Sugar Research Australia

Cane Matters

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(Cover page) *Manager of Bray's Farming Chris Vella in a paddock on the Tablelands.* | ***Picture by:*** *Helen Cook* | ***Design:*** *Karolina Molka*

WELCOME TO *Cane Matters*

Welcome to our first edition of *Cane Matters*. Our new magazine brings the former *Milling Matters* and *CaneConnection* publications into a single quarterly edition.

The new name represents a strong statement on the importance of the sugarcane industry to regional communities and economies – *Cane **Matters***.

We're working hard to improve our communications and engagement and are listening to feedback from industry. Through our engagement, we have heard there's a 'disconnect' across the industry about the challenges each part of the supply chain is working to address, why those problems matter, and how SRA is contributing to the solutions through research. We want to be more effective and provide broader visibility of research across the whole industry.

*Cane **Matters*** will be released in both hard copy and electronically for members. It is also available electronically for other subscribers.

In this edition of *Cane **Matters***, we catch up with Manager Bray's Farming Chris Vella on the Tablelands to discuss a commercial trial of SRA32. The story behind the variety is interesting. It was borne from a milling challenge for a cane better suited to electricity production, without compromising grower returns from sugar production. Its rapid development has been an exceptional response time in plant breeding terms.

On the research front, we take a look at robotic weed control trials showing promise in the Burdekin, maturity management trials in the far north and research into a biopesticide for sugarcane root feeding pests.

The SRA team has been actively engaging with industry from field days to forums on topical issues such as ratoon stunting disease, soil health and harvesting optimisation. The regional milling research seminars were held during March in conjunction with QUT and we examine several of the research projects discussed at those sessions.

Enjoy the read.

As always, we value your feedback.
You can reach me at cweis@sugarresearch.com.au.

Cathy Weis
Head of Industry Communications and Marketing

THOUGHTS FOR OUR INDUSTRY COLLEAGUES IN NORTHERN NEW SOUTH WALES

It has been a challenging start to 2022 for farmers and mills in northern New South Wales. Flooding caused significant damage and disruption, and our thoughts are with all members of the industry who are dealing with the aftermath of flooding.

***(Top)** At the height of flooding at Tweed River **(Bottom)** one month on from the floods. Images courtesy of Robert Quirk.*

Following the extreme weather event, SRA released an information sheet on managing flood damaged cane. The info sheet is available on our website, or via the QR code below.
If you've been impacted by flooding and need advice, please reach out to the team at: sra@sugarresearch.com.au.

PADDOCK TALK: SRA32 IS MAKING AN EARLY CUT

SRA32 was identified in 2021 as 'having the potential to be a significant new variety' when final assessment trials in the Burdekin (from 2016-2020) returned cane yield above the average of the standards in 19 of the 20 harvests.

SRA Variety Development Managers were excited by the data but we wanted to know what the growers had to say and earlier this year Gavin Rodman, SRA District Manager Far North and Graham Cripps, MSF Tablelands Senior Agronomist went for a walk through a Tablelands paddock with Chris Vella, Manager Bray's Farming where a commercial trial of SRA32 is under way.

Read what Chris had to say about the new variety below:

Left to right: Graham Cripps, MSF, Chris Vella, Bray's Farming and Gavin Rodman, SRA discussed how SRA32 is faring on the Tablelands.

We planted the SRA32 in 2020 from a block of tissue culture propagation. It was slow to get going, but once it did, it powered on. Same as when you cut it too, the ratoons are slow, not as quick as KQ228$^{\phi}$, but they're there after two or three months – and away it goes.

Once it starts getting stick on it, it just takes off, it just keeps growing, so much so that it is actually hard to make it stop at the other end.

It looks like a cross between Q208$^{\phi}$ and KQ228$^{\phi}$, a little bit Q138$^{\phi}$ish – with a few more tonnes attached.

Ratoonability, we'll see how it goes, it's only early days but it looks promising and we're going to go again with it (SRA32). It's very impressive where we've planted it in the sand, and it's evened the block up compared to KQ228$^{\phi}$.

It's a really consistent cane, across the top, more so than Q240$^{\phi}$. It may not suit everywhere; I don't know about the red soil but from what I'm seeing here in the porous country it's definitely got a place. We've got a few rows we've planted in some gravel and it's every bit as good as the KQ228$^{\phi}$.

It's not a hard cane to cut at all, we didn't have any trouble with it. It cleans well and it weighs well. I don't think it's going to be a low sugar variety. Out of the little bit of SRA32 we cut, we got some decent sugar out of it. The sample got 16 CCS I would say, at the moment, as a new cane variety SRA32 is up there with the best of them.

Chris Vella,
Manager Bray's Farming

Chris Vella standing in front of Q240[th] (foreground) and SRA32 (background) in February 2022.

SRA32 ON ITS OWN PATH

By Helen Cook

"To produce a different type of variety in commercial milling trials in four years is an exceptional response time in plant breeding terms."

Dr Jason Eglinton

SRA32 started its evaluation as just one of 100,000 seedlings facing a 12-year journey of trials and tests before becoming a released variety with the risk of being discarded at every step.

The experimental clone began life in the field as a single plant at the SRA Brandon site in 2009 and survived the selection process to be planted in its first series of final assessment trials (FATs) in 2015. Further results indicating commercial potential would be required for it to make the cut to be included in a second series of FATs before consideration of commercial release by the Burdekin Regional Variety Committee (RVC). An opportunity to support this would come six years later.

The Board of Mitr Phol (MSF parent company) visited an SRA trial site at Mulgrave in late 2017 to discuss plant breeding and future varieties. Dr Jason Eglinton, Executive Manager Variety Development had only recently joined SRA and was thrown the challenge of developing a different type of sugarcane, better suited to electricity production, without compromising grower returns from sugar production. That meant developing a variety that had a greater fibre production but didn't sacrifice the amount of sugar content per hectare; something quite different to the conventional balance of traits under selection.

"The standard selection program typically takes 12 years from planting a seedling to variety release," Dr Eglinton said. "Commercial evaluation of a new prototype variety needed to be done much faster. Rather than start from the very beginning, the pipeline of germplasm already in the selection program was examined for possible candidates to meet this brief."

The experimental clone QS09-8404 had only completed plant and first ratoon harvests in its first FAT series in the Burdekin at that time and was identified as a contender.

"In those initial trials QS09-8404 had shown a 24 tonnes per hectare yield advantage over the standard varieties, an increase of 0.9% fibre, and 0.6 units reduction in CCS. On a fibre and sugar per hectare basis it was selected as the most promising clone," Dr Eglinton said.

Commercial scale clean seed is only produced for released varieties and some of the most advanced experimental clones. The next challenge was to fast-track the establishment of production for commercial scale milling trials at the MSF Tableland Mill. In 2018 a small clean seed plot at Meringa was used as starting material for tissue culture production which was then planted in 2019 on an MSF-owned farm under a collaboration agreement with SRA.

As is often the way in experiments, life and business happens, and during the trial MSF sold the property with the pilot study but were keen to see the experiment progress. New owner Bray's Farming were happy to be involved and the study continued.

"In 2021 we saw the first commercial scale deliveries go from the property to the Tableland Mill – eight bins, harvested

across three different dates to get a picture of what happens over time - and it went spectacularly well," Dr Eglinton said.

"To go from an initial challenge from the Mitr Phol Board to produce a different type of variety in commercial milling trials in four years is an exceptional response time in plant breeding terms."

At the same time as the Tablelands pilot study was proceeding, east over the Dividing Range the clone was progressing through the standard pipeline and in 2021 the variety was put to the Burdekin Regional Variety Committee (RVC) to consider its release.

"The performance data said it all," Dr Eglinton said. "CCS was 0.8 below the standards, which would not normally interest growers, particularly in the Burdekin. However, the productivity advantage was 16.9 tonnes per hectare compared to the average of the standards. That's more than a 10 per cent increase in these trials. Multiply those factors out and you end up in front in terms of tonnes of sugar per hectare.

The Regional Variety Committee saw the value in that for the grower and the miller. "But SRA32 is not suitable for all growers or all situations," Dr Eglinton said. "Its disease resistance profile is not as strong as other newly released varieties and if harvested immature there is the potential for very low CCS, but it does have the potential to set new productivity benchmarks if managed well.

> **"SRA32 is a great example of what SRA can achieve. It demonstrates that the slow process of plant breeding can be agile in providing solutions to new challenges and opportunities, and it shows significant productivity improvements are possible through genetic gain."**

SRA32 FACTS & THANKS

Has lower CCS than established varieties, averaging 0.8 units below the standards. However, the high yield potential means that the variety offers an advantage in terms of sugar per hectare.

Resistant to leaf scald and mosaic.

SRA and Burdekin Productivity Services worked together to provide SRA32 to growers earlier than would be possible during the conventional propagation procedure.

Rated intermediate in reaction to smut, Pachymetra and Red Rot.

The commercial trial results from the Tablelands have exceeded expectations for productivity and CCS.

Growers are advised that planting into high smut risk situations should be avoided.

Tissue culture was used for the first time in the Burdekin to rapidly produce enough SRA32 plantlets to establish a one-hectare clean seed plot in 2021. This provided growers with retail access one year ahead of the normal schedule.

REGIONAL VARIETY COMMITTEES

SRA'S ***VARIETY GUIDES*** are updated annually, distributed to growers and available on the SRA website. Scan the QR code to access the guides.

There are five Regional Variety Committees (RVCs) in Queensland and one in NSW, each responsible for managing new variety releases and maintaining recommended variety lists within each sugarcane biosecurity zone (SBZ).

The RVCs are made up of industry representatives of growers, mills, SRA and productivity service organisations and each RVC has formed and agreed on the composition and structure of their committee and determined acceptable voting requirements for progression of clones through the breeding program, for new variety release and to oversee appropriate disease thresholds for their region. The RVCs operate under the *Sugarcane Industry Biosecurity Committee* and the *Queensland Biosecurity Act*.

SRA32 IN NORTHERN AND CENTRAL REGIONS

Plant and first ratoon crop harvests from SRA32 final assessment trials (FATs) across the Northern Region were considered by the RVC earlier this year (March 2022).

The variety is holding a yield advantage of 20 tonnes per hectare, CCS of 0.9 below the standards, and TSH 2.1 tonnes above the standards, making it competitive with SRA26Φ and SRA28Φ.

In April 2022 the Northern RVC voted to approve the release of SRA32 for the region and strip trials will be established to test its adaptation in a range of lower yield potential situations.

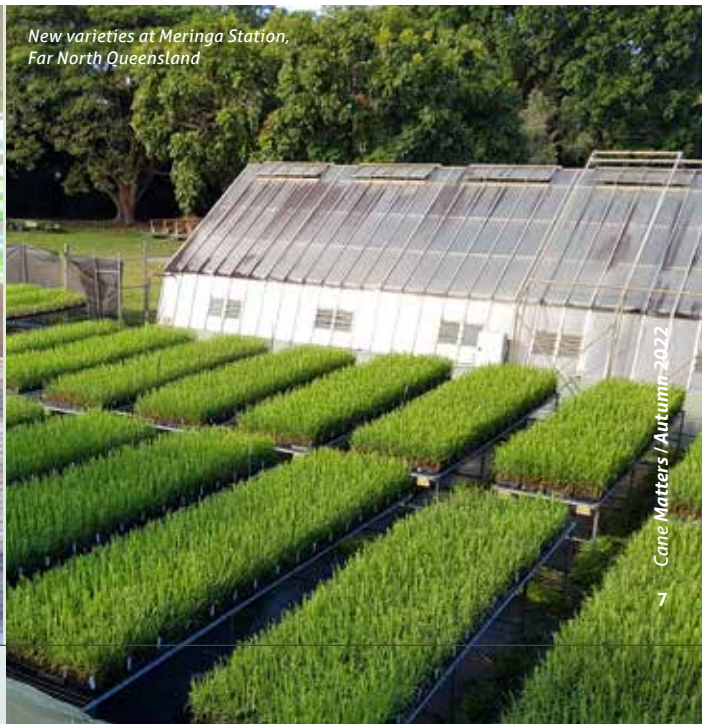
As SRA32 was released ahead of a normal production schedule, productivity service organisations will multiply tissue culture to generate approved seed for growers availability.

SRA32 will be available in 2022 as whole stalk on the Tablelands, to order as tissue culture on both the coastal and Tableland regions for 2023 delivery, and from 2023 as whole stalk on the coast.

In the Central region only plant crop data has been collected for SRA32 which was first planted in the 2020 FAT series. It has shown similar yield potential with an advantage of 15 tonnes per hectare over the average of the standards, however it will need to continue to perform through ratoon crops and subsequent seasons to clearly demonstrate an advantage in the Central region over SRA9, which has the advantage of Pachymetra resistance.

REGION	TCH	CCS	TSH	FIBRE	NO. OF TRIALS (SERIES)
Burdekin	16	-0.8	1.7	1.1	7 (2015/2017)
North	20	-0.9	2.1	0.5	4 (2019)
Tablelands	14	-0.6	1.2	0.5	2 (2019/2020)
Central	15	-0.3	2.2	1.3	2 (2020)

The Northern RVC votes for the release of a new variety at their Cairns annual meeting in April 2022.



New varieties at Meringa Station, Far North Queensland

***(Above)** Herbert District Delivery Officer Glen Park and Burdekin District Manager Terry Granshaw at the NQ Field Days.*

***(Left)** Project Officer - Irrigation Management Armin Wessel demonstrates irrigation automation equipment.*

NQ FIELD DAYS RETURN TO STRONG SUPPORT

The Rotary NQ Field Days have made a return to Townsville after an eight-year break, attracting 5000 attendees and a strong showing from the sugarcane industry.

SRA was among 200 exhibitors at the event held at Reid Park from 7-8 April.

The NQ Field Days showcase best practice in all avenues of farming, agribusiness and related industries. The event featured exhibitor demonstrations, networking, technology and innovation, and education and information sessions.

SRA Burdekin District Manager Terry Granshaw said technology drew strong interest from growers who visited the SRA stand.

"They love the technology. We had a display showing automated irrigation which allowed visitors to see how the valves work," Terry said. "I think people can struggle to understand the concept and what we're talking about when we actually just talk. Seeing is believing and then the touching and feeling, they understand how it works."

Team members from agricultural technology company, AutoWeed, were also at the SRA stand explaining their smart spot-spraying technology which is being trialled through a current research project. (Read more about the project in our story on page 10).

"The AutoWeed display was great," Terry said. "I think people understand we're trying to help them be more profitable and more productive by reducing herbicide use."

Terry said the event provided a great opportunity to share the research and development work being led by SRA.

"We had a lot of conversations about what SRA does, our research, and where the levy goes."

Varieties are always a hot topic at industry events, and the field days were no exception with the popular Q240^{Φ} on display, along with Q238^{Φ}, which is less commonly grown in the Burdekin and the Herbert districts where many attendees travelled from.

"Q240^{Φ} is extremely popular up and down the coast. But Q238^{Φ}, only a small number of growers grow it in the Burdekin and Herbert."

"It was interesting because the two varieties look very similar, and a lot of people couldn't pick which was which. So, one was a bit of a specialist variety, and the other was a very common variety. It was great to see growers trying to work out which one was which."

Terry said it was exciting to see the Field Days return to North Queensland.

"It's just a great community event. I think that farmers and industry and community come here to look at what what's happening in their own backyard. And SRA is a big part of that, so I think it's a great all-round event."
Terry Granshaw

Proceeds from the Rotary NQ Field Days support community initiatives in Townsville and surrounding regions.

Q208Ф AND Q240Ф NECK AND NECK AS MOST GROWN VARIETIES

It was a close race for the top spot in 2021, but in the end Q208Ф prevailed as the most grown variety in Australia by the slimmest of margins.

Q208Ф made up 23.9% of last season's Australian crop, with Q240Ф hot on its heels at 23.8%. The top five varieties grown in Australia accounted for 73.8% of the total crop. Just over 30.13 million tonnes of cane were harvested in the 2021 season.

New South Wales

Q208Ф remained the most prevalent variety in New South Wales at 33.9% of the crop, followed by Q240Ф at 15.3%. Q232Ф (11.3%) remained in third place, followed by Q183Ф (8.6%), and for the first time, Q254Ф (4.8%) was in fifth place.

Across Queensland

For the first time Q240Ф was the most grown variety in Queensland accounting for 24.3% of cane through mills, followed by Q208Ф at 23.4%. KQ228Ф made up 10.3% of the Qld crop, followed by Q183Ф (9.9 %). Q253Ф (6.8%) replaced Q232Ф as the fifth most popular Qld variety.

In the Burdekin and Southern regions, Q240Ф continued its dominance as the most common variety representing 43.4% and 31.1% of the crop respectively. Q208Ф remained the most popular variety in the North (32.1%), Herbert (29.6%), and Central (29.6%), although there was a slight decrease from the 2020 crop as Q240Ф became more widely grown in these regions.

Far North

In the far northern region, Q253Ф tied with Q200Ф at 13.4% as the next most widely grown varieties after Q208Ф. They were followed by KQ228Ф (7.9%) and Q240Ф (7.3%).

Herbert

Q253Ф (20%) continued its rapid rise in the Herbert region in 2021, followed by Q232Ф (8.7%), Q240Ф (8.6%), and Q200Ф (7.8%).

Burdekin

The three varieties that have dominated the Burdekin for many years, KQ228Ф (22.9%), Q183Ф (12.6%), and Q208Ф (10.7%), made a major contribution to the crop in 2021. However, Q183Ф and Q208Ф continued to decrease in importance as Q240Ф increased. The top three varieties in the Burdekin region contributed 78.9% of the 2021 Burdekin crop.

Central

In the Central region, Q208Ф (29.6%) was followed by Q240Ф (24.1%) and Q183Ф (18.3%). SRA9Ф (5.1%) and Q253Ф (3.6%) replaced KQ228Ф and Q232Ф in the top five for the Central region.

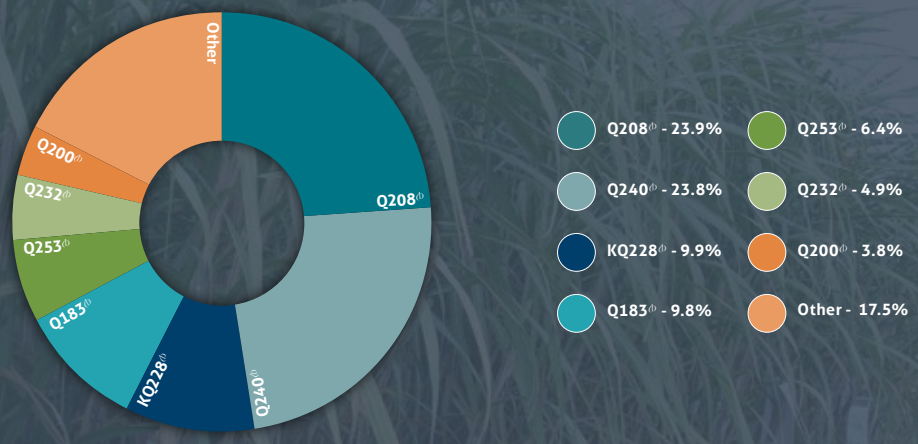
Southern

In the Southern region behind Q240Ф at 31.1%, KQ228Ф accounted for 14.4% of the crop, with Q208Ф the third most common variety at 11%. Q252Ф (5.8%) and Q232Ф(4.3%) rounded out the top five.

Varieties that continued to show good adoption rates in 2021 were:

- Northern: Q253Ф, SRA26Ф, SRA28Ф
- Herbert: Q253Ф, SRA5Ф, Q250Ф
- Burdekin: Q232Ф, SRA23Ф
- Central: SRA9Ф, SRA21Ф, SRA22Ф
- Southern: Q252Ф, SRA11Ф
- NSW: Q254Ф, SRA11Ф

MOST GROWN SUGARCANE VARIETIES IN AUSTRALIA IN 2021



ROBOTIC WEED CONTROL TRIALS SHOW PROMISE IN THE BURDEKIN

Trials in the Burdekin involving artificial intelligence and precision robotic weed control are showing early promise in reducing herbicide use.

The AutoWeed technology at the centre of the research uses artificial intelligence and visible-light imagery to detect and spray specific weeds by differentiating them from the crop.

SRA Burdekin District Manager Terry Granshaw said three initial trials focused on treating nutgrass in sugarcane.

The trials compared traditional blanket spraying of nutgrass applying Sempra® and Krismat® with application of the same chemicals using the spot spraying tool.

On average, the robotic spot spraying tool was 95 per cent as effective as blanket spraying, and reduced herbicide usage by 35 per cent.

AutoWeed Technical Officer Jake Wood said trial outcomes varied according to the degree of weed infestation in a paddock.

SRA District Manager Burdekin Terry Granshaw, AutoWeed Technical Officer Jake Wood and AutoWeed Managing Director Dr Alex Olsen in the field during a robotic spray trial on a legume crop.

***(Right)** The 4-row boom sprayer used in the robotic spray trials on sugarcane.*

"We're seeing big reductions in herbicide. If you've got an 80 per cent infestation of weeds, we can definitely reduce herbicide usage by at least 20 per cent. But if you've only got 20 or 30 per cent weed infestation, we can save 70 per cent herbicide usage," Jake said.

Terry Granshaw said trials are also being undertaken on legumes.

"We're trying to show the adaptability of this robotic spot sprayer, and by doing it on these legume crops we actually target grasses and broadleaf," Terry said. "It's a completely different type of spray rig."

The AutoWeed detection and spot spraying can be retrofitted to existing spray booms. The system uses a camera positioned in front of spray nozzles to detect the presence of a weed and trigger spraying as the vehicle passes over the crop.

This results in herbicide reductions matching the level of weed pressure in a paddock, meaning lower weed management costs for farmers.

The trials follow around six years of research involving AutoWeed and James Cook University, to move beyond the limitations of spray systems currently in the market.

"They use things like near infrared technology and they look for the signature of chlorophyll. That's great. However, crop plants also have chlorophyll and they're the ones you don't want to be spraying. So, they're good for fallow, but not very useful once you start growing the crop and still want to control weeds," Jake said.

"We can take our technology into these paddocks when you've got crops growing already and we can basically pinpoint and target just the weeds of interest. So, if you want to spray specifically broadleaf or if you want to spray specifically grassweeds, we can do that in amongst your already growing crop."

Findings to date, also suggest improved environmental outcomes, with robotic spot spraying reducing the concentrations and loads of herbicide in runoff.

Water quality experiments conducted after the spray trials showed that spot spraying reduced concentration of ametryn and trifloxysulfuron in runoff by 49 per cent and 60 per cent respectively compared to blanket spraying.

Terry Granshaw said the trials were attracting strong interest from growers and had potential to significantly reduce herbicide costs and use into the future.

"If we can save a dollar, why not do it? And the environmental benefit is a bonus." Terry said.

"I don't know a farmer who loves putting herbicide on, and the fact that we can come out here and use this technology, to actually choose a weed within our green crop and target that weed species is amazing.

"I've been at the shed meetings and growers are asking me about this and we've been talking about it just briefly, but there's a lot of interest in it."

Australian Government | Reef Trust

Great Barrier Reef Foundation

The *Reducing herbicide usage on sugarcane farms in reef catchment areas with precise robotic weed control* project is funded by a grant through the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation. The research is a collaboration between James Cook University, AutoWeed and Sugar Research Australia.

SRA District Manager Central Dylan Wedel.

BACKING YOUNG GROWERS

SRA District Manager Central Dylan Wedel believes that one way to prevent the decline in the area of land under cane in the region is to encourage and support young up and coming farmers and help them see the value of staying in the industry.

It is a key reason why SRA Mackay has recently established a Mackay/Plane Creek young growers group with the support of industry stakeholders, to bring together the next generation of growers and involve them in events in the region.

SRA District Delivery Officer Stephanie Duncan is the group organiser, and has established a membership-by-request Facebook group to encourage discussion between on-the-ground events.

Young growers have volunteered for positions on the executive committee and the group has voted to become incorporated. A calendar of events is now being prepared for the months leading up to and after harvest.

"We have also put the challenge out to members of the group that if something happens on their farm, good, bad or ugly, we should share it and get out on farm to learn from it and from each other," Dylan Wedel.

"It is about collaborative learning in a small supportive group."

Equally, Stephanie and Dylan have been working to support the Proserpine Young Growers Group, set up in the past few years.

"The group has similar focus areas to the Mackay group. It means we can bring in guest speakers for events that we can share between the two areas."

Dylan said one of the early learnings from the group is that new growers don't have a lot of knowledge about what information is readily on hand.

"New growers typically rely on what Dad, Grandpa or some other member of the family tells them.

"But SRA has a wealth of resources freely on offer for growers who want to learn from independent sources."

Meeting of the Mackay Area Young Farmers group.

MANAGING THE IMPACTS OF RISING FERTILISER COSTS **WITH SIX EASY STEPS®**

Rising fertiliser costs and complying with reef regulations are both topical issue for industry and highlight the importance of adopting sound nutrient management practices that will deliver balanced nutrition for optimal crop growth and yields.

In recent months, fertiliser prices reached record highs, the surge driven by bottlenecks in supply chains, rising energy costs and most recently, tensions between Russia and the Ukraine.

Environmentally, new reef regulations introduced in December, require growers in the Wet Tropics, Burdekin and Whitsunday catchments to have a nitrogen and phosphorous (N&P) budget prior to fertilising. Accredited Smartcane Best Management Practice (BMP) growers do not need to use an appropriate person to develop and verify their own budget.

Growers grappling with these challenges are reminded to follow the SIX EASY STEPS® approach to on-farm nutrient management:

1. Know and understand your soils
2. Understand and manage nutrient processes and losses
3. Soil test regularly
4. Adopt soil specific nutrient management guidelines
5. Check on the adequacy of nutrient inputs
6. Keep good records and modify nutrient inputs when and where necessary

Principal Agronomist Dr Danielle Skocaj said **SIX EASY STEPS®** is the basis for best practice nutrient management. It is more important than ever growers adopt the **SIX EASY STEPS®** principles when developing their nutrient management plan.

*Scan the QR code to read more about nutrient management and **SIX EASY STEPS®***

"SIX EASY STEPS® provides a sound scientific basis for maintaining and/or improving productivity and profitability on your farm.

If you're following SIX EASY STEPS®, regulation becomes a non-event because you're doing better than regulations."

Danielle Skocaj
Principal Agronomist

Growers watch SRA team members demonstrate the process for measuring biomass in a multi-species crop.

LEARNING FROM PEERS: COUNTING THE BENEFITS OF FALLOW COVER CROPS

High fertiliser prices have seen increased interest among growers to understand the value of cover crops in boosting nitrogen in their soil.

A recent peer learning session in the Herbert drew a strong turnout, as growers observed how to estimate nitrogen contributions from multi-species cover crops available to the following sugarcane plant crop, while learning from the experience of fellow farmer Alan Lynn.

By Cathy Weis

Late on a Friday afternoon at Alan Lynn's Ingham farm, around 15 growers watched on as SRA's District Delivery Officer Glen Park and Principal Agronomist Dr Danielle Skocaj tackle an unenviable task.

Using pruning shears and a cane knife, they manually cut out a one-metre long section of a vigorous multi-species crop, loaded it in a bin, and onto scales.

So dense was the growth, famer Alan Lynn slashed a small adjoining section of the cover crop to enable Glen and Danielle to gain access to the site.

The tricky and tangled task demonstrated how to gauge the quantity or fresh weight of the crop, known as biomass.

"At the moment it's the only way we can assess the biomass that's there," Danielle said. "What we're demonstrating is that it is quite difficult for farmers, especially in these multi-species cover crops, to calculate how much biomass is there."

Understanding the biomass helps inform how much nitrogen (N) is potentially available to the following plant cane crop.

SRA's Glen Park and Danielle Skocaj with grower Alan Lynn at the Herbert biomass peer learning event.

"We need to understand both fresh and dry biomass production in order to estimate potential nitrogen supply," Danielle said.

"In the first crop we sampled, we estimated there were around 34 tonnes per hectare of fresh biomass. If we use an assumption of moisture content, then we then were able to say that there could be around 8.5 tonnes per hectare of dry biomass.

"By the time we account for the above ground biomass and the biomass below the ground, which is an additional 30 per cent, Alan has well in excess of 200 kilograms of nitrogen per hectare that could become available to his plant cane crop."

"That's a pretty good outcome, and in Alan's situation he can be assured there's no need to apply fertiliser N at top dressing. With the practices he follows to terminate the crop and manage the residue up until the point of planting, he's going to maximise how much of the N produced by the cover crop is available to the plant crop."

Danielle said many growers were seeking ways to reduce costs in light of rising fertiliser prices.

"I think we're going to see a lot of growers asking questions about where can I reduce fertiliser inputs without impacting productivity, especially plant cane nitrogen rates, following legume or multi-species cover crops?"

"Growers are always interested in understanding if I'm investing money into growing a crop during my fallow period where I may traditionally have a bare fallow, what are the benefits for me in terms of soil health, but also then the opportunity to look at potential nitrogen savings."

Growers observing the demonstration peppered Alan with questions, as he explained his commitment to soil health.

"There are a lot of questions, especially in the paddock and they're genuinely interested," Alan said. "I'm more about soil health and the nitrogen is a by-product."

Yet with the current cost of fertiliser, he acknowledged the nitrogen in his soil is "a very valuable commodity."

"There's a multitude of advantages - soil protection, weed control. There'll be no weeds in that block, so there's less herbicide to use. It's a win-win situation," Alan said.

Tully Grower Ray Zamora made the trip to Ingham to attend the peer-to-peer session and said he valued the insights gained.

"Alan and I practice similar styles of farming but it's always good to pick up a tip here and there," Ray said.

He was pleasantly surprised at the available nitrogen calculation and will likely ease back on side dressing at his own farm.

"It certainly gives me more reassurance with what I'm doing. It makes it more attractive all the time," Ray said.

Ray said he enjoyed catching up with peers at the event.

"Farmers trust the word of other farmers - it's their hip pocket getting affected. It was a good day out and great to catch up with other growers that I know, being from out of town."

Ray Zamora | Tully Grower

CARING FOR THE MURRAY CATCHMENT **BY MOBILISING WHAT MATTERS TO GROWERS**

Queensland's Wet Tropics is a national park that extends across 894,420 ha (0.12% of Australia) and includes the state's highest peak, Bellenden Ker, which forms part of the northern extent of the Great Dividing Range.

Combined with Queensland's highest annual rainfall it's no wonder that this world heritage area is home to 15 river catchments many of which flow east to the Coral Sea and Great Barrier Reef lagoon; the Murray River Catchment is one.

With the coastal township of Cardwell at its heart, the catchment includes the Murray River and Kennedy and Meunga creeks. Tributaries from the Tully and Herbert catchments also influence the hydrology as does the vast area of highly productive flat alluvial plains where farming land uses include grazing, bananas and sugarcane.

'Mobilising the Murray – Murray Reef Trust VII (MRT7)' is a project launched in 2021 by Terrain Natural Resource Management (NRM) and funded by the Australian Government's Reef Trust.

In 2022, Sugar Research Australia has become a major partner in this hands-on initiative and will support growers in the catchment by addressing productivity constraints and accessing opportunities and incentives for the long-term sustainability of the sugar industry.

Cathy Mylrea is an Environmental Sustainability Scientist and as the MRT7 Project Manager will oversee SRA's involvement. She explains how the project will benefit growers in the catchment.

"In recent years the industry has seen substantial investment from programs that have specifically targeted nutrient management and practices," Cathy said.

"The MRT7 project takes a broader view and asks the farmer what issues, from their perspective, can be identified and addressed, and then goes further by offering financial incentives and expert advice to help the grower address those constraints.

"Constraints might include blocks on a property that are continually low yielding; in this case it would be beneficial for the grower, and the catchment, to investigate why this is.

"For example, whether this is due to soil type, a drainage issue or influences from pests and diseases. Our aim is to work together to find the root cause.

"There will then be the opportunity to provide financial support or services to address these issues through deeper soil tests, Pachymetra tests, drainage management and other identified means; and at the same time support the update of nutrient management plans and whole-of-farm planning," Cathy said.

"This is a very exciting project for SRA to be involved in. The integrated approach of the project aims to leave a legacy of enhanced industry capability driven by productivity and efficiency gains that also deliver water quality outcomes: a great result for growers and the environment.

In April as part of the MRT7 project a soil health workshop with David Hardwick (pictured far left) an agricultural ecologist with Soil Land Food, was held on Derrick and Wendy Finlayson's farm in the Murray Upper district. Participants included growers and extension staff.

Two agronomists have recently joined the SRA team to work exclusively on the project. Both will be based at SRA's Tully Station and be available to work alongside growers, supporting them in identifying constraining factors on their farm.

A series of practical in-field demonstrations, field days and trial sites will form a central part of the project engagement where issues and constraints, along with outcomes can be shared.

Subscribe to SRA's fortnightly eNewsletter to be kept informed of all workshops and events relevant to you in your area.

Growers in the Murray catchment area who are interested in being involved in the MRT7 project can contact Nancy Rincon by emailing NRincon@sugarresearch.com.au

The Mobilising the Murray Reef Trust VII project is funded by the Australian Government's Reef Trust.

Looking south from Tully across the Murray catchment

Acting Ergon Area Manager Ryan Campbell demonstrates the effectiveness of rotamarkers at the NQ Field Days in Townsville.

SPINNING POWERLINE MARKERS DESIGNED TO SAVE LIVES

You're driving at dusk and you don't spot the wallaby until it starts bounding across the road.

It's a familiar story for country drivers and one that explains the effectiveness of spinning powerline markers explained Ergon Energy's Community Safety Manager Aaron Smith.

"Humans are hard-wired to notice movement, so by installing spinning markers on powerlines in high-traffic areas on farms we can increase visibility and reduce the risk of heavy vehicles, machinery and aircraft coming into contact with high-voltage wires," Aaron said.

"Powerlines are such an integral part of our lives that they blend into the scenery and we may not notice them, which isn't a problem until your life depends on it."

Aaron said powerline markers were a worthwhile investment, especially in areas where aerial application and harvesting frequently occurs within close proximity of overhead powerlines.

"Ergon Energy Network is offering to install up to 10 rotamarkers per property at a reduced cost of $100 each.

"We've also joined forces with the Queensland Farmers' Federation (QFF) on an incentive program to encourage more property owners to install rotamarkers in areas of concern where there are heavy vehicles or aircraft operating near powerlines.

"QFF is offering member farmers a co-contribution of up to $500 towards roatamarkers installation costs."

After an alarming increase in heavy vehicles and machinery contacting powerlines, Ergon is appealing to workers in high-risk industries to Look Up and Live.

There were 432 accidental contacts with powerlines in Queensland last year compared to 360 reported in 2020, including incidents involving tractors, harvesters, haul-out vehicles, excavators, spray rigs, augers and irrigation equipment.

"Right across Queensland, whether on farm or in town, people can also utilise the Look Up and Live mobile app; a free, lifesaving tool to plan safe work around powerlines.

"Contacting powerlines could be lethal, cause serious injuries or destroy your plant and equipment, so anything you can do to reduce the risks of an incident on your property or work site is well worth it," Aaron said.

Industry members share an informal dinner and discuss local issues during a barbecue at SRA's Mackay station.

Mackay cane farmer Tony Bugeja with SRA Director Jeremy Burdon, Chief Executive Officer Roslyn Baker and Executive Manager Variety Development Jason Eglinton.

Mackay grower Paul Manning and SRA's Executive Manager Commercial Development Duncan Ferguson

Walkerston grower Lachlan McLennan chats with SRA Director Rowley Winten.

Plane Creek grower and SRA trial co-operator Peter Hackett caught up with Executive Manager Variety Development Jason Eglinton and Farmacist's Nick Hill.

REGIONAL VISIT - AN OPPORTUNITY TO ENGAGE WITH THE INDUSTRY

Sugar Research Australia's Board of Directors will conduct a series of regional meetings and visits this year, providing opportunities to engage with local stakeholders.

The April Board meeting was held in Mackay, where the Board, members of the executive team and SRA employees caught up with local industry members during an informal barbecue.

SRA Chairperson Rowena McNally said the regional visits provided the chance for directors to meet informally with local growers and millers, as well as productivity services, contractors, and other stakeholders, including government representatives.

"It's important to our Board Directors that we understand local issues and challenges and have the chance to meet and connect with industry," Rowena said.

"At the recent barbecue, our directors had some great discussions. We are looking forward to visiting other regions and districts throughout the year to hear what's working well, where we can do better, and what our members need from SRA."

SUGARCANE MATURITY MANAGEMENT TRIALS **SEEK REPEATABLE CCS BOOST**

Trials in Far North Queensland are examining the optimal time to apply a growth regulator to improve crop maturity.

More than 10 sites in the Mulgrave, Babinda and the Tableland are being sampled fortnightly to measure stalk moisture, ahead of application of a growth regulator in mid-May, and a mid-July harvest.

Near Infrared Service Leader Steve Staunton said the timing of application of a growth regulator is critical, with SRA's experimentation involving application of MODDUS®.

"MODDUS® is a crop growth regulator. So, what it does, is it stops the crop growing. This then allows the crop to put its energy into sugar production rather than vegetative growth," Steve said.

"The research that we've been doing is seeking to give a repeatable outcome, which would give confidence to growers using MODDUS® or other growth regulators."

"What we're finding is that there are times when a growth regulator is needed to improve crop maturity. But you do need to know whether the crop is actively growing or not," Steve said.

"SRA is spending a lot of time and effort in developing in-field analyses so we can determine what the best crop maturity status is for application. If you apply it too early, there's a potential for a large loss of yield because you've stopped the crop from growing. If you apply it too late, there's potential you'll get no benefit - so no return on your investment," Steve said.

Steve said observations to date show significant opportunity to improve crop maturity status.

"Our research over a number of years has shown that at around 70 per cent crop moisture is the point where the stalk growth slows significantly, with about 90 per cent of the potential crop yield already present.

With our infield analyser, we get our measurement of the stalk moisture, and if it's greater than 70 per cent there's potential for MODDUS® application. If it's less, we probably need to look elsewhere."

Steve Staunton
Near Infrared Service Leader

"When we look over a season at most sites, we're seeing that there is large potential opportunity for improvements, which is why we're working with industry currently to try and capture some of this potential"

Steve Staunton

District Manager Far North Gavin Rodman said trials were also investigating opportunities for a desiccant or crop finisher to support increased commercial cane sugar (CCS) prior to harvest, where moisture content is less than 70 per cent. Further work will be needed beyond the current trials to validate any initial findings.

Two demonstration sites in the Central district will also be treated with MODDUS to assess the economic benefit of the product. These treatments are being applied in late April to provide sufficient time prior to harvest to improve CCS.

The same moisture requirements will be observed in this work as are being used in the Far North.

While it's early days and more research is needed, Steve Staunton suggested the research had potential to influence the timing for the start of the harvest in some districts.

"We could potentially start earlier if we have control over crop maturity," Steve said.

(Below) *A cane maturity testing trailer in the field. The rig is a trailer-mounted small mill, powered by a generator.*

IMPORTANT RSD REMINDER DELIVERED IN THE HERBERT

More than 40 growers and harvesting contractors have attended pre-harvest ratoon stunting disease (RSD) workshops in Ingham.

The sessions, jointly delivered by Sugar Research Australia and Herbert Cane Productivity Services Limited (HCPSL), highlighted the key actions that growers and contractors should take to manage the incidence of RSD.

SRA Herbert District Manager Phil Patane said RSD was a significant issue in the Herbert region contributing to losses in productivity and profitability.

"The workshops served to heighten awareness of the disease and to educate growers and contractors to help reduce the number of infected crops, and ultimately increase average yield in the district," Phil said.

Pathologist Rob Magarey said the advice delivered at the Herbert sessions applied across all districts where RSD had potential to impact yield.

"While RSD shows no external symptoms other than stunting, diseased fields often have an 'up-and-down' appearance due to different levels of stunting in adjacent stools," Rob said.

He said RSD could cause yield losses from 5-60 per cent depending on the susceptibility of the variety and weather conditions. Yield losses are higher when cane is suffering moisture stress.

"Average yield losses are around 15–20 per cent. No sugarcane varieties are resistant to RSD: they can all become infected, suffer yield losses, and further spread the disease," Rob said. "Recent estimates of losses in the Herbert region suggest that heavily diseased plant crops may suffer losses around 20 per cent, while in diseased ratoon crops, losses around 35 per cent are likely," he said.

The good news is that it can be managed. "Managing RSD includes planting disease-free seed and minimising transmission to healthy crops by disinfecting planting and harvesting equipment, including cane knives," Rob said.

Pathologist Rob Magarey speaks to growers in the Herbert.

UNDERSTANDING THE ECONOMICS

RSD can almost be a silent killer when it comes to a profit loss to a farm.

Example Farm

John had a plant source inspection completed on the material he selected to use for planting that year. John's farm is 150 hectares, and it generally cuts about 85 tonnes cane/hectare (TCH) across the farm.

Unfortunately, John had one positive RSD sample in his Q253 variety, which yielded less than the rest of the farm, at about 68 TCH.

The estimated yield loss due to RSD infection equates to around 20 per cent. John's other two blocks of Q253 were RSD-free.

With zero infection in his other blocks, John managed to cut a higher yield of 85 TCH.

John sat down with his advisor to calculate his losses at the end of the season (comparing RSD-infected and RSD-free blocks).

He concluded that even though he still received a profit for the infected blocks of about $70 per hectare, he had missed out on an additional $423 per hectare in these blocks because of RSD. This equated to a profit reduction of 85 per cent over his entire farm.

If farm hygiene is not taken seriously, lost revenue will continue to increase year on year as the crop cycle continues and infection increases and spreads further through the blocks.

STEPS TO MANAGE RSD

STEP 1:
Fallow management

Fallow periods, in particular volunteer-free fallows, help to break pest and disease cycles.

For managing RSD, it is critical to ensure the fallow is free of volunteer cane to eliminate the disease from the block prior to planting.

STEP 2:
Acquiring clean seed material

It is essential that approved seed is planted into fallow ground with no volunteers.

Approved seed includes obtaining material from your local productivity services provider:

- from approved clean seed plots
- by purchasing tissue culture.

STEP 3:
Machinery hygiene

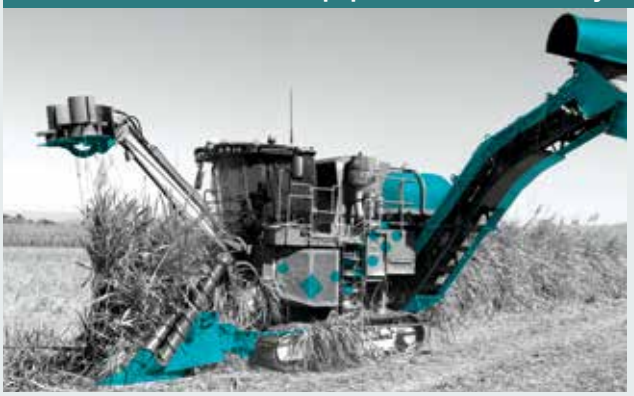
Any equipment which may interact with planting material can spread RSD from an infected source. Therefore, cane knives, harvesters, plant cutters, planters (whole stick and billet) and stool splitters should all be sterilised prior to entering either a clean cane crop from an infected crop or from farm to farm.

The effect of RSD on cane yield: the image shows a diseased crop (left) compared with a healthy crop (right)

UNDERSTANDING MACHINERY HYGIENE

Equipment of concern – Key sterilisation points indicated in BLUE

HARVESTER



BILLET PLANTER

STOOL SPLITTER

WHOLE STICK PLANT CUTTER

CANE KNIFE

STOOL SPLITTER (CLOSE UP)

Sterilising Procedure:

1. Ensure equipment is free of soil and debris. Wash equipment with water prior to sterilising.
2. Use 1 per cent Steri-Max to sterilise equipment thoroughly. Leave equipment to stand for five minutes for the chemical to work effectively. Alternatively, use 30 per cent water and 70 per cent methylated spirits to sterilise equipment. It is not recommended to use methylated spirits where there are potential fire hazards.
3. Steri-Max should be disposed of after 24 hours, once mixed with water. The chemical will de-activate over time.
4. Avoid using water with high organic matter content, when mixing with Steri-Max.

SRA, MAPS and Mackay Sugar staff prepare for the harvesting trials

AN INCENTIVE TO INCREASE ADOPTION OF SRA RESEARCH

By Christine Walker

Sugar milling company, Mackay Sugar has announced an incentive for harvesting contractors who install a cane loss monitor on their machines for the 2022 crushing season.

It follows successful trials at Pleystowe, Marian and Balnagowan last year, in which SRA, Mackay Sugar and Mackay Area Productivity Services (MAPS) validated improved yield results achieved in other sugar districts through the use of a cane loss monitor on the harvester.

Mackay Sugar's Cane Productivity Manager, Markus Reiners, said that after the harvesting trials the company became convinced that there was an opportunity to lower harvest losses by installing a yield loss monitor in harvesters.

"To foster this, Mackay Sugar now offers an incentive for harvest groups that buy a loss monitor," Markus said.

The Cane Loss Reduction Incentive is 3 cents per tonne for five years and is on offer to all harvest groups who harvest cane for Mackay Sugar growers.

Harvesting groups must also be prepared to share their data with Mackay Sugar via a portal which the company can access. The harvest group is responsible for the data transfer, including the set up and installation of the loss monitor.

Mackay Sugar will collate and publish the data anonymously to build industry awareness and understanding of the factors which affect harvest losses and quality.

Commenting on the incentive, Markus Reiners said it was hoped that by making this information widely available, more harvest groups will be encouraged to improve their operations to maximise the value of the cane crop in the region for growers and millers.

"Mackay Sugar and the growers rely on a sustainable cane supply in the years ahead.

"There are two main issues we are working on: firstly, we need to slow down the loss of productive cane land, and secondly, we need to increase productivity."

Markus Reiners

In addition to the Cane Loss Reduction Incentive, Mackay Sugar offers two other incentives to growers to encourage increased productivity – a loan for planting and an incentive for growers who have taken over a low yielding farm or have brought in new ground.

"An expanded supply of cane through improved productivity, by increasing acreage and higher yield, is beneficial to growers, millers and the sugar industry," said Markus.

"We need to get the basics right to be prepared for future challenges and opportunities to create a bright future for the sugar industry," he said.

In another initiative, Mackay Sugar has reintroduced the annual Productivity Awards to recognise growers, harvesting groups and stakeholders who are demonstrating a range of productivity and sustainability improvements.

Mackay Sugar is not the only industry stakeholder encouraging growers and harvesters to improve yields through optimum harvesting practices.

CANEGROWERS Herbert River is asking interested parties to be involved in their yield change program, which is partially funding cane loss monitors for harvesters.

TO CLAIM THE INCENTIVE

Eligible harvesting groups are required to install a commercially available harvest loss monitor on their machines, provided by Mackay Sugar at a subsidised price.

(Left) *SRA, MAPS and Mackay Sugar staff collect samples of the cane losses in the paddock to verify the data provided by the cane loss monitor on the harvester.*
(Right) *Harvesters operated by growers and contractors were fitted with cane loss monitors for the trials.*

RECOGNISING OPTIMUM HARVESTING PRACTICE

Development of an app to support best-practice decision making about harvesting is under way, with a trial version of the tool expected to be available by August.

Sugar Research Australia, in partnership with the Queensland Department of Agriculture and Fisheries is developing the harvesting decision-support tool, which will inform growers about the best possible economical practice for harvesting.

District Manager Herbert Phil Patane said the tool looks at the cost of harvesting as well as yield improvements through practice change.

"Adding that into the system with the live cane loss monitors that are already out there, allows the grower to not only have that live feedback, but know that the practice that they're running is the best economical decision."
Phil Patane

"Information is key. Growers and harvesters will be able to identify what's best practice and most profitable for their business."

"The beauty of that is it will allow the contractor to make a decision on the move of what practice they would like to be undertaking at that specific time."

Phil was speaking at the Herbert Walk and Talk Day where he presented the SRA-sponsored, Harvesting Efficiency Award to Anthony Celotto of Celotto Harvesting.

"David and Anthony Celotto over a number of years have really refined their harvesting operation to ensure that they have a balance between not losing a large proportion of material by trying to quickly cover area, but also not having a high harvesting cost," Phil said.

They've now purchased a new CH-570 harvester with a monitor that will provide live yield and cane loss feedback.

"Working with people like that allows us to move research into on ground practice," Phil said.

"With productivity, we always want to make sure that we're improving year on year."

David Celotto said it made good business sense to consider cane loss and fan speed when harvesting, with all parts of the supply chain benefitting.

"The farmer gets more cane to the mill, so he gets paid more for it. We get paid more for it, and there's more going to the mill," David said.

"The slowing down of the machine also improves the ratoonability of cane. So, there's a few things to it. Some people don't believe in it, but we've believed in it for a long time."

While proud to be recognised among their peers for their focus on efficiency, he acknowledged the efforts of others who share a similar focus.

"It does make you feel a little bit better about it I suppose. But there's a lot of other people are doing it as well."

Herbert Walk and Talk Day was coordinated by Herbert Cane Productivity Services Limited. SRA was among the event sponsors, and also sponsored the Harvesting Efficiency Award, one of multiple awards presented at the event.

The *maximising cane recovery through the development of a harvesting decision-support tool* project is funded through SRA and the Queensland Department of Agriculture and Fisheries over three years to develop the platform and undertake demonstration campaigns for validation.

Queensland Government

Herbert District Manager Phil Patane (right) presents the Harvesting Efficiency Award to Anthony Celotto of Celotto Harvesting, at the Herbert Walk and Talk Day.

(Left) SRA's Andrew Lynch, QUT's Geoff Kent and Wilmar's Jay Venning and Russell Kirk at the Townsville seminar.

(Below) The Meringa seminar was well attended.

STRONG ATTENDANCE FOR MILLING REGIONAL RESEARCH SEMINARS

Around 100 milling representatives attended the Milling Regional Research Seminar series, jointly presented by Queensland University of Technology and SRA during March. Sessions were conducted at Gordonvale, Townsville, Mackay, Bundaberg and Rocky Point, with representatives of New South Wales industry joining the Rocky Point event through a virtual video link.

The sessions provided an update on milling research undertaken over the past 12 months.

QUT's Geoff Kent said the sessions are an important opportunity to discuss research outcomes.

"We try and work in with the mills as best we can to choose a day in each location that suits them," Geoff said. "It's our key face-to-face opportunity to talk about research activities.

"With the Townsville event, working with Wilmar, one of the things we've tried to do is to tie it in with other events that they have planned. Their production superintendents, for example, get together on a regular basis. So, we do our session the day before or after one of those events.

"It's important for us to hear from them what they think of our research. It's not just about what we've done, but we can discuss what didn't we do that perhaps we should have done. What are the benefits?

"They come with a mindset of 'how does this apply to me?' That's incredibly valuable to a researcher to get an understanding of what the end-user wants to do with this. It does really focus the research that we do."

Geoff said the sessions generated great discussion.

"We get a lot of discussion about all the topics. To be honest, there weren't any topics that people weren't interested in," he said.

RESEARCH TOPICS COVERED DURING THE SEMINARS INCLUDED:

- Reducing boiler maintenance costs and deferring capital expenditure through improved technology
- Eliminating roll arcing
- Strategies to minimise impacts of processing soft cane varieties, and industry cost/benefit analysis
- Degradation modelling and condition-based maintenance for pressure equipment in sugar mills
- Real-time measurement of extraneous matter and billet dimensions using machine learning
- Investigations to mitigate the effects of juice degradation in factory evaporators on sugar recovery and quality, corrosion and effluent organic loading
- NIR applications and current and planned SRA research activities
- Defining minimum vapour pressure supply to batch grade pans
- Configuring evaporator stations to provide bleed vapour to batch pan stages
- Managing losses associated with the Maillard reaction in C massecuite processing
- Use of a purge sensor on batch centrifugals to improve fugalling performance.

SEE THE FOLLOWING PAGES FOR SUMMARIES AND ARTICLES ON SOME OF THE RESEARCH INITIATIVES PRESENTED AT THE SEMINARS.

Pictured with the micro NIR at the Meringa regional milling research seminar were John Muller from Tableland Mill, Brendan Rich of Tully Mill, SRA's Joel Simpson and Andrew Lynch, and Michelle Larson from Tully Mill.

NEAR-INFRARED SPECTROMETER (NIR) TECHNOLOGY PROMISES RSD SCREENING IN THE MILL

The Near-Infrared spectrometer (NIR) is proving it has a place in the sugar industry as a fast and cost-effective screening tool for crop-wide Ratoon Stunting Disease (RSD) detection.

A presentation was made about recent NIR developments at the Regional Milling Research Seminars, by Heidi du Clou, SRA's Manager of Industry Services Operations, Steve Staunton, NIR Team Leader, and the NIR team.

In addition to RSD screening, updates on the mill bagasse and mill mud NIR projects were given and future possible applications to develop a small handheld NIR device for on-farm and in-mill "on-the-go" analyses were explored.

RSD detection in the mill

Ratoon Stunting Disease is a significant sugarcane disease limiting yields across several districts. It is estimated that 30 per cent or more of commercial crops may be diseased in some regions, with many farmers unaware of its presence.

The current polymerase chain reaction (qCPR) test for RSD detection is highly sensitive and accurate but logistics make it costly and difficult to test commercial crops. It is normally only plant sources which are tested. As a result, the commercial crop incidence of RSD is not well understood.

A significant proportion of the industry's annual RSD budget is currently spent in RSD preventative measures - testing [assaying] the nursery stock which is given to farmers as clean disease-free cane to plant.

The holy grail for RSD management would be to map the incidence of RSD in a region, quantify its economic impact and enable some targeted remediation and better management.

New technologies now promise to make this possible

SRA and the University of Queensland (UQ) came up with an alternative approach – developing a sensitive loop-mediated isothermal amplification (LAMP) DNA assay to detect RSD in the juice extracted from each rake of cane and exploring whether NIR could be calibrated against the LAMP assay to be used as a low-cost, automated RSD screening tool.

NIR provides indirect routine measurement of cane quality parameters at most Australian sugarcane mills.

Calibrations for various parameters (pol, Brix, CCS, fibre, etc.) are well established and are constantly updated against their respective direct (reference) methods.

The project team explored whether a reliable RSD calibration could be developed using the NIR data and reference mill-juice DNA data to screen for RSD in the incoming cane at the mill.

Using the available infrastructure, SRA and UQ researchers with a participating mill (South Johnstone) worked on this dual approach to determine what level of RSD is coming into a mill in the cane.

NIR calibration development

The in-mill LAMP system to detect RSD DNA in mill juice was validated against the traditional qPCR assay on a series of samples collected over 2019 and 2020 from the South Johnstone mill. These reference data were used together with the associated NIR data to develop an NIR RSD prediction model.

After applying suitable metrics to refine the classification model and systematically removing outlier data pairs, the NIR RSD model was found to provide 98.9 per cent classification accuracy.

Following validation on a subset of 2020 mill juice samples, the NIR RSD calibration returned a fair classification accuracy but was confirmed to be less sensitive than the two DNA methods. Hence the NIR RSD classification method should be viewed as indicative. Follow-up confirmation by a primary RSD method is always desirable, where possible.

Potential value of NIR RSD Screening

The NIR RSD calibration developed was used to conduct a retrospective crop analysis to demonstrate the potential value of this RSD screening tool. Stored NIR data from 2019 and 2020 (about 2 million NIR scans) from the mill were reprocessed to predict the potential RSD incidence.

Researchers then went deeper, sorting blocks by varieties to assess where there possibly was a higher probability of infection.

Researchers next wanted to refine the data to identify potentially heavily infected blocks. Using applied metrics, the calibration was tuned to hone in on only those blocks (about 4 per cent from 2019 and about 1 per cent from 2020) that returned greater than 80 per cent potentially positive NIR RSD classifications.

Using the RSD NIR calibration developed, it was demonstrated that potentially heavily infected crops could now be targeted.

Ground-proofing of the NIR method will start this year in identified mill areas while the project continues to work with mills to adapt the LAMP DNA in-mill system to fit with mill juice laboratory operations.

Summary of findings

Ground-proofing of the NIR RSD screening method will start this year.

Whilst the NIR RSD classification method could be viewed as powerfully indicative, follow-up confirmation by a primary RSD method is always desirable, where possible.

The project has shown real promise that soon the industry could have a less expensive and automated means of mapping RSD in commercial sugarcane crops enabling targeted management and mitigation strategies to limit the impact of this disease on the sugarcane industry.

The project continues to work with mills to adapt the LAMP DNA in-mill system to fit with mill juice laboratory operations.

SRA acknowledges co-funding from the Department of Agriculture and Fisheries for the *Pre-commercial development, testing and validation of RSD LAMP assay for sugar mill roll-out* project mentioned in this article.

NEW DEVELOPMENTS

MICRONIR BAGASSE

An 8cm stainless steel piece of equipment, the Viavi MicroNIR PAT-U instrument, has been installed by SRA researchers at the Tully Sugar Mill to analyse bagasse.

The aims are to measure the amount of pol in bagasse that is lost in the sugar extraction process and the amount of bagasse moisture that is outside the 45-50 per cent range, in order to change milling processes to both recover more pol and control bagasse moisture.

Other parameters being examined include measurements of fibre, ash, and gross and nett calorific value predictions in the bagasse.

MICRONIR MUD

Previous SRA research has measured carbon, nitrogen, phosphorous, potassium and several other components in mill mud.

However, SRA's recent investigations have examined the question of how much pol is lost in the mill factory process to mill mud.

Work on this project last year was challenged by temperatures above 45°C in the Tully Sugar Mill which required the installation of a cooling chamber to house the instrument.

Mud samples are currently being analysed and NIR calibrations will be determined for the 2022 milling season to advance this work.

AUTOMATED STRATEGIES TO EFFECTIVELY PROCESS EXISTING SOFT CANE VARIETIES

Researchers are working to establish improved automated strategies for processing existing soft sugarcane varieties, some of which can cause processing problems in the factory.

Main issues experienced have been feeding of the cane through the milling train and high bagasse moisture contents, which cause subsequent combustion issues and low steam pressure at the boiler station.

The goal is to achieve high throughput and extraction at the mill, as well as low final bagasse moisture.

The research has been coordinated over the last three years by Geoff Kent and Floren Plaza (Queensland University of Technology), Kelly Ryan and Phil Woods (Isis Central Sugar Mill) and Roy Parfitt (Sugar Research Australia).

Work began with pilot scale shredder tests in 2019, followed by full-scale milling trials in 2020, and the installation of additional automated strategies in the Isis milling train in 2021.

The project, funded by Sugar Research Australia, has reached the final stage: carrying out automated trials in the 2022 crushing season.

QUT researcher Geoff Kent said shredder speed and grid-bar adjustment, along with the added water rate were the preferred adjustments, depending on where in the milling train the processing difficulties occurred.

"What we're doing now is adding those things into an automatic control system. That's what's new," he said.

The project builds on many previous studies that measured the impact of adjustments across several mill parameters, and importantly, document the performance using the factory's online process control system.

Geoff said it was important to reduce the preparation of soft cane and reduce the amount of water added onto the extraction process.

"If you want a mill to perform well, you need to load it up so that it achieves a set torque." Geoff Kent

"What we're aiming for is to get to that torque value. When we process soft canes, the torque drops. The torque is telling us when a cane is soft enough that we need to do something."

Researchers have observed different reactions across the first and second mill at Isis, applying a torque control system on each mill.

"When the torque drops off on the first mill, we either slow down the shredder or we increase the setting on the grid. And similarly on the second mill, if the torque starts to get close to the point where it's going to be lost, we can reduce the added water rate with the intent that the torque will come back up again.

"When you lose the torque, the moisture goes up. Low torque means high moisture, and moisture means problems with the boilers because you can't generate steam."

Geoff said the team had also applied a new approach in automating the grid setting on the shredder.

"The shredder is a hammer mill, so you have this rotor that rotates very quickly. It's got a lot of hammers on it. The hammers bash the cane and turn it into straw, breaking a large proportion of the cells and making the sugar juice available for easy extraction.

"After that initial hit, the cane has to work its way through the shredder to get out and we have what we call a grid towards the exit of the shredder, which is a series of spaced bars.

"The cane has to come past those bars. There are very small gaps between the tip of the hammers and bars, while there are gaps between the bars. The resultant flow forces the straw into and out of the gaps.

"The cane straw slows down, then ends up back in the path of the hammers and is impacted repeatedly by the hammers. This increases the number of broken cells in the straw. The gap between the hammers and the bars, and therefore the final preparation, can be adjusted using a hinged door which can move away from the hammers."

In October last year, an automated shredder-grid-door positioner was installed for trials.

"We're using what we call screw jacks. It's basically just like the jack on a car. The positioner is made up of a master/slave configuration with two 5 tonne power jacks. The jacks are adjusted by electric motors controlled by the electrical system."

Geoff said automated milling trials would be carried out during the 2022 crushing season to measure the performance of the automated system.

He said while solutions developed for Isis were specific for that mill, the learnings had potential to be applied in other mills.

2019
Pilot scale shredder tests

2020
Full-scale milling trials

2021
Additional automated strategies in the Isis milling train

2022
Automated milling trials

(Left) *Checking the positions of the electro-mechanical adjusters: Isis Assistant Chief Electrician Adam Lucke and QUT inverter programming subcontractor Darren Horne.*

(Top) *The electro-mechanical adjusters for automated movement of the shredder grid-bar door.*

(Above) *Inverters cabinet at the milling train ground floor – last checks: programming of inverters.*

MILLING PROJECT SUMMARIES

The following summaries relate to milling research undertaken by Queensland University of Technology with funding from SRA. Updates were presented at the recent Regional Milling Research Seminars.

Investigations to mitigate the effects of juice degradation in factory evaporators on sugar recovery and quality, corrosion, and effluent organic loading

Sucrose degradation reactions during juice evaporation cause a direct reduction in sugar yield and revenue. The associated degradation of monosaccharides and other components produces acidic compounds which cause corrosion of pipework, tube plates etc.

The aim of the project was to provide a better understanding of the causes of sucrose degradation and acid formation in factory evaporators and their effects on sugar recovery, sugar quality, corrosion and effluent loadings, and to develop strategies to mitigate these issues.

Anecdotally, improving the quality of juice has been shown to minimise sucrose degradation but detailed attribution to specific impurity types (phenolics, proteins, sulphurous compounds, etc) has not been determined in factory juices. Composite sampling and analyses of juices, syrup, condensates and vents across the evaporator station were undertaken at Isis, Invicta, Condong, Pioneer and Rocky Point mills over the 2018, 2019 and 2020 seasons.

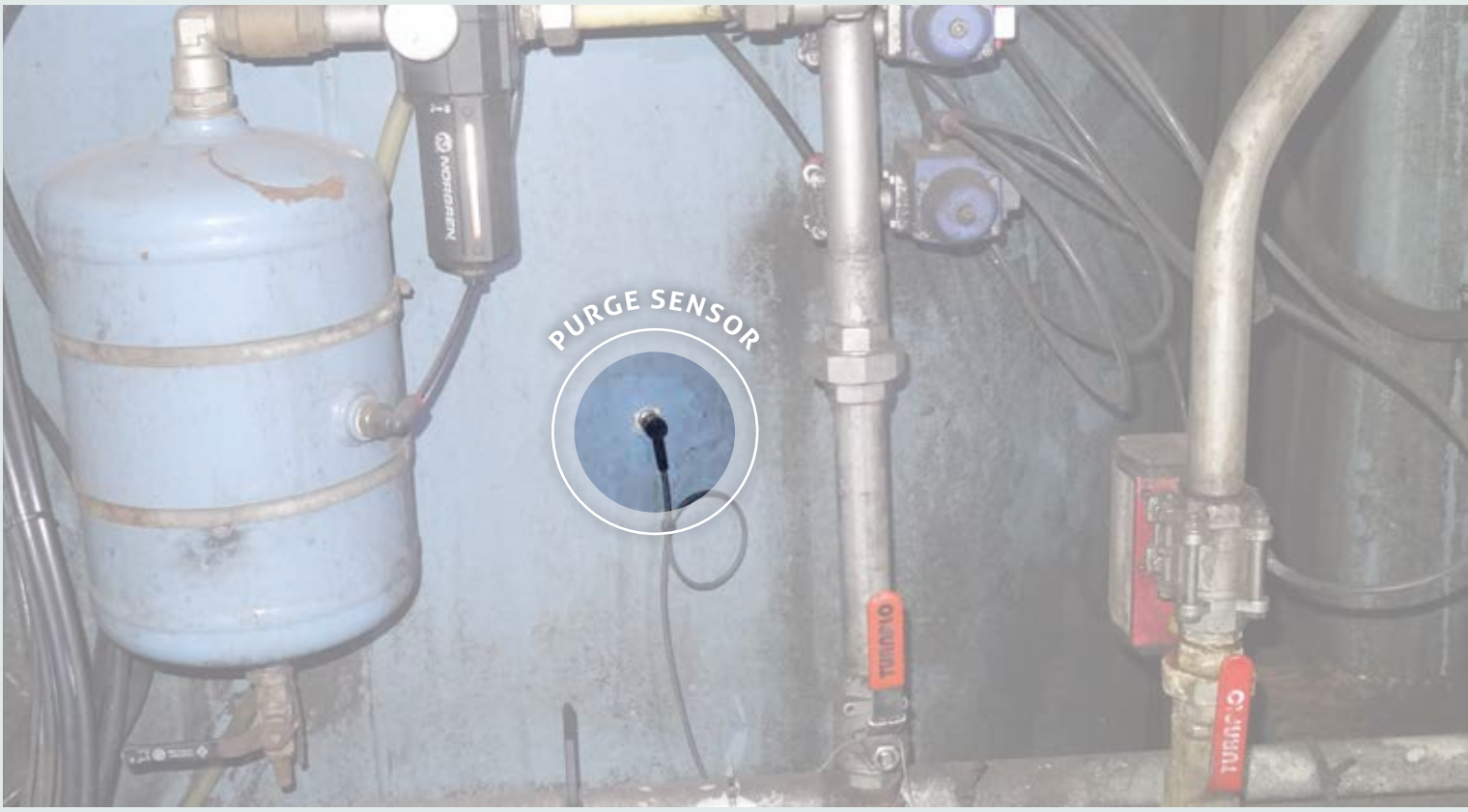
A test program has been conducted as part of a PhD study to examine the pathways of sucrose and monosaccharide degradation by boiling synthetic solutions as well as factory juices in pilot plant evaporator equipment.

These studies have investigated the impacts of pH and individual juice components on the degradation rates and shown that there is substantial interaction in the effects of the individual juice components.

The PhD student, Ms Chalani Marasinghege, presented these results at the 2022 Australian Society of Sugar Cane Technologists conference in Mackay and was rewarded with the Denis Foster Chemistry/Chemical Engineering Award for her paper.

Various mitigation strategies were also tested in the pilot evaporator. Mitigation strategies focus on minimising the sucrose loss from occurring through equipment or process design or dealing with the acidic components produced.

PhD student Chalani Marasinghege and QUT's Darryn Rackemann monitor operation of the pilot evaporator rig at Rocky Point Mill.



Configuring evaporator stations to provide bleed vapour to batch pan stages

Australian sugar factories typically use Robert evaporators in quintuple sets for juice evaporation and large unstirred batch pans for crystal sugar production.

These two equipment arrangements present several challenges for Australian factories to implement large reductions in process steam consumption such as supplying the pan stage with vapour 2 or vapour 3. The pan stage's large and variable vapour consumption must be considered closely when specifying the configuration of the evaporator station.

For evaporator stations to provide high levels of steam efficiency in sugar mills, a trade-off exists between capital investment, complexity of the operation, productivity of the pan stage, steam efficiency and sucrose losses.

This project has used modelling to determine the suitability of using quadruple, quintuple and sextuple evaporator configurations to supply vapour to the pan stage.

Use of a purge sensor to improve performance in the operation of batch centrifugals

All Australian sugar mills except one use batch centrifugals to separate the raw sugar crystals from the mixture of crystals and mother molasses (massecuite) produced during the crystallisation step.

While spinning at high speed, wash water is added to the crystal bed to remove molasses from the surface of the crystals in order to produce the sugar product at the required purity as specified by the customer.

Ideally the wash water addition is conducted in a manner that minimises the dissolution of the crystals.

The optimal timing and duration of this wash water addition is difficult to determine and currently relies on the experience of the centrifugal station operators.

To better understand (and ultimately better control) this process, this project is investigating the use of a purge sensor (pictured above) mounted on the casing of a batch centrifugal.

The purge sensor detects the impact of the molasses and wash water as it passes from the spinning basket onto the casing.

(Above) *RGB colour image of cane billets coming into Tully Sugar Mill.*
(Below) *NIR image of cane billets.*

MAXIMISING THE VALUE OF A CANE CROP IN A MILLING AREA

A persistent thorny question for both the growing and the milling sectors of the industry has been the economic value lost to a milling area of the amount of 'rubbish' (extraneous matter or EM) that is harvested with the cane and sent to the mill for processing.

Why is this figure important?

QUT researcher Ross Broadfoot said high levels of extraneous matter add substantially to the costs of milling operations.

This is "because of less cane to process per bin causing reduced crushing rates, delays caused by milling stoppages due to chokes, and consequently extended season lengths," Ross said.

"In addition, EM can reduce the amount of sugar that can be processed from each tonne of cane due to sugar recovery and liquid purity challenges.

"These are impacts that decrease the value of a cane crop to a milling area affecting both miller and grower returns," he said.

"However, up until now it has not been technically possible nor financially feasible to measure the size of the problem. Without being able to measure it the true costs of harvesting EM cannot be determined."

That has changed with a new project presented at the QUT/SRA Regional Milling Research Seminars - *On-line measurement of the physical properties of each cane consignment at the factory* - which has developed a way to measure the physical properties of individual rakes of cane using equipment costing only about $15,000.

The project has drawn on the expertise at Tully Mill where EM is already being manually measured and where millers and growers already take a cooperative approach to managing cane harvesting, transport and milling operations to maximise the value of the cane crop for the district.

A camera and lights have been set up by QUT researchers in a strategic position at Tully Mill to take an image every 20 seconds of each bin of cane which has arrived in the mill.

View of the camera positioned above the cane carrier to take images of billets and extraneous matter coming into Tully Sugar Mill.

"This project will give the mills the specifications for the required video equipment to be installed above the cane carrier for measurement of EM percentages and billet dimensions based on the developed algorithms."
Ross Broadfoot

The recorded vision data has been linked to the cane receival data through the mill's cane tracking system.

At the same time, a small sorting station at Tully Mill – known by staff as the 'billet box' – has manually segregated grab samples of cane from the same bins into the various components – stools, tops, trash and billets. A dedicated computer has stored the mill data – billet box data, consignment identification and timestamp - and aligned it with the captured imagery.

This data will be used to develop a machine which could learn to estimate billet dimensions and extraneous matter in a cane rake given a set of images of the rake.

In this way, parameters such as the EM level and the cane billet dimensions can be routinely monitored.

"This project will give the mills the specifications for the required video equipment to be installed above the cane carrier for measurement of EM percentages and billet dimensions based on the developed algorithms," Ross said.

"On-line measurement of the physical properties of the cane supply, used with harvesting information such as field loss estimates and transport information such as bin weights will enable optimum harvesting conditions to be determined which would maximise cane value in each district.

"The financial benefits to a cane district from implementing the technology will of course vary across the industry. Differences in cane varieties, crop intensity, green or burnt cane and haulage distances are just some of the factors that will have to be considered to determine the preferred physical attributes of the cane supply. However, for a district crushing green cane the net benefit in terms of increased income and reduced costs is estimated as at $3-$4 per tonne of cane.

"At Tully Mill where EM is manually measured, many growers have shown they are keen to know the EM content in their supplied cane since they are not paid for transporting EM to the mill. Systems that embrace a cooperative use of the data and financial modelling for each district will be valuable in maximising the benefit for all."

MERINGA'S MOTHER OF SUGARCANE **CELEBRATES 40 YEARS**

Turning 40 years of age is special. Celebrating 40 years working for one organisation, at one location is quite an accomplishment.

At SRA's Meringa Station, it's a club with esteemed membership, including the likes of Warren Owens, Jeff Smith, Dr Nils Berding, Dr Jim Skinner and David Calcino; all now retired.

On 13 April, another SRA team member joined the club; but she's not like the others.

Vivien Dunne (nee Ligasacchi) and Viv to family, friends, and colleagues, is the first female 40+ Meringa member. She was recently reminded of her first day at the then Bureau of Sugar Experiment Stations and the reaction from the 'blokes out the back shed'.

"Jeff Smith, a supervisor at the time, recently recalled introducing me to the permanent field hands and the language I was greeted with," Viv said. "We can laugh now but back then this wasn't just a workforce completely made up of men, but they were all men who hadn't worked with a woman before and they couldn't understand what I was doing there, so it wasn't the friendliest of welcomes."

But that wasn't going to put Viv off. She knew she wanted to be there and was meant to be there.

"I was born in Gordonvale hospital and at the age of two, my parents, Mario and Ester Ligasacchi, moved to the 83-acre cane farm that dad had cleared from the bush at Wrights Creek south of Edmonton, just up the road from the station. We lived there with my two younger brothers. My early schooling years were at St Therese's in Edmonton and then, five years at boarding school at Mt St Bernard's College in Herberton.

Viv is harvesting the female panicles (or arrows) from a pollinated cross made between two desirable parents.

"After finishing high school, I applied and was accepted to go to university, but I thought I'd have some time at home before going away. I got offered an office job in Cairns, but I knew that wasn't for me. I applied to Mulgrave mill for a lab assistant position. They turned me down as the season hadn't started. My brother who was two years younger, applied at the same time and was accepted for a boilermaker apprenticeship. A few years later, my youngest brother was accepted for a fitter and turner apprenticeship.

"When I was turned down, the mill suggested I apply to the experiment station. Maybe they thought it was more suitable for a girl. I contacted Dr Jim Skinner the Chief Plant Breeder at the time. He didn't knock me back there and then but said he would let me know when a job opportunity came up. And he did. I applied and was successful."

That was 1982, Viv was 17 years old, the first female Technical Assistant at Meringa and part of an all-male plant breeding team of nine.

Viv remembers how she would stand in the middle of a plot of cane and the others would fire numbers at her to write down.

"I was conveniently slotted in to do all the hand-written stuff at first. A bit like a secretary," Viv said. "There were no computers and phones to help back then of course.

"I was also given the job of packing seed and looking after the seed store, as I was told it was difficult for the men, with their larger hands, to place the seed packets into the tins, stacked in the chest freezers. To this day I am still packing seed and maintaining the seed store but in much better conditions with a dedicated drying and packing room and two cool rooms for storage. No more tins!

"They didn't think I could do the work they did; how could a woman carry 30 sticks of cane? It took me a few months to convince them that I could, but it was 12 months before I cut my first flower, I could only do that after intensive training from Dr Skinner.

"Field work has changed a lot over the years, I remember spending weeks and weeks walking through the paddocks, visually assessing each stool or plot of cane. We handled the cane a lot more then. Computers have helped, of course, they have made it possible to accumulate a lot more data but at the same time I feel I've lost the 'cane touch' I had back then."

During her first decade at Meringa, Viv's role as a technician enabled her to hone her skills in the cane breeding process and selection program; from cross-pollination and maintaining the seed store to germinating the seed, as well as planting and harvesting field trials and running the juice laboratory – Viv did it all ... and got married and had two children.

Over the next 30 years Viv would earn the reputation and title of 'Mother of all sugarcane' admitting she is at her happiest at work raising her cane babies.

"At the moment, at Meringa, we probably have 2-3000 sugarcane parents made up of clones from all our SRA stations as well as imported varieties from overseas that we can use for cross pollination," Viv said. "And we've got seed stored from our cross-pollination program going back to 1988. We are constantly adding to the collection to find an even better sugarcane variety that might be grown commercially to benefit the growers and the sugar industry."

So what is involved in seeking out that new and improved variety?

"During field crossing, which occurs from mid-May, and photoperiod crossing from early July through to September, we inspect all the flowers regularly. We take pollen tests to determine gender and then with the help of a computer crossing program consider the best combinations for pollination. We then take those parents and place them in their honeymoon suites in the crossing paddock."

It is then up to Viv to ensure the crosses pollinate. After two weeks from the date each cross is made, she will throw the males away and the female flowers are left to ripen.

"The flowers are then harvested, dried, germination tested, packaged and stored." Viv said. "From Meringa we distribute seed to each of our stations in Queensland so that the seedlings germinated become the first stage of the selection process.

"What we do is time-consuming work, but it is rewarding. I have seen varieties that we have produced become hugely successful. I have a special soft spot for Q200$^{\phi}$.

"I guess you can say cane chose me. I have loved working at Meringa, we are family. Over the years I have worked with a lot of dedicated, experienced colleagues who have remained friends and I hope to be here for some time yet," Viv said.

Viv uses binoculars to assess the floral development of parents for crossing in the photoperiod facilities.

DEVELOPMENT OF A BIOPESTICIDE FOR SUGARCANE ROOT FEEDING PESTS

Developing a sustainable alternative to agricultural chemicals for the control of greyback cane beetles is the focus of a new collaboration between Sugar Research Australia and The University of Queensland (UQ).

Led by Professor Neena Mitter, Director of the Centre for Horticultural Science at the Queensland Alliance of Agriculture and Food Innovation (QAAFI) at UQ, the project will harness breakthroughs in ribonucleic acid (RNA) based biopesticides for the sugarcane industry.

Neena said she was excited by the challenge, as the greyback cane beetle is from the same group of insects as the Colorado potato beetle, a major pest of potato crops. An effective RNA-based biopesticide has been recently developed for the potato beetle, which is now being progressed to the market.

Neena said it would be at least six months before early investigations on the cane beetle project could be reported.

She said this was due to there being no information to work with on the cane beetle's gene expression or transcriptome sequence, so the team has had to start from scratch.

Gene sequencing is vital to the project as it is through this process that those genes which are critical to the beetle's survival or reproduction can be identified.

Once these genes are known, RNA interference (RNAi) can be applied to switch off or silence them so that the organism cannot survive.

Neena said the RNAi approach mimicked natural defensive mechanisms of the plant by using the pest organism's own genetic messaging systems against itself. The technology could be compared to a plant vaccine.

(Left) *The RNAi will be tested for effectiveness by SRA staff in Cairns who will artificially feed it to a population of cane beetles. Here, Dr Kevin Powell, SRA entomologist, and Dr Ivy Chen, University of Queensland Postdoctoral student, examine canegrubs dug up from a field near Cairns.*

(Far left) *Dr Kevin Powell looks for canegrubs with Dr Ivy Chen and Entomology Technician Samuel Bawa.*

The RNAi will be tested for effectiveness by SRA staff in Cairns who will artificially feed it to a population of cane beetles.

Bioclay™ RNAi biopesticide, invented by Professor Mitter and her UQ colleagues, Professors Gordon Xu and Max Lu in 2017 will be explored as the mechanism to deliver the RNAi for cane beetles

Bioclay™ is a safe medium which is applied on the plants to deliver the RNA in a way that protects it from being destroyed by sunlight or washed away by rain.

The target pest is fed the RNA when it eats plant parts treated with the Bioclay™. It works by turning off the pest's own survival genes, without any genetic modification of the plant taking place or toxic residue left behind.

Neena said BioClay™ represented a great leap forward, promising a revolutionary alternative to chemicals, although the technology's full potential would take time to realise.

She said two major challenges need to be overcome before a biopesticide could be developed for the sugarcane industry - firstly, the effectiveness of the RNAi in controlling cane beetles and secondly, whether sufficient levels of RNAi applied to the leaves of the sugarcane plant will find its way to the roots to be consumed by the canegrubs.

Once the concepts are proven, it will take another three to five years to validate the concept in field trials and for the completion of regulatory requirements before the product can be fully developed.

Neena said sugarcane industry stakeholders were keen for an effective alternative to chemical solutions such as imidacloprid and believes the RNAi technology can deliver a solution.

It's hoped findings may also offer translation potential to target other pests and diseases of sugarcane.

For more information about the project, Innovative RNAi biopesticides for management of sugarcane root feeding pests, is available on the SRA website via the QR code provided.

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

Queensland Government

COLLABORATION BRINGS A WEALTH OF DATA TO INFORM NITROGEN USE EFFICIENCY WHILE MAINTAINING PRODUCTIVITY

In April the final report of an extensive research study into Enhanced Efficiency Fertilisers (EEFs) was released. The research was made possible through a four-year collaborative industry and government partnership.

Sugarcane growers, CANEGROWERS, regional productivity services, Sugar Research Australia (SRA), the Australian Department of Agriculture, Water and the Environment (DAWE), and the Queensland Government's Department of Agriculture and Fisheries (DAF) and Environment and Science (DES) all contributed to the study.

A technical management group made up of representatives from CANEGROWERS, SRA, DAWE, DAF, DES, University of Queensland and CSIRO was responsible for ensuring the research was scientifically robust.

Carried out over three harvests, on 74 sugarcane farms from Bundaberg to Mossman the *Support of cane farmer trials of enhanced efficiency fertiliser in the catchments of the Great Barrier Reef (EEF60)* project and report has shown that these on-farm trials have improved nitrogen use efficiency and maintained productivity for farmers.

"This study evaluated the performance of EEFs relative to conventional fertiliser and was the most extensive evaluation of EEFs undertaken to date," SRA Executive Manager, Industry Services Hywel Cook said.

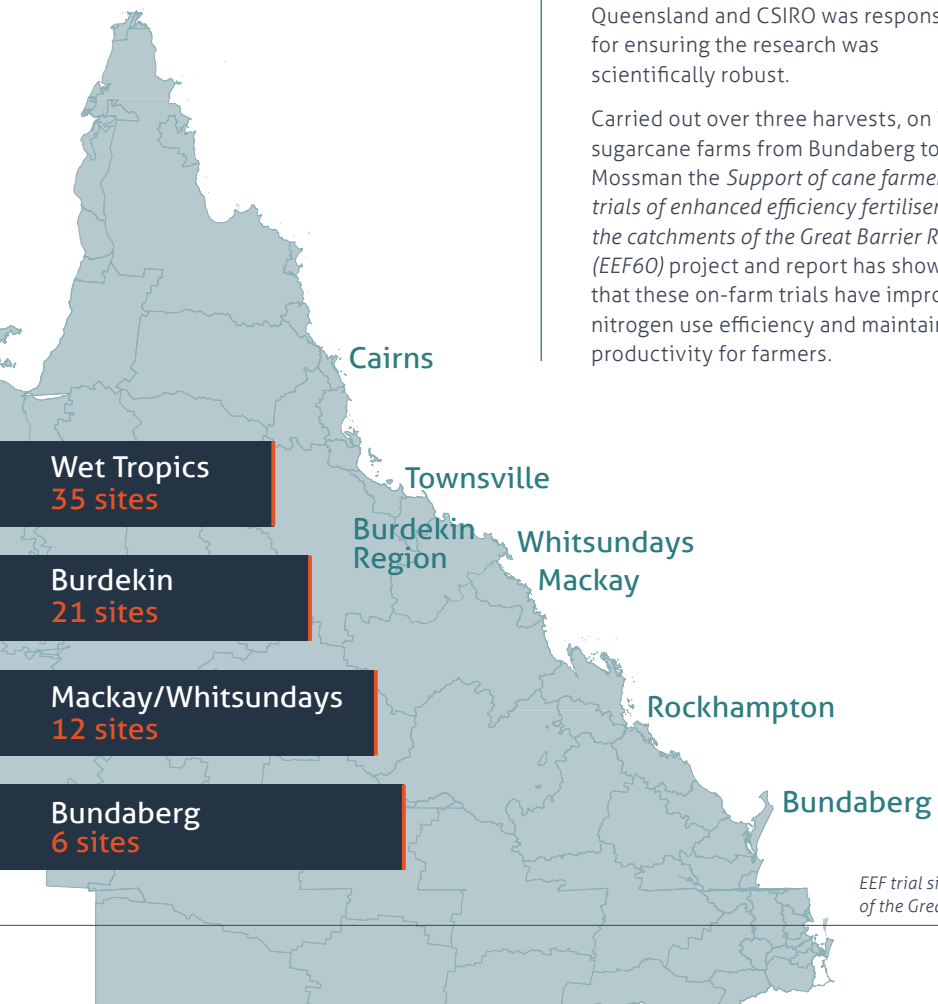
"The large number of trial sites and consistency in trial design enabled the collection and analysis of a wealth of data which determined what types, blends and rates of EEF perform better, where they get the optimal results - such as soil types, rainfall conditions and regions - and the best time for application," Hywel said.

Managed by CANEGROWERS, SRA provided technical oversight through the project leadership of agronomist Julian Connellan and DAF Agricultural economist Matt Thompson, but it was the growers that made the project possible.

"The EEF project partners would like to acknowledge the valuable contributions from all the growers involved in the project over its lifetime," Julian said. "As well as all the harvesting contractors and personnel from mills in each region. It was a huge collaborative effort that provided us with a wealth of data.

"The report concludes that trying EEF products when nitrogen losses are likely is a good starting point that will not impact on productivity or profitability and will improve nitrogen use efficiency (NUE) and water quality; a great outcome for local waterways, the Great Barrier Reef lagoon and collaborative partnerships," Hywel said.

"The high nitrogen fertiliser prices at present provide an additional incentive for farmers to utilise these findings as part of their fertiliser program this coming season," DAF Economics Manager Mark Poggio said.



EEF trial sites within the catchments of the Great Barrier Reef.

Collecting and processing biomass samples in the Burdekin

Post-harvest soil sampling

Two main types of EEFs were tested: controlled release fertilisers (CRFs) and nitrification inhibitors (NIs). Key findings included:

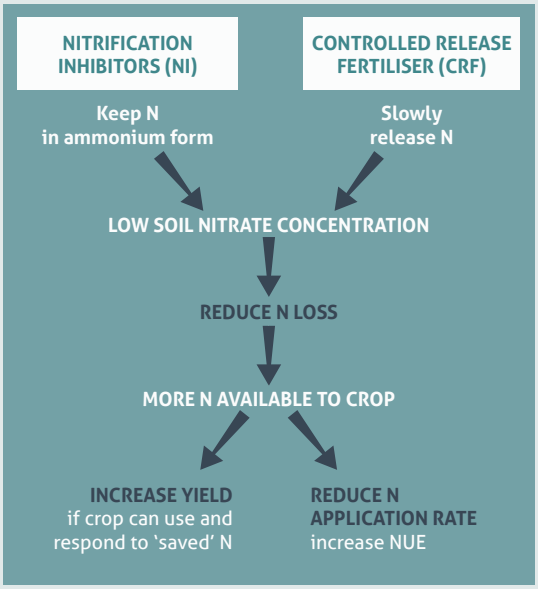
1. Applying urea at 20% less than the SIX EASY STEPS® recommendation results in lost cane yield. Applying Dimethylpyrazole phosphate, a nitrification inhibitor DMPP treated urea at 20% less than the SIX EASY STEPS® recommendation maintains yield and profitability and also improves nitrogen use efficiency.

2. Applying a CRF-urea blend (20% CRF & 80% urea) at 20% less than the SIX EASY STEPS® recommendation maintains yield and profitability and improves NUE.

3. EEF blends with high proportions of CRF cost more, which made them less profitable to apply.

4. Evidence suggests that EEFs were most effective in improving NUE when high loss conditions were experienced, such as in sandy soils, under high rainfall conditions and when applied late in the season.

THE BENEFITS OF EEFs



The EEF60 final report and project guidelines can be downloaded from the SRA website or via the QR code provided.

EEF60 Final Report

EEF Project Guidelines

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	1/07/2022
2017/007	Investigations to mitigate the effects of juice degradation in factory evaporators on sugar recovery and quality, corrosion and effluent organic loading	Darryn Rackemann	QUT	1/05/2022
2018/005	Genetic analysis and marker delivery for sugarcane breeding	Karen Aitken	CSIRO	1/11/2022
2019/002	Validating high-throughput phenomics technologies for sugarcane clonal selection	Sijesh Natarajan	SRA	30/09/2022
2019/004	Harvester losses assessment by real-time Machine Vision Systems	Cheryl McCarthy	USQ	1/12/2022
2019/005	Strategies to minimise impacts of processing existing soft cane varieties, and industry cost/benefit analysis	Floren Plaza	QUT	1/05/2022
2019/007	Eliminating roll arcing	Geoff Kent	QUT	1/08/2022
2019/901	Smarter Irrigation for Profit Phase 2	Multiple	CRDC	30/06/2022
2020/003	Maximising cane recovery through the development of a harvesting decision-support tool	Phil Patane	SRA	1/06/2023
2020/202	Improving pan stage performance by on-line monitoring of C seed grainings using the ITECA Crystobserver	Ashley Curran	Sunshine Sugar/ QUT	1/11/2022
2021/002	Pre-commercial development, testing and validation of RSD LAMP assay for sugar mill roll-out	Jimmy Botella	The University of Queensland	30/06/2022
2021/201	Use of a purge sensor to improve performance and reduce the need for supervision of batch centrifugals	Robert Zahn	Bundaberg Sugar	30/07/2022
2021/202	At-line purity sensor to enhance the monitoring, control, and performance of pan stage	Bruce Tyson	WH Heck and Sons	30/07/2022
2021/203	On-line measurement of the physical properties of each cane consignment at the factory	John Edwards	Tully Sugar	30/07/2022
2021/204	Evaluate the operational performance and industry application for the final evaporator design at Victoria Mill	Jonathon Gilberd	Wilmar Sugar	30/07/2022
Research Mission 2: Position the industry to stay ahead of climate, environmental and biosecurity threats				
2017/809	Modern diagnostics for a safer Australian Sugar Industry	Nicole Thompson	SRA	1/02/2023
2018/010	Moth Borers - how are we going to manage them when they arrive?	Kevin Powell	SRA	3/01/2023
2020/002	Developing an integrated device for on-farm detection of sugarcane diseases	Muhammad Shiddiky	Griffith University	1/04/2023
2020/004	Beyond imidacloprid - chemical and biorational alternatives for managing canegrubs	Kevin Powell	SRA	1/03/2025
2020/007	Environmental DNA technologies and predictive modelling for rapid detection and identification of sugarcane priority pests	Andrew Weeks	Enviro DNA Pty Ltd	1/03/2024
2020/008	Transformational crop protection - Innovative RNAi biopesticides for management of sugarcane root feeding pests	Neena Mitter	The University of Queensland	1/06/2024
2021/003	Scoping study of the requirements for the Development of CaneMAPPs	Ando Radanielson	USQ	1/04/2022
Research Mission 3: Capitalise on changing consumer preferences, and the growing bio and green economies to develop diversification opportunities				
2019/902	Biorefineries for profit - phase 2 (RR&D4P round 4)	Ian O'Hara	QUT	1/06/2022
2020/010	Sugarcane Industry Situational Analysis: Industry consultation and roadmap development	John Sheehy	Pottinger Co	13/05/2022
2020/011	Demonstration of safety, palatability, and efficacy of novel, sugarcane-derived feed ingredients in ruminants	Mark Harrison	QUT	30/08/2022
2020/014	Sugar industry diversification opportunities investigation	Michael Wallis	Procom Consultants P/L	1/05/2022
2021/004	Project BGreen	Greg Watson	Burdekin Renewable Fuels	31/10/2022

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				
2016/807	Support of cane farmer trials of enhanced efficiency fertilisers in the catchments of the Great Barrier Reef.	Julian Connellan	SRA	30/06/2022
2017/004	SIX EASY STEPS® continuing perspectives in time and space	Bernard Schroeder	USQ	1/04/2022
2019/803	Complete nutrient management planning for the Russell-Mulgrave and Lower Barron catchments	Cathy Mylrea	SRA	11/06/2022
2020/001	Environmental risk assessment and life cycle assessment of the raw sugar manufacturing	Stephen Wiedemann	Integrity Ag	1/03/2023
2020/017	A common approach to sector-level greenhouse gas accounting for Australian sugarcane	Kate Ricketts	CSIRO	30/07/2022
2020/802	Mackay Whitsunday Cane to Creek	Matt Schembri	SRA	31/10/2023
2020/803	On ground testing and modelling of the effectiveness of Enhanced Efficiency Fertilisers in the Wet Tropics catchments of the Great Barrier Reef	Julian Connellan	SRA	30/06/2022
2020/804	Reducing herbicide usage on sugarcane farms in reef catchment areas with precise robotic weed control	Mostafa Rahimi Azghadi	JCU	31/08/2022
2020/805	Increasing industry productivity and profitability through transformational, whole of systems sugarcane approaches that deliver water quality benefits	Cathy Mylrea	SRA	30/06/2024
2021/007	Investigating potential for sugar industry participation in green markets	John Rolfe	CQU	1/11/2022
2021/008	Develop a Sustainability Framework for Australian Sugarcane and Sustainability Report in collaboration with stakeholders	Ingrid Roth	Roth Rural	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	QUT	1/05/2023
2018/101	New approaches to quantifying nitrogen fluxes in enhanced efficiency fertilisers in Australian sugarcane soils	Aiden Chin	The University of Queensland	1/06/2022
2018/102	Characterising nitrogen use efficiency in sugarcane	Anoma Ranagalage	The University of Queensland	1/06/2022
2019/006	Australian sugar industry training - development of factory training modules - phase 2	David Moller	QUT	1/05/2022
2019/102	Genetic solutions for determining fibre quality traits in sugarcane	Angela O'Keefe	CSIRO	30/06/2023
2019/806	Advancing techniques for diagnosis of yellow canopy syndrome	Kevin Powell	SRA	13/04/2023
2020/101	Engineering bacterial enzyme secretion for cellulose utilisation	Madeline Smith	QUT	1/02/2023
2021/101	Optimising mill mud and ash applications for soil improvement and carbon sequestration	Hannah Green	James Cook University	30/04/2025
2021/102	Systems biology for sustainable agriculture: evaluation of plant growth-promoting bacteria to produce high-performing biofertilisers	Ian Petersen	The University of Queensland	30/04/2025
2021/401	Risk assessment for the newly discovered parasitic nematode *Pratylenchus parazeae* in the Australian sugarcane industry	Shamsul Bhiyan	SRA	1/05/2023

SRA is also participating in multiple cross-sectoral research activities in conjunction with other Rural Research and Development Corporations.

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