



Sugar Research
Australia

Our **quarterly magazine**
bringing research to
the field



CaneConnection

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Welcome to the Winter 2017 edition of *CaneConnection*

In this edition we feature a range of stories from across SRA and our research, development and adoption investment for sugarcane growers and millers.

Inside, we talk with SRA Researcher Dr Nathalie Piperidis (Page 16-17) on research using introgression to improve sugarcane varieties and explain how SRA is looking to bring “new blood” into the sugarcane variety team.

We also talk to some young and innovative growers at Mackay who have implemented a number of improvements at their properties to help drive productivity and profitability. Each change itself is making incremental improvement, and together it is continuing to add up to an improved bottom line at the end of the year.

We also visit a Burdekin grower on pages 14-15 to talk about SRA-funded research that has looked at technology to automate furrow irrigation, working with three grower collaborators. Not every improvement in farming can be measured precisely in tonnes or dollars, but there is certainly a lifestyle and labour-saving benefit of increasing the automation of irrigation.

In our newsletters, we also answer some of your questions around yellow canopy syndrome, and we explain the Sugarcane Hub, a valuable new tool for researchers, as well as introduce you to Dr Jason Eglinton, who has joined the SRA breeding program.

We also discuss research led by QUT that is assessing the milling performance of low-fibre varieties such as SRA1[®], and we look at the achievements and activities of the Southern Region Group.

Brad Pfeffer

Executive Manager, Communications

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2016 harvest the largest in over a decade

Sugar Research Australia has worked with milling companies to crunch the numbers on the 2016 harvest on a crop that came in at 36.5 million tonne of harvested cane.

Cane yields were above recent years at just over 99 TCH, up from the 91 TCH in 2015. CCS however was down due to a number of factors that included wet weather and more tonnes, at 12.84.

The hectares harvested in 2016 (and early 2017) were down on the previous year, most notably because of areas of cane that have now had to be stood over for harvest in 2017. The 2016 hectares were 368,107, compared to 381,776 in 2015. It was the industry's largest crop since 2005 (96 TCH).

The popularity of staple varieties has remained relatively consistent, with Q208[®], Q183[®] and KQ228[®] again making up the top three.

However, the newer variety Q240[®] continues to increase in usage and is now the fourth most-grown variety and makes up about 8.5 percent of the Australian crop. Last year it was about 4 percent.

Q242[®] and Q238[®] also had small increases in production of 1.1 percent and 0.4 percent respectively.

In NSW, the top five varieties were Q208[®], BN83-3120, Q232[®], Q183[®] and Q211[®]. In Queensland, the top five were Q208[®], Q183[®], KQ228[®], Q240[®], and Q200[®].

In 2016, 69 varieties with plant breeder's rights (PBR) were delivered to Queensland mills, accounting for 33.5 million tonne, or 98 percent of production.

In NSW, 29 varieties with PBR were delivered to these mills, accounting for about 78 percent of production.

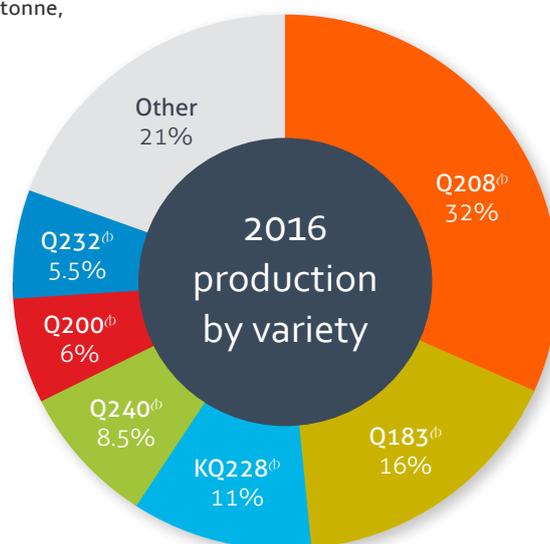
You can find out more about varieties and their characteristics and performance in your region by visiting the online tool QCANeselect™ via www.sugarsearch.com.au.

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Average yield (tonnes of cane per hectare)





The project team in Indonesia recently as part of the ACIAR-funded research to help protect Australia against a potential threat from sugarcane streak mosaic virus, an exotic threat not currently within Australia.

Australia and Indonesia working to understand sugarcane streak mosaic virus

Estimated to be costing the Indonesian sugarcane industry in the region of A\$50 to A\$100 million dollars annually, sugarcane streak mosaic virus (SCSMV) presents a real threat to the Australian industry.

By Matt Reynolds, Adoption Officer

Recent surveys have reported regions of Indonesia with greater than 85 percent of crops exhibiting visible mosaic symptoms. The Indonesian sugarcane industry covers 380-400,000ha with the profitability of the cash crop being important for alleviating poverty amongst the Indonesian sugarcane community.



Above: Recent surveys indicate more than 85 percent of Indonesian cane has visible mosaic symptoms.

SRA's collaborative work with CIRAD, University of Bogor, Indonesian Fibre Crop and Sweetener Research Institute and the Indonesian Sugar Research Institute aims to gain valuable information to prepare and protect the Australian industry.

"The project aims to prepare our industry for a potential incursion of sugarcane streak mosaic virus. Not enough is currently known about the disease and the work we are doing with the Indonesian institutions is shedding valuable light on the disease," Project leader, Dr Rob Magarey, said.

The Australian Centre for International Agricultural Research (ACIAR) is funding the project, which is in its early stages. It is already delivering insight into the impact of the disease, with the virus shown to be capable of reducing yields by more than 20 percent.

In May 2017, the project team met in Indonesia to discuss and plan future work in line with the discoveries already made as part of the project. The meeting offered valuable insight and enabled in-depth discussion on the current work, and it also highlighted the value and expertise that SRA brings to the collaborative arrangement.

The ACIAR funded project aims to:

1. Develop a rapid diagnostic test

A number of diagnostic tests will be developed as part of the project, with those tests already developed showing real promise for their application in Australia. "We are developing a range of diagnostic tests from ELISA to LAMP and qRT-PCR. These methods will be tested to determine their most appropriate application in Australian and Indonesia," SRA Senior Researcher, Dr Nicole Thompson, said.



Above: SRA Technician Ms Liz Wilson and SRA Senior Researcher, Dr Nicole Thompson, in the field in Indonesia.

2. Understand transmission of the virus, associated yield losses, varietal resistance and the distribution of the disease within Indonesia

A number of critical pieces of information are not currently understood about SCSMV. Understanding how the virus is transmitted and the varietal resistance of Australian sugarcane varieties is critical to protect the Australian industry should an incursion occur.



Above: Sugarcane streak mosaic virus symptoms.

3. Extension program aimed at improving management of the disease

Extension is a key part of the project and aims to reduce the level of SCSMV within Indonesia. A recent survey in Java of 931 crops found greater than 85 percent of crops displayed visible mosaic symptoms. Reducing the presence of SCSMV within the Indonesian industry has the potential to reduce the likelihood of an incursion into Australia.

Australia is currently home to two forms of mosaic viruses; sugarcane mosaic virus and striate mosaic virus. SCSMV is caused by a different virus to the two Australian forms and is regarded as being more severe. Streak mosaic exhibits symptoms similar to those seen with sugarcane mosaic virus in Australia with mosaic leaf patterns and stripes on the young stalks and leaves.

Dr George Piperidis, SRA Leader of crossing and selection and the Central Region's plant breeder, was invited to participate in the ACIAR project meeting and took the opportunity to discuss the potential for variety exchange with Indonesia, and the assessment of important Australian varieties for SCSMV resistance. "Indonesia already has a number of older SRA varieties and so the opportunity to gain an understanding of the current commercial standards is critical. The Indonesia program does however present some promising clones for inclusion within our breeding program. Like all, however, they will need to prove themselves under Australian conditions," Dr George Piperidis.



Above: SRA Leader for Crossing and Selection, Dr George Piperidis, with SRA KFA Leader for Biosecurity, Dr Andrew Ward, in Indonesia.

The importance of understanding a disease, which pose a significant biosecurity risk to the Australian industry, is crucial in the event of an incursion. Knowing how the disease is spread, how to identify the disease and the control measures available to the industry are the foundation of any disease management plan. If you believe you have found an exotic pest or disease in Australia please do not hesitate to contact the exotic pest hotline on 1800 084 881, SRA, or your local Productivity Service.

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Dr Bakshi Ram, Director of Sugarcane Breeding Institute, Coimbatore, India, with Mr Neil Fisher, CEO, SRA.

India partnership paving the way for variety improvement

A new collaborative partnership between SRA and the Sugarcane Breeding Institute in India is hoped to lead to mutual benefits for both countries.

SRA is strengthening the relationship with the Sugarcane Breeding Institute, Coimbatore (SBI), in India, as part of a joint effort to improve plant breeding in the two countries.

A collaborative project with SBI, jointly funded by the Australian and Indian governments, is currently underway. It is also funded by SRA and SBI.

With that background, SRA Researcher Dr Prakash Lakshmanan and CEO Mr Neil Fisher visited SBI in April this year and had discussion with the institute staff.

The focus of the project is sugarcane variety improvement for cane yield, sugar content, drought tolerance and red rot resistance through an integrated approach of genomics and phenomics.

Dr Lakshmanan said the project would also look to understand the genetic diversity of Indian and Australian germplasm and make a recommendation on how to use that information for variety improvement and variety exchange.

This research will be conducted by both organisations.

During the visit Dr Lakshmanan and Mr Fisher also visited the Indian Council of Agricultural Research (ICAR) in the Ministry of Agriculture and Farmers Welfare, in New Delhi.

They met with ICAR's Director General, Dr T. Mohapatra, and Associate Director General, Dr RK Singh, and discussed opportunities for SRA-SBI strategic alliance in R&D and variety exchange.

SBI is the principal variety developer for the Indian sugar industry and has supplied foundation materials for breeding to 28 countries, including Australia. It has never had a formal collaboration with Australia, although SBI supplied sugarcane germplasm to Australia in the first half of the 1900s.

"There has been no sugarcane germplasm exchanged between Australia and India for more than 60 years, which makes this collaboration an important step forward for both of our industries," Dr Lakshmanan said.

"Australia already has variety exchange agreements with numerous countries around the world, and exchanging germplasm is vital for seeking continual improvement in the SRA breeding program to deliver outcomes for Australian sugarcane growers and millers."

Dr Lakshmanan said that the industry only had to look to Q208[®] to see the importance of variety exchange. Q208[®] is currently the mostly widely grown variety and last year it represented 32 percent of the crop.

"Most of the ancestors of our most successful variety, Q208[®], trace back to SBI in India. One of the most successful international varieties, NCo310, is a seedling bred in SBI and selected by breeders at the South African Sugarcane Research Institute."

He said that SBI also had a strong introgression program for bringing in traits from wild relatives of sugarcane to commercial varieties.

“On the back of our current collaborative project, we are trying to establish a broader, strategic R&D alliance between SRA and SBI, and the first step of that will be to establish a memorandum of understanding between both institutions.

“SBI is one of the oldest breeding institutes in the world and is a pioneer in creating sugarcane interspecific hybrids of *Saccharum officinarum* and *Saccharum spontaneum*. So this is an exciting opportunity for the Australian sugarcane industry.

“We extend our utmost thanks to SBI, ICAR and the Ministry for Agriculture and Farmers Welfare for their time and cooperation during our visit and we look forward to strengthening our relationship.”

About the Indian sugar industry:

- India is the second largest sugarcane producer
- It cultivates about 4.5 million hectares in both tropical and temperate climates
- 5 million sugarcane growers
- 650 sugar mills



Above (clockwise from top left): A sign marking the collaborative research occurring between SBI and SRA.

The Australian and Indian researchers working on the collaborative project on variety improvement in sugarcane. The researchers held a workshop in April, which included Australian participants Dr Xianming Wei (SRA), Dr Phil Jackson (CSIRO) and CSIRO molecular marker expert Dr Karen Aitken.

Discussing red rot resistance in sugarcane at SBI.

Research trials at SBI.

A drone demonstration from SBI.





Mirani grower Tim Bone inspects this year's crop in March 2017.

Tackling productivity one step at a time at Mirani

After almost seven years of growing sugarcane west of Mackay, Tim Bone and family are starting to see the positive results of productivity enhancements that they have made to their business. By Brad Pfeffer

When Tim Bone first moved to Mirani in 2010, he already had a lifetime of experience with farming and agriculture, but sugarcane was a whole new ball game.

He had grown up in a grain cropping area in Victoria, and had also been working with his wife, Megan, and her family growing grain at Dysart in Central Queensland.

When they bought the property at Mirani in 2010, he admits that it was a steep learning curve that had the added challenge of making a foothold in the industry during a run of consecutive wet and challenging years.

But after overcoming those initial hurdles and now, almost seven years down the track, Tim says that they are now starting to see the results of their

hard efforts over this time in gradually making productivity improvements.

Yields are generally in the 90 tonne per hectare (TCH) range, and he has the goal of getting them to 100 TCH and above in coming years.

The first steps came with introducing new varieties and removing old ratoons, as well as soil testing, which revealed pH problems that have since required lime to rectify. Soybeans are now also a critical component of the crop cycle.

"Being new to sugarcane farming I've had to learn very quickly," Tim said.

"That means going to SRA events, and MAPS (Mackay Area Productivity Services) shed meetings, and also just talking with local progressive growers.

"You don't always have to agree with what someone else is doing, but if you pick up one useful piece of information that can help."

They have 103 hectares under cane and main varieties include Q208[®], Q240[®], Q242[®], Q183[®] and some Q138.

"We spread it around because we are trying to watch our rotations in relation to pachymetra and other diseases. I've heard the stories of rust getting hold of Q124 back in the day, so we are aware of the risk of a disease knocking out a particular variety and we want to make sure we are not susceptible to having the bulk of the farm ever being wiped out.

"You obviously have to look at your most productive varieties that will make you most money, but you also have to spread your risk."

The next step is widening the rows from 1.6 metres to dual row 1.8 m. Tim saw the benefits of this from his work driving a harvester for local grower and contractor, Graeme Blackburn, where he was able to quickly see the damage that the harvester could do to the stool on narrow row configurations.

"We're still building productivity per hectare, but I'm hoping that we can reduce harvesting costs by going down fewer rows, less passes in the paddock with preformed beds, and getting an increase in ratoon length. We changed our first 8ha last year and all our planting this year will go out to 1.8 m, so it will be interesting to see the results once we get the harvester in there."

Another change has been shifting the farm from dunder fertiliser to all granular with a stool splitter and double-disc openers, applied 100mm deep with Confidor for grub control where required.

"We believe in using zinc via foliar application, and all up we find that this approach is doing an excellent job."

"We also want to be efficient with our nutrient use. Having the fertiliser underground helps minimise the runoff as we are very conscious of the environment here being in a high rainfall area."

"At the end of the day we can't afford to be applying chemical and fertiliser that isn't effective where it needs to be."

The farm also has irrigation, although the season for 2017 has generally not required large amounts of irrigation. Up until Cyclone Debbie in late March, the cane was looking promising, but it now has severe damage and Tim estimates losses will be in the order of 15 to 20 percent, depending on what varieties were grown close to rivers and dams, with Q138 being the worst.

He already had standover from last season and there are concerns about the 2017 harvest with dealing with the aftermath of the cyclone.

"We are looking at a low season for sugar content as well due to the cane being lodged."

"Last season was a real juggling act with the wet conditions. Depending on the ground conditions, we had to wait with some paddocks and didn't always cut where we wanted," he said.

"By the end we ended up leaving Q240[®] and some Q252[®] that was standing straight and was plant cane that I didn't want to bog out."

The biggest downside will be an area of lodged Q242[®] that he was not able to get to before the end of the season.

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Below: The early dual-row plant cane in August 2016.





Melissa and Andrew Deguara, Pinevale, run a diversified farming business growing about 30,000 tonne.

Focussing on tonnes to drive profitability

Andrew and Melissa Deguara are running a diversified farming business with attention to detail on productivity drivers for their enterprise. By Brad Pfeffer

Running a diversified farming business that includes sugarcane farming and harvesting, Andrew and Melissa Deguara have approached both the farming and harvesting from the same angle – and that is to ensure the highest returns via a high-yielding crop.

The Deguaras cut about 60,000 tonne at Pinevale west of Mackay, about half of which is their own cane.

With this approach, it is no surprise that they are adopting a wide range of practices that are geared toward maximising productivity and profitability for their business, which consists of cane, soybean, cattle, and the contract harvesting.

This includes a strong focus on irrigation, a soybean fallow crop, improving soil health, and optimising harvest efficiency.

The soybean are considered to be such a priority for the business and improving soil health that this became an important factor in scheduling harvesting as the 2016 season neared its end, to ensure that they could plant their full soybean crop, which is usually 50 to 60 hectares.

“Our fallow is our most important tool for improving soil health, which we had to prioritise in 2016 with the late finish,” Andrew explained.

As with all farmers in the region, with time running out in December and the wet weather setting in, they had to make some hard choices about which blocks to stand over.

They ended up with about 2000 tonnes of standover, which they said “could have been a lot worse” based on the outlook mid-season.

“In early to mid-December it went from dead dry to wet and we were caught out in places with blocks that we could not get back to,” Andrew said.

“But we made the best decisions we could at the time and also had to change our mind a few times as the weeks progressed. We left varieties like Q240[®] and Q208[®], as well as some Q183[®].”

They focussed on cutting varieties such as Q232[®] and Q228[®]. “There are places also where, in hindsight, we should have stood some over, in places where the ratoons won’t be ploughed out this year. They did receive a bit of damage in the wet weather,” they said.

“We didn’t get things exactly right, but in saying that we did plant all our soybean, which is what we were aiming for.”

The Deguaras are also keen to optimise harvest efficiency and have already taken a number of steps. They operate on 1.86m rows and their harvester is equipped with GPS and with EHS chopper drums, which they say has made a big difference.

“There is still room for improvement. We try and keep everything sharp – twice a day – and have our extractor fan speeds down, which we can only do by having everything sharp. We want the ground speed down, and we do that through the tonnes from the irrigation.

“From the farm point of view, things like block layout, weed control, and rocks are all issues to consider. Just a simple thing like picking rocks is something that we feel really cuts down your losses.

“About 70 percent of our contract is under GPS, which is another improvement.”

They also have irrigation via seven centre pivots, soft hoses and flood irrigation. As part of that, they recently attended a workshop as part of the Smartcane BMP

program on irrigation efficiency, where Steve Attard from AgriTech Solutions was the presenter.

“We have the infrastructure for irrigation, but we also feel we can fine tune things to get the water on as cheaply and as efficiently as we can,” Andrew said.

“That will involve decisions around scheduling, investing in new technology, and ensuring we are on the right tariff.

“At the end of the day, I really don’t like cutting poor cane in the harvester, which is half the reason I like irrigating.”

All of these improvements are now assisting them to attempt Bonsucro accreditation, aided by their agronomy consultant Farmacist. The Deguaras first became aware of Bonsucro four years ago at a conference run by the Australian Cane Farmers’ Association (ACFA).

Melissa said that the accreditation was mostly about formally recognising a number of practices that were already in place at the farm, although it had identified a few things that they are

now working on such as ensuring staff received more training, and changing some chemical usage.

“Anything you do, whether it be BMP or Bonsucro, it is helpful in getting you thinking about things you can implement to improve your business,” Melissa said. “We find the same thing with cattle industry forums for that side of our business.”

Following Cyclone Debbie, which tore through about three weeks after **CaneConnection** visited the Deguaras, they said that there had been significant crop and stock losses, which would flow through to this year’s season and a recovery process that will take several years. The recent cyclone event has changed their decision on plant variety selection, mainly due to SP80 having suffered the most damage.

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Below: The 2017 soybean crop pictured in March.





Participants at a SIX EASY STEPS workshop in Mourilyan in 2016.

The full monty on the SIX EASY STEPS nutrient management program

The SIX EASY STEPS aims at balanced nutrition and sustainable soil and nutrient management. It considers the underlying sugarcane farming system and all essential nutrients for sugarcane production.
By Bernard Schroeder, University of Southern Queensland

There has recently been much discussion and comment about the SIX EASY STEPS in terms of nutrient management in the Australian sugar industry. Although this attention has often focused on nitrogen (N), it is important to remember that the SIX EASY STEPS is an integrated and comprehensive nutrient management program. Nitrogen (N) management is only part of the overall package.

The goal of SIX EASY STEPS is to optimise conditions for effective, economic and efficient use of nutrients in the soil and those added by fertiliser or ameliorant applications.

The SIX EASY STEPS is focused on profitable production on-farm without adversely influencing soil fertility or causing off-farm effects.

It recognises the different sugarcane-producing regions and districts in Queensland and NSW. This includes the overarching climate and resources (such as soils and irrigation water) that enable the growing of sustainable sugarcane crops across these regions.

The SIX EASY STEPS program is based on a framework of six steps.

Steps 1 and 2 bring together knowledge of the farm, the different soil types, positions in the landscape and the opportunities and challenges for improving nutrient management on-farm.

Steps 3 and 4 are designed for use with full range soil tests from an accredited laboratory to enable interpretation of the nutrient requirements for each block on the farm. They also enable nutrient management plans to be developed and for determining and rationalising the fertiliser requirements for the farm as a whole.

Steps 5 and 6 enable expansion of the system to include a range of options for further fine-tuning of nutrient management options. This includes refinements for specific circumstances, when new information becomes available, and to meet an individual grower's needs or appetite for risk.

Steps 5 and 6 also provide the basis for a continual improvement and a loop back to the previous steps so that progress can be made along ongoing learning.

The SIX EASY STEPS program is being delivered to industry through a number of tools within the SIX EASY STEPS toolbox:

- District-specific nutrient management guidelines used within Step 4 (all districts).
- District-specific grower-orientated short-courses (most districts).
- District-specific short-course workbooks that are supplied to the course attendees (most districts).
- District-specific soil reference booklets (as funding has become available).
- The SIX EASY STEPS NutriCalc™ – an online nutrient management package that enables determination of nutrient requirements for blocks of cane based on location and soil test values (all districts).
- SIX EASY STEPS information sheets such as soil sampling and leaf sampling procedures (all districts).

Other tools that can easily be added to the SIX EASY STEPS toolbox are the:

- SRA FertFinder that enables users to identify the most appropriate fertiliser products and blends to suit their on-farm nutrient requirements
- Nutrient management plan process for use in the Wet Tropics and endorsed by the Wet Tropics Sugar Industry Partnership.

The SIX EASY STEPS framework:

Step	Description
1	Knowing and understanding our soils.
2	Understanding and managing nutrient processes and losses.
3	Soil testing regularly.
4	Adopting soil-specific nutrient management guidelines.
5	Checking on the adequacy of nutrient inputs.
6	Keeping good records to interpret trends and modify nutrient inputs when/where necessary.

The SIX EASY STEPS program is based on the results of past trials, current long-term field trials that have been monitored for more than 10 years, glasshouse experiments and laboratory investigations. Importantly, these results are interpreted individually, and in conjunction with data from elsewhere, by means of agronomic, economic and efficiency criteria. This approach enables a balanced and multi-faceted assessment of the guidelines that are contained in the SIX EASY STEPS program.

The SIX EASY STEPS program going-forward:

- The content of the SIX EASY STEPS program continues to be reviewed, updated and refreshed.
- Other options, outcomes and outputs from various projects and systems are possible within Steps 5 and 6.
- Some of these other options will align with the SIX EASY STEPS program. Others may be considered different from the intent of the SIX EASY STEPS and then should be considered as separate approaches.
- Just as researchers and development specialists are responsible for the systems and outputs they develop, growers, extension providers and advisors need to have confidence in, and take responsibility for, the system they choose, use and/or promote.
- The SIX EASY STEPS team has proposed a mechanism for assessing additions/modifications to the content of the SIX EASY STEPS program in future.
- It is envisaged that this will be done via the SIX EASY STEPS Advisory Committee (SESAC). This will enable setting of standards for accepting amendments to the SIX EASY STEPS guidelines and delivery package, and to consider developments within a review process. The SESAC will receive submissions for inclusion into the SIX EASY STEPS and assess their suitability following a refereeing process. The SIX EASY STEPS team will incorporate accepted data/information into the SIX EASY STEPS program as appropriate.
- This mechanism ensures that the SIX EASY STEPS program itself continues to grow according to the six principles. It also enables further 'tools' to be added to the SIX EASY STEPS TOOLBOX going forward.

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Denis Pozzebon in the field with the radio receiver.

Automation investment delivering water and energy savings

A project investigating the use of automation systems in furrow irrigation in the Burdekin is showing that there are not just labour savings and lifestyle benefits, but also water and energy use efficiencies.

Project details

Key Focus Area

Farming systems and production management

Project name

Modernisation of furrow irrigation in the sugar industry

Project number

2014/079

Chief investigator

Malcolm Gillies

Late nights, early starts, and interruptions to work and social life are all part and parcel of growing irrigated sugarcane in Australia. It's not just labour intensive work, but it also occurs around the clock.

However, a recently completed research project has investigated the use of commercially available technologies that can help make furrow irrigation easier and more efficient – and avoid some of those 3am wake-up calls.

This project has investigated technology to automate furrow irrigation and has worked with three grower collaborators in the Burdekin to ground-truth the technology.

As part of the SRA-funded project, the work was led by Dr Malcolm Gillies with the University of Southern Queensland and the National Centre for Engineering in Agriculture (NCEA), with partnership from Burdekin Productivity Services (BPS) and AgriTech Solutions.

The project began by assessing a range of off the shelf control hardware, sensors and radio systems. The most suitable combination of automation equipment was then selected and automation systems were installed on the three farms. These farms were chosen because they represented three different, but common, types of irrigation infrastructure.

Each of the growers has contributed to the system with his own resources, in addition to the funding provided by SRA.

Dr Gillies said the farmers are using radio equipment and software to control their existing butterfly valves and pumps and monitor the system in real time.

"The growers computer becomes the base station sending instructions to and receiving data from the field radios. All information is stored on farm but growers can choose to control via the internet," he explained.

"Sensors can be used to detect problems in the supply system and let the grower know via text message, or shut the system down automatically if desired."

"Sensors can also be installed at the end of the row to adjust run times and manage tail-water volume."

In June, *CaneConnection* visited the Airville farm of Denis Pozzebon, where he has 118 hectares with multiple pumps, interconnected pipelines and recycling. He sources his water from the Lower Burdekin Water channel, bores and recycle pits, with an underground pipeline allowing him to move water around the whole farm.

"I became involved in this project because I have always had an interest in automation of irrigation and saw that it would be the way of the future," Denis said. "The experience with this project has been a real eye opener and has been everything I have expected, probably more."

"It starts with an improvement to social life by being able to spend more time with family and to be able to travel away and not worry about irrigating this section of the farm. And it has also included savings to water and energy."

The installation cost for Denis was \$60,000 (about \$2210 per hectare) to install (see table of approximate system costs). Denis points out that only part of his farm has been automated and expects that the average cost to decrease as more area is automated.

"It is an investment in the long term that has to be looked at over five to 10 years. It may not stack up in the short term, say two years, but with energy prices skyrocketing every year and water prices going up, I see this as an investment in the future," he said.

The energy and water savings have come with bringing greater precision to the timing of irrigation shifts, which had been on 12 hours before the automation, but Denis said could at times be one or two hours less, as shown precisely by the end of row sensors now installed in these parts of his farm. He said that this had resulted in an estimated 5-10 percent reduction in run-off, delivering water and energy savings.

So far, he has kept a very close eye on things with either his smart phone, tablet or his home computer, where he has the ability to control the valves and pumps to change the irrigation. Moving forward, though, to the 2017 season he said this would now be fully automated.

"This coming 2017 season, when we go to our peak irrigation period in December, I have full confidence I can go away for a full week to New Zealand for a family holiday with no problem that the system is fully automated and reliable. I will still be able to monitor things from over there."

He said there were learning curves, such as determining the volume of water to be measured by the end-of-field sensors to ensure all the rows had cut through.

There had also been early issues with ensuring efficient use of the equipment and avoiding overflows from cylinders if things went wrong. These have now been resolved and he has full confidence in the system.

At Denis's farm, he started with 27ha but he has already set himself the goal of expanding. Dr Gillies said that the system design, equipment required and area per valve is different for each farm, and this affects the cost. For the project sites, the total cost per hectare ranges from \$600/ha at the Upper Haughton site to \$2200/ha at Airville.

"The equipment that has been installed on the project farms is designed to be modular," Dr Gillies said. "That is, different areas can be automated as time and funds permit. It is not necessary to automate the whole farm at one time."

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Above: Denis Pozzebon checks over the automation system and the wealth of information it puts at his fingertips in his home office.

Keep an eye out for coming SRA email newsletters to see a short video of Denis explaining the project on his farm. In the Spring edition of *CaneConnection*, we talk to growers Aaron Linton and Russell Jordan about their observations and involvement in the project.

System costs (approximate)	
Area automated	27 hectares
Total cost	\$59,700
Cost per hectare	\$2,211
Base station, computer & software	\$7,700
Pump controller & installation	\$3,500
Pressure transducer	\$800
Water meter (not required)	N/A
Actuator control radios x 5	\$15,000
Actuators x 8	\$4,000
Actuator brackets & fitting x 8	\$3,200
End of field radios x 5	\$15,000
Advance sensors x 6	\$3,000
Advance sensor installation	\$2,500
System commissioning (costs cover installation of base station and field radios and checking that all are working correctly)	\$5,000

Using introgression to put new genes into sugarcane varieties

Research is underway looking at the wild relatives of sugarcane to bring in the good traits from these species and see them drive productivity and profitability outcomes for sugarcane growers and millers.

It's that time of year when State of Origin is in full swing, and everyone in Queensland gets patriotic about our dominance over the last decade.

That success has since 2006 has come about because of a team with a winning combination of players.

But, aside from a few key players, the blokes who ran onto Suncorp Stadium in 2006 are a different combination to that running out this year.

To keep winning, Mal Meninga and Kevin Walters have brought in new blood when needed, which is what great footy teams do.

Breeders are always trying to put together the best combination of genes in new varieties for all crops. They must bring in "fresh blood" (new genes) to develop new, improved varieties. In plant breeding, genetically diverse (e.g. foreign clones) and wild species are the source of new genes.

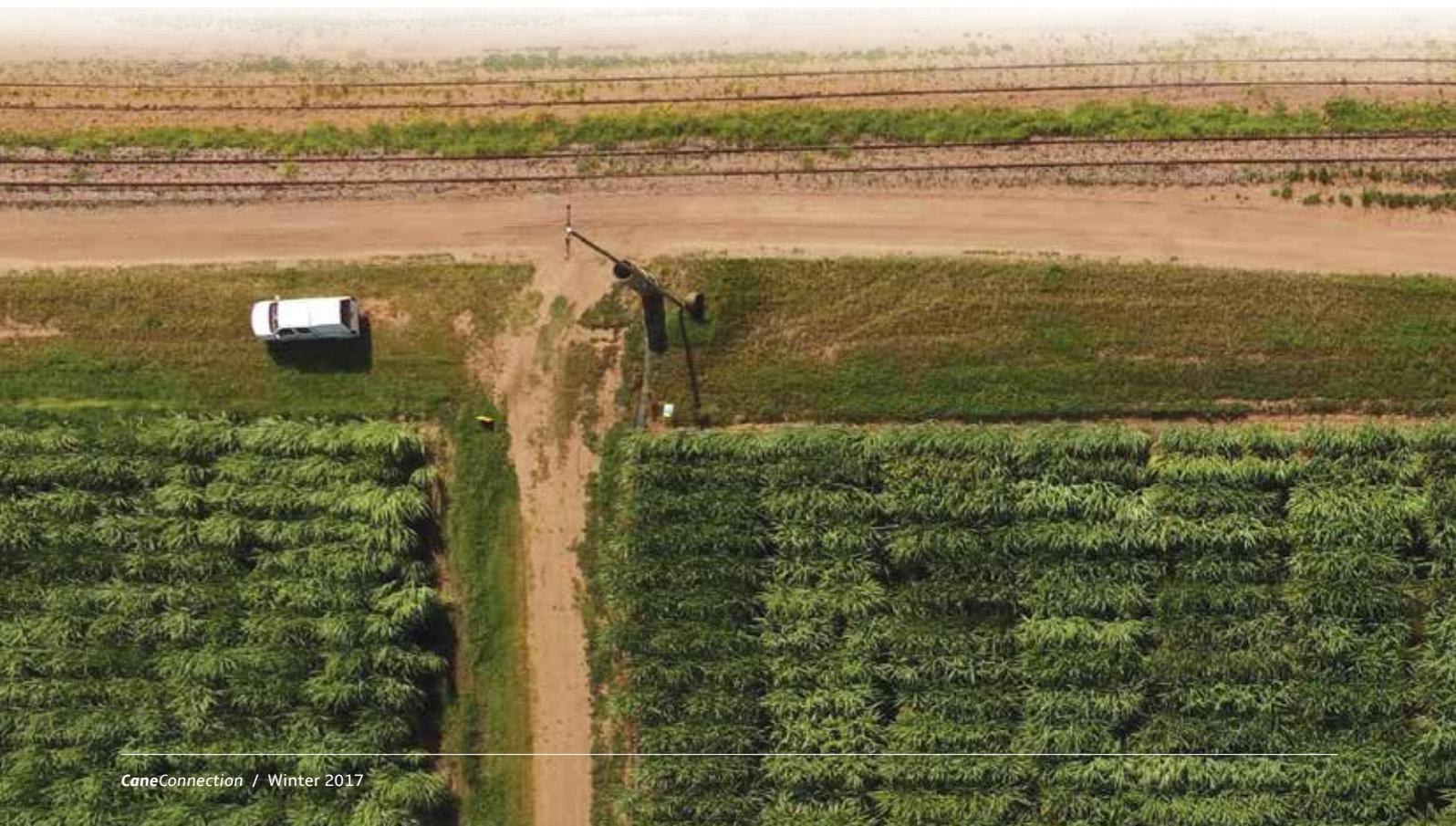
But research is underway to continue to push the envelope of what can be achieved with new sugarcane varieties, by looking at the wild relatives of the sugarcane plant to bring the traits of these plants back to commercial varieties.

This process is called introgression and it is looking at wild relatives that have some traits that would be very valuable for sugarcane growers and millers.

For example, some of these wild relatives have high resistance to nematodes, near immunity to *Pachymetra*, and they can grow in harsh conditions. However, they have very low sugar and fertile hybrids are rare in some species.

Along with a range of other projects that are continuing to improve sugarcane plant breeding, the research is planning to use these wild relatives of sugarcane to help lift the salary cap for sugarcane varieties and help the industry field better teams.

One of these projects is aiming to identify the chromosomes within one wild species (called *Erianthus arundinaceus*) that has traits that would be desirable in sugarcane varieties.



Project details

Key Focus Area

**Optimally adapted varieties,
plant breeding and release**

Project name

Developing cytogenetic and molecular tools to improve selection for soil-borne pathogen resistance in wild hybrids

Project number

2013/358

Project end date

Concluded

If these chromosomes can be identified in the lab, then it will be easier to identify those traits in potential new varieties. This has been the subject of a research project led by Dr Nathalie Piperidis with SRA in Mackay.

“This will be a tool for the breeders to assist in creating new varieties. The tool could be used to identify regions of the

chromosomes from *Erianthus* hybrids, and in the longer term we will be able to associate those chromosomes to disease resistance or other traits in new varieties,” she said.

In other words, the aim is to work out the best “position” or combinations of these chromosomes in the team. This information is useful and important because of the complexity of the sugarcane genome, and the fact that the genome has not been sequenced as it has for many other field crops.

Nathalie is now leading a new project (2016/039) that is also working on bringing in the resistance – or near immunity – to Pachymetra from *Erianthus* into future sugarcane varieties developed by SRA.

It is already understood that wild relatives including some types of *Erianthus* in Indonesia are immune to Pachymetra.

“This work was initiated about 20 years ago to introduce these traits, but it did not work at the time because the first generation hybrids that were created from these Indonesian *Erianthus* were sterile,” she explained. “Today, though, we have a new strategy.”

“For the last 10 years we have been studying *Erianthus* hybrids that were made in China, so now we are looking at crossing the immune *Erianthus* from Indonesia with the fertile *Erianthus*. If we can capture that immunity to Pachymetra and transfer it to our sugarcane varieties, that’s the target we are chasing.”

We are not yet at a point where SRA can create a new variety that would be as good as fielding 13 players of Jonathon Thurston’s calibre, but this new research, along with a number of other approaches to modernise the breeding program, is continuing to find ways to improve new sugarcane varieties.

SRA thanks the Queensland Government (DAF) for the funding contribution towards this research activity (project 2013/358).

For more information on varieties, the Varieties and Plant Breeding Update is provided free to SRA members with each edition of *CaneConnection*, and regional Variety Guides are provided in spring each year.

For more information

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Dr Geoff Kent, QUT, conducting trials at the Isis mill in October 2016.

Milling trials assess soft sugarcane varieties

When a new variety is approved for release for a region within the Australian sugarcane industry, a range of factors are considered to assess how it will perform for sugarcane growers and millers.

An important characteristic that impacts how a variety is processed through the mill is its fibre – that is, where it sits on the spectrum between being a soft cane or a hard cane.

If a variety sits too far at either end of the spectrum, this causes issues for milling.

For example, some people in the industry may remember soft (or low fibre) varieties such as Q87 and Q103 and the stories of lights dimming in factories as these varieties were milled.

In recent years, new varieties with low fibre characteristics, SRA1[®], SRA4[®] and QC04-1411, were released or approved for release in several regions.

Due to concerns that these varieties are too soft in fibre to be milled, and that this would impact value chain profitability, a small research project

took place in 2016 to investigate this further and compare these varieties against standard varieties.

The project was led by Dr Geoff Kent at QUT, funded by Sugar Research Australia (SRA), and SRA Bundaberg-based plant breeder Roy Parfitt has been a major collaborator.

Recent varieties

According to the trials, SRA1[®] had a low fibre content of typically 10 percent and an impact resistance lower than normal. The other two varieties, SRA4[®] and QC04-1411 had relatively normal fibre content of about 14 percent. While their impact resistance was low, it was still within the normal range.

Shear strength is the other fibre quality parameter with a defined normal range. The shear strength of all three varieties was within the normal range, with SRA1[®]

having the lowest values. The final fibre quality parameter, short fibre content, does not have a defined normal range.

It is noted, however, that of the 35 results examined, the two highest values were for QC04-1411 and the next two highest values were for SRA1[®] (Q240[®] was the fifth highest and also had a shear strength lower than QC04-1411).

Milling issues

Dr Geoff Kent with QUT said that while the soft fibre varieties were able to be processed, there were some significant problems that were highlighted during his experiments.

This included mill feeding problems and stalling the elevator at one mill, and large quantities of froth overflowing the drains at another mill after about 15 minutes, which would have eventually led to the mill needing to stop operation.

There were also further issues such as steam pressure reduction in another mill, due to increases in bagasse moisture content.

“Not all factory boilers can withstand significant increases in bagasse moisture content,” Dr Kent said. “The experience at one mill processing SRA1^ϕ resulted in a rapid drop in steam pressure that only avoided a boiler shutdown because SRA1^ϕ was only processed for 15 minutes.”

In light of the research, Dr Kent said that the yield and CCS of such varieties needed to be considered in relation to their practicality and costs with processing and capital upgrades.

Some mills have suggested that improvements that would be required to process such varieties would run into many millions of dollars, which they could not afford.

Other regions at this stage are continuing with the release of SRA1^ϕ, as is the case in NSW, albeit watching the research closely.

“We have also found since starting this project, that some of this information hadn’t been making its way to SRA’s plant breeding program, so we have also identified the opportunity to improve that communication,” Dr Kent said.

The current process

The fibre quality of cane is also considered in relation to a range of other traits including yield, CCS, disease resistance, and ability to ratoon.

In the past, BSES and the Sugar Research Institute developed standard tests that measured a range of characteristics in relation to fibre, and use of these tests has continued at SRA. These particular new varieties were measured to be near the edge of the acceptable parameters, or just outside the parameters in the case of SRA1^ϕ.

The decision to release the varieties continues to sit with the regional committees. SRA is no longer promoting SRA1^ϕ, however the decision to release the variety remains with local regional variety committees.

Further research

A new project is proposed to begin on July 1 with the title *Reviewing and extending knowledge of fibre quality assessment and effects of cane varieties*, also led by Dr Kent with collaboration from Mr Parfitt.

The project will extend the work of the 2016 research by reviewing historical fibre quality measurements (FQM) and understanding the variability within varieties, the impact of different mill arrangements, and consider how FQM could guide variety development. It will also look at how to best present FQM information for selection of new varieties.

This could enhance the feedback for plant breeders on the effect of varieties on mill operation and performance. It will also review the “safe range” FQM.

For more information

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For more detail on recent changes to the variety approval process, see the story within the Varieties and Plant Breeding Update.



Left: SRA1^ϕ in the field.

Below: Frothing at a southern Queensland mill during one of the experiments.





Biomass samples are being used to assess yield results in relation to trialled N strategies.



Soil sampling at DSITI's trial sites is undertaken to 120cm requiring deep soil coring.

Collaborative research to maximise profit from nitrogen

Efficient use of nitrogen (N) opens doors to greater productivity, increased profit and reduced environmental impact, but what is the best way forward for particular farm systems?

This is the key focus of the national *More Profit from Nitrogen Program (MPfN)*, a four year partnership between Australia's major intensive users of nitrogenous fertilisers: cotton, dairy, sugar and horticulture, led by the Cotton and Research Development Corporation (CRDC).

Supported by \$5.8 million from the Australian Government's Department of Agriculture and Water Resources Rural R&D for Profit programme, MPfN is in its first year of delivering findings from 10 research projects.

MPfN has been designed to engage with producers, with over 31 trial sites established to undertake research, and demonstrate tested practices and host field days to encourage farmer input.

Program research is being undertaken under three focus areas for improving productivity and profitability through N use. These are:

- Greater knowledge and understanding of the interplay of soil, weather, climatic and farm management factors to optimise N formulation, rate and timing in relation to irrigation practices;

- Greater knowledge and understanding of the contribution (quantifying rate and timing) of N mineralisation to a crop or pasture's nitrogen budget; and
- Greater knowledge and understanding of how enhanced efficiency fertiliser (EEF) formulations can better match a crop or pasture's specific N requirements by developing new ones and optimising existing ones.

For cane growers, SRA has supported three projects under the MPfN Program.

1. The Queensland Government's Department of Agriculture and Fisheries (DAF) is investigating novel formulations and management techniques to optimise N application for cane crop requirements.

Using cutting edge plant accelerator studies, laboratory micro-dialysis, and rainfall simulation techniques, it is looking to develop new formulations to better match N release to crop uptake demands throughout seasons by controlling nitrogen transformations and solubility, and combating N "leakiness" to the environment via improved, more targeted N formulations.

Trial and demonstration sites will be established in the second and third years in the Herbert/ Wet Tropics and Burdekin catchments.

Dr Matt Redding (Project Research Leader) describes his team's objectives: "The key is to formulate products more suited to tropical conditions where high temperatures and intense rainfall tend to decrease the effectiveness of existing technologies. The set of requirements for nitrogen supply to sugar production are very specific, and we hope to tailor technologies to match those – without introducing chemical or micro-plastic residue issues."

2. Similarly, the Queensland Government's Department of Science, Information, Technology and Innovation (DSITI) project, *Smart Blending of enhanced efficiency fertilisers (EEF) to maximise sugar cane profitability* is concentrating on fertiliser formulations to better match N release to the N uptake dynamics of cane.

This research is investigating optimal blending ratios of existing polymer coated urea (PCU) with conventional urea under various soil and seasonal conditions. While the use of EEFs is currently seen as too expensive by many growers, the project will evaluate the production and profitability gains to be made from blending rather than single product application.

DSITI's Dr Weijin Wang (Project Research Leader) said: "The need to select the most suitable products and optimal blending ratios for a specific farm will be addressed through the development of a decision support tool by the project. Having findings from research sites in Innisfail, Tully, Ingham, Mackay and Bundaberg, and contributions from the other sugar projects involved in MPfN, we are gaining a better understanding of the common and differing soil and weather factors across regions which need to be reflected in the decision making. We are analysing the N dynamics within the plant root zone down to a depth of 1.2 metres and in plant biomass throughout various stages of plant growth."

3. Finally, the NSW's Department of Primary Industry is concentrating its work in the subtropical cane growing regions of the State. It seeks to reduce the cost of more expensive EEF applications by improving the ease by which farmers can make more informed precision decisions.

"If we can better determine when and how much N is supplied from organic matter through mineralisation, throughout the soil profile, we can better match current application rates of PCUs so that N is available to the plant in the right form at the right times, making it more cost effective," said project leader, Dr Lukas Van Zweiten.

Soil sampling undertaken across 30 sites is informing the development of new technologies to rapidly predict soil mineralisation and ¹⁵N stable isotope technology is being used on three core research sites, located on commercial farms in the Tweed, Richmond and Clarence catchments, to assess contributions of fertiliser N, versus soil present N, to crop uptake. Research outcomes will include development of a simple model for farmers that can predict the economic returns of using an EEF product based upon current pricing.

The results of all three MPfN research projects will be incorporated into the industry SIX EASY STEPS guidelines and will contribute to the development of a decision support model.

"With research and demonstration underway in all cane growing regions, farmers are encouraged to become involved in the project, as practical relevance to farm management and assessing accurate profitability gains for the farm business are paramount to the ongoing legacy of the More Profit from Nitrogen Program," said Marguerite White, Science Coordinator for the program.

More can be found on the sugar projects by visiting the new SRA website www.sugarresearch.com.au/research-portfolio under Key Focus Area 2 or the broader MPfN Program at www.crdc.com.au/more-profit-nitrogen.



Left: The DISITI team came together recently in Brisbane to collaborate on research findings to date and plan for the year ahead.

Back: Felice Driver (SRA), Stephen Ginns (QDAF), Charlie Walker (Incitec Pivot), Marijke Heenan (DSITI), Steven Reeves (DSITI), Robert Slugget (Farmacist).

Front: Lawrence Di Bella (HCPSSL), Charissa Rixon (TRAP Services), Kylie Bezzina (Farmacist), Fang You (DSITI/ University of Queensland).



SASRI Extension Specialist, William Gillespie, and Brad Pfeffer talk with growers in the Midlands area.

Lessons from South African approach to boosting farm productivity

The South African sugarcane industry has a diverse mix of farmers from small holders to large scale commercial growers with the largest growing around 4000 hectares. SRA Executive Manager Communications, Brad Pfeffer, travelled to South Africa to talk about their approach to communication and extension.

The Australian sugar industry has been given an insight into the successful communication and technology transfer techniques being used to expand production and increase productivity in South Africa.

SRA's Brad Pfeffer made the trip in April 2017 to learn more about communication tools used by the South African Sugarcane Research Institute (SASRI).

There are about 1400 commercial growers in South Africa, and 22,500 small scale farmers, about half of whom deliver to a mill each year from areas ranging from 0.5 hectare to 4ha.

Brad said the visit presented insights into how they communicated with these small-scale growers, as SASRI and their partners have developed novel techniques suited to these growers' needs.

For example, this diverse group includes people who do not speak English but speak Zulu, and growers who are illiterate, and also large groups (trusts) of people who own land.

This has resulted in the deployment of novel technology transfer methods and segmentation strategies.

"SRA communicates with our growers through major channels such as our magazines, our newsletter, field days and events, and also with the help of people like ABC Rural," Brad said. "That approach is similar in South Africa, but they also use other tools that are delivering substantial productivity gains for their growers and millers."

William Gillespie is an Extension Specialist with SASRI who has helped deliver improvements to the Midlands

over the last decade via work with local extension officers working with small scale farmers.

Improving productivity is not easy. "How do you explain volume and area to someone who does not know what a hectare is?" Mr Gillespie said.

"How do you help them calculate fertiliser rates? These were our challenges. So we have also found ways to help transfer technology to people who have not been to school and who speak a non-technical local language, and that means a lot of visual knowledge transfer and demonstration plots.

"We are focussed on building them up, where they can create beautiful homes and gardens, as we know that growers must be happy and making money."

Their extension approach is focussed foremost on the needs of the grower: what does she want? (The farmers are mostly women).

Through a coordinated extension program, they have greatly increased yields for these farmers over the last 10 years to match the commercial farms. This has resulted in tremendous economic development in the local community through sugarcane growing, and greatly increased mill viability.

Over the last 10 years, the number of growers in Mr Gillespie's extension area has increased from 264 growers to 383, with yields going from 51t/ha in 2004 to 78t/ha in 2014. In 2016, yields were 62t/ha due to the drought. Crops grown in this elevated region of the Midlands are generally two-year old.

Small holder farmers receive varieties that have been proven by commercial growers and they usually choose between two varieties from a demonstration plot. While commercial growers will have a mix of about five varieties, the small growers will only have one variety, so it is crucial that the variety decision is correct.

They use artists at shed or tree meetings to visually draw their extension messages and they use visual tools like mock rand (currency) notes to demonstrate profit and value.

For example, to demonstrate the lost value from burning cane in their area, they burnt the mock currency to demonstrate lost profits.

SASRI Knowledge Manager, Michelle Binedell said that belief in the research conditions was crucial for facilitating adoption – something in complete parallel with Australia.

"The growers want to see things in commercial conditions," Ms Binedell said. "They also want to understand things in their own way of communicating, and respond well when things are working for other farmers."

She said that SASRI was also working to better understand their audience and who the best person is to speak to regarding business decisions.

This is also the case at SRA, and Brad said that SRA was continuing to refine its approach with growers and millers to deliver better outcomes for them.

"SRA has eight miller members and about 2400 grower members," he said. "We know that some growers want to read the hard copy of the magazine, some read their emails on the tractor and use Facebook for farming news, and some will always tune in at midday for the Country Hour.

"There are similar barriers for adoption of new technology. The SRA grower survey in 2016 identified a range of barriers to adoption including happiness with current practices (53 percent), low availability of financial resources (29 percent), and other factors like small farm size or not being able to see the benefit.

"SRA is continuing to work on a number of innovative approaches to deliver information in a range of ways that suits diverse learning styles and personality types, by working in collaboration with prod services, millers, and the private sector.

"Talking with SASRI about some of these issues is helpful in generating ideas and innovation for SRA.

"I extend my utmost thanks to SASRI staff for sharing their observations and discussing these important areas of common interest."

For more information

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Brad Pfeffer travelled to South Africa as part of an SRA Travel and Learning Award. For more information on these awards, subscribe to the SRA eNewsletter via www.sugarresearch.com.au.



Above (clockwise from top left): A farm house and garden on a small farm in the Midlands – sugarcane has stimulated economic activity in the region and allowed people to improve their living conditions.

The farming landscape in the Midlands area.

Most of the sugarcane is hand-cut in South Africa.

Plenty of parallels in farm challenges with SA counterparts

Australian farmers face many similar challenges to those faced in the South African sugarcane industry. By Brad Pfeffer



It's no secret that Australian farmers operate in some of the toughest conditions in the world. We have a harsh and variable climate, we have high operating costs and we aren't subsidised, leaving us at the mercy of fluctuating commodity and currency markets.

In recent years, there has unfortunately been a multitude of these challenges confronting the Australian sugarcane industry.

But we are not alone. During a recent visit to South Africa, I gained a better understanding of the similar challenges facing our counterparts (see story page 22-23).

Their industry shares many similarities with Australia. Their farmers deal with familiar challenges including drought, frost, pests, diseases and weeds.

There are also differences. More than 95 percent of the cane is hand-cut, resulting in improved soil health through reduced compaction, greater ratoon length, and an ability to farm on steep terrain. Labour is considerably cheaper, which is a driving force behind the hand-cutting.

However, they have additional political and economic uncertainty, impacting all agricultural sectors.

According to the conference I attended, South African agriculture is constrained by debt and restricted by a low appetite for foreign investment due to uncertain

economic and land security issues. There are currently government proposals to limit the size of land holdings to no more than 12,000 ha (a small area in SA) and also limit foreign ownership, which farm leaders said was a risk to growth and development. Net farm income is rising at a slower rate than debt is rising. The farm interest rate ranges from between 9 percent to 19 percent, while inflation is 6 percent.

Like Australia, South African farmers are not subsidised.

The South Africa cane industry has a broad range of scale – ranging from less than a hectare for small scale farmers, right up to their largest individual farmer, Charl Senekal, who has about 4000ha.

Mr Senekal said the challenges in South Africa were causing him to look to other countries to expand.

He added that his entire continent had an important role to play in feeding the world, particularly as the population is forecast to increase from 1 billion to 2 billion people on the African continent by 2050.

He hosts numerous farm tours to his properties, as many neighbouring countries do not have extension networks and services.

"I want to build an Africa that is successful and believe that the larger commercial farmer must get involved in

uplifting the smaller farmers," Mr Senekal said.

Other farm leaders are also trying to lift the continent out of poverty through adoption of improved practices and more research and development.

Theo de Jager, President of the SA Confederation of Agricultural Unions, said that underinvestment in R&D was starting to take a toll on production.

He also said, though, that Africa had already proven it could rapidly adopt new technology by bypassing landline phones and going straight to smart phones, with a smart phone now in the pocket of almost every farmer.

He wants to parallel this practice change in agriculture.

"Can we do the same with modern tractors and GPS guidance, which cost more than our land? Maybe we can, if we group 500 smaller farmers together. The key is how you mobilise farmers, as together we can do more," Mr de Jager said.

While they have their own unique challenges, so does Australia. But at the end of the day, there are far more commonalities than differences.

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Capability development, attraction and retention

A brief look at recent activity within SRA's capability, development, attraction and retention program.



'How the soil environment affects root feeding scarabs with particular emphasis on the canegrub'

Adam Frew – Sugar industry postgraduate scholarship

Recently, plant researcher Adam Frew completed his PhD thesis at the Hawkesbury Institute for the Environment at Western Sydney University with support through SRA's Capability development retention and attraction program. Adam's thesis on the interactions between the soil environment and root feeding scarabs, such as the canegrub, provides the industry with a number of applied and fundamental outputs that are directly applicable to management of canegrubs and lay important foundations for further work and pest management strategies. Adam investigated the impacts of silicon (Si) and arbuscular mycorrhizal (AM) fungi on sugarcane and the canegrub and showed a number of interesting results including that the application of both improved sugarcane performance (in pot trials) while Si also significantly reduced canegrub performance.

Adam (pictured above) presented his work at the 2017 annual conference of the Australian Society of Sugarcane Technologists (ASSCT) and has also published a number of peer-reviewed academic papers associated with his findings. Congratulations Adam!

'Delivery technology of bio-fertiliser for next-generation sugarcane cropping without pollution footprint'

Dr Chanyarat Paungfoo-Lonhienne – Early-mid career research award

University of Queensland research fellow, Dr Chanyarat Paungfoo-Lonhienne, recently completed a SRA early-mid career research award. These awards fund small projects designed to give emerging researchers the opportunity to expand their skills and/or build highly valuable collaborations in pursuit of an innovative initiative.

Chanyarat's project investigated an alternative system for plant nutrition based on Plant Growth Promoting Rhizobacteria (PGPR) in effort to explore options of increasing sugarcane biomass yield without standard inorganic fertilisers. Through small-scale greenhouse trials in association with a number of industry partners (Sustainable Organic Solutions, Wilmar BioEthanol (Ag services), Bundaberg Sugar and the Department of Agriculture, Fisheries and Forestry) she demonstrated the potential efficacy of a bio-fertiliser inoculum formulation that in combination with milling by-products and some inorganic fertiliser may deliver promising biomass yields. Chanyarat's results are vital early steps in the examination of advanced bio-fertiliser technology in the Australian sugar industry. Chanyarat is preparing a paper for publication based on her findings.



The Southern Region Group has identified improving harvest efficiency as a priority for improving production.

Southern Region Group working together to drive productivity

The Southern Region Group was formed to bring together stakeholders to drive productivity improvements, and has so far focussed on the key issues of optimising harvesting efficiency and improving production on marginal soils. By James Ogden-Brown

The Southern Region Group was formed three years ago, with stakeholders from across all three mill areas in the region: Bundaberg, Isis and Maryborough.

It consists of SRA delegates, growers, millers, productivity services, harvesting contractors, DAF and SRA with the primary aim of addressing agronomic issues that are affecting production in the region.

The group's primary focus is to increase production in a profitable and sustainable way. The two issues that the group first identified were harvest losses and increasing production on marginal soils.

Work conducted by SRA over a number of years showed that losses from mechanical harvesting were taking place.

However, these losses needed to be identified commercially so that we can see what is actually happening in the field.

Adoption Officer Phil Patane from SRA has been very active across industry as well as in the Southern Region working closely with harvest contractors, millers, growers and researchers demonstrating that commercial losses exist.

The work is showing that losses can be very high if harvest set-up is not correct, if excessive speeds are used in harvesting a crop, and if presentation in the form of hill profile is not correct.

These losses can be as high as 20 percent, and in most cases they sit around 5 to 15 percent.

So, knowing that it is very difficult to recover losses below 4 percent, this would indicate recoverable losses are around 10 percent, on average.

Let's put this another way: the Southern Region produces around 4 million tonnes of cane and we are leaving 400,000 tonnes behind at \$47/tonne = \$18.8 million of crop thrown away.

This is the value we are trying to recapture.

Marginal soils is where expansion in the cane industry for the region will take place. There is a lot of pressure from tree and small crops for the better class soils. I am referring to grey forest type soils (sodic duplex).

What are the issues with these marginal soils?

They have a high silt content and low organic matter, which creates crusting issues, they are sodic by nature with low cation exchange capacity which can lock up nutrients, they have low pH at depth and high toxic levels of aluminium and other elements where the plants roots will not grow. In other words, they are poor soils (I have heard other terms used).

The group had several discussions with SRA researchers Barry Salter and John Panitz and DAF researcher Neil Halpin based on the work that has been done in Maryborough by the Cronau brothers and Andrew Dougall from MSF Sugar. By applying compost at depth, the Cronau Brothers found that there was a yield response of 10 percent.

SRA funded a joint project with DAF to conduct research into this work to see if the results are consistent and if the economics stake up. Trial sites have been set up in the Central as well as the Southern region.

As the group is an active group Terry Cunningham (who has just retired) from Bundaberg Sugar also set up an observation trial by applying mill mud ash, cow manure and chicken manure at depth. Bundaberg Sugar noted that 20t/ha of cow manure as well as the mill mud/ash increased their yields by 20TCH.

What else has the group identified as important issues?

A concern for those growers that it affects is soldier fly as it has a significant effect on ratoonability of crop where the insect is found.

There are a number of questions that need to be addressed. What does the insect do that affects the crop ratooning? How do we effectively manage the insect? Are there varieties that are tolerant to the effects of soldier fly?

SRA Biosecurity Leader, Andrew Ward, and his team at SRA are assessing methods of controlling the pest including new insecticide chemistry. The regional productivity services are assessing varieties along with SRA plant breeding to see if there is varietal tolerance.

The SRA Board has also recently approved new investment in research to understand the fundamentals of the impacts of soldier fly.

Another concern is that in the market place there is only one effective insecticide to control cane grubs and that is imidacloprid (suSCon Maxi, Confidor Guard, etc). If we continue to use just this one group, we will end up with resistance to it. Again, Andrew Ward and his team are conducting trials to assess new groups of insecticides and control measures for the future.

What's next?

This question was put to the group at the last meeting and the decision was to focus on farming systems and all aspects of it, which include:

- Matching row spacing to the heavy gear
- Soil health and amelioration
- Legume rotation
- Reduced tillage
- Efficient and effective irrigation systems

Yes, it will be a holistic approach by including all the above. Our end objective is increase production in a profitable and sustainable way.

It is not a closed group and anyone in the Southern Region who would like to attend the meeting is welcome.

For more information

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Below left: Mill mud being placed at depth, as part of research into improving production from marginal soils.

Below right: Roots growing into the mill mud zone.



Total Research Investment

Sugar Research Australia aims to invest in projects that will deliver real benefits on key issues for its investors.

Project Title	Project Number	Principal R&D Provider	Chief Investigator	End Date
Key Focus Area 1 (Optimally-adapted varieties, plant breeding and release)				
Improving the accuracy of selection in sugarcane breeding trials through accounting for site variability	2012/351	SRA	Xianming Wei	02/06/2018
Applying the genome sequence for variety improvement: validation and implementation	2013/030	CSIRO	Karen Aitken	01/08/2018
Phase 1: advancing yield, disease resistance and ratooning by exploiting new sources of genetic variability from wild relatives of sugarcane	2014/053	SRA	George Piperidis	30/06/2017
Field assessment and further development of high-sucrose sugarcane	2014/069	UQ	Luguang Wu	31/10/2017
Sugarcane root systems for increased productivity; development and application of a root health assay	2015/002	CSIRO	Anne Rae	01/07/2018
Impact of stool architecture on ratooning ability	2015/004	CSIRO	Anne Rae	01/08/2018
Leaf sucrose: the link to diseases such as YCS and enhancement of sugarcane productivity	2015/016	SRA	Gerard Scalia	30/06/2018
Generation of a high throughput SNP marker chip for introgression of resistance genes from wild germplasm into sugarcane, targeting smut, pachymetra and nematodes, to generate more resistant varieties faster	2015/025	CSIRO	Karen Aitken	01/08/2018
Selecting high value chromosomes from wild introgression material to deliver more resistant varieties faster	2015/026	CSIRO	Karen Aitken	01/08/2018
The Sugarcane Hub, development of a interface between the sugarcane genome sequence and sugarcane genetic data to allow researchers to identify genes that underpin important agronomic traits	2015/027	CSIRO	Karen Aitken	01/08/2017
Improving early stage selection of SRA breeding program by indirect selection of plant vigour	2016/028	SRA	Jaya Basnayake	01/07/2019
Optimising productivity, variety recommendations and mill operations through analysis of mill data	2016/032	SRA	Jo Stringer	01/02/2021
New approaches to identify and integrate Pachymetra resistance genes from Erianthus into SRA breeding program	2016/039	SRA	Nathalie Piperidis	31/12/2019
Licence to Farm: Nitrogen use efficient varieties to meet the future environmental targets	2016/044	SRA	Prakash Lakshmanan	01/07/2019
Reviewing and extending knowledge of fibre quality assessment and effects of cane varieties	2017/001	QUT	Geoff Kent	01/09/2018
Implementing and validating genomic selection in SRA breeding programs to accelerate improvements in yield, commercial cane sugar, and other key traits	2017/002	UQ	Ben Hayes	01/07/2022
Genetic control and genomic selection for important traits in sugarcane (funding through: Australia-India Strategic Research Fund)	2016803	SRA, Sugarcane Breeding Institute, Coimbatore	Prakash Lakshmanan	01/05/2019

Project Title	Project Number	Principal R&D Provider	Chief Investigator	End Date
Key Focus Area 2 (Soil health and nutrient management)				
Strategies to manage soil-borne fungi and mitigate sugarcane yield decline	2013/101	CSIRO	Paul Harvey	01/06/2018
Regenerating a soil food web capable of improving soil health and reducing losses from soil-borne pests and pathogens of sugarcane	2014/004	Biological Crop Protection	Graham Stirling	15/07/2017
Role of controlled release fertiliser in Australian sugarcane systems	2014/011	CSIRO	Kirsten Verburg	15/07/2017
Boosting N-use efficiency in sugarcane through temporal and spatial management options	2014/045	USQ	Bernard Schroeder	01/10/2017
Improving NUE for sugarcane crops with constrained yield potential	2015/065	SRA	Danielle Skocaj	30/06/2019
Decision support for informed nitrogen management: soil nitrogen mineralisation test and the assessment of soil crop N contribution to crop N requirements	2015/069	DSITI	Phillip Moody	30/06/2018
Spatially explicit estimation of Achievable Yield Potential – an improved basis for fertiliser management	2015/070	CSIRO	Rob Bramley	01/07/2017
Improving management practices of legume crop residues to maximise economic and environmental benefits	2015/074	DSITI	Weijin Wang	30/06/2018
How much N will that crop need? Incorporating climate forecasting into nitrogen management in the Wet Tropics	2015/075	JCU	Yvette Everingham	30/06/2019
Waste to revenue: Novel Fertilisers and feeds (Rural R&D for Profit)	2015/905	APL	Janine Price	30/06/2018
More profit from nitrogen	2015/907	CRDC	Felice Driver	30/06/2020
Master classes in soil health and soil biology for the sugar industry	2016/025	SRA	Andrea Evers	30/07/2018
Molecular assay of major soil-borne pathogens for better exploitation of commercial varieties	2016/047	SRA	Rob Magarey	01/07/2018
SIX EASY STEPS – continuing perspectives in time and space	2017/004	USQ	Bernard Schroeder	31/12/2021
Measuring soil health, setting benchmarks and driving practice change in the sugar industry	2017/005	SRA	Dave Olsen	30/06/2022
Unravelling the impact of climate and harvest time on nitrogen fertiliser requirements	2017/009	SRA	Danielle Skocaj	01/02/2022
Key Focus Area 3 (Pest, disease and weed management)				
Solving yellow canopy syndrome	2014/049	SRA	Dave Olsen	30/06/2018
Developing an alternative herbicide management strategy to replace PSII herbicides in the Wet Tropics area	2014/050	SRA	Emilie Fillols	01/01/2018
A Novel Polyphasic Framework to resolve yellow canopy syndrome Paradox	2014/082	UWS	Brajesh Singh	30/06/2018
Validation of LSB-PCR diagnostic for ratoon stunting disease and characterisation of non-Lxx strains of Leifsonia associated with sugarcane	2014/086	USQ	Anthony Young	01/09/2017
Delivery of remote sensing technology to combat canegrubs in Queensland cane fields	2015/038	SRA	Andrew Ward	01/01/2018
Securing Australia from PNG biosecurity threats	2015/046	SRA	Rob Magarey	02/08/2017
Identifying new-generation insecticides for canegrub control as contingency for loss of amenity with the existing product	2016/003	SRA	Andrew Ward	01/01/2020
You can't manage what you can't identify – Managing threat from exotic moth borers through accurate identification	2016/041	SRA	Andrew Ward	01/07/2018
Molecular assay of major soil-borne pathogens for better exploitation of commercial varieties	2016/047	SRA	Rob Magarey	01/07/2018
Investigation of biotic causes of yellow canopy syndrome	2016/064	UQ	Andrew Geering	01/12/2019
Keeping chemicals in their place – in the field	2017/008	SRA	Emilie Fillols	30/06/2020
Delivering solutions for chlorotic streak disease	2017/010	SRA	Kathy Braithwaite	30/06/2020
Integrated disease management of sugarcane streak mosaic in Indonesia (ACIAR-funded project)	HORT/2012/083	SRA	Rob Magarey	31/12/2018

Project Title	Project Number	Principal R&D Provider	Chief Investigator	End Date
Key Focus Area 4 (Farming systems and production management)				
Product and profit – delivering precision to users of precision agriculture in the Australian sugar industry – yield monitoring	2014/028	USQ	Troy Jensen	01/06/2017
A non-pneumatic cane cleaning system with no cane loss	2014/035	QUT	Floren Plaza	20/12/2017
Too wet to forget – reducing the impact of excessive rainfall on productivity	2014/046	SRA	Barry Salter	01/07/2017
Increased harvest recovery: reducing sugar loss and stool damage	2014/048	SRA	Joseph Bonassi	01/05/2019
Modernisation of furrow irrigation in the sugar industry	2014/079	USQ	Malcom Gillies	01/07/2017
Demonstration of GPS-guided laser levelling and its associated productivity response	2014/094	Mulgrave Central Mill	Matt Hession	01/02/2018
Assessment of new management strategies for marginal soils	2015/007	SRA	Barry Salter	31/12/2019
Bio-prospecting for beneficial endophytes of sugarcane	2015/051	AgResearch	Stuart Card	01/02/2019
Cropping solutions for the sugarcane farming systems of the Burdekin (extension of 2011/922)	2015/077	SRA	Barry Salter	Complete
Sensors for improved harvesting feedback: a feasibility study	2015/080	SRA	Eloise Keefe	Complete
Opening the data highway: Access to remotely sensed spatial and temporal data for the Australia sugar industry to assist with yield forecasting and nitrogen management	2016/062	UNE	Andrew Robson	01/01/2020
Understanding interactions between basecutters and other forward – feed components with the cane stalk, and determining practical strategies to minimise damage as harvester speed increases (Rural R&D for Profit)	2016/952	Norris ECT	Stuart Norris	01/04/2020
Commercial scale economic evaluation of post-harvest cane cleaning to maximise the returns to the supply chain (Rural R&D for Profit)	2016/953	QDAF	Stephen Ginns	30/06/2019
Southern Sugar Solutions	2017/012	DAFQ	Neil Halpin	31/12/2020
Seeing is believing: managing soil variability, improving crop yield and minimising off-site impacts in cane using digital soil mapping	2017/014	UNSW	John Triantafilis	30/06/2020
Cane Farmer Trials of Enhanced Efficiency Fertiliser in the Catchments of the Great Barrier Reef (Funding provider: Commonwealth Department of Environment and Energy (Reef Trust 4))	2016807	CANEGROWERS and SRA	Barry Salter	01/05/2021
Key Focus Area 5 (Milling efficiency and technology)				
Reducing the maintenance costs of mill rolls	2013/060	QUT	Geoff Kent	01/08/2019
Real time harvest and transport system	2014/037	QUT	Geoff Kent	01/05/2018
Improving mill efficiency through rapid analysis methodologies	2014/051	SRA	Eloise Keefe	01/09/2017
Managing aspects of raw sugar quality in the Australian sugar industry	2014/052	SRA	Eloise Keefe	01/08/2017
Investigation into modifying pan boiling techniques to improve sugar quality	2015/013	QUT	David Moller	30/06/2018
Increasing capacity to undertake cane preparation research through modelling and experimentation	2015/018	QUT	Geoff Kent	01/05/2018
Develop a blueprint for the introduction of new processing technologies for Australian factories	2015/043	QUT	Ross Broadfoot	01/09/2017
Online analysis systems to measure the available nutrients in mill mud	2016/019	SRA	Eloise Keefe	01/03/2020
Reducing boiler maintenance costs and deferring capital expenditure through improved technology	2016/020	QUT	Floren Plaza	01/07/2019
Evaporator liquor brix sensor	2017/003	Wilmar	Jay Venning	31/12/2018
Managing aspects of raw sugar quality in the Australian sugar industry – Part II	2017/006	Griffith University	Chris Davis	30/06/2019
Investigations to mitigate the effects of sucrose degradation and acid formation in factory evaporators on sugar recovery and quality, corrosion and effluent loadings	2017/007	QUT	Darryn Rackemann	01/12/2020

Project Title	Project Number	Principal R&D Provider	Chief Investigator	End Date
Key Focus Area 6 (Product diversification and value addition)				
Process for making bagasse paper pulp	2012/053	QUT	Thomas Rainey	01/05/2018
A profitable future for Australian agriculture: biorefineries for higher-value animal feeds, chemicals and fuels (Rural R&D for Profit)	2015/902	QUT	Ian O'Hara	01/03/2019
Key Focus Area 7 (Knowledge and technology transfer and adoption)				
Increasing farm business intelligence within the sugar industry	2014/001	AgProfit	Matthew Bryant	01/09/2017
Measuring the profitability and environmental implications when growers transition to Best Management Practice (as defined by the new Canegrowers Smartcane BMP)	2014/015	DAF	Mark Poggio	02/05/2018
Improving industry returns through harvest best practice	2014/091	Sunshine Sugar	Ian McBean	30/06/2017
Understanding the impact of harvester speed on subsequent ratoon performance in the Burdekin	2014/092	BPS	Robert Milla	30/06/2017
Sugar industry productivity and data recording spatial data hub for research and extension	2015/045	Agtrix	Robert Crossley	28/02/2018
Stimulating private sector extension in Australian agriculture to increase returns from R&D (Rural R&D for Profit)	2015/906	Dairy Australia	Neil Webster	30/06/2019
Protecting our chemicals for the future through accelerated adoption of best management practice	2016/002	SRA	Belinda Billing	01/08/2019
Master classes in soil health/soil biology for the sugar industry	2016/025	SRA	Andrea Evers	30/06/2018
Development of an intelligent tool to allow real time evaluation of harvesting practices as part of a framework for improved harvester payment systems (Rural R&D for Profit)	2016/951	Norris ECT	Chris Norris	30/06/2019
Adoption of practices to mitigate harvest losses (Rural R&D for Profit)	2016/955	SRA	Phil Patane	30/06/2019
Productivity improvements through energy innovation in the Australian sugar industry	2017/011	Ag Analytics	Jon Welsh	30/06/2020
Key Focus Area 8 (Capability development, attraction and retention)				
Enhancing sugarcane for decreased water content and increased sugar content at harvest	2011/072	QUT	Anthony Brinnin Mark Kinkema	01/05/2018
Production of furanics and chemicals from bagasse and molasses	2012/074	QUT	Joshua Howard William Doherty	01/06/2017
Investigating the utility of mill mud for soil health conditioning and nutrient use efficiency on sodic soils within the Burdekin	2013/077	USQ	John Bennett	01/06/2018
Effect of organic nutrients on sugarcane growth, microbial activity and greenhouse gas emissions	2013/078	UQ	Susanne Schmidt	01/06/2018
Sugarcane for water limited environments: characterization of a selected sugarcane germplasm for transpiration efficiency and high biomass production for the sugarcane growing regions in Australia	2014/102	UQ	Sijesh Natarajan Shu Fukai	30/06/2018
Investigation of genetic control of sugar accumulation within the sugarcane culm (stalk)	2014/107	UQ	Patrick Mason	01/06/2018
Soil nitrogen dynamics – a microdialysis approach to quantify nitrogen cycling in sugarcane soils	2014/108	UQ	Scott Buckley	01/06/2018
Statistical data mining algorithms for optimising analysis of spectroscopic data from on-line NIR mill systems: improving system calibrations for quality measures and variety discrimination	2014/109	JCU	Justin Sexton	01/02/2019
Reduction of post-harvest deterioration of sugarcane	2014/401	SRA	Anthony O' Connell	Closed
Enhancing sugarcane growth and yield by biocontrol agents/biofertilizers	2014/402	QUT	Jan Zhang	Closed
A boiler simulator for improved operator training	2016/001	QUT	Anthony Mann	01/07/2018
Integrated standardised competency based training for sugar milling operators	2017/013	QUT	David Moller	01/12/2019

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