Sugar Research Australia

Cane Matters

Summer 2022/23

CONTENTS

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Sugar Research Australia Limited acknowledges and thanks its funding providers, including levy payers (sugarcane growers and millers), the Commonwealth Government, and the Queensland Government (Department of Agriculture and Fisheries).

(Cover page) Brandy Creek grower and planting contractor, Andrew Holmes, with Sugar Services Proserpine (SSP) Manager, Frank Millar. Picture by: Chris Walker

WELCOME TO
THE SUMMER 2022/23 EDITION OF
Cane Matters

The final quarter of 2022 has flown by, with plenty of activity to close out the year.

In this edition, we introduce three new Directors elected at SRA's Annual General Meeting and share research highlights and impacts from the 2021/22 financial year.

SRA's research portfolio is focused on delivering tangible solutions and real impacts to growers, millers and other stakeholders. Each year, we engage independent consultants to measure the economic, environmental, and social impact of past solutions released to the industry, and we share the findings of those analyses.

One of Sugar Research Australia's most important investment roles is in mitigating biosecurity risks. A key body of work in this area is reviewing the *2016 Biosecurity Plan for the Sugarcane Industry* along with the *2017 Farm Biosecurity Manual* with the support of Plant Health Australia. Since international trade, travel, and even weather events have the potential to introduce exotic pests and diseases, this is essential work to understand and manage the industry's changing exposure to threats.

In our varieties feature, we look at SRA22$^{\Phi}$ and what makes it an attractive option for growers in the Central district, including tonnage, commercial cane sugar and disease resistance. In other updates we examine how the latest phenomics, genetics and cytogenetics research and work within SRA is contributing to plant breeding and may help speed the development of new varieties.

Varieties were also topical at the recent Bundaberg Field Day, which drew strong attendance, and included a range of presentations and demonstrations, including soil profiles, iMapPESTS national plant pest surveillance program and the latest varieties for the district.

In the Spring edition of *Cane **Matters,*** we shared insights from SRA's grower survey. This time, we examine the miller survey and some of the changes being made in response to the feedback.

And in the Burdekin, we catch up with young leaders of the future to discuss how innovation and technology are addressing environmental challenges for the sugarcane industry and local communities to manage water and food security.

Happy reading.

SRA stations are closed from 24 December, re-opening Tuesday, 3 January 2023.

Whatever you're doing this holiday period, we wish you the very best of the season and hope you have a restful and safe break with family and friends.

We look forward to working with you during 2023.

Cathy Weis
Head of Strategy, Insights and Engagement

Editorial contributions by Cathy Weis, Christine Walker and Helen Cook. Design by Eli Lin.

PLANNING GEARS UP FOR 2023 EVENTS

Sugar Research Australia is fine-tuning a schedule of events for 2023 – a year that will mark ten years since the formation of SRA.

District managers, researchers and variety development teams are all eager to continue engaging with the industry about local District Productivity Plans and to share the latest updates on research, varieties and other industry developments.

District Productivity Plans highlight specific local issues and proposed solutions and actions to address them.

The plans are updated and reviewed annually to drive investment at the local level and to ensure they address the most important constraints that are impacting productivity and profitability at the local level.

Updated plans are due for release in early February 2023 and a series of events will kick off soon after, with field days to again feature on the calendar.

The Meringa field day, planned for 18 April, is expected to attract visitors from across the industry since it coincides with the Australian Society of Sugar Cane Technologists Conference, being held in Cairns from 18-21 April.

Keep an eye out for more information on upcoming events from the end of January 2023.

SRA Variety Officer Far North Rhylee Pendrigh promotes the 2022 Meringa Field Day. Fingers crossed for dry weather for the 2023 event.

RESEARCH HIGHLIGHTS IN THE SPOTLIGHT AT ANNUAL GENERAL MEETING

Further information, including ballot outcomes and video recordings from SRA's AGM are also available on the website.

Sugar Research Australia's Chairperson and Chief Executive Officer highlighted achievements of the 2021/22 financial year at SRA's Annual General Meeting (AGM) held in late November.

Chairperson Rowena McNally said the first year of implementing the 2021-2026 Strategic Plan included the collaborative development of the industry roadmap – *Sugar Plus, Fuelling the Future of Food, Energy and Fabrication.*

"SRA's work is built on partnerships, collaboration and engagement," Rowena said.

"These were key in co-developing our strategy with growers and millers and have remained central to SRA's operations over the past 12 months. This has particularly been demonstrated through our District Manager model, variety development and in shaping our Research Investment Plan."

Chief Executive Officer Roslyn Baker noted the importance of biosecurity and managing pest and disease risks for the industry.

"Biosecurity has gained much public attention this year, mostly due to the concerns in the livestock sector with foot and mouth disease and lumpy skin disease," Roslyn said.

"Plant biosecurity is equally essential, and one of SRA's most important investment roles is to mitigate biosecurity risk to the sugarcane industry.

"This year, together with Plant Health Australia, SRA has completed a full review of the industry's biosecurity risk profile to identify the consequences and the likelihood of a new incursion risk impacting our Australian industry."

Roslyn also highlighted SRA work occurring in neighbouring Papua New Guinea to monitor and better understand exotic moth borers and the volume of samples and pest and disease tests handled over the past year.

"I have to give credit to our teams in our diagnostics and screening centres, who locally have processed almost 18,000 samples and delivered nearly 30,000 tests to detect the presence of pest and disease – RSD (ratoon stunting disease), Pachymetra and nematodes, for example - and to assess cane quality for the industry.

"SRA is also undertaking risk assessments on a newly discovered parasitic nematode, its capacity to cause disease, and the resistance of our germplasm to it.

"Additionally, we continue work on pre-commercial development of a LAMP assay test to detect RSD in cane entering the mill. While there is still some work to do on this project, excitingly work could lead to an ability for the industry to detect the DNA of all endemic and potential exotic threats by testing cane entering the mill. This would be a major breakthrough for biosecurity detection for the industry," Roslyn said.

Roslyn highlighted early-stage work into integrated pest management using insect-specific viruses to manage canegrubs.

"Not only is this research critical to industry's productivity, but also important to build the Australian industry's sustainability credentials without compromising productivity. This area of research will become even more critical for our industry into the future,"
Roslyn Baker

Roslyn also noted improvements in variety development.

"The number of clones in our program that were elite to Q208(f) in 2014 was 21. In 2022, this number has risen to 208, providing us with a strong indication that the strength of the germplasm pipeline is significantly improving and even more hope that our commercial variety pipeline will improve and continue to improve over the coming years.

SRA's 2021/22 Annual Report provides an in-depth look at progress over the past year. It can be viewed in the Publications area of the SRA website.

NEW BOARD MEMBERS ELECTED

Members of Sugar Research Australia elected three new Board Directors at SRA's AGM in late November.

Gavin Whiteley, Rosemary Richards and Shaun Coffey were each elected for terms of three years.

SRA Chairperson Rowena McNally welcomed the new Directors while thanking outgoing Directors Lindy Hyam and Dr Jeremy Burdon for their commitment and service.

Shaun Coffey

Mr Coffey is an internationally acknowledged leader in science and innovation.

His interests in the sugar industry stem from the 1990s, when he was a Regional Director, then Director of Research and Extension, in the Queensland Department of Primary Industries.

An agronomist by training, Mr Coffey has developed broad interests across science and technology through key leadership roles, such as Foundation Chief of the CSIRO Division of Livestock Industries (2002-2006) and as CEO of the NZ Crown entity, Industrial Research Ltd (2007-2013).

Mr Coffey serves on the Board of the Future Fuels Cooperative Research Centre, as Chair of the Agriculture and Food Forum of the Australian Academy of Technological Sciences and Engineering, and as Director of Capacity Building in the Crawford Fund for a Food Secure World.

He also serves on SRA's Research Funding Panel.

Rosemary Richards

Ms Richards has more than 20 years of experience in the food and agribusiness sectors, including considerable executive and board experience.

She has held various roles in broadacre cropping including board roles in the grains, cotton and the research and development sectors.

Ms Richards is Deputy Chair of the Cotton Research and Development Corporation (CRDC) and Chair of the Australian Oilseeds Federation.

She is a passionate communicator and industry advocate. Her experience in project management, trade policy and strategy development extends across all facets of agri and food sectors.

Ms Richards has extensive experience in the biotechnology sector, including regulatory frameworks, commercialisation and advocacy.

Gavin Whiteley

Mr Whiteley is an experienced property, agribusiness and food sector executive and non-Executive Director.

He has an extensive background across the broader food and agribusiness supply chain, having held Executive roles in the agricultural property, grain, beef, cotton and chicken meat industries.

His roles have extended from research and development, corporate advisory and capital-raising work through to the production, processing and distribution sectors.

Mr Whiteley is the Managing Director of The Micketymulga Group, a private Australian agribusiness and property investment, management and advisory business. He also chairs several family boards, primarily within the Australian agricultural sector.

He holds an honours degree in Agricultural Economics from the University of New England and an Associate Diploma in Farm Management. He is a CPA-qualified accountant, a Fellow of the Australian Institute of Company Directors and a graduate of the Australian Institute of Company Directors and the Australian Rural Leadership Program.

SRA acknowledges co-investment partnerships and funding received during 2021/22 from the Commonwealth Department of Agriculture, Fisheries and Forestry; the Queensland Department of Agriculture and Fisheries; the Cooperative Research Centre for Developing Northern Australia (CRCNA); the Queensland Department of Environment and Science; the Great Barrier Reef Foundation; the Commonwealth Department of Climate Change, Energy the Environment and Water (Reef Trust); and the Australian Research Council. SRA was also involved in cross-sectoral partnerships with other rural research and development corporations.

Queensland Government

Australian Government
Department of Agriculture, Fisheries and Forestry

$14.25 MILLION GRANT TO BOOST RESEARCH, DEVELOPMENT AND EXTENSION

The Queensland Government is continuing its support for the sugarcane industry with a 5-year $14.25 million funding grant to Sugar Research Australia Limited (SRA) for research, development and extension (RD&E) activities.

Minister for Agricultural Industry Development and Fisheries and Minister for Rural Communities Mark Furner said the Queensland Government had been working with and supporting this iconic industry for 122 years.

"The Queensland Government has a long-standing history of supporting RD&E activities that improve the prosperity and sustainability of the sugarcane industry," Mr Furner said.

"This grant will see a further $14.25M committed to strategic RD&E investments that will increase our understanding of industry problems, enable the uptake of advanced technology, and implement innovative management practices to strengthen the industry.

"RD&E is critical to driving productivity and innovation in Queensland's agricultural industries.

"Our research support for agriculture, together with investment from our research partners, is key to helping farmers to solve production problems, so they get on with what they do best, growing the world's best food and fibre."

SRA's 5-year Strategic Plan is focused on growing and shaping the prosperity of the Australian sugarcane industry and regional communities. A key focus area is the development of an RD&E growth strategy for the sugarcane industry, ensuring investments provide greater impact and lead to new innovations that are easily adopted.

The Department of Agriculture and Fisheries (DAF) will work with SRA to identify critical areas for investment aligned with industry priorities. Potential areas of focus include adoption of digital technology, diversification of sugarcane use, decarbonisation opportunities, and biosecurity preparedness, management and prevention.

SRA Chief Executive Officer Roslyn Baker said the funding commitment from the Queensland Government was extremely welcome and would greatly assist the industry to grow and adapt to future challenges.

"Sugarcane is a vital industry to Queensland's economy and for building regional prosperity," Ms Baker said.

"SRA is focused on boosting our industry to deliver immediate value through our industry services and also long-term sustainability and growth. Investment in RD&E is critical, and I welcome the Queensland Government's commitment to sugarcane RD&E through this grant."

APPLICATIONS OPEN FOR SMALL MILLING PROJECTS

Applications are open for SRA's Small Milling Research Project (SMRP) investment scheme.

Manager Research Missions Dr Tinashe Chiurugwi said the scheme enables investment in relatively low-cost, short-term, industry-identified research projects for the milling sector.

"Proposed research projects should be attempting to solve industry-identified issues and aim to deliver almost immediate outcomes that will be readily adopted," Tinashe said.

"Examples of SMRP project activities are the development or testing of new products, services or processes to provide solutions for sugar mills."

The scheme encourages applications from milling organisations, equipment manufacturers or suppliers, consultants, research organisations and other organisations. However, at least one of the project participants must be from a milling organisation. This will ensure that projects are practical and focused on delivering industry benefits.

SRA investment is capped at $75,000 per project, with $250,000 per year available. There is also a capital expenditure restriction on SMRP investments to a maximum of $5,000 per project. All successful projects are expected to be completed within 12 months of the starting date.

Applications are due to close at 5pm AEST on 17 February 2023.

SMRP investment is specifically aligned with SRA's Research Mission 1 (PROFITABLE AND PRODUCTIVE - Continuous improvement in farming and milling profitability).

More information on SRA's website: https://sugarresearch.com.au/research/milling/

Or scan the QR code.

NEW TEAM MEMBERS SUPPORT RESEARCH PROGRAM

SRA's next wave of research investments is due to be announced from late January 2023, following the review of proposals submitted during Round 1 of the Research and Innovation Fund in October.

Team members supporting the research program will work closely with project teams to contract and establish the new initiatives.

(Left to right): Dani Austin has taken the role of Contracts and Projects Officer to support the team.

Dr Tinashe Chiurugwi recently joined SRA and is one of three Research Missions Managers. The second new Research Missions Manager is Former Environmental Sustainability Scientist, Dr Cathy Mylrea, based at Meringa.

With Stephen Mudge, Cathy and Tinashe report to Head of Research MIssions, Jane Trindall, while Dani reports to Head of Partnerships and Grants, Bronwyn Venus.

The revitalised research missions team consists of new and familiar faces.

BUNDABERG FIELD DAY IS THE HIGHLIGHT OF THE 2022 SOUTHERN DISTRICT PLAN

More than 50 growers and industry stakeholders attended the Bundaberg Field Day in November, despite the district's sugarcane growers and millers still being busy with the 2022 crush.

The Field Day was one of a series of successful events held as part of the Southern District Productivity Plan, which was developed and rolled out by Southern District Manager Lisa Devereaux throughout the year.

Like other SRA field days held across the State, the purpose of the event was to share with our stakeholders some of the research and development activities SRA and our partners are engaged in to benefit the sugar industry. At the same time, it gave growers direct access to SRA's expert researchers so they could get answers to their own questions one-on-one.

District Managers are now hard at work reviewing the 2022 district plans, which will be updated with learnings and highlight new activities for 2023 to increase engagement with stakeholders.

BUNDABERG FIELD DAY

Grower Ashley Petersen with Executive Manager Industry Services, Hywel Cook.

SRA's team of presenters and demonstrators were: (l to r) Dr Sijesh Natarajan, Dr Rob Magarey, Hywel Cook, Dr Barry Salter, Dr Danielle Skocaj, Lisa Devereaux, Dr Chuong Ngo, Dr Kevin Powell and Dr Heidi du Clou.

***(Below)** Extended Vision Drone Services demonstrated the available services for growers.*

ABC Rural Reporter Kallee Buchanan (R) chats with Southern District Manager Lisa Devereaux about the Bundaberg Field Day.

Some of the participants at the Bundaberg Field Day.

Lunch was a crowd pleaser, served by the local Lions Club.

"I look forward to continuing to build on this year's Field Day to create more momentum in SRA's engagement in the Bundaberg/Wide Bay area," Lisa Devereaux said.

The Southern District Productivity Plan covers sugarcane production in the Burnett Mary Region – Bundaberg in the north, Isis in the centre and Maryborough to the south. (A separate plan was written for Rocky Point under an agreement with CANEGROWERS, while Northern NSW operates their own program in conjunction with their mills, calling on SRA advice as needed).

If you are unfamiliar with the current Southern plan and the others across the State, please visit the SRA website: https://sugarresearch.com.au/resources-and-media/district-productivity-plans/

Scan to read District Productivity Plans.

SRA34$^{\Phi}$ LOOKS LIKE A GOER IN THE SOUTHERN DISTRICT

Variety Development Manager Southern and NSW, Roy Parfitt, spoke at the Field Day about the new varieties released during 2022 for Southern growers.

"We've released two varieties so far, SRA34$^{\Phi}$ and SRA38$^{\Phi}$, and there's possibly a third. They have good yield and sugar, and they all tick the box as far as fibre quality goes. SRA34$^{\Phi}$ and SRA38$^{\Phi}$ are both new varieties that have good disease resistance.

"Disease resistance is important in the region. We encourage our growers to either order tissue culture from SRA or they can contact the local productivity services board for clean seed.

Roy Parfitt discusses new Southern varieties.

"SRA34$^{\Phi}$ is an all-round solid performer in our eyes. It is doing slightly better than some of our standard commercial varieties. SRA34$^{\Phi}$ has also been released in NSW and the Burdekin. The main diseases in the Southern Region are smut, Pachymetra, Fiji disease, leaf scald and mosaic. SRA34$^{\Phi}$ is resistant to all of them except smut to which it has intermediate resistance, well within the region's biosecurity zone resistance threshold.

"This year, we will get commercial results for the variety from Bundaberg Sugar. I'm actually waiting on the edge of my seat for those results."

Roy stepped through the process of determining fibre quality at the station, which is undertaken as part of the overall analysis of a variety.

"The samples go through a small hammer mill, which represents the crusher, and then we test them for three fibre quality traits: shear strength, short fibre percentage, and impact resistance. Those three traits, together with fibre content, give the miller a good indication about whether a new variety can be processed through the mill without any issues. A very soft cane can process into a kind of porridge. If that happens it won't flow through the rollers in the mill properly. Additionally, a cane with a low fibre content and making up a significant proportion of the crush could negatively affect the boilers and steam production. So, we check that the fibres are not too short and weak and that the cane has an acceptable fibre content."

SOIL PIT SHOWS THE LAYERED WORLD **BELOW THE SURFACE**

Bundaberg Station staff dug a soil pit for the Field Day which visitors could walk through to see the different layers of the soil profile in the area.

Manager Translational Research Dr Barry Salter and Principal Agronomist Dr Danielle Skocaj made the point to growers that the soil type which was contained in the soil profile pit only occurred in around five per cent of the Bundaberg region.

They stressed that the soils on growers' own farms – the colours, textures and structures - could be completely different.

"There are multiple soil types in the region, and different soils in Isis compared with Bundaberg," Barry said.

"Different soils should be managed differently, including cultivation, irrigation and nutrient inputs. Nutrient loss pathways also differ between soils and therefore require altered management practices to ensure fertilisers are taken up by the crop."

Danielle Skocaj agreed.

"People are surprised to see how much the colour changes from the surface. The layers below the surface are very different to the soil we see on the surface," Danielle said.

Barry and Danielle talked to growers about the resources available on the SRA website for nutrient management. These include soil booklets and nutrient guidelines for their own region and the Australian Sugarcane Nutrition Manual.

These resources are available here: https://sugarresearch.com.au/growers-and-millers/nutrient-management/

"Sugarcane growers who understand their soils and keep good records are in an excellent position to be able to refine their nutrient inputs for specific situations," Barry said.

Scan to read Australian Sugarcane Nutrition Manual.

(Top) *Principal Agronomist Danielle Skocaj and Manager Translational Research Barry Salter get ready for visitors to the soil pit at Bundaberg Field Day.*

(Bottom Left) *Soil tests were demonstrated to growers visiting the Field Day.*

(Bottom Right) *The soil profile shows how shallow the layer called the top soil is.*

iMapPESTS Project Coordinator Shakira Johnson talked to growers about the Sentinel 6 at the Field Day.

STANDING SENTINEL AGAINST PESTS **AND DISEASES IN CROPS**

Sentinel 6 was on display at the Bundaberg Field Day as part of the iMapPESTS national plant pest surveillance program, supported by SRA.

The sentinel has been involved in trials across a range of plant industries in Queensland, including a trial at the SRA Meringa Station in the summer of 2021/22.

iMapPESTS Project Coordinator Shakira Johnson said it was just one type of mobile surveillance unit that has been developed by the South Australian Research and Development Institute (SARDI).

"Depending on different disease and pest surveillance needs there are others with six metre insect suction towers and ones that deploy at one metre or can be stacked to deploy at two metres.

"They are all designed to boost on-farm pest management through rapid and accurate monitoring and reporting of airborne pests and diseases that affect crops, including sugarcane."

Shakira explained how Sentinel 6 worked.

"Powerful suction traps collect insects from the air around the sentinel. These are collected in a series of pots in an automatically operated carousel. Fungal spore samples are also collected and placed into airtight tubes. Once a week the collections are taken back to the lab for analysis.

"The collecting equipment has barcodes so that the date of collection is recorded, together with weather data which is married up with the pests and disease diagnostics data."

The program is made up of six different sub-projects spanning surveillance, diagnostics, communications, and extension."

SRA has had a strong role to play in the biosecurity and disease diagnostics area, led by Molecular Plant Pathologist, Dr Chuong Ngo.

"Our part in the iMapPESTS project has been to update outdated sugarcane diagnostic tests so that we are better prepared to intercept exotic and endemic pests and diseases.

"We do quite a lot of testing in post-entry quarantine and we need to ensure our tests work effectively when plant breeders bring in new material from overseas."

The project will finish between January and March 2023.

Growers who want to read more about the iMapPESTS project can visit: www.iMapPESTS.com.au.

Scan here to view iMapPESTS project

This project is funded by the Federal Government's Department of Agriculture, Fisheries and Forestry as part of the Rural R&D for Profit program with contributions from the Research and Development Corporations for plant production, including Sugar Research Australia.

Australian Government
Department of Agriculture, Fisheries and Forestry

DRONE PLANNED TO SUPPORT VARIETY ASSESSMENT IN BUNDABERG REGION

Phenomics scientist Dr Sijesh Natarajan spoke at the field day about the use of drones and machine learning algorithms that has enabled him to observe and measure physical and physiological characteristics of potential varieties in plant breeding trials.

"In the next two years SRA will implement this technology at the Bundaberg station to support plant breeding in the region," Sijesh said.

That means a drone will be coming to the Bundaberg station which will be operated by Southern Field Operations Leader and (soon to be) Drone Pilot Richard Cervellin.

"The idea is that Richard will fly the variety trials multiple times at different stages of development, to capture a series of images which will be uploaded into a cloud database.

"We will process the images and give back the relevant data to Variety Development Manager Southern and NSW Roy Parfitt and Richard to enable them to make better variety assessment decisions."

Read more about Sijesh's work on pages 26-27.

Grower Ian Rasmussen chats with Sijesh Natarajan after his presentation.

(Left) *SRA Variety Development Manager Far North Felicity Atkin met with the LEA group to discuss preferred varieties for improved productivity in the South Johnstone mill area.*

(Right) *SRA Pathologist Rob Magarey met with the LEA Disease Management working group to discuss key diseases impacting productivity in the South Johnstone mill area and identify key action items.*

LEA IDENTIFIES PRIORITY ACTIONS TO LIFT PRODUCTIVITY **AND PROFITABILITY IN THE SOUTH JOHNSTONE AREA**

Last Summer, we reported on the progress of the Local Expert Analysis (LEA) initiative in the Tully and South Johnstone mill areas.

The initiative had been piloted in the Tully district with good industry collaboration.

Through 2022 SRA has guided the LEA initiative in the South Johnstone mill area, working closely with representatives from local industry groups including MSF Sugar, CANEGROWERS Innisfail, Innisfail and Babinda Cane Productivity Services (IBCPS), and the Australian Cane Farmers Association (ACFA). Each of these organisations contributed to the LEA process.

SRA's Executive Manager Industry Services Hywel Cook said the overall approach of the LEA is enabling the development of immediate, mid and longer-term productivity strategies to address declining yields.

"In the first stage of the South Johnstone LEA, SRA specialists and organisation partners engaged to gather available industry data so they could begin to understand the main productivity constraints.

"Farmers were then consulted to share their perspectives on the findings and issues they saw as important to enable them to make productivity improvements; while considering the implications for their own farms," Hywel said.

Dr Robert Magarey is SRA's Pathologist based at the Tully station and has been a key member of the LEA initiative. He says the data already gathered has enabled the identification of significant productivity constraints affecting the area.

"In-depth discussions with farmers have provided background information on sugarcane management practices in the local area and an excellent context for data analyses, interpretations and further investigations," Rob said.

"Preliminary observations from these data suggests that two 'hidden' diseases, Pachymetra root rot and ratoon stunting disease (RSD), are significantly limiting productivity."

SRA Principal Agronomist Dr Danielle Skocaj said there were also nutrition constraints.

"We've also identified poor nutrition may be a contributing factor. Calcium deficiency, and in some cases magnesium and silicon deficiencies, especially in older ratoons, are limiting yields in some crops."

Dr Magarey says that while more data will be gathered on all identified constraints, the LEA will continue to seek out further opportunities for productivity improvement over the next 12 months and share these with growers.

"We want growers to make management decisions based on their farm, identified by block and crop specific data, rather than district-wide recommendations.

"The long-term aim of the LEA is to identify the productivity constraints operating in the South Johnstone Mill area, minimise their effects, take hold of opportunities to improve operating systems (such as data capture), encourage change and improve the adoption of best practices.

"We are all here to support that change, by working together to achieve higher profitability and the long-term viability of the South Johnstone Mill Area," Rob said.

Mick Ward, Senior Cane Supply Manager with MSF Sugar said that the LEA process has been key to guiding the industry in South Johnstone in managing key productivity constraints.

"We had identified the low productivity of old ratoons as an issue, so to have the SRA LEA team confirm old ratoons show higher levels of Pachymetra and RSD, along with nutritional constraints, means we are on the right track," Mick said.

IBCPS Chair Steve Bonso added that the combined input from the local industry organisations has enabled significant findings to come from the LEA process.

"As a result, I'm hopeful that in the next few years we'll see an improvement in both profitability and sustainability in the South Johnstone area," Steve said.

ADDITIONAL PROJECTS IN THE AREA, ARE ALSO HELPING TO ADDRESS CONSTRAINTS IDENTIFIED THROUGH THE LEA PROCESS.

The *Cassowary Coast Reef Smart Farming* (CCRSF) project led by CANEGROWERS Innisfail, is capturing more crop specific data. Manager Grower Services, CANEGROWERS Innisfail, Debra Telford says the CCRSF is an extension project tailored to meet the needs of each participating enterprise.

"Farming is not a recipe, and every enterprise and situation is unique," Debra said.

"This project is working very closely with growers to evaluate their physical, economic and socio-cultural drivers. We are focusing on improving productivity and profitability by refining nutrient management and farm practices to increase plant uptake of nitrogen.

"Through this process we are tailoring a plan that works for the individual farm while delivering the best possible environmental outcomes."

Economists from the Queensland Department of Agriculture and Fisheries (DAF) are also working with local industry staff to provide information on the economic benefits of better constraint management, changes in industry practices and the outcomes from adopting specific opportunities.

Two harvesting trials were conducted by SRA and DAF in the South Johnstone region during the 2022 season to validate the new online tool ***Harvest Mate.*** Results will be presented to the South Johnstone LEA early in 2023.

PRIORITIES IDENTIFIED FOR NEXT STEPS

Now with a greater understanding of constraints, the LEA has prioritised key opportunities for productivity improvement and actions for the next stage of the process. These include:

- **Better disease management:** this is being strategised through improved crop and farm-specific data on disease severity and through better advice on variety selection, plant source selection and integrated disease management.
- **Balanced crop nutrition**: guidelines will be provided to growers to help ensure all essential nutrients including calcium and magnesium are adequate, especially in older ratoon crops, therefore maintaining yields, improving soil pH and delaying the need for replanting. Demonstration plots are currently being established to highlight the importance of reapplying calcium, magnesium and in some circumstances silicon, to older ratoon crops. A leaf survey to check on the adequacy of nutrient inputs, assess crop nutrient uptake and identify hidden hunger is also planned for early-mid 2023.
- **Accelerated adoption of new varieties**: growers will be encouraged to make increased use of recently released disease-resistant varieties such as SRA26(f) and SRA28(f). Plans are underway to increase the availability of disease-free seed cane with satellite plots established from tissue culture early to mid 2023.
- **Crop specific information**: activities are focusing on how to provide disease information (Pachymetra root rot, RSD) specific to an individual farmer's crops to enable better disease management. Demonstration plots (diseased/disease-free) will also be planted to highlight the importance of managing both diseases.

At this time the LEA encourages all growers in the South Johnstone mill area to take representative soil samples from every block to be fallowed this year, for nutrition and Pachymetra assays.

The Cassowary Coast Reef Smart Farming program is funded by the partnership between the Australian Government's ReefTrust and the Great Barrier Reef Foundation.

SRA acknowledges the funding contribution of the Queensland Department of Agriculture and Fisheries for this research activity.

Kelsey Creek grower, Doug Lee (left) talks about the cane varieties he grows in his farm's trial block with Sugar Services Proserpine's George Cole and Frank Millar and SRA's Central Variety Development Manager, George Piperidis.

SRA22Φ IS A GREAT OPTION FOR DISEASE RESISTANCE IN THE CENTRAL REGION

Growers in the Central district should check out sugarcane variety SRA22Φ which has some great characteristics that make it worth growing, according to growers in Proserpine.

It has an interesting pedigree.

It originated from a cross made in 2003 between a southern elite clone and a clone imported from Canal Point in the United States.

SRA imports clones not only from the US but many other countries. CP72-2086 became one of the parents of SRA22Φ.

Variety Development Manager Central Dr George Piperidis picks up the story:

"The other parent is a Southern elite clone, QS91-7179," George said.

"The progeny from this cross was first planted as seedlings in 2004 at the Bundaberg research station.

"QS04-772 (the seedling name for SRA22Φ) was selected through the early stages of the program in the southern region and made it to the final stages.

"It then went through the Final Assessment Trial (FAT) but ultimately it wasn't chosen for release as a commercial variety.

"However, within SRA all the regional breeding programs have an inter-station exchange. We exchange the best of the best with each other every year.

"SRA Mackay received SRA22Φ when it was still named QS04-772 in 2011. We planted it in our FAT trials in 2013 and again in 2016. We presented the data to the Regional Variety Committee and they made the decision to commercially release it in 2019.

"Growers in Mackay, Plane Creek and Proserpine have been able to access it since 2020."

SRA22Φ ticks the boxes when it comes to disease resistance:

"We know it is resistant to both smut and Pachymetra root rot. Developing a variety that is resistant to a combination of those two diseases has been very difficult and elusive so this is a breakthrough," George said. "All the recently released varieties in the Central region are resistant to one but intermediate to the other disease. (However, Q253Φ released in 2017 is also resistant to both smut and Pachymetra.)

"SRA22Φ is also resistant to Fiji disease, brown and orange rust, and mosaic disease, too, with intermediate resistance to leaf scald," he said.

Despite a rating of intermediate for red rot, concerns were raised in 2020 about the possibility of the variety being susceptible. This followed observations on the MAPS farm during maturity testing in mid-November 2020 of internal reddening of SRA22$^{\Phi}$ stalks and a decline in CCS.

According to SRA pathologist, Dr Shamsul Bhuiyan, internal reddening of stalks can be caused by several diseases including fusarium and sclerotium sett rot as well as red rot. Whole stalks of symptomatic SRA22$^{\Phi}$ were sent to Dr Bhuiyan at Woodford for further investigation.

Dr Bhuiyan reported: "When split open, light to deep reddish lesions were observed throughout the tissue. No white patches across the lesion were observed. This implied that the stalks under investigation were not infected with red rot. The infected tissues were cut and inspected for fungal growth but none was observed."

George said that in 2020, SRA's maturity testing trailer was used to test varieties for CCS throughout the year. SRA22$^{\Phi}$ was tested six times and it was only during the last test in mid-November when the internal reddening symptoms were observed, and a sharp decline in CCS was recorded.

"The preliminary CCS results from the maturity trailer suggest that SRA22$^{\Phi}$ is better harvested early to mid-season," George said.

"Otherwise, so far as tonnage and CCS are concerned, the variety is considered a desirable choice for planting – and the disease resistance makes the variety a good option."

There are no problems as far as the mills are concerned:

"As part of the release process, the millers asked us to present data on fibre quality as well as sugar quality," George said.

"The mills looked at the quality of the fibre – particularly the percentage of short fibre in the cane. A variety with too much short fibre has the potential to clog up the mill. However, this is not a problem in the current suite of varieties, including SRA22$^{\Phi}$."

"BETTER IN THE BIN THAN SHE LOOKS": SRA22$^{\Phi}$ SPIKES INTEREST IN PROSERPINE

Sugar Services Proserpine (SSP) Manager, Frank Millar said that while it was still early days for SRA22$^{\Phi}$, there were a lot of growers in the district who liked to grow some of a new variety from the get-go to see how it performs.

SSP is working hard to get more clean seed to growers because of problems in the district with smut and Pachymetra. The district also has a major problem with ratoon stunting disease (RSD) and to tackle all of these, SSP has been offering tissue culture seedlings to growers as part of the clean seed program for several years.

SSP obtained the first SRA22$^{\Phi}$ as whole stick cane from SRA Mackay in 2020. The cane was cut into one-eye setts to bulk up the variety quickly for early adopters.

According to Frank, the benefit of seedlings, as opposed to hot water treated cane, is that the seedlings are already established and you get a seed plot without any gaps.

The next part of the process is to establish a mother plot using tissue culture seedlings. This was done in 2021.

Doug Lee, a third-generation cane grower at Kelsey Creek, harvested the row to plant out conventionally in the SSP two-hectare distribution plot. Billets were on sale to growers in 2022.

Doug has been farming for 40 years – "and I'm still learning", he says. He has expanded his farm area under cane over the years and now has about 400 ha of productive ground. His two sons are also growers and are involved in farming some of this production.

As well as looking after the SSP distribution plot, Doug has been involved in SRA's Final Assessment Trials (FAT) trials for more than 20 years.

"The industry has been good to me and I like to give something back," Doug said. "Years ago, I was having a whinge to someone one day, saying, 'gee, I'd like a good variety', and they said, well, why don't you get involved? And I thought, well, why not?"

(Continued next page)

All up the commercial release of SRA22ϕ has been a two-year process and that's not quick enough for some growers. They want to be straight out of the starting blocks with a new variety and so they purchase tissue culture seedlings from SRA direct – coordinated by SSP.

"The growers who purchased the tissue culture are a year ahead of us," Doug said. "Which means, if you put your ear to the ground, you can generally tell how good the variety is going.

"A lot of growers will make a decision about a variety chatting about it around the back of a ute."

Doug said the process on his own farm was to put a new variety into trial plots.

"FAT trials are good but that's SRA's own carefully 'looked-after' paddocks. It gets abused when we get hold of it," Doug said laughing.

"We compare rows with our benchmark, Q183ϕ. So, in one plot we've got SRA22ϕ, Q183ϕ, and then SRA21ϕ.

"Q183ϕ is close to a good allrounder but while it's a good cane it's also an old cane. We're looking for something new because about a third of the district is growing it. That's not a good position for disease control. We're also phasing out some of our other canes like SP80 and Q240ϕ.

"Smut is our biggest problem but we also have Pachymetra in some blocks. SRA22ϕ is resistant to both. We think SRA22ϕ will grow best on a medium soil type, on a sandy loam. I don't think it will go well in our heavy soils nearer the creeks."

Doug has discovered something interesting about SRA22ϕ.

"When you're cutting the cane out and you see what's going in the bin you think 'Oo, that's going to be a lot of sugar'.

"The cane is quite squat, not as tall as others, but it's got a good-sized stool and grows more stalks to the stool than a lot of varieties I've seen.

"It germinates quickly and well and there are no problems with ratoons.

"We planted in August this year because of the weather which means everything is behind. But while it sat still for about a month it's now caught up with Q183ϕ – they are running neck and neck.

"We expect to get four bins out of it at 100 tonnes/ha next season which will give us enough to send to the mill for the CCS rating."

If the farmers don't buy the cane from the distribution plot, Doug cuts it and uses it himself.

"We don't like to waste it. We'll put a little bit on all our farms and then at first ratoon we'll send it to the mill.

"It's too precious to waste. We put in all the varieties. You never know which one is going to be a real goer on your farm."

Doug has SRA9ϕ, SRA12ϕ, SRA13ϕ, SRA21ϕ and SRA22ϕ and Q183ϕ on three of his farms.

"I'm a great salesman," Doug laughs.

"I generally know when the growers tell me where they are from what their soil is like because we have our farms in those areas, too.

"The growers come out here to pick up one variety and I'll sell them another two!"

SRA22ϕ FACTS

SRA22ϕ is a variety that is resistant to Pachymetra, smut and Fiji leaf gall.

It has intermediate resistance to leaf scald and is intermediate to red rot.

In final assessment trials (FATs) it had equal TCH and high CCS when compared to current commercial cane varieties.

SRA22ϕ was first released to Central district growers in 2020.

It achieved an overall performance of 89 after 2013 series FATs (2014, 2015 and 2016) and 2016 series FATs (2017, 2018 and 2019). This compares with Q208ϕ of 86 and Q238ϕ of 85.

(Centre) Doug Lee, Proserpine grower, with Sugar Services Proserpine's George Cole (L) and Frank Millar, on Doug's farm at Kelsey Creek.

SSP Manager, Frank Millar, chats with Brandy Creek grower and planting contractor, Andrew Holmes about SRA22Φ.

"IT MAY NOT BE TALL BUT IT FILLS IN WELL FOR A CLEAN ROW": MORE POSITIVES FOR SRA22Φ

Andrew Holmes is a grower on 105 ha at Brandy Creek. He also works as a planting contractor and plants about 1500 ha a year just about everywhere in the Proserpine and Mackay districts.

So, like Doug Lee, he has a fair handle on who's planting what.

"There's still not a lot of SRA22Φ out there but everywhere we've cut it it's done surprisingly better than you'd think. It's much better than it looks and fills the bin.

"There's some weight to it, too.

"Even one of my carters, the first time we loaded it up, he said, 'oof, there's weight in this!'

"I didn't take too much notice," said Andrew laughing, "but then when he put it in the planter, I could tell there really was some weight."

Andrew grows all the SRA varieties.

He has a two-hectare observation block where he leaves a variety in for two years, then ploughs it out and starts again.

For his business Andrew has two planters and tractors with GPS, but the 12 rows of SRA22Φ on his farm were planted using "the pride of the fleet" a 1960 whole stick drop planter.

"A stick'll go a long way with this," he says.

"I planted SRA22Φ into some poor soil when I first got it – we call it the 'quarry paddocks' – but it didn't do well. Then I planted four or five hectares in better country where it did better. It doesn't like being in too deep, either. It's now in a pure white clay loam and the planting followed two crops of soybean. It's looking very good in that," he laughed.

"What I can say about SRA22Φ is it fills in well and gets a canopy. When we cut plants the row's as clean as a whistle, not a blade of grass weed to be seen.

"The cane never gets very tall and has a narrow leaf, a bit like a Q208Φ or Q240Φ, but there's a real volume of sticks in every stool."

Andrew is a busy man and can't find the time anymore to grow from tissue culture although he was considered one of the early adopters of it in the district.

"I used to do it but I'm just never home now and don't have time. I just go and cut sticks. I let Frank do all the hard work!"

The volume of imports into Australia is expected to double in the next decade.

THE IMPORTANCE OF PLANNING TO STAY AHEAD OF BIOSECURITY THREATS

Under an SRA-funded initiative Plant Health Australia (PHA) will review the *2016 Biosecurity Plan for the Sugarcane Industry* along with the *2017 Farm Biosecurity Manual*.

The investment is among initiatives under SRA's *Research Mission 2: To position the industry to stay ahead of climate, environmental and biosecurity threats.*

The 2016 Biosecurity Plan was coordinated by Plant Health Australia (PHA) and formally endorsed that year by CANEGROWERS, and all state and territory governments (through the Plant Health Committee). The plan considered all potential pathways by which a pest might enter Australia, including natural and assisted spread (including smuggling).

PHA National Manager, Preparedness and Research, Development and Extension Stuart Kearns says updating these two documents will ensure both industry and government are able to make informed decisions about the growing biosecurity threat in Australia.

"The 2016 plan identified more than 240 exotic plant pests and the potential biosecurity threat that they represent to the Australian sugarcane industry," Stuart said. "We're now aware, thanks to the internet and more sharing of international findings and information, of hundreds more pests and diseases that we can add to the list; and possibly hundreds more that we have yet to identify."

With the recent increase in international trade and the return of international travellers, Stuart says there are many reasons to keep on top of biosecurity, but it all comes down to economics.

"Diseases in sugarcane are already costing the industry hundreds of millions of dollars, in prevention and lost revenue, each year. We need to ensure every dollar spent is effective," Stuart said.

"Australia doesn't have a large manufacturing base and we've already got a huge volume of imports coming into the country every single day. That is expected to double by 2030; and that means the potential for even more 'hitchhiker pests' arriving through sea containers, airfreight; and with recently reopened borders, more tourists.

"Add to that significant weather events that can carry pests from northern neighbours and the biosecurity risk is not only heightened by the numbers of pests but also through the increased volume of material coming to Australia through identified pathways," Stuart said.

"We don't need another pest or another disease to come into Australia that's going to increase costs for farmers. We need to understand the changes in current pathways, identify new ones and understand how our exposure is changing."

PHA currently works with 39 different industry members and has developed biosecurity plans for organisations from avocados to passion fruit, but Stuart says it can be the plants that are not grown commercially that may harbour the hidden threats.

"While PHA's clients are predominantly growers of commercially grown plant-based products, we have delivered biosecurity plans for plant species that may impact on neighbouring crops," Stuart said.

"An example of this relevant to the sugarcane industry is mangroves, another is the acacia. We've got a significant number of both these plants close to

sugarcane, and both could harbour pests and diseases that could impact a variety of crops; so, what that's now doing is encouraging industry groups to come together to develop biosecurity plans against a common threat; it's all about economies of scale."

Another shift in biosecurity thinking since the publishing of the 2016 report, Stuart says, is the greater awareness and on-farm activity that farmers, including cane growers, are already undertaking.

"Farmers have a lot on their plate, cane growers included," Stuart said. "They're dealing with labour shortages and extreme weather events. They're dealing today with what they need tomorrow. Realistically, biosecurity comes down the list, and that's because I suppose in the past, we've all looked at it more as an insurance, and we trust the system will minimise the threat - but that's changing, although growers might not realise it.

"Farmers don't necessarily see the activities they do on a day-to day basis as biosecurity, but what they're already doing is critical work.

"A farmer on a tractor carrying out crop inspections is an important line of defence in the biosecurity war. It is a sure-fire way of picking up something that's different, not normal; and questioning and acting on it. This way we can pick up a new pest and disease quickly, making it cheaper to eradicate and control.

"So that's the first thing – keeping an eye out. But maintaining clean farms also helps in the fight. That can include farm property mapping, machinery wash downs and keeping on top of pests and diseases. It's all going to be better for the bottom line but, at the same time, stop pests and diseases from building resistance and developing new strains and potentially spreading diseases," Stuart said.

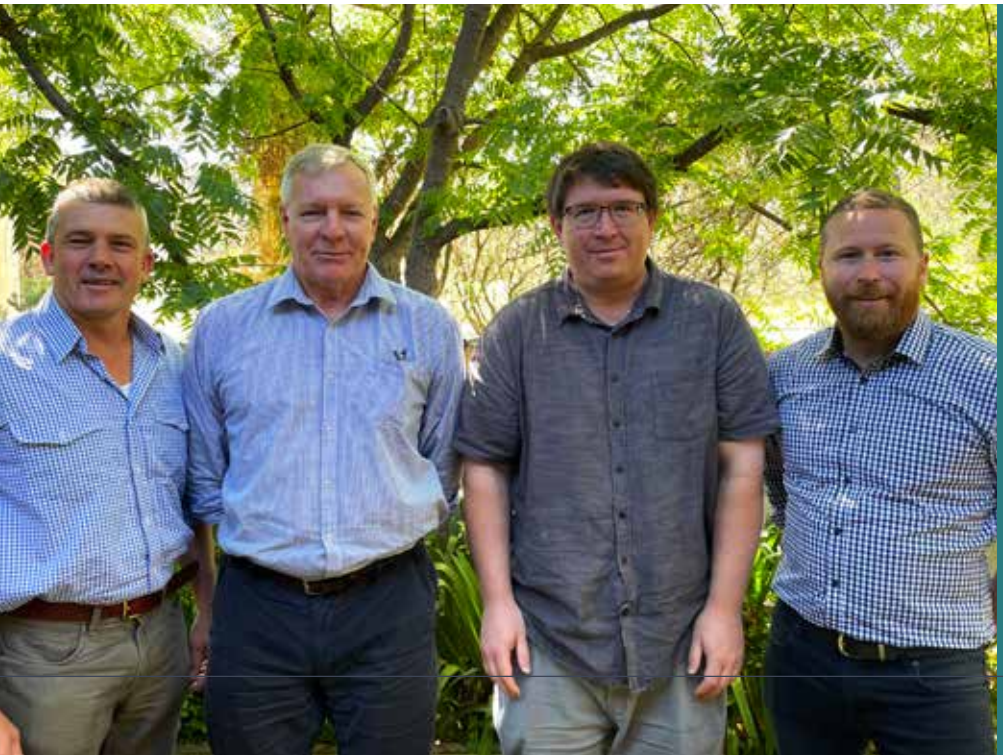
"That's where updating the *Farm Biosecurity Manual for the Sugarcane Industry* will come in. And it won't be one size fits all. We expect there will be different approaches for the wet tropics and the subtropics.

Stuart expects the PHA team to be spending the first year of the four-year project mainly conducting desk-top research before then consulting with SRA staff, cane growers and industry.

"We need to get a feel for what industry wants from this manual, and the level of detail that's needed. We don't want this to be a manual that sits on a shelf," Stuart said.

"Producing a new biosecurity plan together with a farm biosecurity manual are the first and critical steps with which to begin an industry-wide biosecurity awareness program designed to improve the long-term biosecurity capacity of the whole sugarcane industry."

PHA has delivered biosecurity plans for plant species such as mangroves and acacias which may impact on neighbouring agricultural crops.



ABOUT PLANT HEALTH AUSTRALIA

Plant Health Australia (PHA) is the national coordinator of the government-industry partnership for plant biosecurity in Australia.

PHA was formed to address high-priority plant health issues and to work with all its members to develop an internationally outstanding plant health management system that enhances Australia's plant health status and the sustainability and profitability of plant industries.

The PHA team from left: Stuart Kearns, National Manger, Preparedness and RD&E, Trevor Dunmall, Biosecurity Planning Manager, Andrew Vossen, Biosecurity Planning Coordinator, and Luke McKee, Project Officer, Biosecurity Planning.

MILLER SATISFACTION AND ADVOCACY

In the last edition of *Cane Matters* we shared insights from SRA's grower survey and committed to do the same with our miller survey.

Like the grower survey, the miller survey sought feedback from milling company representatives on SRA's progress in implementing our Strategic Plan 2021-2026. We measured the same outcomes including district-level engagement, and familiarity and satisfaction with SRA products and services, plant breeding, and communications.

The survey was completed from May to July this year. A total of 23 senior milling company representatives from eight companies completed the survey. Feedback was sought from representatives from the nine milling companies currently operating in Australia. Respondents represented a range of senior roles, from CEO to executive and operational management positions.

WHAT MILLS TOLD US

Milling representatives report **moderate overall satisfaction** with SRA's research and development (R&D) levy investment. Results suggest 13 per cent of representatives rated satisfaction strongly, 60 per cent provided a modest rating, while 27 per cent rated dissatisfied. The average performance score was 5.6 on a scale of 0 to 10 where 0 indicates extremely dissatisfied and 10 extremely satisfied.

The range of ratings likely reflects different awareness, knowledge, involvement and experiences with SRA. It's clear from these results that not all representatives share the same perspective of SRA. For reference, growers rated 6.2 on the same measure.

Milling **advocacy** of the services, products and information provided by SRA scored -17, using the net promoter scale of -100 to +100 where -100 is extreme negative and +100 is extreme positive. This result is a significant improvement from the previous survey cycle in which advocacy improved by 57 points from a score of -74. This result indicates milling representatives are now more likely to recommend SRA products, services and information to other milling and industry colleagues than before. For reference, growers rated -24 on the same measure.

Notes: 2019 = -88, 2020 = -74 and 2022 = -17. Scale range = -100 to +100.

Millers confident about the future

There was a strong statement from milling representatives about their confidence in the future of the Australian sugarcane industry over the next 12 months. More than one in three (37%) reported being 'very positive' about the future, a strong statement of optimism. Almost all milling representatives reported being confident (94%), with just a very small number holding a more pessimistic outlook.

Engagement by SRA staff

Results suggest 60 per cent of milling representatives believe SRA staff are actively engaged in industry matters at the district-level. That said, there remains a sizeable group who offered a different, more critical perspective (18 per cent undecided and 22 per cent reported staff were 'not active'). In any case, this result indicates that SRA's strategic focus on increasing engagement in each district is making progress.

Moderate familiarity and satisfaction with SRA's organisational plans

Milling representatives typically report moderate familiarity and satisfaction with SRA's Strategic Plan 2021-2026, research investment planning, and district plans. Data indicates millers are more familiar and satisfied with these plans than growers.

Satisfaction with key milling touchpoints

**The average satisfaction score provided underneath each topic is a rating of 0 (extremely dissatisfied) to 10 (extremely satisfied).*

Familiarity and satisfaction with SRA's research portfolio

PROGRAM	% FAMILIAR & AVG SATISFACTION
Small Milling Research Program	71% (6.9)
Harvesting	65% (7.1)
Nutrient management	64% (7.0)
Pests, diseases and weeds	62% (7.2)
Farming systems	62% (7.6)
Biosecurity	60% (8.4)
Land stewardship	42% (6.8)

**average satisfaction score reported on a scale of 0 to 10*

Satisfaction with plant breeding

VARIETIES	AVG SATISFACTION
Information about variety performance and selection provided by SRA is useful and credible	7.4
Satisfaction that plant breeding program offers value	7.3
Satisfaction with the distribution of new varieties from local approved plots	7.0
Satisfaction with quality of new varieties (SRA9[(1)] or later)	6.9

**average satisfaction score reported on a scale of 0 to 10*

Most familiar products and services and satisfaction

PRODUCT & SERVICE	% FAMILIAR & AVG SATISFACTION
Mill laboratory NIR service for quality assurance and factory process control	79% (7.8)
Online NIR service for quality assurance and factory process control	71% (7.8)
SIX EASY STEPS® program to help growers improve nutrient management	66% (7.8)
QCANESelect® to help growers select optimal varieties	58% (7.3)

**average satisfaction score reported on a scale of 0 to 10*

WHAT ARE WE DOING IN RESPONSE TO FEEDBACK

In the last edition of *Cane **Matters*** we committed to share actions in response to feedback from growers and millers. Below are some examples of actions we are undertaking to improve satisfaction.

Build greater familiarity with our organisational plans, products and research

A sizeable cohort of growers and milling representatives indicated they are unaware of our plans, products, and research. For example, 20 per cent of growers and 31 per cent of milling representatives are unaware of SRA's biosecurity program and activities undertaken for risk management for the industry. This is despite the fact the program has produced significant value to the industry which was reported in an independent benefit-cost analysis completed in 2021 [net present value for investments in Ratoon Stunting Disease ($67.5M), Fiji Leaf Gall ($72.7M), and exotic threat incursions ($147.6M)]. We will build familiarity with the biosecurity program along with other touchpoints, so industry is more aware of the resources available to them.

Increasing engagement with growers, milling representatives and other industry stakeholders

Central to SRA's Strategic Plan and feedback from industry is the need for SRA staff to engage with growers, milling representatives and other stakeholders at the district-level. Results from this year's surveys suggest SRA is making progress delivering against this strategic outcome with most growers and milling representatives reporting staff are actively engaged in their district. However, 30 per cent of growers and 22 per cent of milling representativeness surveyed still believe we need to do more, and we will continue to focus on improved engagement.

We have introduced engagement key performance indicators (KPI) for industry-facing employees to ensure every effort is made to connect with and understand the needs of grower and miller levy payers.

Clear and practical information about new research and products

Most growers and milling representatives are moderately satisfied with the quality of SRA's communications for providing useful and credible information. However, almost one in five growers perceived information was not useful, relevant, or credible, is difficult to access, or were simply not aware of it.

Like engagement, ensuring that growers and milling representatives are satisfied with the quality and accessibility of SRA information is integral to our Strategic Plan. Over the coming months SRA will work to adapt the information we distribute to industry to be more relevant and demonstrate why our research is credible. We will also use other channels such as podcasts, videos and more district events to make our information about research, new products and tools more accessible.

(Left) *Dr Nathalie Piperidis with her colleagues, Dr George Piperidis and Dr Angélique D'Hont at the Mackay research station.*

(Top) *In September, Nathalie was a speaker at the Genetica 22 conference, hosted by the Brazilian Society of Genetics in Natal.*

EXPLORING THE SURPRISING **COMPLEXITIES OF SUGARCANE**

The Australian sugar industry has one of the world's most renowned sugarcane cytogeneticists working in Mackay, SRA's Dr Nathalie Piperidis.

Cytogenetics was only developed in sugarcane in the 1990s and Nathalie is one of the pioneers, having worked in the field since 2005.

Another world-renowned cytogeneticist in sugarcane is Angélique D'Hont from the French Agricultural Research Centre for International Development (CIRAD), in Montpellier, France.

Nathalie first met Angélique while she was studying for a Masters in Plant Improvement in France in 1998. In 2000, Angélique became one of Nathalie's supervisors for her PhD. Nathalie has continued to work in collaboration with Angélique since then.

Nathalie's strong background in molecular markers in sugarcane from her PhD, saw her appointed as a scientist at the Mackay station.

Angélique and her team at CIRAD have many sugarcane 'firsts', in particular the publication of the first sugarcane genome sequence in 2018 and the discovery and characterisation of the gene for resistance to brown rust – called Bru1.

The year 2018 was actually quite late in the world of genome sequencing. The entire genome sequence of a human being was released in 2000, the rice sequence in 2002, but the first genome sequence of just ten (out of more than 100) chromosomes of sugarcane was not completed until 2018.

"In human beings there are only 46 chromosomes. In modern sugarcane, there are 110 to 120," Nathalie said.

"In humans, scientists now know which genes control most traits, like eye and hair colour. There are commercial probes to assist doctors to diagnose

Nathalie Piperidis chats with students informally over dinner at the Genetica 22 conference.

different genetic diseases and predict if a foetus is developing normally.

"But sugarcane is much more complicated and it takes time!"

To study chromosomes, Nathalie uses the tip of the sugarcane roots (an actively growing part of the plant) to examine under an electron microscope. You need patience to find them as they only become visible when the plant cells are dividing.

In 2020, Nathalie developed a new cytogenetic method called 'whole chromosome painting' to improve the analysis of the genome composition of modern cultivars and their parental species. These probes are called oligonucleotides (oligos).

International sharing of genetic material

In September, Nathalie travelled to Brazil to speak about her research at the Genetica 22 conference, hosted by the Brazilian Society of Genetics in Natal.

She was also invited by the Department of Genetics at the University of Sao Paulo to give a lecture at the Luiz de Queiroz College of Agriculture (ESALQ) to present her latest paper and discuss sugarcane research with students and researchers.

Following her visit to the Institute of Agronomy , breeders will again cooperate with SRA to share sugarcane genetic material between the two countries.

In November, Angélique visited Nathalie in Mackay. She had been invited to be a plenary speaker at the TropAg conference in Brisbane to talk about her work on the banana genome. She also spoke about recent advances in sugarcane research. While in Mackay, she gave a special presentation of her paper to SRA employees.

Discovering sugarcane's secrets

"It can be very frustrating to conduct research on such a complicated plant," Nathalie said. "But it is also very exciting as there is so much more to learn. This new era of research will hopefully mean we can deliver vastly better results (in plant breeding) more quickly to our growers."

After Nathalie's visit to the Institute of Agronomy in Ribeirao Preto, Sao Paulo State in September, breeders there have agreed to cooperate with SRA again to share sugarcane genetic material such as the varieties on display.

WHAT IS CYTOGENETICS?

Cytogenetics is a specialised field of research which combines cytology (the study of single cell types), genetics (the study of inheritance and inherited characteristics), molecular biology (the branch of biology that looks at the structure and function of cells and their proteins and nucleic acids essential to life), and biotechnology (the use of biological processes for agricultural and other purposes). Specifically, cytogeneticists study the function and the structure of chromosomes.

WHAT ARE CHROMOSOMES?

They are microscopic threadlike structures made up of acids and protein which are found in most living cells. They carry genetic information in the form of genes.

Improving basic genetic and genomic knowledge leads to a better understanding of which gene controls important traits in sugarcane cultivars and how this is done, to improve yields, enhance resistance to disease and pests, and increase tolerance of climatic conditions such as drought.

WHY DOES SRA INVEST IN CYTOGENETICS?

Executive Manager Variety Development Dr Jason Eglinton said there is a practical application for cytogenetics.

"We are learning to understand the genetic composition of novel clones that are coming through the introgression pipeline." Jason said.

Introgression means the transfer of genetic material from one species into another by repeated crossings with one of the early parents.

"The aim is to access novel genes and traits that are not present in modern varieties," he said.

"Significant positive differences in disease resistance and quality are expected. An understanding of their genetic architecture will support their inclusion in new varieties in the future."

In the early stages of the project Laura MacGillycuddy (centre) SRA Pathology Senior Technician based at Tully conducted a workshop with SRA staff on how to recognise and rate the severity of disease symptoms.

HOW RESEARCH COULD SPEED THE DEVELOPMENT **OF NEW SUGARCANE VARIETIES**

Dr Karen Aitken is a Principal Research Scientist at CSIRO Agriculture and Food, based in Brisbane. She is also the principal investigator on a United States Department of Energy community science project that is sequencing the first complete sugarcane genome. The aim of that research is to generate the first sugarcane high-quality genome sequence. This sequence will be instrumental in the future development of molecular tools for the sugarcane industry providing information that will be used to develop higher-yielding and more resilient sugarcane varieties for the farmer.

Karen Aitken in the CSIRO glasshouse with sugarcane clones.

Dr Karen Aitken joined CSIRO in 2000 to work on sugarcane genomics, genetics and disease interactions, and has for the past four years been working with SRA on an SRA-funded project, 2018/005 *'Genetic analysis and marker delivery for sugarcane breeding'.*

Now with the completion of that project, Dr Aitken has successfully produced new high throughput marker technology to enable the use of genetic markers in an analysis pipeline which can be used in the earlier stages of plant breeding.

Having worked on developing new marker technology in sugarcane for over 20 years and continuing the work through this project, Karen is excited by the findings and future possibilities of the work.

"New varieties are the major drivers of productivity in the Australian sugarcane industry," Karen said. "But their development can take on average 12 years, and many important traits such as disease resistance are only assessed relatively late in the breeding cycle. Being able to select clones early in the breeding program, with markers for disease resistance, could speed up the development of new sugarcane varieties significantly," she said.

"The use of molecular markers – or tags to the genome - linked to key traits in the variety development program will give breeders the ability to apply selection at earlier stages of the breeding cycle. And this will then allow selection of promising clones and elimination of undesirable ones, earlier on in the breeding program, for a faster and more efficient selection of varieties." Karen said.

Put simply, Karen explains the marker pipeline as "being able to identify sooner which parts of the genome you want and which parts you don't want when breeding new cane varieties".

"Tags allow you to do this; to identify regions (within the plant) that have genes that you want; like increasing yields or disease resistance. And you can have regions that you don't want that make the plant more susceptible to disease or lower the yield," she said.

Karen's project was specifically looking for regions of the genome that were associated with resistance to important sugarcane diseases, including smut, Pachymetra root rot, and red rot.

"Resistance to these diseases are difficult to breed for using traditional methods, so the development of molecular tools to help the sugarcane breeder is really important," Karen said.

Karen credits the project's findings with a strong collaborative process.

"Smut is complex," she said. "But working with SRA staff, we have been able to carry out trials to identify genomes that are strongly associated with smut resistance and verify these in different environments.

"Throughout this project, I've worked closely with George Piperidis, SRA Variety Development Manager Central based in Mackay and Shamsul Bjuiyan, now SRA Manager Biosecurity and Disease Screening, at SRA's Woodford station.

"Shamsul grew initial trials which were scored for smut resistance in the plant and ratoon at Woodford This data was used to identify regions that were associated with the disease.

"George's team also grew the same population in a trial in Mackay, where we had a natural infestation of smut".

The experiments included extracting DNA, screening through a process called SNPs (single nucleotide polymorphisms) developed through earlier research projects, and then analysing that data (and there was lots of it) combined with disease resistance scores of genotypes.

"We were able to compare the results from these two experiments and identified the same regions of the genome in both experiments, which gives us confidence that these results are robust and show some clear environmental variables," Karen said.

"And while this information allows us to tell the plant breeders which genotypes they need to be looking for to build a more resistant plant, we have to continue to ask why a variety that was disease-resistant in one environment suddenly becomes susceptible in another with different climatic conditions?"

While Karen and the SRA team have seen exciting results, the technology they used is too expensive to be used in early selection in the sugarcane breeding program, but that issue has also been addressed through this project.

"What we've also been doing, working with Jenny Sun, SRA's Genomics Scientist, is to convert that expensive technology to a high throughput cheaper method, and we've had success there, too. We're using that technology to identify four tags for smut resistance that Jenny is now using for implementation into the SRA breeding program. That's a great outcome."

While the project has been delayed due to weather events during 2022, it will conclude in 2023, and Karen is already looking to the future.

"We've had a long development time because sugarcane has a complex genome – the most complex of any crop plant - which makes doing all this molecular genetic work very difficult. We've also needed to gather a few years of data to be absolutely sure what we're seeing is real and not a one-off event," Karen said.

"Good research is about being rigorous and making sure that what you find is consistent. These findings are exciting, but it's important that we carry on the work and maximise the results we get so that we can make sure that new varieties are highly disease resistant in any environment and resilient to climate change."

Karen will be presenting the final results of the project at the Australian Society of Sugar Cane Technologists (ASSCT) 2023 conference being held in Cairns, 19-21 April.

Molecular marker technology **enables plant breeders to select individual plants based on their marker pattern (genotype) rather than their observable traits (phenotype).** This process is called marker assisted breeding (MAB) or marker assisted selection (MAS).

Scoring sugarcane yield-related traits (from left) Jingchuan Li (CSIRO), Kylie Garlick (SRA), Karen Aitken (CSIRO) and Shamsul Bhuiyan (SRA).

Identifying and scoring Pachymetra root rot.

DRONES A GAME CHANGER FOR VARIETY SELECTION

Unmanned aerial vehicles (UAVs) were first put to work in the mid-1800s when Austrian forces attempted to float and drop bombs over a besieged Venice. Now, commonly called drones, UAVs with cameras and sensors have been embraced by photographers, movie makers and many industry sectors for their ability to take quality aerial imagery. SRA Phenomics Scientist Dr Sijesh Natarajan has gone as far as calling the technology 'a game changer' for the sugarcane industry.

"Plant physiology is the study of plant function and behaviour," Sijesh said. "Phenomics is about observable characteristics and the measurement of the plants' physical and physiological traits.

"Drones with imaging sensors, have proven to be effective phenotyping tools, capturing key crop traits with high throughput and precision that could improve selection efficiency in clonal assessment trials (CATs)," Sijesh said.

Since 2016, SRA has invested in two successive research projects *2016/028 Improving early stage selection of SRA breeding program by indirect selection of plant vigour* and *2019/002 Validating high throughput phenomics technologies for sugarcane clonal selection.*

Sijesh was involved in both projects which he described as the 'discovery' and 'validation' phases of the drone technology for use in sugarcane variety breeding. Now that these have both successfully concluded, Sijesh is leading the 'implementation' phase of the work to introduce drones into SRA's plant breeding program across the regions.

"Improving the quality of field experiments and phenotyping accuracy is a fundamental goal of variety development for accelerating rates of genetic gain," Sijesh said. "For example, correcting cane yield by exact plot length detected using the drones would be expected to improve the assessment of the true genetic value of clones," he said.

"One of the major problems identified in the current breeding program is the accuracy of cane yield estimation in stage two (CAT). Some of the traits such as height, the photosynthetic capacity and the canopy temperature of the crop - all good predictors of yield - were measured by hand in the past, and that took time, and the data was often unreliable.

Sijesh and Johan prepare the drone for a flight over field trials in the Burdekin.

Drone image of a clonal assessment trial in the Burdekin.

"When we used these state-of-the-art drones and sensors, we were able to gather this data with higher accuracy in one day than we would have gathered in a week using the manual method. And from this data we were able to predict cane yield in the CAT with high accuracy and show that it would improve genetic gains in the stage three final assessment trial (FAT)."

Sijesh says that after six years of testing, the technology has shown great potential for improving the efficiency and effectiveness of SRA's plant breeding program.

"We have all this knowledge, from decades of research projects, about the crop physiology and morphological traits that contribute to yield but until now that information hadn't been implemented in a breeding program. But with the drones, we now have that opportunity. The drones really are a game changer."

Over the next two years SRA will be incorporating UAV-based phenotyping in all regions across SRA's variety selection programs to support breeding outcomes. Identified SRA staff within plant breeding teams will qualify for their drone licence and Sijesh and SRA Phenomics Technician Johan Deutschenbaur will support the team understand the images and data.

"A significant part of the validation phase (from Project 2019/002) was to develop methods and algorithms to extract useful information from the images taken by the sensors on the drones. We have now developed a semi-automated image processing pipeline that significantly cuts down the in-field data collection to decision-making process," Sijesh said.

"We will be utilising this information in our plant breeding program and throughout the implementation phase. Over this two-year period the adopted methods and models will be continually validated and improved. Adoption of the project outputs will also facilitate further phenomics applications in other stages of variety development.

"While we're starting with the breeding program there are lots of opportunities and possibilities where drones might benefit the sugarcane industry," an excited Sijesh said.

Some of the variety traits picked up by cameras mounted on drones include:

- plant height or canopy closure and missing stools in later ratoon crops as a measure of ratooning ability – using a visual camera
- crop health, moisture and nutrient content, photosynthesis capacity – using multispectral vegetation indices
- canopy temperature to provide data on how much water the crop is using – using a thermal camera
- reflective properties indicating changes in the physiology of the plant from weeds, diseases and deficiencies – using hyperspectral sensing.

Research conclusion Project 2019/002

The SRA investment in two successive research projects (2016/028 and 2019/002) is an example of successful new technology development and implementation.

Various UAV and sensor hardware products were evaluated, trait estimates were ground-truthed against physiological measures and traditional yield data, a semi-automated data analysis pipeline was developed, and the utility of phenomics approaches was validated in dedicated trials in irrigated and rainfed conditions. The research was planned and conducted as an integrated part of plant breeding which has contributed to the relevance of project outputs. The routine implementation and resourcing of phenomics selection as an ongoing plant breeding activity is a significant measure of success for research projects in the field of breeding technology.

SRA is now using drone-based selection for variety assessments in the Far North, Herbert, and Burdekin regions, with implementation in the Central and Southern regions to begin in 2023/34.

Acknowledgement: Field trial management and technical assistance provided by the Burdekin and Herbert variety development teams are greatly appreciated.

INDUSTRY SHOWCASES HOW INNOVATION AND TECHNOLOGY ARE ADDRESSING ENVIRONMENTAL CHALLENGES

Sugar Research Australia recently hosted a group of 30 students in the Burdekin, from Townsville's Pimlico High School, for an excursion related to a youth conference and leadership program.

District Manager Burdekin Terry Granshaw said the visit and the conference centred on water and the environment and their importance to agriculture and regional communities.

Terry partnered with multiple organisations, including Rocks Farming Company, Wilmar's Invicta Mill, Lower Burdekin Water and Sunwater, to showcase each organisation's role in the distribution, or efficient and responsible use, of the region's precious water to address environmental challenges.

"We started at the SRA station where the students heard about sugarcane variety development and some of the technology we use to make this happen, such as drones, and how important water is to produce the crop in the Burdekin. We also discussed how important water and food security is to the whole community," Terry said.

The next stop was at Lower Burdekin Water pump station, where Executive Officer David Sartori spoke about measures to address water salinity and maintain the underground aquifer.

"David actually goes into some really good historical facts about why this fresh water is pumped into sand dams, so it pushes back the salt," Terry said.

Rising groundwater and efficient irrigation application was discussed at Rocks Farming Company, where students saw a demonstration of automated irrigation operated through cloud-based technology. While a number of farms in the district have existing automated irrigation systems, Rocks Farming has implemented a brand new, state-of-the-art automated irrigation system. The automation system was a way of enabling the change of irrigation sets that have higher water inflows and run for less duration.

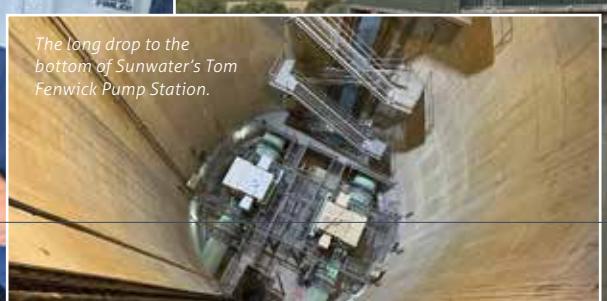
Students were impressed with what they saw and heard as their tour took in Wilmar's Invicta Mill and Sunwater's Clare Weir and Tom Fenwick Pumping Station.

Year nine student Damian Campbell, who aspires to a career in physics, had plenty of questions, soaking up the knowledge of host organisations and presenters. He particularly enjoyed seeing the automated irrigation.

SRA's Terry Granshaw, Sunwater's Robert Trail and student Damian Campbell in the control room at Tom Fenwick Pump Station.

Students enter the Tom Fenwick Pump Station.

The long drop to the bottom of Sunwater's Tom Fenwick Pump Station.



Students hear from Rocks Farming Company's Bryan Granshaw about automated irrigation technology that has enabled improved water efficiency and productivity.

"The farm is very innovative in using all these new technologies," Damian said, recounting the benefits of automated irrigation technology. "It allows the water to soak up quicker, which reduces the amount of sediment that runs off and is more efficient with the water use. It's really energy efficient too, and makes the job easier and more sustainable."

Damian is undertaking a global studies program, a humanities course in which students develop skills to be adaptable for the future to help address the social, moral, political, economic, and environmental issues of the day.

Another group of students undertaking a Certificate II in Leadership liaised with Terry Granshaw to arrange aspects of the tour, while also coordinating an associated conference involving more than 100 students from across Queensland, New South Wales, Victoria and South Australia.

Year 11 student Sophia Reeson was part of the organising group.

"It's basically focused on encouraging a youth voice," Sophia said of the conference that enables students to collaborate to develop and deliver an environmental initiative.

"We wanted to do something where we could focus on making improvements in our own communities, so we decided on the theme of water which related to the sustainable development goal for the United Nations," Sophia said.

Terry Granshaw was among a group of experts working with students at the conference.

He said both events were opportunities to demonstrate the exciting careers available in agriculture and the commitment of industry to a sustainable future.

"It's through events like these that we're able to get the message across from the sugar industry about what's available out there and what we are doing to address these environmental issues," said Terry Granshaw.

"It's just been amazing to watch the students embrace the technology and to see the enthusiasm – there's a couple of younger students here who were really enthusiastic about possibly one day working in ag, which is what we want."

Students hear from Rocks Farming Company's Bryan Granshaw about automated irrigation technology that has enabled improved water efficiency and productivity.

BAGASSE-BASED FEED PELLETS PROVE PALATABLE **AND DIGESTIBLE FOR SHEEP**

The emerging global bioeconomy is creating new market opportunities for primary producers which could also underpin the viability of existing crops and supply chains, says QUT Associate Professor Mark Harrison.

Mark was the lead investigator in the third phase of the Biorefineries for Profit project completed in 2022. This phase looked at the safety, palatability and efficacy of sugarcane-derived feed ingredients in ruminants (sheep).

"Sugar mills are sugarcane-based biorefineries and currently use sugarcane billets to produce raw sugar, molasses, bagasse, electricity, and ethanol. However, there is scope to expand into a range of value-added products manufactured on-site or nearby," Mark said.

QUT's Associate Professor, Mark Harrison, holds a container of fodder for ruminants created from bagasse.

"A 2014 study by Deloitte Access Economics and Corelli Consulting established that the financial benefits from rural and regional biorefineries for feed, fuels and fibre in Queensland could generate more than $21.5 billion in revenue in the next 20 years and create 6,640 new full-time jobs.

"In the case of livestock feed, Australian livestock consume about 12 million tonnes of feed every year, excluding pasture, hay, and silage. Most of this feed is supplied by commercial grain mills or produced on-site at integrated livestock facilities.

"Sugarcane bagasse is a potential source of fibre for livestock feed and is produced within practical transport distance of major livestock producing regions.

"It has a fibre content about double that of high-quality fodders such as Lucerne hay, oaten hay, and vetch. Until now, the only problems have been the digestibility of bagasse and the fact that the crude protein content is only about one per cent - or one-twentieth of the crude protein content of high-quality fodders."

Technologies to improve the nutritional value of sugarcane bagasse were developed in the Biorefineries for Profit - Phases 1 and 2 projects over the past five years.

"In the previous two phases of the project, a thermochemical pre-treatment increased bagasse digestibility and nutritional value in ruminants from 30 per cent to that of high-quality fodder (about 80 per cent)," Mark said.

Phase 3 established a pilot-scale system to produce 250 kg of modified fibre from bagasse for incorporation into feed pellets at 20 per cent or 40 per cent inclusion rates.

These pellets were used in a six-week feeding trial that demonstrated the safety and palatability of bagasse-based livestock feed ingredients in sheep.

In a six-week trial, merino wether lambs were fed a pellet diet which included a gradual increase in the percentage of bagasse over 42 days. Their weight and health were compared with lambs fed a control diet. At the end of the trial, the palatability and digestibility of the bagasse-based feed pellets were assessed.

"This project has laid the groundwork for further development of the manufacture of bagasse-based ruminant feed ingredients for future, larger-scale animal feeding trials," Mark said.

"The good news is that the livestock sector has already expressed interest in trials for these and similar modified fibre products at a demonstration scale."

Biorefineries for Profit - Phase 3 was funded by Sugar Research Australia.

Earlier phases were also supported by SRA and the Queensland Department of Agriculture and Fisheries with funding from the Australian Government's Department of Agriculture, Fisheries and Forestry as part of its Rural R&D for Profit program with partners, Cotton Research and Development Corporation, Forest & Wood Products Australia, Australian Pork Limited, Southern Oil Refining, Queensland University of Technology, and NSW Department of Primary Industries. Bioproton Pty Ltd, Mercurius Australia Pty Ltd and Rivalea Australia also supported stages of the project.

PRODUCING OIL **FROM SUGARCANE**

The sugarcane industry has released the Sugar Plus vision and roadmap for 'Fuelling the Future of Food, Energy and Fabrication'. Through its research and innovation programs, SRA undertook an analysis of diversification opportunities which identified producing natural oils from sugarcane as a potential option.

Genetic engineering advances have increased production of natural oils and waxes which are called fatty acids or lipids in plant dry matter or biomass.

Plant lipids in the form of triacylglycerol (TAG) are of global interest because they can be used to make biodiesel and biomaterials such as heart valves.

TAGs are already used as food oils. They include soybean, canola, sunflower, peanut, olive, and palm oil. TAGs have also found wide industrial applications in paints, soaps, cosmetics, detergents, and pharmaceuticals.

Former Director of the Queensland Alliance for Agriculture and Food Innovation, Professor Robert Henry and UQ Centre for Crop Science, Professorial Research Fellow Professor Frederik (Frikkie) Botha undertook to review current global TAG production in sugarcane for SRA and its partner, the Queensland Department of Agriculture and Fisheries.

The value of TAG was set conservatively at AUD $1200/t, compared with sucrose at AUD $360/t.

However, to equal the current value of the sucrose production system, per hectare, a sugarcane plant would have to yield at least 10 per cent oil, while the overall crop would need to yield an equivalent harvest tonnage.

Global research results so far have only achieved high oil accumulation in the leaves of transgenic tobacco and a small flowering plant known as Arabidopsis.

"A limited number of groups are working on oil production in sugarcane," Professor Henry said. "The most advanced research is being done at the Department of Energy's Centre for Advanced Bioenergy and Bioproducts Innovation (CABBI) at the University of Florida.

"To accumulate larger amounts of TAG in sugarcane's vegetative tissues such as leaves and stems genetic engineering has been used to manipulate sugarcane's metabolic processes," he said.

"Ribonucleic acid interference (RNAi) has been the most effective tool used by the Altpeter research group in Florida, in collaboration with CABBI.

"But these technologies do not show promise for commercial applications in sugarcane due to dramatic yield reductions, decrease in sucrose, and low TAG production potential."

Oil levels in the leaf have varied from between 1 and 8 per cent, and 0.2 and 4 per cent in the stem.

"Where oil content has increased to more than 5 per cent the value of the crop rapidly diminishes because of a biomass yield penalty," Professor Botha said.

"TAG is also currently produced at the expense of sucrose and molasses production."

Moreover, to extract TAG, leaves and tops would need to be added to the milling train. Oil present in the juice and the bagasse would require two separate extraction processes to recover it.

"Eventually, oilcane production areas could be set up in specific mill areas to allow other regions to remain GM-free. Oilcane bagasse might produce oil and then retain its industrial use for electricity and other products like ethanol," Professor Botha said.

"While the gene technology is not currently advanced enough to support oilcane production, in the long term it could contribute to developing a larger industry, while supporting Australia to become increasingly energy self-sufficient," Executive Manager, Commercial Development, Duncan Ferguson said. "These types of opportunities illustrate the role that the sugarcane industry can play in supporting Australia's long term economic development, including the importance of agriculture's role in the transition to net zero carbon emissions across numerous industries."

Queensland Government

This project was funded by the Queensland Department of Agriculture and Fisheries and Sugar Research Australia.

RAW SUGAR MANUFACTURING LIFE CYCLE ASSESSMENT SHOWS A REDUCED CARBON FOOTPRINT

Environmental sustainability of industries and food products has become a key focus for consumers and governments worldwide. Life cycle assessment (LCA) is the most common method for determining the environmental impacts of products. Preliminary findings of a recent assessment commissioned for the industry have shown positive signs.

More than a decade since the last comprehensive assessment of environmental impacts across the Australian raw sugar supply chain, SRA contracted Integrity Ag & Environment to undertake an up-to-date LCA on behalf of the industry.

Integrity Ag & Environment's Senior Agricultural Scientist Dr Simon Clarke said LCA is a standardised method for quantifying the environmental impacts of product life cycles.

He said preliminary findings, yet to be peer-reviewed for scientific publication, suggest improvements from the previous assessment.

"The preliminary LCA showed a carbon footprint for raw sugar at least 15 per cent lower than that of the previous assessment for an average Queensland mill, reducing from 481 kilograms of

Farm-stage processes dominated environmental impacts for raw sugar.

Irrigation contributes to climate change, fossil energy use and water impacts.

carbon dioxide emissions per tonne of raw sugar (kg CO2-e/t) to 365 kg CO2-e/t," Dr Clarke said.

"The contemporary fossil energy footprint of sugar from all regions was also equal to or less than the fossil energy footprint for an average Queensland mill in the previous assessment

Average freshwater use per tonne of raw sugar was 30 per cent lower than the previous assessment, reducing from 223 kilolitres per tonne of raw sugar (kL/t) to 155 kL/t."

Dr Clarke said that consistent with previous LCAs, environmental impacts for raw sugar were dominated by farm-stage processes such as the application of fertilisers and manufacture of farm chemicals, along with machinery operations for planting and harvesting cane.

He said irrigation was an important secondary contributor to impacts in irrigated regions since it increases climate change, fossil energy use and water effects.

At the mill stage, an important secondary contributor for impacts was mill energy supply, which varied across regions.

"The preliminary results showed that Australian raw cane sugar is competitive with that of its major international competitors, Thailand and Brazil, particularly in terms of climate change impacts," Dr Clarke said.

Integrity Ag & Environment Principal Scientist Dr Stephen Wiedemann said the study benefitted greatly from the input of the milling and distillery sector.

"They provided comprehensive data on inputs and outputs representing 99 per cent of Australia's annual crush," Dr Wiedemann said.

He also acknowledged the insights of industry experts and access to industry reports and data sources.

"This provided a means of generating model input data that was accurate and contemporary, but also one-of-a-kind – no other raw sugar supply chain has commissioned an LCA as comprehensive as that produced for the Australian industry," Dr Wiedemann said.

"The LCA provided an opportunity to emphasise the environmental benefits of supply chain electricity and bioethanol production. Both products were 'energetically'-beneficial.

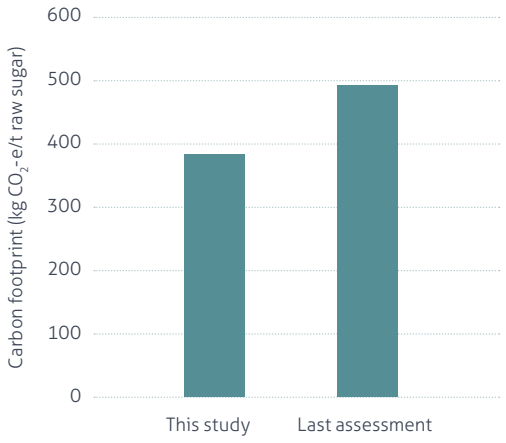
"This means that more energy was derived from these products than the fossil energy used in their supply chains. This creates opportunities for industries reliant on these energy sources to reduce their carbon and fossil energy footprints."

The final step in their research is to submit a manuscript reporting the impact assessment for peer review in a scientific journal. Dr Wiedemann said peer review is important because it provides a means to verify that the LCA has been conducted to international standards, while scientific publication ensures a public record that the industry could use to report its environmental impacts.

2020/001 Environmental Risk Assessment & Life Cycle Assessment of the Raw Sugar Manufacturing was undertaken by Integrity Ag & Environment.

This project was funded by the Queensland Department of Agriculture and Fisheries and Sugar Research Australia.

Queensland Government



The average carbon footprint per tonne of Australian raw sugar. Result shown for the last assessment is re-calculated from an average Queensland mill co-generating electricity (Renouf et al., 2011).

The average fresh water consumption per tonne of Australian raw sugar. The result shown for the last assessment is re-calculated from an average Queensland mill co-generating electricity (Renouf et al., 2011).

References

Renouf, M. A., Pagan, R. J., & Wegener, M. K. (2011). Life cycle assessment of Australian sugarcane products with a focus on cane processing. The International Journal of Life Cycle Assessment, 16(2), 125–137. https://doi.org/10.1007/s11367-010-0233-y

Carolyn Jones, Greg Shannon and Erin Headon are amongst a small group of volunteers and committee members ensuring the preservation and promotion of the Australian sugar industry's heritage at the Mourilyan centre.

SUGAR HERITAGE CENTRE IS MORE THAN A MUSEUM **AND WELL WORTH A VISIT**

Anyone who has travelled the Bruce Highway in Far North Queensland will have passed, and possibly stopped at, Mourilyan just south of Innisfail.

The community was built around the Mourilyan sugar mill, which operated from 1884 until it was destroyed by Cyclone Larry in 2006. For the last 50 years the Australian Sugar Heritage Centre, run entirely by volunteers, has proudly shared the spirit and legacy of the sugarcane industry in the town, and Queensland.

The Heritage Centre is housed, adjacent to the highway, in what was originally the Sugarama Theatre that operated on the site from 1956 to 1972. In 1974 funds were made available by the State Government and the Johnstone Shire Council to purchase the building and property to establish a Regional Information Centre including the Australian Sugar Industry Museum.

Sam Spina has been Chair of the currently named Australian Sugar Heritage Centre Management Committee for the past 12 years and says the committee no longer thinks of the centre as a museum.

"We call it the Heritage Centre," Sam tells me. "We changed the name, from museum, several years ago because museum conjures up thoughts of old things, of which of course there are, but our centre is much more than that.

"There are a lot of people that visit the centre that have travelled up the coast and they've seen literally thousands upon thousands of hectares of sugarcane, but don't know very much about it – so they have lots of questions.

"Our centre engages people in a way where they can see what the industry is doing today and how the industry treats the environment that it works within," Sam said.

"We have a little theatrette where visitors can go and watch a short movie, six or seven minutes, that gives you an idea of what the industry is doing. Then you move on to some more pictorial displays as well as videos about sugar milling, including everything about planting, fertilising and harvesting.

"That then leads visitors onto the historical displays because the current information gives context to what the historical displays are all about," Sam said.

The centre houses old tractors, restored steam locomotives, harvesters, a blacksmith's station, model mill and cutters' barracks and working display of a 500 horsepower crushing mill once used in a regional mill.

SRA Agronomist Erin Headon is a recent recruit to the centre's volunteer team.

"We are constantly getting requests from people that have old equipment sitting in their sheds that they'd like to donate to the centre," Sam said. "Yes, they want to make room in their sheds, so they ring us to see if we're interested, and we usually are.

"At the moment we've got an old Don Mizzi harvester that's still out on farm that we hope to collect in the next two or three months. And we've got a metal lathe that was originally in Mulgrave Mill and has been donated to the centre. We're told it's probably close to 100 years old."

But donations of this size, are not without their challenges.

"The problem then becomes where do we house all this stuff, and how do we manage it?" Sam said.

"We get huge support from CANEGROWERS Innisfail, and the centre wouldn't exist without the volunteers that give their time on the committee and greet visitors at the centre but we do struggle to keep going.

"When I joined the committee the outgoing members were all in their late 60s and early 70s wanting to retire out of the industry. That hasn't changed. We need young blood to pass the baton on to. And we need the industry to support the centre, for the future.

"As a third-generation cane farmer myself, I am very proud of the heritage of the industry and the wealth it has created for Australia and continues to contribute to the economy. I don't want to allow that to be forgotten," Sam said.

"I'm also proud of what has been achieved at the centre. We've got lots of ideas to modernise the displays and information but that will all take money. We'd love everyone who can to support us and continue this legacy."

If you're travelling to the Far North these holidays, and passing through Mourilyan, why not stop, and take a look at the wealth of information in the centre and contribute in some way?

Use the voucher provided for a two for one entry, valid to 31 December 2023.

Find out more at:
www.sugarmuseum.com.au

Scan for more information.

Sam Spina has been Chair of the Australian Sugar Heritage Centre Management Committee for the past 12 years

SUGAR AND SPORT ON DISPLAY

By Greg Shannon

One of the newer displays in the Heritage Centre is 'Sugar and Sport'. Opened in late 2020 this display seeks to highlight the historical achievements of people who come from or have worked in the sugar industry, and gone on to represent Queensland, New South Wales or Australia in a major sport.

Sport was often a unifying factor in the development of many sugar communities so this display falls into the cultural history category.

The sports covered are many and varied and the display was set up by former manager of the Heritage Centre and CANEGROWERS Innisfail, Wayne Thomas

From world champion triathlete Brad Bevan, who grew up on a Mirriwinni cane farm, to Australian Opals coach and four time Olympian Sandy Brondello who comes from a Mackay cane farm, to the Burdekin's Para-Olympian Brooke Stockham; all are on display.

Rugby league is also highlighted, given it is a major winter sport in sugar in all communities and literally dozens of well-known rugby league players have come from the industry since the game started in Australia in 1908.

Not to mention two current members of SRA staff whose sporting achievements are on display! Former Australian Rules Queensland representative Dr Rob Magarey and former Australian indoor hockey player Rhylee Pendrigh.

Greg Shannon is Deputy Chair of the Heritage Centre, Cane Productivity and Development Manager, Tully Sugar Ltd, a member of the Queensland Rugby League history committee and North Queensland Toyota Cowboys historian.

Greg Shannon (pictured) volunteers regularly at the Heritage Centre on his weekends and is happy to take visitors through the Sugar and Sport display.

Australian Sugar Heritage Centre Mourilyan

Entry for 2 Adults for the price of 1 Adult

AUSTRALIAN SUGAR HERITAGE CENTRE

Present this voucher
Valid until 31 December 2023

A HIGH PERFORMING **RESEARCH PORTFOLIO**

SRA's Annual Report 2021/22 included a detailed overview of Strategic Pillar 2 - a high-performing research investment portfolio.

Across SRA's five research missions, based on the key industry challenges they seek to address, the following 20 highlighted projects were among 61 research, development, and adoption investments during the 2021/22 period.

For a complete overview of the portfolio, including technology solutions in development and estimated release dates, please view SRA's Annual Report 2021/22.

SRA's 2021/22 Annual Report available here.

Research Mission 1
Profitable and Productive

Continuous improvement in farming and milling profitability

The objective of this research mission is to increase the ongoing competitiveness of the Australian sugarcane industry by supporting year-on-year improvements to productivity, in aggregate and at a regional level.

To achieve this in 2021/22, SRA invested $17.59M towards 16 research innovation and translation projects, plus industry services, and plant breeding under Research Mission 1.

SRA's projects produced 16 technology solutions at various stages of development, to address productivity and profitability challenges experienced by growers and millers. Highlights include:

1. New evidence by The University of Queensland validates efficacy of a genomic selection method for more profitable varieties in SRA's Variety Development Program.
2. Adoption of economically improved harvesting practice via the decision support tool is estimated to increase productivity by 4.9 tonnes per hectare and grower profitability by $116 per hectare.
3. Final development of high throughput, low-cost single nucleotide polymorphism (SNP) markers has been completed by CSIRO to enable faster selection of varieties in SRA's Variety Development Program. SNP is a type of a genetic marker used in the determination of disease or trait and its association with the genetic variations.
4. A novel design and operational method for mill evaporators to minimise sugar degradation, corrosion and maintenance costs was developed and delivered to industry by Queensland University of Technology. Adoption of new technology is estimated to generate 80 cents per tonne of cane crushed in additional revenue.

SRA partnered with 15 organisations and engaged 55 investigators, including four post-doctoral research and PhD positions, for projects under Research Mission 1.

Former QDAF Senior Agricultural Economist Brendon Nothard demonstrated the Harvest Mate to growers at the Bundaberg Field Day in November.

Research Mission 2
Resilient and Enduring

Position the industry to stay ahead of climate, environmental and biosecurity threats

The objective of this research mission is to minimise and control the risk to production resulting from pests, diseases, weeds, and climate/ environmental threats.

To achieve this in 2021/22, SRA invested $5.38M in Research Mission 2 towards 13 research innovation and translation projects, plus industry services, and plant breeding.

SRA's projects produced 13 technology solutions, at various stages of development for release, to address climate, environmental and biosecurity challenges experienced by growers and millers. Highlights include:

1. Novel technology by Griffith University reduces time to detect sugarcane smut from 15 weeks to 8 weeks and sugarcane mosaic virus from 8 to 2 weeks following inoculation.
2. Commencement of industry-first RNAi biopesticide by The University of Queensland to manage sugarcane root-feeding pests such as canegrubs.
3. Bureau of Meteorology releases seasonal forecast tools that provide information about the likelihood of unseasonal and extreme rainfall and temperature events in sugarcane growing districts.
4. Pre-commercial development of assay that detects ratoon stunting disease in sugarcane entering the mill is completed and available for deployment.

SRA partnered with 45 organisations and engaged 40 investigators, including two post-doctoral research and PhD positions, for projects under Research Mission 2.

At the SRA/SSP Proserpine Young Growers Precision Ag workshop in June, guest presenter, Dr Neil Cliffe, Department of Agriculture and Fisheries, showed growers how to access Bureau of Meteorology climate statistics and weather information for their local area - in this case, Myrtlevale.

Research Mission 3
Diversified and Adaptable

Capitalise on changing consumer preferences and the growing bio and green economies to develop diversification opportunities

The objective of this mission is to deliver research, development and analysis to support the industry in:

- increasing revenue by leveraging existing resources, brand reputation and supply chain
- remaining profitable during sugar price fluctuations
- finding opportunities to monetise biomass potential.

To achieve this in 2021/22 SRA invested $1.12M in six research innovation projects under Research Mission 3.

SRA's projects produced five technology solutions, at various stages of development for release, to capitalise on diversification opportunities for growers and millers. Highlights include:

1. Industry roadmap was developed in partnership with industry representative organisations and funding partners: Sugar Plus – Fuelling the Future of Food, Energy and Fabrication.
2. Research findings demonstrated the feasibility of biofuel technologies and associated market opportunities and economic value to the sugarcane industry.
3. Polylactic Acid (PLA) is identified as the most realistic focus for bioplastics derived from sugarcane. While costs are higher than conventional plastics, the longer-term outlook is expected to improve as government policy shifts and more single-use plastics are removed from sale.
4. Proof of concept was demonstrated for an engineered microorganism that breaks down toxins in sugarcane by-products paving the way for high-value products.

SRA partnered with 20 organisations and engaged 26 investigators, including one masters research position, for projects under Research Mission 3.

Research Mission 4
Wealth Generating Through Land Stewardship

Position the Australian sugarcane industry as leaders in profitability, environmental sustainability and resource-use efficiency.

The objective of this research mission is to recognise that the future success of the industry depends on the sustainable use of inputs including land, water, carbon and energy, and aims to ensure that the Australian sugarcane industry's practices sustain the natural environment and are profitable for growers and millers.

To achieve this in 2021/22 SRA invested $5.52M in 20 research innovation and translation projects under Research Mission 4.

SRA's projects produced 13 technology solutions, at various stages of development for release, and seven training and extension packages to address environmental sustainability and resource-use efficiency challenges experienced by growers and millers. Highlights include:

1. Smarter Irrigation for Profit Phase II demonstrated 25% reduction in water usage from automation and optimisation technologies applied on sugarcane irrigation systems.
2. More than 480 growers participated in SRA supported land stewardship programs through Mackay Whitsunday Cane to Creek, Russell-Mulgrave Complete Nutrient Management Planning, Mobilising the Murray, and the Burdekin Irrigation Project.
3. Total estimated dissolved inorganic nitrogen (DIN) reduction of 88 tonnes as a result of land stewardship programs managed by SRA. (Projects: Mackay Whitsunday Cane to Creek, Russell-Mulgrave Complete Nutrient Management Planning, Mobilising the Murray, and Burdekin Irrigation Project).
4. Proof of concept research commenced to develop a novel bio fertiliser to address declining crop yields and soil health.

SRA partnered with 61 organisations and engaged 26 investigators, including four PhD positions, for projects under Research Mission 4.

Farm Hand Cornel Du Blessis –"Duppie" - programs an automated irrigation schedule from the office.

Research Mission 5
Skilled for the Future

Support the development of an adaptable, professional, commercial and entrepreneurial industry and research community

In 2021/22 SRA invested $1.4M in six research innovation projects and capability building programs under Research Mission 5.

A method for rearing and assessing the health of the sugarcane pest Dermolepida abohhirtum *(greyback canegrub) by Dr Pauline Lenancker and Dr Kevin Powell was published in the* Journal of Applied Entomology *on 18 September 2022.*

SRA's projects produced three technology solutions, at various stages of development for release, and capability building programs to support the sugarcane industry's research capability and commercial community. Highlights include:

- SRA's research investments supported more than 38 full-time jobs in the research community.
- SRA participated in nine cross-sectoral research and development corporation projects.
- 49 publications related to SRA-funded projects were reported by investigators. This includes published and submitted for publishing papers to traditional journals, conferences, and thesis dissertations.
- Development commenced on an industry-first digital platform to enable geospatial mapping and analysis to assist growers to select farming management practices to increase productivity, profitability and sustainability.

SRA partnered with 21 organisations and engaged 23 investigators, including 11 post-doctoral research and undergraduate positions, for projects under Research Mission 5.

SRA acknowledges the funding contributions received from all funding partners for these research activities including, but not limited to, the Queensland Department of Agriculture and Fisheries, the Australian Government Department of Agriculture, Fisheries and Forestry through the Rural R&D for Profit Program, and the Cooperative Research Centre for Developing Northern Australia.

MEASURING THE IMPACT OF RESEARCH INVESTMENTS

SRA's research portfolio is targeted towards delivering tangible solutions that deliver real impacts to sugarcane growers, milling companies, and other industry stakeholders.

Each year, SRA and partners engage independent consultants to measure the economic, environmental, and social impact of past solutions released to the industry. This evaluation is essential to SRA's efforts to improve the performance of new research investments and report the return on investment made by levy payers and research investment partners.

In 2021/22 SRA, the Queensland Department of Agriculture and Fisheries, and other partners, completed 12 benefit-cost analyses of eight research, development and adoption (RD&A) investments and two programs. These analyses quantified the monetary benefit of solutions delivered to the sugarcane industry, as well as detailing impacts such as improvements to productivity and avoided losses from disease.

For every $1 invested by SRA, the Queensland Department of Agriculture and Fisheries, the Commonwealth Department of Agriculture, Fisheries and Forestry, and other partners, $5.50 of economic value was created.

$5.50 to $1

The aggregated benefit-cost ratio for these analyses is $5.50 to $1

$396.9M

$396.9M estimated net present value

Impact assessment highlights

Optimising productivity, variety recommendations and mill operations through analysis of mill data

This solution produced valuable knowledge by analysing mill data in North Queensland to identify farm production units performing below potential and the factors associated with this. The knowledge gained from this project will support growers and milling companies to increase farm productivity and profitability by recommending more appropriate selection of varieties to match field conditions, address impediments to farm productivity and nutrient management planning.

The assessment found outcomes translated to a **net present value of $9.75 million and benefit-cost ratio of $8.60 to $1** from investment by SRA and the Queensland Department of Agriculture and Fisheries.

The analysis did not quantify the value of impacts delivered to milling companies, and as a result, it was not possible to report the benefit distribution across the industry's value chain. SRA will address this limitation by working with future providers and research partners to improve data collection by projects so that this is possible in future analyses.

2016/032 project analysis by Marsden Jacobs Associates

Energy solutions, including analysis of the costs and benefits of using renewable energy to support irrigation of Australian sugarcane farms, and a related training and extension package for growers

This solution supported growers to reduce their energy costs associated with pumping water and to lower carbon emissions by incorporating solar photovoltaic (PV) technologies into irrigation sites.

Research findings suggest PV technologies are most cost-effective than other energy options including diesel generators, batteries, and turbines, and support environmental outcomes including reduced carbon emissions. For more information visit **SRA's irrigation resource webpage.**

The assessment concluded that because there is limited data available on the adoption of PV technologies by sugarcane growers, these outcomes could not be translated easily to net present value.

The benefit-cost ratio to date from this investment is $1 to $1.

The analysis identified that with sufficient adoption, it is likely that a high benefit value will be demonstrated from this investment in the future.

2017/011 Productivity improvements through energy innovation in the Australian sugar industry, analysis by Marsden Jacobs Associates

Diversification/new revenue solutions by converting sugar and cotton waste to animal feed and probiotics

Currently in mid-stage development, this solution will generate new revenue streams in the bio and green economies when its technology is fully developed and enables sugarcane and cotton waste to be converted to animal feed and probiotics. The current assessment focused on the second phase of the project which included pre-commercial assessment trials to demonstrate the viability of technologies.

The assessment found outcomes translated to **a net present value of $17.3 million and a benefit-cost ratio of $10.30 to $1** from investment by SRA and partners.

In relation to spillover benefits, **53 per cent of the present value benefit is attributed to animal feed and probiotics from sugarcane waste** and 47 per cent to the production of 5-chloromethyl furfural (CMF) for animal feed from cotton gin trash.

The analysis did not value animal feed for poultry or employment and community spillover benefits. SRA will address this limitation by working with providers to collect relevant data for future assessments.

Soil health solutions, including in-field methods to measure indicators, and a training and extension package

This solution supported growers to increase profitability from improved farming practices, reduce nutrient runoff and greenhouse gases, and spillover benefits to other RD&A projects through knowledge transfer.

The assessment found outcomes translated to **a net present value to the industry of $14.9 million and a benefit-cost ratio of $5.20 to $1.**

The analysis did not value environmental impacts. SRA will address this limitation by using the soon-to-be-completed life cycle assessment tool (2020/001 Environmental Risk Assessment & Life Cycle Assessment of the Raw Sugar Manufacturing) to measure these impacts in future assessments.

2017/005 Measuring soil health, setting benchmarks, and driving practice change in the sugar industry, analysis by Marsden Jacobs Associates.

SRA acknowledges the funding contribution of the Queensland Department of Agriculture and Fisheries towards these research activities, and for funding for the Biorefineries for Profit program by the Australian Government Department of Agriculture, Fisheries and Forestry through the Rural R&D for Profit Program.

Queensland Government

Australian Government
Department of Agriculture, Fisheries and Forestry

Queensland Department of Agriculture and Fisheries Senior Entomologist, Hugh Brier, recently trained SRA and Mackay Area Productivity Services (MAPS) staff in scouting insect pests in fallow crops.

Dr Kevin Powell met with Central growers face-to-face to discuss pest and disease research issues of local importance, including YCS research.

DISTRICT PRODUCTIVITY PLANS

Sugar Research Australia's District Productivity Plans have been developed through consultation and engagement undertaken by SRA's Industry Services team.

SRA CENTRAL SUPPORTING GROWERS' NEEDS

SRA Central District Manager Dylan Wedel welcomes contact from growers who want to ensure the current District Productivity Plan is well aligned with District priorities.

Dylan was referring to the Central District Productivity Plan which is currently being reviewed for 2023. Please contact Dylan if you would like to discuss how current plan ideas could be modified.

"For example, in support of complementary fallow cropping activities, we invite growers to borrow our soybean planter at no charge. The aim is to encourage growers to try fallow crops without having to buy their own planter until they have the confidence in making the crops work on their farm.

"SRA Central District staff and MAPS productivity services staff have also recently been trained in scouting the variety of insects which affect soybean crops to give growers a hand in this area."

Turning to irrigation, Dylan said he was looking to assist more growers with their irrigation systems, aimed at improving irrigation use for profitability and productivity.

"We have established a demonstration in Proserpine of an automatic controller for flood irrigation and we plan to have a field walk for growers to check out the set up in the new year. We'd love to replicate this in Mackay or Plane Creek, too.

"We have also been helping growers with irrigation system assessments and benchmarking using CaneCalcs (www.CaneCalcs.com) and we invite other interested growers to get in contact with us to talk about their irrigation system design/operation needs.

"We've got a number of Chameleon soil moisture probes deployed across the region to assist growers in targeting irrigation and this is only one form of scheduling that we are assisting growers with utilising.

"We are also working with local stakeholders to develop a major irrigation utilisation project in the region – watch this space!"

Dylan said work was continuing with SRA's Agricultural Machinery Specialist Phil Patane on a prototype harvester sterilisation unit to assist growers control diseases such as RSD. We're working to enhance the first version of the equipment on Mackay station's harvester. Dr Rob Magarey has been instrumental in providing advice on how the system is currently performing and where it needs to be adapted.

"We also recently invited Entomology Leader Dr Kevin Powell to meet with growers face-to-face to discuss pest and disease research issues of local importance. We've been assisting Kevin with his work on YCS in the region and we will continue to monitor crops this year".

Scan the QR code to download your district plan.

CURRENT PRIORITIES BY DISTRICT

INITATIVE	COLLABORATORS	PROPOSED OUTCOME	STATUS – December 2022
Far North District Manager: Gavin Rodman grodman@sugarresearch.com.au 0476 807 355.			
Mulgrave CCS Improvement Project	CANEGROWERS Cairns Region, MSF Sugar and Mulgrave growers.	Identify opportunities to improve CCS, yields and profitability through productivity data analysis and on-farm practice review.	On-farm practice reviews completed and analysis underway. Analysis of NIR data from the mill underway. Pachymetra surveying commenced.
Development of application parameters for ripeners	MSF Sugar, Far Northern Growers.	Develop in-field parameters to support successful applications of sugarcane ripeners to improve CCS.	Final trial harvested. Initial findings complete, statistical analysis underway. Confirmation for second year of trials to be undertaken and site selection process ongoing.
Strategies for emerging weeds	Nufarm, Queensland Department of Agriculture and Fisheries, Federation University, FNQ Growers.	Develop management strategies for balsam pear, itch grass and navua sedge.	Navua sedge and itch grass trial ongoing with fortnightly monitoring.

INITATIVE	COLLABORATORS	PROPOSED OUTCOME	STATUS – December 2022
North District Manager: Phil Patane ppatane@sugarresearch.com.au 0431 818 482			
Local Expert Analysis (LEA) South Johnstone	Innisfail Babinda Cane Productivity Services, Innisfail CANEGROWERS, local growers, MSF Sugar, Cassowary Coast Reef Smart Farming Project and local industry organisations.	Improved productivity and profitability in the mill area.	Meetings to be conducted with local industry to present progress of the LEA.
Local Expert Analysis (LEA) Tully	Tully Cane Productivity Services Ltd, Tully CANEGROWERS, Tully Sugar.	Improved productivity and profitability in the mill area.	Currently conducting stakeholder engagement meetings to review action plan.
Variety observation plot and CCS maturity profiling	SRA Plant Breeding.	Variety demonstration plot and CCS maturity profiling.	Two demonstration plots planted and CCS maturity curve captured for 2022 season. Data to be presented at the 2023 Regional Variety Committee meeting.
Sterilisation unit for harvesting	Fire Suppression Services QLD PTY LTD.	Prototype automatic spray unit to clean a commercial harvester to minimise RSD transmission.	Unit installed and tested during the 2022 harvest season. Results will be presented at the next Herbert Harvesting forum.
Refining nutrient recommendations for ratoon crops	Wilmar Sugar Australia.	Improved understanding of nitrogen requirements to manage CCS following application of mill by-products.	One trial site underway. Due to wet weather second site has been delayed.
Herbert Temporal Nitrogen trial	University of Southern Queensland.	Generating cane yield and nitrogen uptake response curves for different enhanced efficiency fertiliser products.	Data compiled and to be presented during the offseason at a farming systems workshop.
Herbert harvesting demonstration trials	Queensland Department of Agriculture and Fisheries, CANEGROWERS Herbert River, Agrifutures and Clevvi.	Validating best economic harvest practice utilising Harvest Mate.	Of two trials planned, due to wet weather the second trial was unable to be harvested. Results from the first trial, as well as other districts, will be presented at the next Herbert harvesting forum.
Burdekin District Manager Terry Granshaw tgranshaw@sugarresearch.com.au 0457 650 181			
Burdekin Irrigation Project	BPS, Agritech Solutions, Farmacist, BBIFMAC, James Cook University, Department of Agriculture and Fisheries, North Queensland Dry Tropics, Wilmar and Growers. In-kind from Sunwater.	Reduce energy costs, improved 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.	After three rounds of EOI's, 70 growers are participating with more than 1000ha of fully automated furrow irrigation systems after round 2. Three demonstration sites selected across different soil types and water sources. Two demonstration sites with fully installed infrastructure and replicated strip trials measuring differences between flows, scheduling, and energy use. One site with partially installed infrastructure.
Reducing Herbicide usage on farm with precise weed control	Autoweed, James Cook Univeristy, Queensland Department of Agriculture and Fisheries.	Reduce herbicide use by comparing efficacy of weed control and evaluate economic savings.	Successfully secured funding to build on the existing trials. Planning stages for new trials. Mounting of infrastructure to new spray rig with dual pesticide capacity.
Burdekin phosphorous response trial	Wilmar and Burdekin Productivity Services.	Investigate P management for sugarcane crops growing in alkaline soils.	Three-month biomass sampling completed.
Central District Manager Dylan Wedel dwedel@sugarresearch.com.au 0490 029 387			
Increasing irrigation utilisation	Productivity services companies, growers, Mackay Sugar, local water boards, government bodies.	Increase utilisation of irrigation to increase profitability and productivity. Note: Seeking more growers to work with in the irrigation space.	Established a remote start and automatic off flood irrigation controller demonstration in Proserpine – field walk planned for the new year. Undertaken several system assessments/benchmarking using CaneCalcs. Provided advice on irrigation system design/operation and ongoing support with irrigation scheduling. Working with local stakeholders to develop a major irrigation utilisation project in the region.
Supporting complementary Fallow Cropping	Productivity services companies and growers.	Improve productivity by breaking the monoculture and profitability with a complementary cash crop.	The SRA soybean planter has been returned to service and is available to growers to trial complementary fallow crops.
Variety Observations	Productivity services companies.	Improve knowledge of varieties, particularly with regard to early CCS and the impact of soil moisture on CCS.	Data collection for 2022 has concluded and the soil moisture probes removed. Data analysis is currently underway.
Ripener Trials	Productivity services companies and growers.	Improve CCS when cane is harvested earlier in the season.	Completed early season trials for 2022. Preliminary results have shown economic returns for growers. The data will now be analysed alongside trial results from the Far North.
Southern District Manager Lisa Devereaux ldevereaux@sugarresearch.com.au 0456 590 497			
Local Expert Analysis (LEA) Bundaberg/ Wide Bay	Productivity boards and mills.	Identification of unrealised industry constraints.	Initial phase underway. Working with stakeholders to obtain nutrient management data.
Rocky Point Pest and Disease Management Surveys	Rocky Point Canegrowers.	Reduced impact of RSD on farm. Further, extend and promote benefits of clean seed scheme and farm hygiene.	RSD Management Plan report completed. Recommendations being prioritised for action in early 2023.
Increase adoption of the cane loss monitoring system (SCHLOTLive)	NSW Agricultural Services.	To maximise returns through decrease harvesting losses.	Project on hold until 2023.

RESEARCH PROJECT INVESTMENTS

PROJECT IDENTIFIER	TITLE	CHIEF INVESTIGATOR	RESEARCH AGENCY	END DATE
Research Mission 1: Continuous improvement in farming and milling profitability				
2017/002	Implementing and validating genomic selection in SRA breeding programs to accelerate improvements in yield, commercial cane sugar, and other key traits	Ben Hayes	The University of Queensland	1/10/2023
2018/005	Genetic analysis and marker delivery for sugarcane breeding	Karen Aitken	CSIRO	1/05/2023
2018/012	Pan design and operational changes to suit Australian pan stages operating on low pressure vapour	Ross Broadfoot	Queensland University of Technology	1/05/2023
2019/005	Improved strategies to process soft canes	Floren Plaza	Queensland University of Technology	1/05/2023
2019/007	Eliminating roll arcing	Geoff Kent	Queensland University of Technology	1/02/2023
2020/003	Maximising cane recovery through the development of a harvesting decision-support tool	Phil-Anthony Patane	Sugar Research Australia	1/06/2023
2022/202	Optimising milling train extraction through added water control using online NIR cane and bagasse data	John Edwards	Tully Sugar Limited	1/06/2023
Research Mission 2: Position the industry to stay ahead of climate, environmental and biosecurity threats				
2017/809	Modern diagnostics for a safer Australian Sugar Industry	Chuong Ngo	Sugar Research Australia	1/02/2023
2017/901	Rural RnD4Profit - Forewarned is forearmed: managing the impacts of extreme climate events	Tom Davidson	Meat & Livestock Australia MLA	29/04/2023
2018/010	Moth Borers - how are we going to manage them when they arrive?	Kevin Powell	Sugar Research Australia	2/01/2023
2020/002	Developing an integrated device for on-farm detection of sugarcane diseases	Muhammad Shiddiky	Griffith University	21/03/2024
2020/004	Beyond Imidacloprid - Chemical and Biorational Alternatives for Managing Canegrubs	Kevin Powell	Sugar Research Australia	31/01/2024
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	30/04/2024
2021/401	Research Award - Risk assessment for the newly discovered parasitic nematode Pratylenchus parazeae in the Australian sugarcane industry	Shamsul Bhuiyan	Sugar Research Australia	31/03/2023
2021/402	Towards more sustainable pest control strategies through a metagenomic survey of viral entomopathogens in canegrubs populations	Kayvan Etebari	The University of Queensland	1/05/2023
2022/002	Updating the Sugarcane Industry Biosecurity Plan	Stuart Kearns	Plant Health Australia	1/06/2027
2022/003	Agri-climate outlook	Danielle Skocaj	Agricultural Innovation Australia Limited	31/12/2024

PROJECT IDENTIFIER	TITLE	CHIEF INVESTIGATOR	RESEARCH AGENCY	END DATE
Research Mission 3: Capitalise on changing consumer preferences, and the growing bio and green economies to develop diversification opportunities				
2020/101	Engineering bacterial enzyme secretion for cellulose utilisation	Madeline Smith	Queensland University of Technology	31/01/2023
Research Mission 4: Position the Australian sugarcane industry as leaders in profitability, environmental sustainability and resource-use efficiency				
2020/001	Environmental Risk Assessment & Life Cycle Assessment of the Raw Sugar Manufacturing	Stephen Wiedemann	Integrity Ag & Environment	1/03/2023
2020/017	A Common Approach to Sector-Level GHG Accounting for Australian Agriculture	Michelle Ford	Agricultural Innovation Australia Limited	27/02/2023
2020/802	Mackay Whitsunday Cane to Creek	Cathy Mylrea	Sugar Research Australia	31/10/2023
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	Cathy Mylrea	Sugar Research Australia	30/06/2024
2021/008	Develop a Sustainability Framework for Australian Sugarcane and Sustainability Report in collaboration with stakeholders	Ingrid Roth	Roth Rural Pty Ltd	1/05/2024
2021/804	Mobilising the Murray	Cathy Mylrea	Sugar Research Australia	30/06/2023
2021/805	Soil specific management for sugarcane production in the Wet Tropics	Danielle Skocaj	Sugar Research Australia	23/04/2024
2021/806	DES122685 Sugarcane Nutrient Management Training	Lisa Devereaux	Sugar Research Australia	30/06/2023
Research Mission 5: Support the development of an adaptable, professional, commercial and entrepreneurial industry and research community				
2018/015	Sugar Milling R & D Capability Building Program	Geoff Kent	Queensland University of Technology	30/09/2023
2019/102	PhD Scholarship - Genetic solutions for determining fibre quality traits in sugarcane	Angela O'Keeffe	The University of Queensland	30/06/2023
2019/806	Advancing techniques for diagnosis of yellow canopy syndrome	Kevin Powell	Sugar Research Australia	25/06/2023
2021/101	Optimising mill mud and ash applications for soil improvement and carbon sequestration	Hannah Green	James Cook University	30/04/2025
2021/102	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

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