Sugar Research Australia

Cane Matters

Spring 2023

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(Cover page) Principal Research Scientist Dr Rob Magarey (right) at SRA's Tully station, with CANEGROWERS Innisfail, District Extension Officer Peter Becke, loading the last of 9,000 tissue culture seedlings raised in the glasshouse. The seedlings are bound for a satellite seed plot in South Johnstone and the direct result of strategies initiated through the Local Expert Analysis (LEA) in the South Johnstone mill area to address declining yields.

Editorial contributions by Helen Cook, Christine Walker, Glenda Viner and Mike Ebner. Design by Eli Lin.

A MESSAGE *from our* ***Chair***

In August this year, Sugar Research Australia celebrated its 10th year anniversary, which marks a significant chapter in our journey. This journey has been intertwined with the development of the Australian sugarcane industry for more than a century.

Sugar Research Australia was created through the merger of the Sugar Research and Development Corporation (SRDC) and the Bureau of Sugar Experiment Stations (BSES). Our history can be traced back to 1900 with the establishment of BSES under the *Sugar Experiment Stations Act 1900 (Qld).*

This rich history serves as a testament to our commitment to innovation, collaboration, and the advancement of Australia's sugarcane industry.

Throughout the past decade, Sugar Research Australia has built on the strong foundations laid down by its predecessors. We have evolved into an organisation well-placed to embrace cutting-edge technologies, data-driven insights, and industry-wide collaboration. Our journey has been one of growth, transformation, and adaptation aimed at addressing the challenges faced by the sugar industry, while exploring new opportunities for its prosperity.

Instrumental in our success is our ongoing relationship with sugarcane growers and millers, partnerships with industry groups, research organisations, academic institutions and dedicated staff who deliver on research outcomes and adoption activities.

Through our collaborative efforts we have achieved remarkable outcomes in the development of innovative farming techniques, pest and disease management strategies, and sustainable cultivation practices.

This edition of *Cane* ***Matters*** is a demonstration of our continued focus on high-impact research and service delivery to support Australia's sugarcane industry. We look to the future with new research projects, our ongoing innovation in the field with *Harvest Mate*, our engagement with our communities during National Science Week and the Royal Queensland Show, and our acknowledgment of Dr Rob Magarey's lifetime of work and its benefits for the sugarcane industry.

Thank you for your ongoing support, and we are looking forward to another decade of success and progress for the Australian sugarcane industry.

Rowena McNally
Chair
Sugar Research Australia

Above: SRA Indooroopilly Organic Chemist Peimaneh Lee-Steere, who has worked at BSES/SRA for more than 27 years had the honour of cutting the 10th Anniversary cake in Brisbane with SRA Chair Rowena McNally.

10 YEARS OLD. 100 YEARS OF HISTORY.

SRA Board members and staff from Meringa to Broadwater came together from their kitchens and meeting rooms, to (virtually) share cake and celebrate SRA's 10th Anniversary.

INNOVATIVE RESEARCH PROJECTS ANNOUNCED

Canegrubs, soldier fly and extraneous matter (EM) at the mill, are the target of three new research projects recently announced by SRA with funding from the Department of Agriculture and Fisheries, Queensland.

Shaun Coffey, SRA's Interim Chief Executive Officer, said these projects ensured that new investments addressed the research gaps and requirements in SRA's Strategic Plan.

"These projects were chosen as part of a considered selection process and confirmed by the Research Funding Panel and the SRA Board based on the positive outcomes they will deliver for our growers, millers and industry," Mr Coffey said.

Canegrubs are the major pest in the sugarcane industry and soldier fly is another root-feeding pest of sugarcane that causes productivity losses in some sugarcane growing districts. Researchers will investigate the potential of new biocontrol agents for canegrubs, and diagnostic tests and an artificial diet to better evaluate in the laboratory what agents can be used to control soldier flies.

In several sugarcane growing districts, the cane supplied to mills consistently records high levels of extraneous matter (such as cane tops, roots and leaves - EM) and shorter billets (125 to 150 mm) in harvested green cane. The EM and billet size reduces the overall sucrose content, impacts on the efficiency of the milling process, and increases milling costs.

"By developing a machine learning system to measure the EM and billet length in each cane consignment, the industry will be able to identify where harvesting practices need to be improved, and where promotion and adoption of Harvesting Best Practice (HBP) will deliver increased CCS per tonne and efficiencies for growers and millers," Mr Coffey said.

About our Research Missions
The Australian sugarcane industry requires a strong portfolio of research that delivers value and return on investment. At SRA, this is achieved through a Research Missions approach. Each new research project is identified against one of our five research missions.

Click to visit our website for all our current RESEARCH PROJECTS.

RESEARCH MISSION 1 **Profitable and Productive**

Project 2022/012
Use of machine learning to determine the extraneous matter and billet length in cane consignments

Ross Broadfoot, Queensland University of Technology (QUT)

Project rationale

Cost pressures in harvesting and transport in the sugar industry have led to higher extraneous matter (EM) levels and shorter billets in harvested green cane. There is no cost-effective procedure to measure either of these important parameters.

Manually sorting and weighing grabbed samples of cane (as used to be standard practice in the 1970s and early 1980s) is no longer a viable option for Australian sugar mills due to prohibitive costs and shortage of labour.

Tully Mill is the only factory that still regularly undertakes manual sorting (using an automated EM lab) but, even then, less than 15 per cent of consignments are analysed.

QUT and Tully Mill recently (July 2022) completed a Sugar Research Australia and Sugar Research Institute funded small milling research project to evaluate the potential for machine learning technology to undertake this task. That work is the forerunner of this project.

Expected outputs and industry benefits

- Developing and demonstrating a machine learning (ML) system to analyse images of cane consignments on the conveyor as they enter the factory to provide estimates of EM content and billet length.
- This will allow growers and millers to work collaboratively to maximise the value of the harvested crop for the mill district and provide further opportunities for research into harvesting improvements, variety selection, cane transport and milling efficiencies.
- The method will also be important when increased biomass is required for diversification projects.

Organisation collaborators include Tully Sugar Limited, Wilmar Sugar Australia Limited, and Isis Central Sugar Mill Company Limited.

Queensland Government *This project is funded by Sugar Research Australia and the Department of Agriculture and Fisheries.*

RESEARCH MISSION 2 **Resilient and Enduring**

Cane field damage by soldier flies.

Project 2022/004
Soldier fly diagnostics, distribution, and development of an artificial diet

Kevin Powell, Sugar Research Australia

Project rationale

Soldier fly, a root-feeding pest of sugarcane comprises of a many *Inopus* species causing productivity losses in some key cane-growing regions.

Currently there are no effective chemical or biological control options available for soldier fly.

Expected outputs and industry benefits

- Species diversity and geographic distribution will be determined through targeted area-wide ground surveys, in major cane-growing regions.
- Surveys will collect data not just on species present, but also on varietal preferences, soil type preferences, and degree of damage.
- Molecular and morphological diagnostics will be utilised for the development of rapid identification of soldier fly species.
- For the most significant species, host preferences will be used to develop an artificial diet that will enable laboratory-based rearing of soldier fly and screening of novel control agents in laboratory bioassays.
- The artificial diet and improved species diagnostics will form the fundamental basis for future novel and targeted control options for selected sugarcane growing regions, to avoid major productivity losses arising from soldier fly infestations.

Queensland Government *This project is funded by Sugar Research Australia and the Department of Agriculture and Fisheries.*

New research investment projects continued...

Dr Kayvan Etebari and Prof. Michael Furlong.

Project 2022/016
Viruses to aid biological control of major root-feeding pests of sugarcane

Kayvan Etebari and Michael Furlong
The University of Queensland

Project rationale

In Australia, canegrubs are the major endemic root-feeding pest of sugarcane, and they cause significant yield losses in some sugarcane growing regions.

Recent work* revealed a great diversity of viruses in these pests, and virus-based biopesticides have been safely used in many agricultural sectors for several decades.

Expected outputs and industry benefits

- Identification of novel viruses in the Greyback canegrub (and potentially other species), and an assessment of the effects of these novel viruses on Greyback canegrubs and their potential as biological control agents.
- Identification of novel plant viruses that may represent a biosecurity risk. These are likely to be identified during the search for insect viruses, following ingestion by the plant-feeding insect.
- The long-term outcome from this research will be a sustainable alternative to traditional chemical control agents for root-feeding insect pests of sugarcane.

*(*Project 2021/402: Towards more sustainable pest control strategies through a metagenomic survey of viral entomopathogens in canegrub populations)*

Queensland Government

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

RESEARCH INVESTMENTS TO DELIVER POSITIVE OUTCOMES

In July, SRA announced nine new research investment projects which are introduced across the following pages.

These investments focus on advancing technological solutions, soil research and biological research on pest and disease risks and threats.

All of these projects have been chosen as part of a considered selection process and confirmed by the Research Investment Panel and the SRA Board based on the positive outcomes they will deliver for our growers, millers and industry.

Use the search tool on SRA's website to view details of all Current Research Projects or check the list on pages 38-39 of this edition of *Cane* ***Matters***.

RESEARCH MISSION 1 Profitable and Productive

Project 2022/011
Australian Sugar Industry – Development of factory training modules – Phase 3

Bruce King, Sugar Research Institute

- Training within the Australian milling sector has been on an ad hoc basis.
- Coupled with the transient nature of mill staff, this has created gaps in knowledge and understanding of mill operations.
- Training systems for the Australian sugar industry need to be developed to facilitate 'any time' operator training.
- Training will be developed that caters for those with limited literacy and numeracy levels, new employees, those current employees who need updated skills or for those changing positions in the mill.

This project will continue to develop training packages, mapped to Food, Beverage and Pharmaceutical – Sugar Milling (FBPSUG) competencies, which will encompass the training needs of the industry.

The outputs from this project will be the on-line training modules on:

- Boilers
- Extraction
- Laboratory skills (Part 1) - Collecting samples
- Laboratory methods (Part 1).

The courses will be available to the Australian sugar industry in the Australia Sugar Industry Training - Learning Management System (ASIT LMS).

Online training using the ASIT LMS is convenient and comprehensive for mill employees. Pictured: Production Superintendents Blake Ripper and Jack Lennon at Racecourse Mill. (Image supplied by Mackay Sugar Limited).

RESEARCH MISSION 2 Resilient and Enduring

Fiji leaf gall (FLG), formerly known as Fiji disease, is caused by planting diseased setts or by infected planthoppers feeding on the plant. FLG is controlled through the use of clean planting material and planting of resistant varieties.

Project 2022/003
Fiji Leaf Gall Eradication Strategy: Peri-urban surveillance for area freedom

Rob Magarey, Sugar Research Australia

- Fiji leaf gall (FLG) has been a major disease of sugarcane in Australia, significantly affecting commercial yields.
- It requires resistance screening of many new clones coming through the SRA breeding program, causing the elimination of highly susceptible but high yielding new clones.

This project will address development of the best inspection strategy to provide the data needed to show whether FLG is currently present in Australia (commercial/peri-urban areas) or not.

If eradication of the disease from Australia can be safely implied, then resistance screening activities can be reduced, controls on the movement of germplasm relaxed (making for a more efficient and productive breeding program), susceptible but high-yielding clones retained (leading to higher productivity gains) and SRA pathology resources diverted to better managing other diseases.

Emilie Fillols has been working as a researcher on weed management with SRA since 2008

Project 2022/005
Assess weed impact/distribution for prioritisation

Emilie Fillols, Sugar Research Australia

- Crop loss due to weed competition has been estimated to cost the sugar industry $33 million a year (based on a 3 per cent yield loss). To tackle the problem, the sugar industry spends an estimated $50 million a year to control weeds.
- That's a total cost of $83 million a year.
- These general estimates do not help the industry understand the extent of productivity constraints due to weeds management at a district level.
- This project proposes to collect weed issues as perceived by farmers using an online survey.

The goal is to identify the scale of prevalent weed issues as perceived by the industry.

The collected weed data by district are a precursor to a larger project that will collect weed distribution data - utilising aerial surveys and ground truthing to confirm the perceived issues acknowledged in the scoping online survey, and their potential causes.

Identifying the main weed issues that impact the industry in each district will help prioritise research investment into specific weed problems.

New research investment projects continued...

SRA Molecular Plant Pathologist, Dr Chuong Ngo presented at the Herbert Cane Productivity Services Ltd (HCPSL) training day earlier this year. Image supplied by HCPSL.

Project 2022/006
Development of a resistance screening method for chlorotic streak

Chuong Ngo, Sugar Research Australia

- Chlorotic streak (CS), caused by the protozoan *Phytocercomonas venanatans* is an important disease of sugarcane that can cause up to 40 per cent yield loss if susceptible varieties are planted.
- This is costing the Australian sugarcane industry an estimated $10 million annually.
- The recent identification of the pathogen by SRA researchers provides an opportunity to better assess the resistance ratings of elite clones in the breeding program.

This project will build on previous work to better understand relationships between clones, symptoms and pathogen load to develop an effective method of screening new and commercial clones for CS disease. CS disease resistance information will be extended through Variety Guides, new variety Fact Sheets and other extension mechanisms.

If 50 per cent of growers plant resistant varieties in CS disease-prone fields, the industry could avoid potential losses of up to $5 million annually. Crop cycle lengths may also be extended through better ratooning.

ANALYSING THE WHOLE CROP FOR RSD AT THE MILL

Project 2022/007
Delivery of a pest and disease diagnostic step change for the sugarcane industry (RSD - NIR)

Rob Magarey and Steve Staunton, Sugar Research Australia

- Ratoon Stunting Disease (RSD) is currently the most economically significant disease for the Australian sugarcane industry, causing an estimated $25M in losses each season.
- RSD has been challenging to diagnose because there are no external symptoms (other than reduced yield), and while molecular diagnostic tests have been developed, there has been a relatively low throughput, and so very few commercial crops are assessed for RSD.
- Management practices that minimise RSD are well established, but the "invisibility" of the disease means that there is poor adoption of the recommended practices because growers are unaware that they have a problem.

Building on technology developed in previous SRA-funded projects, this project aims to provide sugar mills with the capacity to measure the RSD levels in every rake of cane entering the mill, using near infra-red (NIR) spectroscopy.

The project aims to:

- Further refine NIR calibrations for RSD, using molecular Loop Mediated Isothermal Amplification (LAMP) assays for validation.
- Train and support staff in mills to undertake routine RSD screening.
- Give mills the ability to provide growers with a summary of RSD status in every rake of cane.

NIR Service Leader Steve Staunton is excited to see his earlier work with NIR now take RSD detection from the field to the mill.

"This project is not only an exciting step change, where we're able to analyse the whole crop for RSD as it's delivered to the mill, rather than just in seed plots, but this is an example of real innovation and utilisation of existing capital," he said.

"It's getting more use from what we've already learnt; and we hope it will give us a real understanding of the strengths and weaknesses of the NIR technique and how we might appropriately use this data to mitigate or fix the RSD problem."

The project will run over four years and work in collaboration with industry and The University of Queensland which is carrying out project 2022/015 (see details opposite). The project will map RSD incidence across the South Johnstone, Tully, Mossman and Bundaberg mill areas.

"The mills we're working with are aware that they have reduced yield, and this could be due to a multitude of issues. What we will be able to do with this project is to identify if RSD is contributing to that problem and work to mitigate or eliminate it as one of the causes of reduced yield, allowing us to focus on any other contributing factors."

SRA's NIR Service Leader Steve Staunton says this project is not only an exciting step change for RSD testing but is an example of real innovation and utilisation of existing capital.

Dr Sriti Burman (UQ) shows Tully Cane Productivity Services Manager Peter Sutherland how the RSD-LAMP assay works.

Project 2022/015
Delivery of a pest and disease diagnostic step change for the sugarcane industry (RSD-LAMP)

Jimmy Botella, The University of Queensland

- Ratoon stunting disease (RSD) is a major disease limiting sugarcane profitability in Australia, yet the true extent has not been identified or actual monetary losses calculated.
- Detection is typically limited to testing planting material, which requires a lengthy and costly process to identify/confirm RSD presence.
- Correct identification of RSD using a method that is timely and cost effective is the solution to detection and thus management.

This project proposes to finalise a molecular RSD assay to be used during milling that would immediately provide information on the commercial crop distribution of RSD in the Australian industry. This would provide a profound step change to our current knowledge of where the disease occurs and provide for an economic assessment of the commercial effects of the disease in every mill area. Targeted management would then be possible with improved profitability an outcome.

Successful research outcomes could transform commercial crop disease detection in Australia via the ability to easily assay cane coming into the sugar factory with much geographically referenced information (GIS) attached. This could be of immense value in both detection of exotic and endemic diseases.

New research investment projects continued...

RESEARCH MISSION 3 **Diversified and Adaptable**

PROGRESSING PRACTICAL NEXT STEPS FOR INDUSTRY DIVERSIFICATION

Project 2022/018
Building industry engagement capability for a diversified and adaptable Australian sugarcane industry

Madeline Smith, Queensland University of Technology (QUT)

- A 12-month project funded by SRA and QUT to progress the sugar industry's access to the burgeoning bioeconomy.
- The Industry Roadmap - *Sugar Plus – Fuelling the Future of Food, Energy and Fabrication* – was released last year and outlines diversification opportunities for the Australian sugar industry to secure and grow its value for future generations.

This project aims to bring together sugar industry stakeholders, researchers, and policymakers to create a collaborative network. Its goal is to help Australian sugarcane businesses thrive in the global bioeconomy by sharing knowledge, enhancing skills, and building connections.

Enhanced collaboration among stakeholders will enable the development of a varied range of research innovations, allowing Australian sugarcane growers to explore additional revenue opportunities in bio-based sectors. This project will be led by Madeline Smith as Innovation Coordinator, a previous recipient of a SRA postgraduate research scholarship. The project is underway and will be guided by a steering committee of executive stakeholders from industry and government.

Click to view more information on our website.

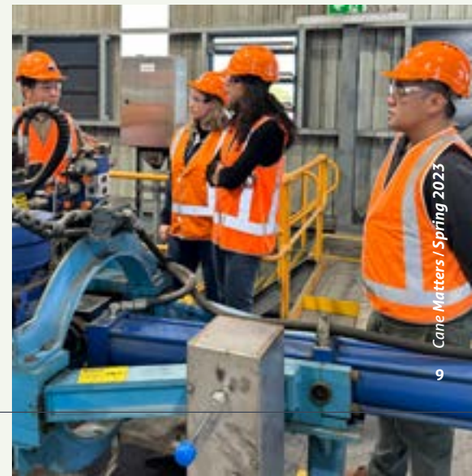
This project will hold a series of webinars focusing on the main areas of diversification identified by SugarPlus: fuel, food and fabrication. These events will feature talks and panel discussions from biotechnology companies, enabling the industry to have meaningful conversations with potential end-users of sugarcane feedstock.

The Australian sugar industry already offers biotech researchers, entrepreneurs and investors sizeable advantages in terms of valuable sugar industry infrastructure already in place including:

- 3,600 cane farm businesses
- 22 sugar mills, some of which are already supporting co-generation facilities
- expertise in producing a range of high-quality sugar products.

Underpinned by innovative science, the sugar industry can fuel the production of high-value, low-impact, bio-based products, positioning the industry and Queensland at the centre of the Australian bioeconomy.

"This project will create the collaboration needed across the supply chain to build diversification opportunities for the sugar industry," Innovation Coordinator Madeline Smith said.



During a tour of the Mackay Renewable Biocommodities Pilot Plant, Dr Jerome Ramirez addresses Madeline Smith and PhD Student Karen Rodrigues Martinez while Dr Heng-Ho Wong looks on.

RESEARCH MISSION 4 **Sustainable and Efficient**

LEAF AND SOIL SURVEY FOCUSES ON MACRO AND MICRO NUTRIENT CONSTRAINTS

SRA Agronomists Nancy Rincon (left), District Delivery Officer Glen Park (centre), Project Officer Armin Wessel (right) with soil and leaf samples for the survey.

Project 2022/010
Industry wide leaf and soil survey to detect hidden macro and micronutrient constraints

Barry Salter, Sugar Research Australia

- An industry-wide leaf and soil survey and analysis are underway to look beyond nitrogen to other nutrient constraints on productivity and profitability in the sugarcane growing industry.
- Leaf samples have been taken from three main cane varieties chosen for the research – Q208, Q240 and Q253.
- Soil samples will come from an even number of different soil texture classes including sand, loam and clay soils found throughout the sugarcane industry.

Chief Investigator and SRA Manager Translational Research, Dr Barry Salter said that the aim of the research was to do a stocktake of micro and macro nutrients in soils and cane throughout the sugarcane industry.

"Macro nutrients include nitrogen, phosphorous, potassium, calcium, magnesium and sulphur. Micronutrients include elements such as copper and zinc," Barry said.

"There's been a large focus on nitrogen and nitrogen research in the past 20 years because of water quality issues associated with the Great Barrier Reef.

"However, we've been working on nitrogen for so long that we feel we need to start making sure that other macro and micro nutrients have not been overlooked.

"We are trying to find out whether, or not, there are any hidden or developing nutrient constraints.

"For instance, we don't get lots of reports of nutrient deficiency symptoms being seen in paddocks. But, there might be a case of something just ticking away in the background that hasn't got to that level yet. It might be having a low impact on productivity but it's not yet at the point where it's causing deficiency symptoms.

"We want to find these developing constraints, sometimes called hidden hunger, early before they cause visible deficiency symptoms.

"If you identify and address these constraints early you've got a better chance of rectifying the issue. It also costs less to fix.

"The leaf and soil survey is about making sure we are aware of what the trends are out there in terms of nutrient management. Has our management of all nutrients been appropriate? If there are some concerning trends we can then focus research and management efforts on those to make sure they don't develop any further."

Leaf samples were collected from February through to May this year. Forty samples were taken from the Southern region, 40 from the Central region, 40 from the Burdekin and 80 from the Wet Tropics (from the Herbert through to Mossman).

"Samples have also been collected as part of other regional projects and we hope to combine the data from all sampling activities and conduct a metaanalysis," Barry said.

Samples from both young and old ratoons have been included following previous work conducted by SRA Principal Agronomist Dr Danielle Skocaj in the Wet Tropics. She found nutrient constraints in older ratoons compared with younger ratoons.

The process of analysing the samples is now underway at the SRA Inorganic Chemistry Laboratory at Indooroopilly by Technician Farzana Darain and Manager Industry Services Operations Dr Heidi du Clou.

"It is expected to be the end of December before all the soil samples have been analysed. The statistical analysis will then be undertaken by Statistician and Data Analyst Muyiwa Olayemi," Barry said.

"After that we will start reporting back to the industry about what we've found."

Taking leaf and soil samples from the same site should provide some interesting information on nutrient uptake.

"If you've got a high amount in the soil but a low amount in the leaves, that would indicate that there's something going on in terms of taking up that nutrient. It might point to issues with the root system."

Barry thanked the growers who participated in the project. More than 290 sites across the sugar industry have been sampled.

He also acknowledged the productivity boards and milling companies for their assistance in finding suitable sites.

Project 2022/011
Understanding phosphorous requirements for sugarcane crops growing in alkaline soils

Danielle Skocaj and Barry Salter, Sugar Research Australia

- Phosphorus requirements for sugarcane crops growing in alkaline soils is poorly understood.
- This will be investigated using a combination of pot and field experiments, soil and crop sampling and novel soil testing methods.
- This will improve the understanding of soil assays, providing the best measure of plant available phosphorus, amount of fertiliser phosphorus recovered by the crop and phosphorus fertiliser application rates for alkaline soils.

Addressing this fundamental research gap will deliver new scientific knowledge critical for the development of best practice and soil specific phosphorus management for sustainable sugarcane production, while minimising offsite environmental impacts.

SRA Principal Agronomist Dr Danielle Skocaj carries out post harvest sampling to measure soil phosphorus levels.

NEW ARC PROJECTS TO BOOST DEVELOPMENT IN THE SUGARCANE INDUSTRY

New projects announced for the sugar industry will focus on engineering sugarcane plants for biofuels; improving genetic gains in cane variety breeding; and tackling major biosecurity risks to sugarcane production.

They will be delivered by collaborative research partnerships between Sugar Research Australia and the Australian National University (biosecurity); and SRA and The University of Queensland (variety breeding and biofuels).

The projects have been funded through three research investments made by the Australian Research Council (ARC).

SRA Interim CEO Shaun Coffey said that the investment was very valuable for the sugar industry at an important time in its development.

"We are very excited by the strong strategic networking and collaboration that this investment will provide, coupled with access to new technologies and expertise for the benefit of the sugarcane industry," Shaun said.

In a partnership investment with the ARC Research Hub for Engineering Plants to Replace Fossil Carbon, SRA and the Queensland Alliance for Agriculture and Food Innovation (QAAFI) at The University of Queensland will focus on actions needed to develop the required technology, infrastructure and capacity to meet demand for biofuel in the aviation industry.

Positive announcements in recent months of financial support for the development of a domestic Sustainable Aviation Fuel (SAF) industry by the Qantas Group, Airbus and a consortium of investors, and the Queensland and Australian Governments, was expected to encourage investment in sugarcane industry diversification.

The enormous potential demand for SAF if the airlines are to meet their zero emission obligations by 2050 could at least partially be met by the Australian sugarcane industry. In recognition of this, the ARC funding was provided under its Industrial Transformation Research Program.

SRA's Executive Manager, Variety Development, Dr Jason Eglinton, said the Australian sugarcane industry had an important opportunity to grow because of the demand for biofuel production from the aviation industry.

"The potential benefits will improve profitability across the industry through new added-value products that generate better returns and create new revenue streams to diversify risk," Dr Eglinton said.

"Over the long term, the conversion of sugarcane bagasse to sustainable aviation fuel could create a substantially larger industry, whilst also enabling Australia to become increasingly self-sufficient, improving both economic resilience and national security."

Dr Eglinton said the funding provided by ARC will fund a sugarcane gene editing platform and sugarcane mutant populations targetting improved biomass yield and composition for the production of jet fuel.

SRA and The University of Queensland's partnership investment with the ARC Training Centre in Predictive Breeding for Agricultural Futures.

Dr Eglinton said the aim of the Centre was to provide elite level training to a group of students who will become the next generation of leaders in plant and animal breeding.

"Two PhD students will be based at SRA and they will join existing initiatives on developing nematode resistant sugarcane and predicting the performance of cross combinations for their project work," Dr Eglinton said.

"The Centre will also develop and deliver plant breeding training modules to support the professional development of SRA technical staff. The technical excellence of the Centre will be supported by a series of Industry Research Fellows, including one based at SRA to work on integrating DNA-based predictive breeding with the established platform of drone-based predictions for cane yield," he said.

Dr Jason Eglinton (left) and Dr Kevin Powell (Right) (Sugar Research Australia).

Dr Eglinton said parasitic nematodes were estimated to cost the sugarcane industry $80 million per annum in production losses.

"All sugarcane varieties are susceptible, and growers have no cost-effective control measure."

"This partnership project will fast track the introgression of nematode resistance in cane varieties and produce a commercial variety using genomic selection."

A second PhD project, predicting the performance of cross combinations in variety breeding, will use historic and current progeny performance data as the basis for investigating genetic determinates of parental performance in sugarcane breeding.

Dr Eglinton said SRA aimed to improve the efficiency of the sugarcane breeding program to achieve target genetic gain of two per cent year-on-year:

"Advances in technology achieved through engagement with the Centre will contribute to SRA delivering improved varieties to increase the on-going competitiveness of the Australian sugarcane industry. It will also provide strategic support for future skills development."

SRA and The Australian National University will also partner in investment with the ARC Training Centre in Plant Biosecurity.

SRA Entomologist Dr Kevin Powell said that the partnership investment with the Centre would assist SRA to control the risk to production from pests, weeds and diseases, through improved monitoring and detection of potential, new and emerging pests and diseases. Importantly, the Centre would also train future biosecurity researchers.

"There are many potential biosecurity threats to the sugarcane industry from other parts of the world. Some are geographically very close to us (e.g. in Southeast Asia and Papua New Guinea). Being able to identify the pest species quickly is very important. Then, if we do get an incursion, we want to be able to manage it quickly. These actions need to be sorted out now, not only by the current research team at SRA but also those who will be taking up the baton and leading efforts in the future."

The funding will support an Early Career Researcher at SRA, and two PhD students who will work on sugarcane biosecurity projects.

SRA'S 2023 ANNUAL GENERAL MEETING (AGM) NEW DATE

The AGM is an opportunity for members to participate and ask questions about SRA.

WHEN: 10:00AM (AEST) THURSDAY 16 NOVEMBER 2023

WHERE: The AGM will be held as a 'hybrid' meeting, which means that it will be held both by use of an online platform for hosting meetings, and in Brisbane.

SRA has made the decision to hold the AGM as a hybrid AGM to allow as many of our members as possible to participate. The hybrid meeting provides the opportunity for members to ask questions, make comments and vote electronically.

VOTING BEFORE THE AGM

If you are an SRA member or member representative and would like to vote, please note the completed voting form must be received 48 hours prior to the AGM. Any voting form received after that time will not be valid for the scheduled AGM.

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

By email:
members@sugarresearch.com.au

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

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

New date: *In the winter edition of Cane* ***Matters*** *we advised the Annual General Meeting would be held on 27 October. Please note this has now changed to 16 November 2023.*

ENERGY EFFICIENCY **OPTIONS** FOR DIVERSIFIED MILLS

Project 2018/012
Pan design and operational changes to suit Australian pan stages operating on low pressure vapour

- **Expansion of energy and fuel markets may encourage investment in sugarcane industry diversification**
- **Energy and fuel demand could at least partially be met by the sugarcane industry**
- **The milling sector may now be encouraged to make the large investments required so as to use bagasse for other income streams**
- **This project looks at ways for mills to improve energy efficiency in order to use less bagasse to make steam and power.**

Dr Ross Broadfoot, Queensland University of Technology

A project led by Chief Investigator Dr Ross Broadfoot from the Queensland University of Technology (QUT) has looked at ways to improve energy efficiency in the mills by modifying operations at the pan stage.

"The aim is to use less bagasse to make the steam and power required for the factory. Then the surplus bagasse can be used in the off season, or exported to another facility for another purpose like ethanol production," Dr Broadfoot said.

"In Australian sugar mills the steam from the exhaust of the turbines – the engines driving the plant – runs the evaporators to produce the syrup and the vacuum pans for crystallisation.

"Typically there are five stages of evaporation to produce the syrup with 70 per cent soluble solids (brix).

"This is the feed that goes into the crystallisation stage, which is called the pan stage because the vessels that do the crystallisation are vacuum pans, typically eight of them.

"The mix of mother molasses and crystals is called massecuite and three different grades are produced: A – the highest purity, B – lower purity, and C, the lowest purity.

"The steam or vapour is typically fed from the turbines into the calandria (the steam chest) of the pans. On the other side of these tubes the sugar solution boils and crystals grow.

"The massecuite then goes into centrifugals where the crystals are separated and dried to produce raw sugar ready for shipment to market.

"The six most energy efficient mills in Australia currently use 40 per cent steam on cane. If they are crushing 500 tonnes an hour that's 200 tonnes/hour of steam. However, most factories are still at 50 per cent steam on cane," he said.

"Overseas, in places like India, many factories use only 30 per cent steam on cane. They have adopted a number of energy efficiency improvements to generate large surpluses of bagasse to allow year round operation of cogeneration plants and/or to operate distilleries for biofuel production.

"Within only a few years they have gone from zero to 10 per cent of all gasoline used in India being blended with ethanol, thanks to a supportive government offering incentives to the mills.

"Of course, the cost of doing things in India is much less than here and labour is less of an issue.

"The cost to Australian sugar mills to reduce their steam consumption from 40 per cent to 30 per cent would be extremely high.

"To reduce the process steam consumption, the pan stage needs to operate with vapour (steam) bled from the evaporators rather than using turbine exhaust steam. Greater reductions in process steam consumption can be achieved by sourcing the steam from a later stage in the evaporator set.

"Currently there are six mills using Vapour 1 (i.e. vapour from the first evaporator), one using Vapour 2 and none from later evaporators.

"Overseas steam efficient factories use Vapour 3 (i.e. vapour from the third evaporator), with a big reduction in the amount of steam needed per cent on cane.

"However, their equipment is different. Because of the high cost of capital in Australia, we use a few but large vacuum pans of up 240 tonnes capacity, without mechanical stirrers. By comparison, Indian or Brazilian mills might have several 60-tonne pans, often with stirrers.

"When using vapour in the late evaporators, the vapour pressures and temperatures are lower. As a result, the pans can't boil as quickly and it is more difficult to maintain the high levels of sugar quality and recovery. That's the trade-off. As an industry we need to find ways to maintain high productivity but increase our energy efficiency."

Dr Broadfoot says some mills are looking very seriously at making the large energy efficiency improvements needed to diversify their production. These changes must be undertaken in the most cost-effective way.

The final report for the project *Pan Design and Operational Changes to Suit Australian Pan Stages Operating on Low Pressure Vapour* was finished in May this year. This project has identified several changes that are needed to allow the mill pan stages to reduce their average steam consumption and also to reduce the large variations in steam consumption caused by large batch pans as they cycle through their operations.

Key technological changes will be required for both the evaporation and pan stations to maximise the benefits. These include increased use of continuous pans (horizontal and stirred vertical types), installing mechanical stirrers into the batch pans, pre-heating the feed liquor and molasses, and supervisory control of the pan stage. Several changes will also be required on the evaporator station to better manage the use of bleed vapour to the pan stage.

"The outputs from this project can be utilised by all Australian sugar factories aiming to maximise the availability of surplus bagasse, steam or power in implementing diversified production. The project provides important information to assist Australian factories to actively participate in decarbonising the Australian economy."

Vacuum pans in an Australian sugar mill.

The Burdekin Bridge spans the Burdekin River between the towns of Ayr to the north and Home Hill to the south, both in the Shire of Burdekin, Queensland.

BBIFMAC's Angus Houston and Arwen Rickert install a San Dimas flume and water height logger.

NEW PROJECTS IN THE LOWER BURDEKIN

In 2020 the Burdekin Irrigation Project (BIP) was launched with ambitious goals, including to transition growers to proven world class scalable, sustainable and technologically advanced practices in irrigation management.

The project is already achieving these goals and complementary projects are now being funded in the Burdekin region.

"The BIP has done great work in progressing growers' advancement in irrigation,"

NQ Dry Tropics Sustainable Agriculture Program Manager and Project Coordinator, Rob Hunt said.

"The technical expertise and hard work by the project delivery team, in a complex production system, has been exceptional. Now, thanks to additional funding from the Great Barrier Reef Foundation and a partnership with XXXX we can expand irrigation projects in the Lower Burdekin," Rob said.

New projects:

- **Project 2022/801**
  The **XXXX *Lower Burdekin Smart Irrigation Project*** provides a property-specific approach to help farmers reduce water and energy costs and improve the efficiency of irrigation systems, and an opportunity to demonstrate BIP technology in a break crop and in a drip irrigation system.

- **Project 2022/802**
  The ***Lower Burdekin Cane Major Grants Project*** provides an opportunity to employ the successful framework designed and implemented for the BIP with a further ten growers.

Participating growers have already been signed up to the projects.

SRA Environmental Sustainability Scientist Dr Simon Clarke is Chief Investigator on the BIP and the new projects. He said the BIP framework has been successful because the project activities address industry priorities and water quality targets simultaneously.

"The BIP, thanks to the local delivery team, has delivered what was promised - time, water and energy savings - and reduced the likelihood of nutrients moving off-farm," Simon said.

"We are now excited about supporting Lower Burdekin irrigators to transition to more efficient irrigation systems and nutrient practices to reduce on-farm irrigation expenses, runoff and deep drainage losses. This will mean improvement for productivity, profitability and environmental outcomes."

The BIP and the Lower Burdekin Cane Major Grants Projects are funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation.

Read more about the project and funders here:

Click to view
XXXX Lower Burdekin Smart Irrigation Project

Click to view
Lower Burdekin Cane Major Grants Project

Click to view
We're helping farmers help our Reef

The *Burdekin Irrigation Project* is funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation with support from Sugar Research Australia, Farmacist, AgriTech Solutions, Burdekin Productivity Services, Burdekin Bowen Irrigated Floodplain Management Advisory Committee, NQ Dry Tropics, James Cook University and the Queensland Department of Agriculture and Fisheries.

IMPROVED WAYS TO PROCESS SOFT CANE

Project 2019/005
Improved strategies to process soft canes

- **Soft canes can be more difficult and costly to process**
- **Some soft canes may have better productivity**
- **This project looked at ways to improve processing**
- **A cost benefit analysis can show a net revenue benefit for processing soft canes**

Dr Floren Plaza.

Soft cane varieties are a sensitive subject in the milling industry because they can be more difficult and costly to process, and can take more supervision through the mill.

During the development of new cane varieties, Sugar Research Australia carries out tests for fibre quality to identify likely factory processing issues as early as possible. Three tests are conducted on prepared cane – shear strength and short-fibre content; and on billets, impact resistance.

Some districts will not approve soft canes for release. However, some soft canes may have better productivity in terms of tonnes of sugar per hectare than others.

Consequently, if there are improvements that can be made in processing soft canes, the Central and Southern industry where soft canes are primarily grown may benefit.

A project completed this year by Chief Investigators Dr Floren Plaza and Dr Geoff Kent from Queensland University of Technology (QUT), SRA Variety Development Manager Southern Roy Parfitt and Isis Engineering Manager Kelly Ryan, has looked at identifying the best strategies to process soft canes in the factory.

That includes establishing improved automated strategies in the cane preparation and milling stations in order to assist the milling console operator to achieve high throughput and extraction, together with low final bagasse moisture, for soft cane varieties.

An initial literature review confirmed that soft canes in the industry are not new. They have been around for more than 60 years and millers in the past have learnt to deal with them.

"Soft canes are part of the continuum of cane varieties. They are not a separate subset or a special kind," Floren commented.

"By making adjustments in the mill it has been possible to process them in the past."

The main processing issues have been with feeding the cane through the milling train and the high bagasse moisture content. In the past to combat soft canes, mills made changes to the front end of the factory. For example, in 1981, Bingera and Isis mills lowered shredder preparation, lowered added water and changed the milling units' feed chute setting to control torque.

Several mills in the Mackay District handled soft canes in the past through reductions in shredder speed, reductions in added water or maceration either by diverting the juice/water to a mill closer to the front of the train or by diverting direct to mixed juice.

Some Australian factories had the means of automatically adjusting the shredder grid setting.

In addition to the literature review, the researchers talked to Tully Mill, which some years before had installed a hydraulic shredder grid door adjuster to optimise the transfer of power from the turbine to the shredder, by opening the grid door automatically before the turbine reached maximum capacity. This could also be used for soft canes.

From this preliminary research, the researchers looked at measuring the effect of shredder speed, shredder grid settings, grid door adjustments, added water rate and added water temperature on the operation and performance of cane preparation and milling stations, to produce prepared cane with good feeding characteristics and provide mill settings that delivered good feeding.

Experiments were carried out at Isis Mill, which already had semi-automated systems in place. Factory experiments in 2020 determined the best controls to use in the milling train. That control logic and an electro-mechanical grid door positioner were put in place at Isis. Tests of the automated systems were carried out last year when soft canes came into the factory.

"What was done during the project was not completely new, but we believe our approach in automating the controls improved the system," Floren Plaza said.

"The objective is to assist the milling train operator in achieving good milling performance."

From the project a better understanding of the behaviour of soft canes through a milling train was gained. While there was not enough test data to show statistically which control option resulted in the best milling control, there was a trend that indicated that one of the automated control methods in place, working together with the operator, was better than only manual control. The results are also applicable to the processing of normal cane varieties.

A cost benefit analysis showed that if a soft cane variety can achieve a 0.2 CCS increase or higher over the main varieties, a significant net revenue benefit is likely to be achieved. Two cane varieties SRA11$^{\Phi}$ and Q249$^{\Phi}$ which were identified during variety development as soft canes, may fall into this category.

However, a further full crushing season of data is needed to provide more conclusive results on better control of milling units and to better quantify the cost or benefit of soft canes to the industry.

This project was funded by Queenland University of Technology, Sugar Research Australia and Isis Central Sugar Mill Co. Ltd.

QUT researchers Dr Ehsan Arzaghi and Mr Jose Juan Vasquez mix prepared cane for analysis and testing, Isis Mill.

REDUCING IRRIGATION COSTS IN MACKAY

In the last edition of *Cane Matters* (Winter 2023) pages 34-35 focussed on the 2023 Central District Productivity Plan. We shared how Central District Manager Dylan Wedel and District Delivery Officer Stephanie Duncan are supporting growers in the region by developing low-cost irrigation systems.

At a demonstration walk held in August in Gargett in the Pioneer Valley, Dylan and Steph were able to demonstrate how a full irrigation scheduling system can be established for under $3,000. This included seven moisture probes connected to the one base station, which cost about $28 per hectare.

The breakdown of costs was approximately:

- Wi-Fi Base Station (materials sourced locally) $522.89
- 7 Chameleon Wi-Fi Soil moisture probe (VIA Farms) @ $275 each

The total came to approximately $2,837.

Dylan takes up the story

"Through our work and trials, we've managed to compile and successfully test a suite of low-cost solutions for different irrigation challenges, with tools all easily sourced.

"On display at the demonstration walk were multiple Chameleon Wi-Fi soil moisture probes located on various soil types from sandy loam to cracking clays," Dylan said.

Different irrigation management zones had also been set up, comprising about 100 ha and featuring three centre pivots.

The probes are solar powered and require little or no maintenance following installation.

Prior to harvest the above ground pole can be temporarily removed and the sensor cables buried. Alternatively, harvesting can take place around the pole.

Most farms already have a Wi-Fi network at the house or sheds. From here, Wi-Fi extenders costing about $85 each can securely lengthen the internet connection across the farm, either in a single 60-degree beam or by connecting multiple extenders to establish a meshed network.

At the Gargett demonstration site, an initial internet connection was established using a Telstra 4G hotspot with an extended antenna to boost the initial mobile connection. This device created a Wi-Fi network that can then be extended across the farm to connect the Chameleon soil moisture probes.

In addition to the scheduling tools, automated and remote pump controllers and valves and on farm security were also discussed as benefits to be gained from an on-farm Wi-Fi network.

"As we are supplementary irrigators in this region, we aren't applying large quantities of irrigation to be able to justify costly control systems.

"We aim to apply our limited irrigation at the right time, at the lowest cost, and as easily as possible, to maximise profit – this is assisted by the use of these low-cost tools," Dylan said.

Local grower Ian Harris has been using a Wi-Fi base station with seven moisture probes on his farm for the past six months and says he has already seen the benefits

"The integrated irrigation scheduling tools developed by Steph and Dylan were simple and inexpensive to install.

"They have helped with our irrigation timing and effectiveness and allowed us maximise crop growth throughout the season," Ian said.

"The setup has also provided a great insight into the water-holding capacity of the different soil types on this farm."

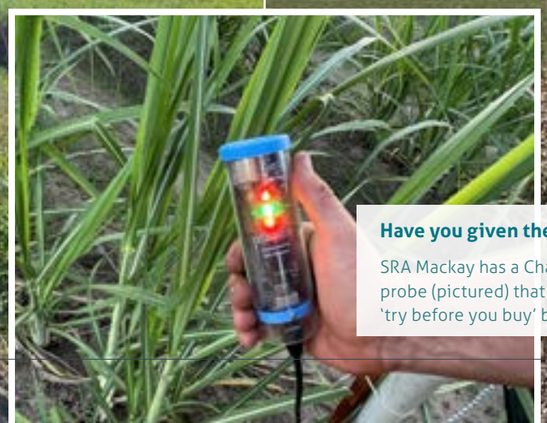
More irrigation field days across the Central District are planned - keep checking the SRA website for details or subscribe to* the SRA enewsletter *for all the latest news and upcoming events.

If Central district growers would like to discuss how some of these tools and technologies may be able to help them with irrigation on their farm, please contact:

Dylan Wedel M: 0490 029 387 | E: dwedel@sugarresearch.com.au
Stephanie Duncan M: 0459 863 298 | E: sduncan@sugarresearch.com.au

Below: Central District Delivery Officer Stephanie Duncan (left) shows growers at the Gargett demonstration a Wi-Fi base station.

Opposite: Central District Manager Dylan Wedel (left) discusses low-cost irrigation tools with growers.



Have you given the probe a try?

SRA Mackay has a Chameleon soil moisture probe (pictured) that growers can borrow on a 'try before you buy' basis.

Left: *SRA District Manager Far North Gavin Rodman facilitates a meeting of the Mulgrave CCS improvement project at SRA's Meringa station.*

Far left: *Mulgrave grower John Ferrando has been involved in the CCS improvement project.*

A GOOD START FOR CCS IMPROVEMENT PLAN

In recent months SRA Far North District Manager Gavin Rodman has been working closely with CANEGROWERS Cairns region, MSF Sugar and district growers, in response to concerns from the local industry that Commercial Cane Sugar (CCS) in Mulgrave has been experiencing a long-term decline.

Delivered through the Far North District Productivity Plan the Mulgrave CCS Improvement project aims to improve CCS by;

- monitoring and measuring crop indicators
- developing new and reviewing existing datasets
- understanding the impact of current practices on CCS, and
- identification of management strategies to support improvement.

The project has involved ten farming operations in Mulgrave to identify productivity data trends and on-farm practices for the 2010-2021 period. From these activities, several insights into factors potentially impacting CCS have been identified. These include the following:

- crop maturity is having a large impact on CCS, with losses of 0.6-2.0 units when crops were harvested younger than 11 months of age compared to those older than 11 months
- timing of planting is likely to affect harvest scheduling and crop maturity, as only 14.5 per cent of survey responses were targeting pre-season planting
- sugarcane growth regulators are considered a tool to support CCS improvement, with recent trial results indicating a profitable response when applied to crops with stalk moistures between 71-75 per cent
- CCS variability increases later in the season
- the increasing percentage of ash and extraneous matter may be greatly impacting CCS
- 77 per cent responses indicated that the average practice is little to no topping during harvest
- row profiles are impacting crop presentation and likely increasing extraneous matter levels, with a recent survey finding more than 60 per cent of sample sites not conducive to efficient harvesting, and
- significant yield and economic losses due to Pachymetra root rot with a recent soil survey estimating a loss of 151,000 tonnes and $4.76 million in 2021 alone.

Gavin says that whilst not every crop will experience all of these factors, most crops will likely be impacted by one or more to some extent.

"Information and data on each of these insights is being shared with growers in the Far North through a series of fact sheets, workshops and demonstrations. Further information is being collected to gain a better understanding of these impacts.

"I encourage all growers in the Far North who have any questions about the project or its initial insights, to contact either myself or District Delivery Officer Paul Calcino and look out for the shared information sheets in their email inboxes."

Gavin Rodman
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JEFF DAY IS A MULGRAVE GROWER WHO HAS BEEN HAPPY TO GIVE HIS TIME AND SUPPORT TO THE PROJECT

"I can't say exactly when we started seeing the decline in CCS on our farm and in the Mulgrave area, but I'd say it has certainly been noticeable in the last decade," Jeff said.

"Every grower will have their own view, as to what's causing the decline, but we can't act on individual beliefs.

"We needed SRA to drive a broader perspective, to see what's going on in the whole system, and help us, the growers, make a difference in the paddock. Our CCS should be better than it is.

"The Mulgrave CCS improvement initiative is taking us down a road that we need to go. It's considering all the options and guiding potential actions. It might take some time to find the answer to improve our CCS but at least we're all trying, together."

John Ferrando is another Mulgrave grower "within spitting distance of SRA's Meringa station" and says he has always believed that SRA working with farmers, rather than farmers working on their own, or SRA working on its own to solve problems, brings with it a better outcome.

"We've all been wondering for years where the CCS was going," he said.

"The wet years haven't helped. The last three years have all been wet starts, but it goes back further than that.

"We can't control the weather and that might make up about 70 per cent of what we do, the other 30 per cent we should be able to influence as farmers.

"The data that has been gathered and shared through this project has given us a better insight into our own farming practices." John said.

"Some farmers have been blaming varieties. We all know a lot of things make up good CCS and that's what we're considering here.

"This project isn't a silver bullet but the more insights we can gather, the more we can improve our practices, and we hope our CCS. This is a good start, but we're not finished yet."

Growers and harvesting contractors who attended the Harvest Mate *workshop in Tully included (left to right) Roy Butcher, Steven Crema and Peter Reed.*

HARVEST MATE - MAKING A DIFFERENCE IN THE PADDOCK

Earlier this year there was a buzz amongst canefarmers and cane harvesting contractors that hadn't been felt before. There was an exciting new tool that promised to create change, and with it increase profitability in the paddock.

After more than four years in the making, *Harvest Mate,* the online platform with smartphone App, was launched and made freely available for industry use.

Four months later, SRA Agricultural Machinery Specialist, Phil Patane says that *Harvest Mate* is already delivering on its commitment as he supports growers and contractors who have embraced the decision-support tool and are seeing its benefits this season.

"The interest and uptake of *Harvest Mate* has been as we'd hoped," Phil said.

"There are some growers who have signed up online to see what it's all about, but they are holding off to see what happens with users this harvest. There are others who have jumped right in to give it a go this season.

"And why's that? Because *Harvest Mate* links agronomics with economics," he said.

"You won't find many other tools that do that. And the ease of using *Harvest Mate* is because we've listened to hundreds of growers and contractors.

"At the end of the day a farmer wants to know if practice change is worth the time, effort, and money. The question they have is 'What is the cost and benefit for me to go from this practice to that practice?'" Phil said.

"Some growers and harvesting contractors may question the benefits of *Harvest Mate* compared to a yield loss, or cane loss monitor. A key difference is that those tools are telling you what you've done after harvesting. Whereas *Harvest Mate* is a forward-looking tool to help you consider which harvesting options will increase your income. It can also be used to help you adapt what you're doing in the field to reach your optimal practice."

Phil and SRA staff are currently supporting 12 growers and harvesting contractors in the Mulgrave, South Johnstone, Tully/Kennedy, Herbert and Mackay districts - across 1 million tonnes of cane. These early users of *Harvest Mate* will provide valuable feedback on the tool for future users.

Harvest Mate *workshops kicked off in Ingham (pictured) and were well attended at all sites along the Queensland coast.*

Harvesting contractor Ian Ghidella has been using *Harvest Mate* in the Tully district this season and says he's pleased to see that the recommendations he's getting from the tool are very close to what he is actually doing.

"It's good to see that I am running the harvester to best practice," Ian said.

"The App recommended I run the fan a little slower at times, especially around a light topping cane. On a heavy lodged crop, it recommended I increase the fan a bit more.

"It's all a matter of tweaking but it's these one per cent improvements that all add up economically," he said.

Ian also said that setting up and using *Harvest Mate* was straightforward thanks to the one-on-one support from Phil.

"My priority now," Phil said. "Is to work with other SRA staff and industry advisors who can support the uptake of *Harvest Mate* in their district. I'll be carrying out training soon.

"Next season we hope to see many more users benefiting from the App, with the help of these advisors, and sharing with the industry the added benefits that *Harvest Mate* can bring. But our work isn't going to stop there.

Harvest Mate was made possible thanks to the contribution by economists from the Queensland Department of Agriculture and Fisheries (DAF).

DAF Manager, Agricultural Economics, Mark Poggio says the *Harvest Mate* project has achieved what it set out to do and raised new opportunities.

"Adoption of any new decision-support tool is always going to be a challenge, and harvesting has its own challenges for growers and harvesting operations as well as implications for the milling sector," Mark said.

"*Harvest Mate* has been very successful since its launch earlier this year. That was reflected in the attendance at the workshops that SRA and DAF held along the Queensland coast.

"We had a number of growers come up to us after the presentation saying they'd like to register to use the online platform and App. And I know Phil and other SRA staff have been working hard to support users and assist with adoption.

"Our next challenge is how we (together with SRA) move forward with what is already a great tool, to see how we can make it even better.

"DAF is keen to explore opportunities for future development of this tool in collaboration with SRA and will be looking at feedback we get from users this year."

"The added beauty of this tool is that industry came to SRA and DAF with a problem," Phil added.

"Growers and contractors wanted to know what the cane loss was in dollars during harvesting (Project 2016/955). With *Harvest Mate* we're now able to answer that question, but as with all new technology, once you develop it, you want to see what more you can get from it.

"An additional component to the tool we would like to see in the near future is to make it automated; that is live and accessible in the cab. That will allow growers and contractors to review fan feeds, ground speeds and yield in real-time," he said.

"And we've got more questions we'd like answered, the first being burnt cane. We'd like to include that as a component of *Harvest Mate* but that's an additional project for the future.

"For the moment we're very happy seeing the productivity and profitability improvements our first *Harvest Mate* graduates are making and excited about working with more growers and harvesting contractors next season."

Click to read more about *Harvest Mate* on SRA's website

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

Queensland Government

Rob and wife Sue travelled to Canberra for the 2023 Farmer of the Year Awards in June.

THANK YOU DR MAGAREY FOR A LIFETIME OF EXCELLENCE IN SUGAR

For anyone from Queensland's far north, a trip to Canberra isn't something you'd normally plan in winter. And when Dr Rob Magarey and wife Sue travelled from Tully to the nation's capital in June, this certainly wasn't something they had planned, or the soon-to-be retired SRA plant pathologist had expected.

Rob had been invited to Canberra to be nationally recognised for Excellence in Agricultural Research at the Kondinin Group and ABC Rural's annual Australian Farmer of the Year awards sponsored by the Australian Centre for International Agricultural Research.

There were nine award winners, representing a cross section of agricultural sectors and roles. Rob had not only brought sugarcane to the table but an awareness of exciting opportunities in research in pests and diseases and its implementation in other agricultural sectors.

"The award is a nice way to approach retirement," Rob said back in the warmth of Queensland. "But what I'm most appreciative of is that it acknowledges the sugar industry; current and previous research teams and the local Tully community; we can all be happy about that," he said.

While retirement plans include rebuilding from scratch a second Model T Ford and supporting the Tully centenary celebrations in 2024/25, Rob's involvement with SRA and the local sugarcane industry will continue. Funding has just been announced for a new project based on former work using Near Infrared (NIR) Technology to detect Ratoon Stunting Disease (RSD) which Rob will be involved with.

"What is exciting to see now is the work we've done leading to new technology that could transform the way we detect disease." Rob says.

"In the past we've only been able to detect RSD in nursery cane. We'll now be able to predict the incidence of the disease in commercial crops using technology applied at the mill. This is a step-change for the industry*," Rob said.

Read more about this recently funded research project 2022/007 on page 8.

Left to right: At work in the Tully shed Jamiee Magarry, Wilma Tomasin, Kim Badcock, Sal Badcock, Brodie Macarone, Judi Bull and Ryan Smith.

Rob will be retiring from SRA later this year, after 42 years in the same office at the Tully research station; and 29 years working alongside laboratory assistant Judi Bull who retired recently.

We wish Rob and Judi a long and happy retirement in their respective regions of beautiful Far North Queensland.

ROB ALSO SEES A GREAT FUTURE FOR SRA INTERNATIONALLY

"A career highlight for me was carrying out surveys across northern Australia/ Cape York, Torres Strait and Papua New Guinea. That was a really interesting time 2001 to 2004. Navigating PNG - the original home of sugarcane - was amazing," he said.

"I've also had the opportunity to work in Southeast Asia, Vietnam and China where Australian scientists are well respected and well received. I hope our younger researchers will get these same opportunities, which can only benefit the organisation and the industry. Gaining experience in overseas industries allows us to gauge the likelihood of potential threats entering our industry and to develop appropriate strategies to combat them, should they arrive."

Rob has led a number of overseas research projects to develop industry solutions to such threats.

RECALLING ROB'S 42 YEARS IN SUGAR

CANE MATTERS ASKED FORMER COLLEAGUES BARRY CROFT AND JOHN REGHENZANI TO REFLECT ON THEIR TIME IN TULLY WITH ROB

Barry Croft, now retired, worked closely with Rob for 34 of his 38 years with the organisation.

"*When Rob started work with the Bureau of Sugar Experiment Stations (BSES now SRA) in 1981, he was based at the BSES Pathology Farm at Eight Mile Plains, near Brisbane. He was supervised by then head pathologist, Colin Ryan, who later became Director of BSES. Rob was transferred to Tully in early 1984, where I'd been working as a pathologist since 1981, previously starting with BSES after graduating from the University of Melbourne," Barry said.*

Northern Poor Root Syndrome and Pachymetra

"Rob's first major project focused on what was then known as Northern Poor Root Syndrome (NPRS). He joined the NPRS multiple disciplinary working group which was initially led by Brian Egan and then Colin Ryan. The team was made up of plant pathologists, Rob and myself, agronomists, Alan Hurney and John Reghenzani, entomologist/ nematologist, Keith Chandler and extension officers Archie Matthews, Eddie Spry and others," Barry said.

"At that time, the variety Q90^{ph} made up 90 pr cent of the crop from Tully to Mossman, in the far north. Initially it produced excellent yields but productivity rapidly declined. Poor root growth led to Q90^{ph} stools being ripped out of the ground by harvesters as a result of the very poor root system. Soil attached to the stools caused extensive and costly damage to the sugar mills. Goondi Mill had to stop on numerous occasions simply to provide time for soil cartage from the factory.

"Rob was a key player in the breakthrough that identified a new organism now known as *Pachymetra chaunorhiza* which was a major component of NPRS. Q90^{ph} was found to be highly susceptible to this organism.

"Rob would go on to conduct detailed studies of the biology and symptoms of Pachymetra root rot collaborating with an expert in the United Kingdom, Michael Dick, who identified Pachymetra as a new species unique to Australia.

"Pachymetra root rot was later found to be present throughout the Australian

Barry Croft, Judi Bull and Rob Magarey, pictured at SRA's Tully research station in 2009. The plant pathologists and laboratory technician have served BSES/SRA for a total of 109 years. Rob will retire from SRA later this year.

sugar industry and is now recognised as one of the most important Australian sugarcane diseases. Once identified, Rob would go on to develop a method for counting the distinctive Pachymetra spores in the soil. The test showed that the rapid glasshouse method for screening varieties for resistance to Pachymetra is highly correlated with field reaction and therefore a reliable method. The test also showed that susceptible varieties were suffering losses of up to 40 per cent from Pachymetra. These findings gave the industry confidence that this organism was important and that resistant varieties were the best method to control the disease. The pathology team then worked closely with SRA plant breeders to breed Pachymetra resistant varieties that continue to be the best method to manage this disease.

"Rob's Pachymetra soil test is still widely used by industry to monitor levels on farms and in district surveys to ensure that the disease is effectively managed.

Orange rust, smut and chlorotic streak

"In 2000, there was an outbreak of a new strain of an old disease, orange rust, that attacked the then most widely grown variety, Q124$^{\Phi}$. This disease outbreak brought dramatic losses in many regions and particularly the Central region where Q124$^{\Phi}$ was 90 per cent of the crop. Rob played a major role in testing and registering a number of fungicides that helped growers reduce losses in the interim period before they could replace Q124$^{\Phi}$. Rob also developed and conducted methods to screen new varieties for resistance to yellow spot and orange rust.

"When smut was found in Queensland for the first time in 2006, Rob was a key team member in the emergency response. He conducted detailed studies of the spread of smut in different regions and the losses it caused. He also developed a spore trap network to detect atmospheric smut spores – providing early detection of the disease. Spore traps detected smut up to 18 months before diseased crops were observed, allowing farmers to make preparations for the disease before it became widespread. This technology was then deployed overseas (Papua New Guinea and Fiji) to determine if the disease was present in those countries.

"Chlorotic streak was a widespread disease in the Wet Tropics that Rob had a long-term interest in. He was a team member that eventually cracked the 90-year-old mystery of how the disease was caused-by a unique single celled animal belonging to the *Cercomonas* family. This outstanding scientific discovery will help the industry to understand and control this important disease," Barry said.

SRA has recently announced funding for a new project to build on this research and develop a method to screen varieties for resistance to chlorotic streak (See page 8 - Project 2022/006).

International projects to benefit Australia

"Rob has led a number of international projects that have prepared the Australian sugarcane industry for potential incursions of pests and diseases from our northern neighbours, PNG, Indonesia and other Southeast Asian countries. These projects have greatly increased the scientific knowledge of key exotic pests and diseases such as moth borers, Ramu stunt, downy mildew, sugarcane streak mosaic, Fiji leaf gall and others. His work has benefited the Australian industry and helped the overseas industries manage these diseases, thus reducing the risk to Australia," Barry said

Publications, collaborations and awards

"Rob produced a field guide *Diseases of Australian Sugarcane*. This is still an excellent tool for growers, productivity service staff and SRA staff. This was a prelude to field guides developed for Australian pests and later for pests and diseases in the Southeast Asian region. He has conducted countless training and extension meetings on sugarcane diseases.

"He was a team member in the multiple disciplinary yield decline joint venture team lead by Alan Garside that has developed a range of sustainable farming systems. He has represented the sugar industry on the national and international stage as the President of the Australasian Plant Pathology Society (2005-2007) and Councillor representing Australia on the International Plant Pathology Society. He led the establishment of the Australasian Soil-borne Disease Symposium series which has now seen 11 meetings spanning 24 years. He was President of ASSCT in 2017 and has been awarded the Australian Society of Sugarcane Technologist's (ASSCT) President's medal on three separate occasions, having written more than 100 scientific papers for ASSCT.

John Reghenzani, former agronomist at the Tully Station shared his memories working with Rob, and their families growing up together.

"I have very fond memories of the 18-year period during the 1980s and '90s when I was based in Tully, and I expect so does Rob. Tully is where our children grew up and enjoyed the life of this small and friendly country town. Because housing was in short supply in the Tully region in those early days, BSES built two houses on Tully Station at Dallachy to accommodate staff. They later built another two residences in Bell Street in the township itself. Our families (along with the Crofts) lived opposite each other in the Bell Street cul-de-sac, which gained the reputation of being full of kids and pets. Together, our children swam in crystal-clear creeks, scaled the sheer slopes of adjacent Mount Tyson and adventured in the rainforest which surrounded the BSES homes in which we lived," John said.

A shift in sugarcane research methodology

"What is well known is Rob's role with Barry Croft in finding the primary cause of Northern Poor Root Syndrome (NPRS), a previously unknown and unidentified fungal pathogen of sugarcane roots. The solution also came from their involvement in the development of methods to test for varietal resistance to this disease," John said.

"What is not well known is that the NPRS approach represented a fundamental shift in sugarcane research methodology, previously criticised by sugar industry 'outsiders' as being too insular. Rob played a most valuable role in new multidisciplinary and multi-organisational research teams.

"Pathologists, agronomists, and other disciplines now worked together in a genuine spirit of cooperation. New colleagues came from the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Department of Natural Resources (DNR), Department of Primary Industries (DPI), Australian Institute of Marine Science (AIMS), universities and other organisations. What was initially approached as a primary pathological problem expanded, as encapsulated in the Yield Decline Joint Venture program, into wider, holistic research on soil biological, physical, chemical and environmental health.

"While growing sugarcane in the tropics can be difficult, so can conducting research in this environment. Rob approached the task in front of him with competence, good humour, and more than anything, patience. Professionally, Rob has an enviable sugarcane research and publication record. Privately, he is someone with a deep faith-based involvement in family and community activities. Moreover, he is one of life's true gentlemen," John concluded.

DID YOU KNOW?

Rob was an outstanding AFL footballer and played for the Queensland State team on 16 occasions. When he was based in Tully, he flew to Sydney, Canberra and Hobart to play weekend games. Former colleagues report he was always back at work first thing Monday morning.

GROWERS LEARN NEW RESEARCH **FINDINGS AT BUNDABERG FIELD DAY**

It was a packed morning's program at the Bundaberg Field Day in July.

SRA Southern District Manager Lisa Devereaux introduced each speaker to participants who filled both the meeting room at Bundaberg Station and spilled into the adjoining room.

Interest and the level of discussion from participants with the speakers was high and at times intense.

First up, **Acting Executive Manager Commercial Development Jane Trindall** introduced SRA's Research Mission team and outlined the annual scholarships and research awards program, the small milling research program, and new research projects *(detailed in this issue)*.

She was followed by **SRA Manager for Biosecurity and Disease Screening, Dr Shamsul Bhuiyan** who discussed a smut trial that has been set up at the Woodford station after an unusually high smut incidence was observed in one of the resistant varieties last year in the Isis area. He emphasised the best management strategies for growers to defeat smut in sugarcane.

Next on the program was new **Leader Field Pathology Dr Seona Casonato** who is looking forward to bringing growers solutions to their pathogen challenges through applied projects "which enable growers to get the best returns they can". She and **Pathologist Robert Magarey** outlined new projects in RSD using Near Infrared (NIR) technology and LAMP assays that are now underway.

Entomology Leader Dr Kevin Powell next provided details of the projects he is leading in searching for an alternative control to imidacloprid for canegrubs. He also outlined trial work in Papua New Guinea and Indonesia to ensure the sugarcane industry is prepared for a biosecurity emergency if moth borers or other exotic vectors reach Australia.

He was followed by **DAF Coastal Farming Systems Team Leader Neil Halpin** who provided updates from the DAF Bundaberg Research Facility for soybean, peanut and sugar industries.

The final speaker on the program was **SRA District Manager Burdekin, Terry Granshaw** who provided a summary of his region's District Productivity Plan and its focus on automating irrigation in the Burdekin to reduce water and energy use as part of the Burdekin Irrigation Project.

Participants were able to take a break during the program and view the presentations set up around the Station.

These included:

- viewing the planter designed by SRA Bundaberg Station Field Operations Manager Richard Cervellin to increase precision planting in SRA sugarcane trials
- a field walk to view new varieties in the Southern District
- a demonstration of the Online Sugarcane Nutrient Management Training program and how to register for it
- the one eye sett propagation program discussed by Bundaberg Sugar Services' Field Officer Michael Turner, and
- a demonstration of the Near Infrared (NIR) handheld device used in the NIR Cane Analysis System demonstrated by SRA Manager Industry Services Operations, Dr Heidi du Clou.

Bottom row left to right: *Variety Officer Southern Clare Hogan (centre) speaks to growers about new varieties; SRA District Manager Burdekin Terry Granshaw (left) talks to DAF Coastal Farming Systems Team Leader Neil Halpin and participants after his presentation at the Field Day; and growers were able to view the precision planter designed by SRA Bundaberg Station Field Operations Manager Richard Cervellin.*

The workshop included an outdoor demonstration where participants used their mobile phones to identify weeds using the free Pl@ntNet app. "You can quickly identify weeds with the digital tools you have in your pocket," Emilie said.

NSW ADVANCED WORKSHOP: WEED TIPS AND TACTICS

In August more than 20 Southern growers accompanied milling representatives from Sunshine Sugar, to participate in SRA's Advanced Pre-Emergent Herbicide Workshop held in Wardell, New South Wales.

SRA Weed Scientist Emilie Fillols' regionally customised presentation covered identifying weeds, pre-emergence herbicide management and good herbicide placement. "Everything growers need to know to take control of weeds, before they take control of your farm," Emilie said.

Feedback was positive. Local grower Marty Walsh emphasised the importance of continuous learning in the field.

"You can never know enough about spraying," he said.

Father and son growers John and Jason Schaefer both appreciated the opportunity to attend the event and learn directly from the experts how they might manage their weeds better.

"It's very good for us. There are a few things that one can question such as what is recommended compared to what we actually use," Brendan Nash, a cane farmer from Palmer's Island said.

Thank you to Sunshine Sugar for hosting the event with SRA at the historic Wardell District War Memorial Hall.

Workshops in Gordonvale and Mossman

Far North cane growers and advisors will get another chance to attend Emilie's regionally customised advanced pre-emergent herbicide workshop in October.

Click to find all the details on the EVENTS page on the SRA website.

Top row left to right: *Dr Shamsul Bhuiyan addresses Field Day participants; visitors were absorbed in Kevin Powell's presentation; SRA Board Director Mark Day (left) chats with visitors to the Field Day and Dr Heidi du Clou (right discusses Near Infrared Technology with visitors.*

BUNDABERG FIELD DAY

Mums, dads, and children were able to place the live canegrubs on their palms and those who were brave enough to do this received a free tattoo of a canegrub, cane beetle or soldier fly.

Former Mackay residents, now living in Brisbane, enjoyed a VR trip back to the cane fields.

Sugarcane ONE PLANT, MANY PRODUCTS was the message for the Ekka 2023, hosted by CANEGROWERS, Sunshine Sugar and Sugar Research Australia.

VIRTUAL REALITY AND CANEGRUBS **DRAW CROWDS AT THE EKKA**

About 400,000 people enjoyed the Royal Queensland Show, or Ekka, in August this year. That's the biggest attendance since 2019.

Ag Education Hall, supported and staffed by CANEGROWERS, Sunshine Sugar and Sugar Research Australia, was kept busy during the 10-day event as show-goers enjoyed a Virtual Reality (VR) experience and an up-close encounter with canegrubs.

For the second year running the six-minute VR experience provided by Sunshine Sugar gave visitors, many of who had no knowledge of the sugar industry, a bird's eye view of cane country, before bringing them right into the tractor cab alongside farmers as they planted sugarcane.

Viewers – young and older – were then stepped through the production process, as they got to experience driving haulouts and harvesters, before moving to the mill, sugar terminal and refinery to gain a true understanding of sugar's journey from billet to bag.

Back in the real world of the collaborative display SRA Entomologist Dr Kevin Powell was a hit with the public as he showed off his display of live sugarcane grubs, encouraging the 'show and tell' approach to education.

While many visitors to the display were convinced they had the same grubs in their Brisbane gardens, Kevin was able to point out the differences between lawn grubs, witchetty grubs and cane grubs, and the work his team is doing to control the latter.

"Many people have a fascination with insects," Kevin said, "Often that can be because the insects are seen as either a nuisance or a novelty.

"Visitors to the stand were confusing the greyback cane grubs we had on display with witchetty grubs, or lawn grubs or white grubs that are destroying their gardens. Unless you're a cane farmer or an entomologist the chances of you knowing what a cane grub looks like are slim. And you certainly wouldn't be aware of the havoc they cause in the cane field.

"There are, of course many differences between the grubs found in urban gardens, and cane grubs; the main being that witchetty grubs are generally considered to be a wood-feeding larvae of a moth and they are traditionally used as a food source.

"Lawn grubs and white grubs are larvae of beetles and they will eat your lawn grass roots, but they don't eat sugarcane roots."

Canegrubs, representing 20 different species, are the most significant economic pest of sugarcane in Australia and are spread across most cane-growing regions.

"Canegrubs cause damage by feeding on and damaging the root system," Kevin explained.

"If not managed, most of the cane growing area is potentially at risk and canegrubs would threaten sustainability of the industry through lost production and reduced profitability."

Kevin and his entomology team at SRA's Research Station in Meringa are undertaking research to find new methods to control the canegrub.

"At present there is only one active chemical ingredient, imidacloprid, that has been used effectively for canegrub management in the past two decades," he said.

"If this chemical product were no longer available or restricted in use, due to potential legislative withdrawal on environmental grounds, or if insecticide resistance develops, there would be significant consequences for the industry."

SRA has undertaken screening activities with both chemical and biorational pesticides that show promise for controlling canegrubs.

Previous SRA research and overseas research have also laid the foundations for potential commercial and novel alternative products to be used in the future.

"Our work is investigating these alternative products, and at the same time focusing on an integrated management strategy for incorporation into SRAs Greyback Canegrub Management Manual," Kevin said.

"This will mean improved grower confidence that there are other chemical or biological options for managing canegrubs and preserving water quality in the future."

Project 2020/004 *Beyond imidacloprid - Chemical and biorational alternatives for managing canegrubs* is funded by Sugar Research Australia and the Department of Agriculture and Fisheries.

The research is being conducted in collaboration with a range of agricultural companies.

CANEGROWERS

sra Sugar Research Australia

Sunshine Sugar

Queensland Government

Left to right: Greg Shannon, Tully Mill, Matt Kealley CANEGROWERS, Phil Patane, SRA and Chris Condon (local farmer) shared their experience in the cane industry with students at the National Science Week event.

SCHOOLS CELEBRATE SUGAR SCIENCE

National Science Week is Australia's annual celebration of science and technology.

Running each year in August, it features more than 1000 events around Australia, including those delivered by universities, schools, research institutions, libraries, museums and science centres.

This year two schools in Tully and Silkwood teamed up with CANEGROWERS Tully and industry partners Sugar Research Australia, Tully Sugar, Terrain NRM and CANEGROWERS' staff from Brisbane to provide students with an immersive sugar science lesson.

A virtual reality experience took the students on a sugar journey to see the growing, milling and refining processes. The students also experienced a mobile mill, learnt about soil health and water quality through hands-on activities and got up close to bugs and grubs.

The event also provided opportunities for Year 6 students to showcase their drone piloting skills and to explore how innovation in fields of Artificial Intelligence and energy generation are being used to solve real world problems.

"This collaborative event was a great opportunity for our students to learn first-hand from those involved in local industry about the role that science and technology plays in sugarcane farming," St Clare's Principal Karran Burzacott said.

"An event like this also showcases future opportunities for students in these local industries," she said.

National Science Week events at St John's School, Silkwood and St Clare's School, Tully were made possible through funding from the Australian Government, the Cassowary Coast Regional Council and product donations from IGA Tully.

NATIONAL SCIENCE WEEK


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1. *The start of a big day.*

2. *I know all about mill mud!!*

3. *Dr Elissa is fully immersed in the sugar virtual world.*

4. *Getting up close in the bug room.*

5. *SRA Agronomist Nancy Rincon shared data with young science recruits Rylee and Ashlyn.*

6. *We all need engineers like Max.*

7. *SRA's Danielle Skocaj explains to budding paramedic Charlotte that farming is all about healthy soil.*

8. *St Clare's Prep staff Gita Sima and Pauline Colombini became Professors for the day.*


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SUGAR RESEARCH CAREERS

From agronomists to entomologists, skilled technicians, to visionary district managers, SRA employs a range of professionals shaping the future prosperity of the Australian sugarcane industry.

BE A PART OF THE FUTURE - CLICK TO DOWNLOAD OUR CAREERS PACK

DISTRICT PRODUCTIVITY PLANS - CURRENT PRIORITIES

INITIATIVE	COLLABORATORS	PROPOSED OUTCOME	STATUS – September 2023
Far North District Manager: Gavin Rodman E: grodman@sugarresearch.com.au M: 0476 807 355.			
Mulgrave CCS and Mossman Productivity Improvement Projects	CANEGROWERS Cairns Region, MSF Sugar and Mulgrave growers. CANEGROWERS Mossman, Far Northern Milling Pty Ltd, Mossman Agricultural Services and Mossman growers.	Improve CCS through monitoring and measuring crop indicators. Development of new datasets. Identification of management strategies. Identify the impact of current practices on CCS, including those impacting upon extraneous matter.	The Mulgrave CCS Improvement Project has recently shared with the industry in the Mulgrave and Babinda areas initial insights on potential CCS impacts. These include; crop age at harvest, increasing ash %, timing of planting and harvest scheduling, use of growth regulators/ripeners, topping practices, row profile and crop presentation, and Pachymetra root rot. The Mossman Productivity Improvement Project is in its initial phase. The first field surveys began in July and August.
Development of application parameters for ripeners	MSF Sugar, Far Northern growers.	Develop in-field parameters to support successful applications of sugarcane ripeners to improve profitability.	Year 1 results shared with Far Northern industry at SRA March update events. 2023 sites selected, treatments applied and monitoring ongoing. Some sites have been harvested in 2023. Strong linkages to CCS and Productivity Improvement Projects.
Strategies for emerging weeds	Nufarm, Queensland Department of Agriculture and Fisheries, Federation University and Far Northern growers.	Investigate efficacy of herbicides registered for vine control and aerial application. Identify and develop germination protocols for itch grass to support pot trials. Develop management strategies for post-emergence of balsam pear, itch grass and navua sedge.	Year 1 results shared with Far Northern industry at SRA March update events. Balsam pear trial #3 complete. Other vine species trial complete. Navua sedge monitoring ongoing at two sites with one field walk completed. Collection of itch grass seeds for germination protocol development underway.
North District Manager: Phil Patane E: ppatane@sugarresearch.com.au M: 0431 818 482			
South Johnstone District Productivity Plan	Innisfail Babinda Cane Productivity Services, CANEGROWERS Innisfail, local growers, MSF Sugar, Cassowary Coast Reef Smart Farming Project and local industry organisations.	In mid-2021 a Local Expert Analysis (LEA) was initiated in the South Johnstone District. A general LEA industry reference group was formed for the area which included local industry scientists from agronomy, pathology, machinery, variety development and NIR. The group objectively considered local constraints influencing yield and milling operations. The LEA is embedded in the South Johnstone District Productivity Plan.	The initial LEA analysis suggested that the most significant constraints affecting productivity were poor nutrition in older ratoon crops, severe Pachymetra root rot, widespread incidence of RSD, low uptake of Pachymetra resistant varieties, poor adoption of highly productive new varieties, less than ideal extension materials and insufficient quantities of approved seed. There is also opportunity to adopt tools, such as *Harvest Mate*, to optimise economic returns for industry. Targeted actions have now been assembled to address the known constraints in the first South Johnstone District Productivity Plan which can be downloaded from SRA's website. The LEA is closely collaborating with the Cassowary Coast Reef Smart Farming initiative led by CANEGROWERS Innisfail. Both initiatives have a common goal to improve nutrient use efficiency and increase grower productivity and profitability.
Local Expert Analysis (LEA) Tully	Tully Cane Productivity Services Ltd, Tully CANEGROWERS, Tully Sugar.	Improved profitability through balanced crop nutrition, targeted use of mill by-products, automated mill alerts for poor yielding crops, better disease management, improved use of NIR to indicate crop status, and validation of *Harvest Mate* for optimising harvesting economic outcomes.	Currently conducting stakeholder engagement meetings to review Tully Productivity Plan. Draft Plan has been completed and will be reported in the Summer edition of *Cane* ***Matters***.
Variety observation plot and CCS maturity profiling	SRA Plant Breeding.	Variety demonstration plot and CCS maturity profiling.	Continuation of the CCS maturity curve sampling being conducted during the months of May, June, July and August. Data to be collated with 2022 season data by the end of the 2023 season.
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. Modifications currently being made to the harvester. Three machines will be installed during September 2023.
Refining nutrient recommendations for ratoon crops following application of surface banded mill by-products to manage the effect on yield and CCS	Wilmar Sugar Australia.	Improved understanding of nitrogen requirements to manage CCS following application of mill by-products.	One trial implemented at the Orient - mud/ash was subsurface banded in fallow at 80 wet t/ha and then planted. Sampling completed for this trial. Two trials established for surface banded mill by-products on ratoon cane.
Implementation of Harvest Mate	Department of Agriculture and Fisheries Queensland	Adoption of new technologies	Four harvesting contractor groups utilising *Harvest Mate* during the 2023 season supported by Sugar Research Australia.
Burdekin District Manager Terry Granshaw E: tgranshaw@sugarresearch.com.au M: 0457 650 181			
Burdekin Irrigation Project (BIP)	Burdekin Productivity Service (BPS), Agritech Solutions, Farmacist, Burdekin Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC), James Cook University, Department of Agriculture and Fisheries, North Queensland Dry Tropics, Wilmar and growers. In-kind from Sunwater.	Reduce energy costs, improve water costs and irrigation efficiencies. Measure water quality benefits. Modernisation of farming systems e.g. smart farming technology. Improve productivity/profitability which has a direct effect on environmental outcomes.	One BIP demonstration site has been successfully harvested and preliminary results look very good. This site has had all sensors and infrastructure put back in place to capture irrigations in the ratoon crop. The two other demonstration sites will be harvested towards the end of the year. Sunwater and Lower Burdekin Water Board have provided electronic meters as in-kind support to two of the sites. An SRA drone was flown over one of the demonstration sites to capture canopy height, canopy temperature and canopy cover.
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.	Spray trial 7's target paddock was an early-stage plant cane block with a dense infestation of grass and broadleaf weeds. The paddock was sprayed with SRA's four-row trailed boom sprayer with broadcast nozzles. Prior to the spray trial, the AutoWeed team collected and labelled 28,522 images of the paddock and trained an artificial intelligence model that achieved an average classification accuracy of 91% making it suitable for field use. For the spray trial, six 1.5 ha replicated treatments were sprayed alternating blanket spraying and spot spraying. Therefore, for this trial the AutoWeed technology reduced herbicide usage by 55% with an average weed knockdown efficacy of 81%.
Burdekin phosphorous response trial	Wilmar and Burdekin Productivity Services.	Investigate phosphorous management for sugarcane crops growing in alkaline soils.	All soil and crop measurements, except harvesting of the plant cane P trial site, were successfully completed on trial site 1. Unfortunately, the establishment of a new plant crop experiment was adversely impacted by unseasonal rainfall and severe waterlogging immediately after planting. Poor germination has made the continuation of the experiment uncertain. Additional field experiments will be established in 2024.
Mill mud/ash trials in outer regions of the district	Queensland Department of Agriculture and Fisheries	Measuring economic impact of applying low rates of mill mud/ash.	Trial plan developed, growers engaged, and mill mud ash pads established. No mud has been applied due to weather conditions and unavailability of spreading equipment.
Central District Manager Dylan Wedel E: dwedel@sugarresearch.com.au M: 0490 029 387			
Increasing irrigation utilisation	Sugar Services Proserpine, Plane Creek Productivity Services Ltd, Mackay Area Productivity Services, Eton Irrigation, Greater Whitsunday Alliance Water in Agriculture Working Group and growers.	Increase utilisation of irrigation to increase profitability and productivity. Note: Seeking more growers to work with in the irrigation space.	Field walks at our demonstration sites are underway showcasing low-cost scheduling and system control tools in action. These provide interested growers with the opportunity to try the Chameleon Soil Moisture probes to access live soil moisture data on their phones. This assists growers with the adoption of low cost irrigation tools to make their irrigation systems less labour intensive e.g. remote pump starting and auto shutoff, monitoring dam levels – there is a solution to most challenges!
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. Earlier this year several paddocks were successfully planted – through trash, ratoon drills and cultivated beds. Two growers who used the planter have successfully taken their crop through to grain profitably.
Improving Early CCS: Variety observations	SRA Variety Development	Improve knowledge of varieties, particularly regarding early CCS and the impact of soil moisture on CCS.	Fortnightly sampling is continuing, targeting a suite of upcoming clones in SRA Variety Development's Final Assessment Trial program.
Improving Early CCS: Crop Ripener	Productivity services companies and growers.	Improve CCS when cane is harvested earlier in the season.	Several growers have taken advantage of crop ripeners this season with positive responses. Local growers are encouraged to contact SRA if they would like us to assess paddocks for the application of crop ripener to improve CCS. Samples from paddocks are collected and processed with the mobile maturity trailer to determine crop moisture to aid in decision making.
Southern District Manager Lisa E: Devereaux ldevereaux@sugarresearch.com.au M: 0456 590 497			
Local Expert Analysis (LEA) Bundaberg/Wide Bay	Bundaberg Sugar Services, Isis Productivity Ltd, CANEGROWERS Maryborough	Identification of unrealised industry constraints.	Soil and leaf survey samples were obtained and are waiting results. A decision as to whether the LEA program will proceed will be made once analysis has been completed.
Rocky Point Pest and Disease Management Surveys	CANEGROWERS Rocky Point	Reduced impact of RSD and Pachymetra on farm. Further, extend and promote benefits of clean seed scheme and farm hygiene.	The Pachymetra survey yielded promising results across the district with an overwhelming number of samples indicating a low probability of severe disease. Individual productivity plans continue in the area with growers. Results from the nematode project sampling to be reviewed.
NSW multi-year productivity program	NSW Agricultural Services NSW Sunshine Sugar	Improved profitability and productivity through various projects including harvesting 2yr cane to 1yr cane.	Project commenced August 2023. The initial phase is to understand the criteria, trends and drivers suited for growing 1 year old cane in the Harwood and Broadwater areas.
Six Easy Steps Online Sugarcane Nutrient Management Program	Department of Environment and Science, CANEGROWERS	Enable all Australian sugarcane growers to access nutrient management training that will improve the efficiency and productivity of their farms if applied.	The program receives new registrations weekly through wider promotional activities. Participants who finish the program receive a certificate of completion.

Click to view copies of all six District Productivity Plans are available to download from SRA's website, including the recently released South Johnstone 2023 Plan.

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
2020/003	Maximising cane recovery through the development of a harvesting decision-support tool	Phil-Anthony Patane	Sugar Research Australia	1/06/2023
2022/012	Use of machine learning to determine the extraneous matter and billet length in cane consignments	Ross Broadfoot	Queensland University of Technology	1/02/2027
2022/014	Australian Sugar Industry – Development of factory training modules – Phase 3	Bruce King	Sugar Research Institute	1/03/2027
2022/201	Feasibility study of using mill waste streams by a 5 ha micro-algae facility for supplemental income	Craig Wood	Isis Central Sugar Mill Co Ltd	6/10/2023
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
2023/201	Bagasse fly ash system performance benchmarking	Jonathon Gilberd	Wilmar Sugar Australia Limited	30/06/2024
2023/202	Evaluating the suitability of measuring massecuite dry substance for control on Australian pan stages	Bryan Lavarack	Mackay Sugar Limited	1/07/2024
Research Mission 2: Position the industry to stay ahead of climate, environmental and biosecurity threats				
2018/010	Moth borers - how are we going to manage them when they arrive?	Kevin Powell	Sugar Research Australia	1/06/2025
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	30/06/2024
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	Fiji Leaf Gall (FLG) Eradication Strategy: Peri-urban surveillance for area freedom	Rob Magarey	Sugar Research Australia	1/12/2023
2022/004	Soldier fly diagnostics, distribution, and development of an artificial diet	Kevin Powell	Sugar Research Australia	1/05/2025
2022/005	Assess weed impact/distribution for prioritisation	Emilie Fillols	Sugar Research Australia	30/06/2024
2022/006	Development of a resistance screening method for chlorotic streak	Chuong Ngo	Sugar Research Australia	1/06/2026
2022/007	Delivery of a pest and disease diagnostic step change for the sugarcane industry (RSD - NIR)	Rob Magarey and Steve Staunton	Sugar Research Australia	1/12/2025
2022/015	Delivery of a pest and disease diagnostic step change for the sugarcane industry (RSD-LAMP)	Jimmy Botella	The University of Queensland	1/05/2026
2022/016	Viruses to aid biological control of major root-feeding pests of sugarcane	Michael Furlong & Kayvan Etebari	The University of Queensland	1/08/2027
2022/901	Agri-climate outlooks	Danielle Skocaj	Agricultural Innovation Australia Limited	30/12/2024
Research Mission 3: Capitalise on changing consumer preferences, and the growing bio and green economies to develop diversification opportunities				
2022/018	Building industry engagement capability for a diversified and adaptable Australian sugarcane industry	Madeline Smith	Queensland University of Technology	30/06/2024

PROJECT IDENTIFIER	TITLE	CHIEF INVESTIGATOR	RESEARCH AGENCY	END DATE
Research Mission 4: Position the Australian sugarcane industry as leaders in profitability, environmental sustainability and resource-use efficiency				
2020/802	Mackay Whitsunday Cane to Creek	Simon Clarke	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	Simon Clarke	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	1/11/2024
2021/804	Mobilising the Murray	Simon Clarke	Sugar Research Australia	31/12/2023
2021/805	Soil specific management for sugarcane production in the Wet Tropics	Danielle Skocaj	Sugar Research Australia	23/04/2024
2021/806	DES122685 Sugarcane Nutrient Management Training	Lisa Devereaux	Sugar Research Australia	30/06/2023
2022/010	Industry wide leaf and soil survey to detect hidden macro and micronutrient constraints	Barry Salter	Sugar Research Australia	31/03/2024
2022/011	Understanding phosphorous requirements for sugarcane crops growing in alkaline soils	Danielle Skocaj	Sugar Research Australia	30/06/2027
2022/801	XXXX Lower Burdekin Smart Irrigation Project	Simon Clarke	Sugar Research Australia	1/05/2025
2022/802	Lower Burdekin Cane Major Grants Project	Simon Clarke	Sugar Research Australia	1/05/2024
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	31/03/2024
2019/806	Advancing techniques for diagnosis of yellow canopy syndrome	Kevin Powell	Sugar Research Australia	25/06/2023
2021/101	PhD Scholarship - Optimising mill mud and ash applications for soil improvement and carbon sequestration	Hannah Green	James Cook University	30/04/2025
2021/102	PhD Scholarship - Systems biology for sustainable agriculture: evaluation of plant growth-promoting bacteria to produce high-performing biofertilisers	Ian Petersen	The University of Queensland	30/04/2025
2021/401	Research Award - Risk assessment for the newly discovered parasitic nematode *Pratylenchus parazeae* in the Australian sugarcane industry	Shamsul Bhuiyan	Sugar Research Australia	1/04/2024
2022/101	PhD Scholarship - A novel biosensor device for on-farm sugarcane disease diagnosis	Simon Strachan	Griffith University	29/02/2024
2022/401	Research Award - Harnessing the SynBio potential of Australia's stingless bees, the first step.	Natasha Hungerford	The University of Queensland	31/03/2024
2022/402	Research Award - Genomic prediction of ratoon yield robustness	Eric Dinglasan	The University of Queensland	14/05/2024

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