhD project to improve sampling and awareness..
NSW multi-year productivity program	NSW Agricultural Services NSW Sunshine Sugar	Improved profitability and productivity through various projects including the development of an economic model for farmers to determine whether to harvest one or two year cane.	Economic modelling and grower engagement on the benefits and drivers for growing one year old cane in the Harwood and Broadwater areas commenced.
SIX EASY STEPS® Online Sugarcane Nutrient Management Program	Department of Environment and Science, CANEGROWERS	Enable all Australian sugarcane growers to access nutrient management training that will improve the efficiency and productivity of their farms if applied.	The program celebrated over 300 registrations since launch in 2023. Participants who finish the program receive a certificate of completion.

RESEARCH PROJECT INVESTMENTS

PROJECT IDENTIFIER	TITLE	CHIEF INVESTIGATOR	RESEARCH AGENCY	END DATE
Research Mission 1: Profitable and Productive				
2022/012	Use of machine learning to determine the extraneous matter and billet length in cane consignments	Geoff Kent	Queensland University of Technology	1/02/2027
2022/014	Australian Sugar Industry – Development of factory training modules – Phase 3	Geoff Kent	Sugar Research Institute	1/03/2028
2022/201	Feasibility study of using mill waste streams by a 5 ha micro-algae facility for supplemental income	Craig Wood	Isis Central Sugar Mill Co. Ltd	6/10/2023
2023/201	Bagasse fly ash system performance benchmarking	Jonathon Gilberd	Wilmar Sugar Australia Limited	30/06/2024
2023/202	Evaluating the suitability of measuring massecuite dry substance for control on Australian pan stages	Bryan Lavarack	Mackay Sugar Limited	1/07/2024
2023/203	Billet Quality Assessment	Barton Wixted	Grifith University	30/06/2024
2024/201	Hybrid pH control strategies to reduce sucrose losses and control corrosion in sugar factory evaporators	Aaron Baker	Sunshine Sugars	1/07/2025
2024/202	Demonstrate the use of a microwave dry substance transducer for controlling high grade boilings	Dr Bryan Lavarack	Mackay Sugar Limited	1/07/2025
2024/203	Greenhouse gas emissions from sugar factory boilers	Line Jenssen	Wilmar Sugar Australia Limited	30/06/2025
2024/204	Thermo-digester for Rapid Conversion of Mill Mud to Green Fertiliser	Stephen Xu	Charles Darwing University	1/07/2025
Research Mission 2: Resilient and Enduring				
2018/010	Moth borers - how are we going to manage them when they arrive?	Kevin Powell	Sugar Research Australia	1/06/2025
2020/004	Beyond Imidacloprid - Chemical and Biorational Alternatives for Managing Canegrubs	Kevin Powell	Sugar Research Australia	1/03/2025
2020/007	Environmental DNA Technologies and Predictive Modelling for Rapid Detection and Identification of Sugarcane Priority Pests and Diseases	Andrew Weeks	EnviroDNA Pty Ltd.	1/06/2024
2020/008	Transformational crop protection – Innovative RNAi biopesticides for management of sugarcane root feeding pests	Neena Mitter	The University of Queensland	30/06/2024
2022/002	Updating the Sugarcane Industry Biosecurity Plan	Stuart Kearns	Plant Health Australia	1/06/2027
2022/003	Fiji Leaf Gall (FLG) Eradication Strategy: Peri-urban surveillance for area freedom	Seona Casonato	Sugar Research Australia	1/06/2024
2022/004	Soldier fly diagnostics, distribution, and development of an artificial diet	Kevin Powell	Sugar Research Australia	1/05/2025
2022/005	Assess weed impact/distribution for prioritisation	Emilie Fillols	Sugar Research Australia	10/06/2025
2022/006	Development of a resistance screening method for chlorotic streak	Chuong Ngo	Sugar Research Australia	1/06/2026
2022/007	Delivery of a pest and disease diagnostic step change for the sugarcane industry (RSD - NIR)	Seona Casonato and Steve Staunton	Sugar Research Australia	1/12/2025
2022/015	Delivery of a pest and disease diagnostic step change for the sugarcane industry (RSD-LAMP)	Jimmy Botella	The University of Queensland	1/05/2026
2022/016	Viruses to aid biological control of major root-feeding pests of sugarcane	Michael Furlong and Kayvan Etebari	The University of Queensland	1/08/2027
2022/901	Agri-climate outlooks	Danielle Skocaj	Agricultural Innovation Australia Limited	11/06/2024
2024/001	ARC Industrial Transformation Training Centre – Centre for Plant Biosecurity.	Stephen Mudge	Australian National University	30/06/2029
2024/401	Proactive Preparedness for Incursion of Leafhopper Vectors of White Leaf Disease – A Major Biosecurity Threat	Kevin Powell	Sugar Research Australia	8/08/2025
2024/402	The Sweet Smell of success: Sustainable Canegrub Management using Host Plant Volatiles	Samuel Bawa	Sugar Research Australia	19/12/2025
Research Mission 3: Diversified and Adaptable				
2022/018	Building industry engagement capability for a diversified and adaptable Australian sugarcane industry	Madeline Smith	Queensland University of Technology	30/06/2024

The contact email address is sraresearchinvestments@sugarresearch.com.au

PROJECT IDENTIFIER	TITLE	CHIEF INVESTIGATOR	RESEARCH AGENCY	END DATE
Research Mission 4: Sustainable and Efficient				
2020/802	Mackay Whitsunday Cane to Creek	Matt Schembri	Sugar Research Australia	30/06/2024
2020/804	Reducing herbicide usage on sugarcane farms in reef catchment areas with precise robotic weed control	Emilie Fillols	Sugar Research Australia	30/06/2024
2020/805	Increasing industry productivity and profitability through transformational, whole of systems sugarcane approaches that deliver water quality benefits	Simon Clarke	Sugar Research Australia	30/06/2024
2021/008	Develop a sustainability framework for Australian sugar and sustainability report in collaboration with stakeholders	Ingrid Roth	Roth Rural Pty Ltd	1/11/2024
2021/804	Mobilising the Murray	Simon Clarke	Sugar Research Australia	31/12/2023
2021/805	Soil specific management for sugarcane production in the Wet Tropics	Danielle Skocaj	Sugar Research Australia	13/06/2024
2022/010	Industry-wide leaf and soil survey to detect hidden macro and micronutrient constraints	Barry Salter	Sugar Research Australia	30/06/2024
2022/011	Understanding phosphorous requirements for sugarcane crops growing in alkaline soils	Danielle Skocaj	Sugar Research Australia	13/12/2027
2022/801	XXXX Lower Burdekin Smart Irrigation Project	Simon Clarke	Sugar Research Australia	1/05/2025
2022/802	Lower Burdekin Cane Major Grants Project	Simon Clarke	Sugar Research Australia	1/05/2024
2022/8803	Cassowary Coast Reef Smart Farming - Tully	Simon Clarke	Sugar Research Australia	17/05/2024
2023/901	Know and Show Your Carbon Footprint - Build 1	Bronwyn Venus	Sugar Research Australia	30/09/2024
Research Mission 5: Resourced and Skilled				
2018/015	Sugar Milling R & D Capability Building Program	Geoff Kent	Queensland University of Technology	31/03/2027
2019/102	PhD Scholarship - Genetic solutions for determining fibre quality traits in sugarcane	Angela O'Keeffe	The University of Queensland	31/03/2024
2021/101	PhD Scholarship - Optimising mill mud and ash applications for soil improvement and carbon sequestration	Hannah Green	James Cook University	30/04/2025
2021/102	PhD Scholarship - Systems biology for sustainable agriculture: evaluation of plant growth-promoting bacteria to produce high-performing biofertilisers	Ian Petersen	The University of Queensland	30/04/2025
2021/401	Research Award - Risk assessment for the newly discovered parasitic nematode *Pratylenchus parazeae* in the Australian sugarcane industry	Shamsul Bhuiyan	Sugar Research Australia	1/04/2024
2022/101	PhD Scholarship - A novel biosensor device for on-farm sugarcane disease diagnosis	Simon Strachan	Griffith University	29/02/2024
2022/401	Research Award - Harnessing the SynBio potential of Australia's stingless bees, the first step	Natasha Hungerford	The University of Queensland	31/03/2025
2022/402	Research Award - Genomic prediction of ratoon yield robustness	Eric Dinglasan	The University of Queensland	14/05/2024
2023/101	Development of an automated system to perform localised in-crop replanting of sugarcane gaps	Bruen Smith	University of Southern Queensland	19/03/2027
2023/103	PhD Scholarship – An economic and agronomic assessment of Nitrogen Use Efficiency and the factors influencing it	Kristopher Woodrow-Smith	The University of Queensland	31/12/2025
2023/801	DES 1231311 Sugarcane practice change program - Herbert	Phil-Anthony Patane	Sugar Research Australia	31/08/2026
2023/802	DES 1231311 Sugarcane practice change program - Southern	Lisa Devereaux	Sugar Research Australia	31/08/2026

Sugar Research Australia

CALLING ALL SUGARCANE GROWERS IN EVERY DISTRICT

Please complete the online **SRA Weed Distribution Survey** to help us focus on the priority weeds in each district to develop better weed management strategies for sugarcane growers.

Click here for more information and to get started:

Complete the survey for your chance to **WIN a drum of** Nufarm DROPZONE

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www.sugarresearch.com.au/research/sra-weed-survey

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