

CanecoNNECTION

Autumn 2018

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(Cover Page) Tully grower Chris Condon continues to look for more opportunities to improve harvest efficiency.

Welcome to the Autumn 2018 edition of *CaneCONNECTION*

We have a diverse range of stories for you in this edition looking at research, development and adoption innovations occurring at SRA and across the industry.

We start this edition in the Far North, where we meet with Glen Anderson and hear about the benefits that he has measured through GPS-assisted Laser levelling at his farm.

In that vein of practical on-farm improvement, we also meet with Tully grower Ray Zamora to hear about his approach to soil health, we chat with Adrian Darveniza about the economic benefits of Smartcane BMP adoption, and we talk with several growers who have been involved in SRA's harvesting demonstration trials in 2017.

Moving from wet areas to irrigated areas, and we also report to you on a current project looking at opportunities for energy innovation in the cane industry. With the huge rise in electricity prices over recent years, this project is investigating practical outcomes for the industry, which you can read more about on page 12 and 13.

We also have a look at recent research where SRA has worked with the South Australian Research and Development Institute (SARDI) in assessing Predicta technology for our industry. We've also refreshed the design of CaneConnection thanks to the work of SRA Graphic Designer, Catherine Jorissen, who started with SRA recently. You will be seeing more of Catherine's work in our magazines, fact sheets, and event material.

We hope you find this edition useful, and if you have any comments or suggestions, please let me know at bpfeffer@sugarresearch.com.au or (07) 3331 3340.

Brad Pfeffer

Executive Manager, Communications

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1.7

The tonnes of sugar per hectare gained when comparing recommended harvesting practice to nominal practice for Chris Condon

Page 6



\$3365

The net return per hectare for Glen Anderson following field trials assessing GPS-assisted laser-levelling

Page 4

By the numbers

115

The number of farmers surveyed as part of an AgEcon project investigating opportunities for energy innovation in Australian sugarcane

Page 12



50%

The potential possible yield loss from Downy Mildew, which has been the subject of biosecurity research at SRA

Page 16



2000

The number of sugarcane germplasm lines maintained at the Yunnan Sugarcane Research Institute

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Mr Ian McBean appointed Executive Manager, Regional Delivery



SRA has appointed experienced sugar industry professional, Mr Ian McBean, as its Executive Manager, Regional Delivery.

Mr McBean has had an extensive career in the sugar industry in Australia and internationally and was most recently employed at Sunshine Sugar in NSW, where he was part of the Executive Team and held the role of General Manager.

SRA has worked with the Australian sugarcane industry to develop a new strategy for industry-led adoption activities. As part of this process, the industry identified the need for SRA to appoint an Executive Manager, Regional Delivery, and Mr McBean will be the driving force behind the strategy in this newly-created role.

"Ian has extensive experience working with growers in Queensland and NSW,

he has an in-depth understanding of the needs of the milling sector, and he has been instrumental in delivering extension and adoption outcomes throughout his career. This has been an area of focus in recent years in NSW," SRA CEO, Mr Neil Fisher, said.

"He understands that the Australian sugarcane industry must be productive, profitable, and sustainable, and that a key component of this is ensuring that the research developed by SRA is adopted on-farm by growers.

"A large part of our industry operates adjacent to the Great Barrier Reef, and our industry is acutely aware that we must continue to make positive steps forward through research and adoption of best practices. The industry adoption strategy is a critical component of ensuring this future productivity, profitability, and sustainability."

Levelling trial shows 20 percent improvement to net return



Glen Anderson already knows how important precise drainage is to his productivity, but work on an SRA-funded project run by MSF Sugar is providing eye-opening numbers for the impact on his bottom line.

BY BRAD PFEFFER

For Far North Queensland sugarcane grower Glen Anderson, drainage is paramount to optimising the productivity of his farm.

Farming at Fishery Falls, north of Babinda, the annual rainfall is 3430mm and daily and weekly rainfall tallies can be huge during the wet season.

This means that he continues to plan his farming operations around drainage to minimise the damage from waterlogging.

"When we have our long wet seasons, there's often not much we can do, but we also know the more water we can get rid of, the more cane we can grow," he said.

This is why he has been a keen participant in a recent SRA-funded project through MSF Sugar that assessed the costs and benefits of investing in GPS-assisted laser-levelling.

The project worked with four farms in the Mulgrave mill area to assess a control area against a GPS-assisted laser-levelled area.

Data was collected for the 2016 season, and for Glen he said the results showed that the investment was worthwhile, to the point where he has now laser levelled the control area as well.

"Before this project we already had a network of drainage pipes and drains across the farm and had started levelling. But we were basically doing our own land plaining without GPS-guidance, just doing it by eye and experience," he said. "The GPS brought more precision, and I've since continued with it for other blocks. I was sick of having to get into the control block with a shovel to let the water out, so it is laser levelled now, too.

"The increase in tonnes has been out of sight, although we still have to be careful

with any wet weather at harvest, as we don't want to ruin the laser levelling."

For the 2016 harvest as part of the trial, Cane Supply Field Officer with MSF Sugar Matt Hession ran the project and he said this site was the wettest and most poorly drained of the three sites that were harvested in the project.

"Glen's lasered block had a positive response in all four productivity benchmarks of actual CCS, cane yield, sugar yield, and net return," Mr Hession said. "There was a 9 percent better response in tonnes of cane per hectare with 138TCH compared to 126TCH.

"Relative CCS was 0.58 units better in the lasered block than the non-lasered block. As a result, sugar yield was 15 percent better and net return was 20 percent better for the lasered block."

| FARM | VARIETY CLASS GB | SOIL GROUP | DELIVERY (TONNES) | ACTUAL CCS | REL.CCS | HARVESTED AREA (HA) | CANE YIELD (T/HA) | SUGAR YIELD (T/HA) | NET RETURN* (\$/HA) |
|-----------|------------------|-------------------------|-------------------|------------|---------|---------------------|-------------------|--------------------|---------------------|
| Laser | Q208(ϑ PL G | Granitic | 264.22 | 12.97 | 12.65 | 1.91 | 138.34 | 17.5 | 3,365 |
| Non-laser | Q208(ϑ PL G | Poorly Drained Alluvial | 122.00 | 12.24 | 12.07 | 0.97 | 125.77 | 15.18 | 2,795 |



The net return was \$3365/ha in the lasered, compared to \$2795/ha for the non-lasered.

The crop was approximately 18 months old at harvest, due to delays in getting to the blocks because of wet weather that year.

Glen Anderson added that he felt that 2016 was a year that favoured the control block. "We didn't have the usual flood and had a pretty good mix of rain and sunshine, and therefore both of the treatments grew well. If we had experienced a normal season and flood, I expect the control would have been further behind."

He is yet to make a long-term assessment, but he hopes that GPS-assisted levelling could ensure his crops get to a third or fourth ratoon, as sometimes the floodwaters and still water sitting in the paddock can do significant damage.

Looking beyond the project, he said the trial site had also performed well in 2017. "Because we got caught with the weather during harvest in 2016, this meant the crop was quite young when it came time to cut in the normal cycle last year.

"So the tonnes were down in 2017, but it has since come away nicely and looking like it will be a good crop again this year."

He said while levelling is far from new, the project has helped him become re-educated with it and learn how modern technology has improved it.

"It is definitely worth it, but levelling also needs to be considered in the context of the finances each year, and having contractors available. I'll keep laser levelling every year, doing a bit each year, focussing first on my wet blocks and the dry blocks can come later."

He has not yet completed a crop cycle yet with any of the lasered country, but

said he expects the ground will all need touching up each cycle.

His row spacing was 150cm, and is now 162cm, and he is looking at trying 180cm. He is also using a variable rate fertiliser box, GPS guidance, and looking at zonal tillage. ■

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"It is definitely worth it, but levelling also needs to be considered in the context of the finances each year, and having contractors available..."

(Over Page) Fishery Falls farmer Glen Anderson has seen positive results through trial work analysing the benefits of GPS-assisted laser levelling. (Above Left) No drain – no cane. One of the many drains at the Anderson farm. (Above Right) Some of the beautiful views at the farm.

Information and experimentation drive harvest efficiency

SRA has worked with harvesting groups across the industry on 43 demonstration trials in 2017, with 60 more planned to follow in 2018. Tully grower Chris Condon and his group were one participant.

For Tully grower Chris Condon, improving harvesting efficiency is an ongoing evolution.

That evolution requires information and experimentation, which then inform modifications to practices or farm layout, and then the process continues.

This is why he was a keen participant in observation trials in 2017 as part of a project run by SRA to work with harvesting groups to examine their local harvesting conditions and practices, and then work with them to optimise the harvest.

“We had experienced harvesting trials before, but this new project offered the advantage of serious follow-up,” Chris explained.

“Sometimes in the past we would receive data from harvesting trials, but we were unsure what to do with that data. In this project, we are receiving the follow-up to help us make changes.”

Running a 2017 John Deere CH570, the harvester cuts mostly the family’s own cane, which was about 118,000 tonne in 2017, plus approximately 20,000 tonne for another grower. The harvester is driven mostly by Mark Camilleri.

The 2017 trial had four treatments:

| TREATMENTS | FAN SPEED (RPM) | GROUND SPEED (KM/HR) | SECONDARY EXTRACTOR FAN |
|---------------------------------|-----------------|----------------------|-------------------------|
| Low | 600 | 3 | Off |
| Recommended | 700 | 4 | On |
| Nominal (Conventional practice) | 700 | 6 | On |
| Aggressive | 850 | 6 | On |

The trial confirmed what Chris already suspected, although he said it also gave him useful information on some of their assumptions that weren’t quite right.

“The trial was in a block where doing things differently could have a big

impact on profitability,” he said. “It was a beautiful crop of cane and had good presentation, so there was room to either get it right or wrong – which means either being profitable or unprofitable.”

This table provides a snapshot of the results:

| | CANE YIELD (TONNE/HA) | CCS (%) | SUGAR PRODUCTION (TONNE/HA) | BINS PER HECTARE | GROWER REVENUE PER HECTARE (AFTER MILL DEDUCTIONS) | CONTRACTOR REVENUE PER HECTARE |
|---------------------------------|-----------------------|---------|-----------------------------|------------------|--|--------------------------------|
| Low | 89.2 | 15.6 | 15.2 | 10.6 | \$4423 | \$707 |
| Recommended | 90.5 | 15.3 | 15 | 10.3 | \$4314 | \$711 |
| Nominal (Conventional practice) | 81.1 | 15 | 13.3 | 11.4 | \$3818 | \$641 |
| Aggressive | 87.1 | 15.5 | 14.8 | 9.6 | \$4278 | \$693 |



The figures are based on the results of the trial and an economic analysis from the Queensland Department of Agriculture and Fisheries. The trial also assessed a range of other data such as extraneous matter, harvester economics, bin weights and value, and billet quality.

SRA Adoption Officer for Harvesting, Mr Phil Patane, said the 2017 results varied from group to group, and region to region, but consistently showed the opportunities for improvement in harvesting practices.

"The information presents huge opportunities for the industry. It also presents data to help us overcome remaining challenges such as ensuring adequate bin supply, fair payment for harvester operators, and striking the right balance between minimising losses and getting the job done," he said.

Chris Condon said the results presented a wealth of information, although he admitted that decisions were still sometimes difficult.

An example of where flexibility is still required comes with pour rate. Chris is looking to base the contract around 90 tonnes per hour pour rate and determining the steps needed to achieve that.

He admits that sometimes it isn't achievable and more cane has to be

pushed through to get the job done some days.

"There are a lot of factors to work out, but now we've got hard data in our conditions to base the discussion around."

Even before the trials, Chris had been working to improve harvesting efficiency. The biggest step came with the decision to invest in their own harvesting equipment to provide more control over key harvester settings, especially ground speed.

There has also been changes on the farm. They have laser-levelled and changed layout to create long, straight paddocks for the harvester.

"We're constantly trying to improve the farm to make all our operations easier, including harvesting," he said.

Chris said that they were also having challenges with their 1.9 metre dual row system.

"As the stools became wider, the duals were up to 600mm apart, and by the time that happened we found we were cutting the outside part of the stool with the outside of the basecutter disc, and the stool was actually falling away," he said. "The crew was trying their best, but we were always leaving cane behind. It wasn't their fault, as it was the set-up of the row profile.

"We also observed the dual row cane had thinner stalks, so we had issues getting bin weights as well."

After planting a small area of single row on 1.9 metres, Chris felt that the tonnages were similar to the dual row and has now made the switch to single rows. ■

This work is one element of a much larger project called *Enhancing the sugar industry value chain*, which is funded by the Department of Agriculture and Water Resources and SRA as part of the Rural R&D for Profit Program.



Australian Government
Department of Agriculture
and Water Resources

(Over Page) Tully grower Chris Condon continues to look for more opportunities to improve harvest efficiency. (Above) Chris Condon and Phil Patane discussing the outcomes of 2017 harvesting demonstration trials.



Practical demonstration helps guide harvest efficiency

Participation in 2017 harvesting demonstration trials has shown Lorens Riera opportunities for improvement for harvesting efficiency.

Lorens Riera felt that he was in the box seat to capitalise on any positive changes that he could make to improve harvest efficiency.

Farming at Innisfail, Lorens cuts his own cane plus a small contract, which all together is between 23,000 and 26,000 tonnes.

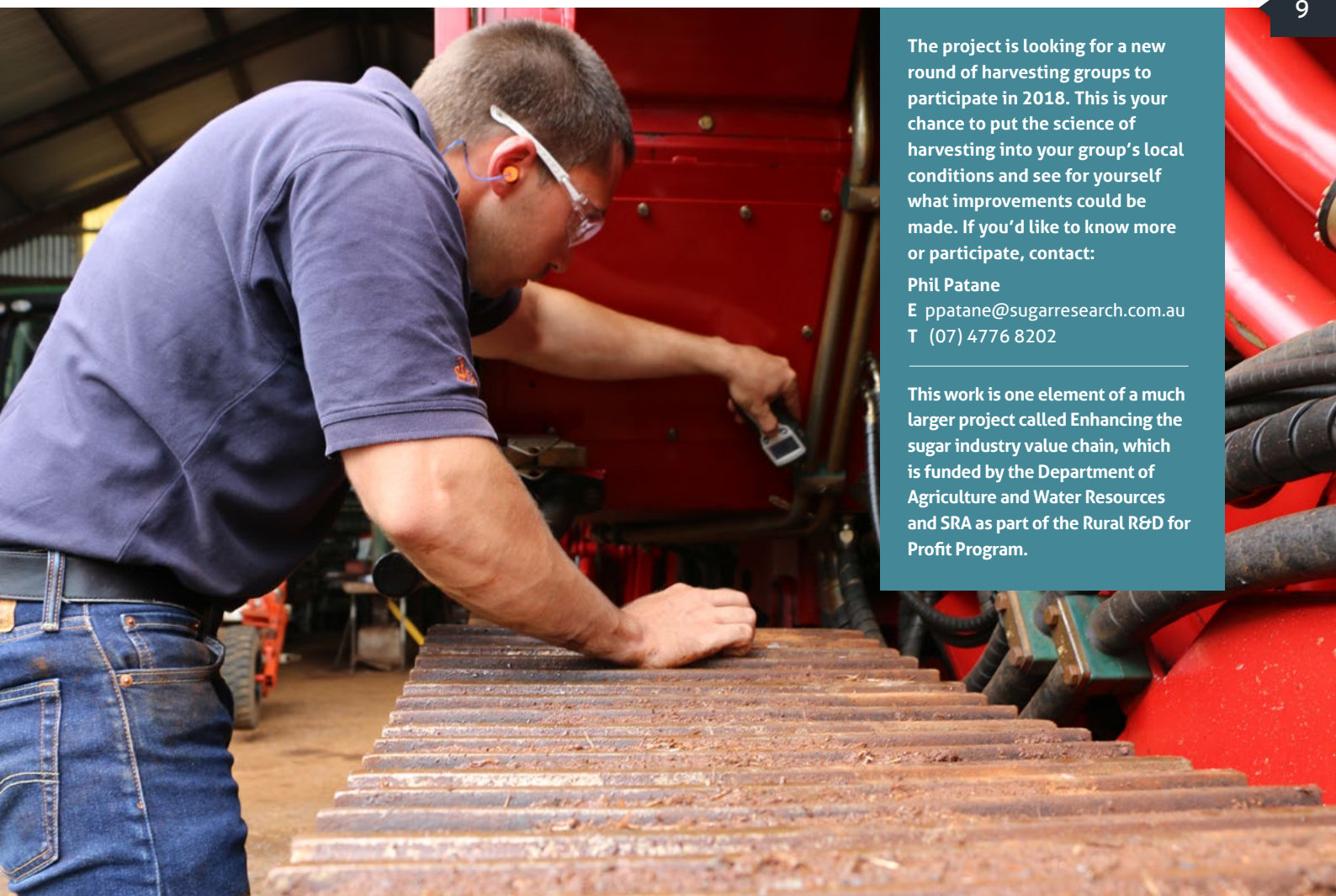
“Cutting our own cane, we knew that we would see the benefits straight away,” he said. “In that situation, we already felt our practices were where we want them to be, but we also wanted to benchmark ourselves and find out what improvements could be made.”

In 2017, Lorens and his team participated in SRA’s in-field demonstration trials, in an erect crop of Q200(b) harvested in mid-August. This was then followed with a meeting in November with SRA to talk about specific steps to make improvements.

Lorens’s trial had four treatments:

| TREATMENTS | FAN SPEED (RPM) | GROUND SPEED (KM/HR) | SECONDARY |
|---------------------------------|-----------------|----------------------|-----------|
| Low | 600 | 3 | Off |
| Recommended | 700 | 4.5 | On |
| Nominal (Conventional practice) | 850 | 6 | On |
| Aggressive | 950 | 6 | On |

“The results have shown us that there are benefits to slowing down a bit,” Lorens said. “We are able to make that change easily because we cut our own cane.”



The project is looking for a new round of harvesting groups to participate in 2018. This is your chance to put the science of harvesting into your group's local conditions and see for yourself what improvements could be made. If you'd like to know more or participate, contact:

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This work is one element of a much larger project called Enhancing the sugar industry value chain, which is funded by the Department of Agriculture and Water Resources and SRA as part of the Rural R&D for Profit Program.

This table provides a snapshot of the results:

| | CANE YIELD (TONNE/HA) | CCS (%) | SUGAR PRODUCTION (TONNE/HA) | BINS PER HECTARE | GROWER REVENUE PER HECTARE (AFTER MILL DEDUCTIONS) | CONTRACTOR REVENUE PER HECTARE |
|---------------------------------|-----------------------|---------|-----------------------------|------------------|--|--------------------------------|
| Low | 82.8 | 15.4 | 14.6 | 12.3 | \$4178 | \$687 |
| Recommended | 85.4 | 15.4 | 15 | 13 | \$4293 | \$706 |
| Nominal (Conventional practice) | 81 | 15.4 | 14.6 | 12.4 | \$4168 | \$685 |
| Aggressive | 77.1 | 15.4 | 13.5 | 11.3 | \$3857 | \$634 |

The figures are based on the results of the trial and an economic analysis from the Queensland Department of Agriculture and Fisheries. The trial also assessed a range of other data such as extraneous matter, harvester economic, bin weights and value, and billet quality.

In addition to the trial, Lorens has also had his Case 8800 optimised with the help of the harvesting team at SRA. This has ensured the rollers are all running together at an optimum tip speed, which also helps

put appropriate tension on the cane bundle for a decent cut that doesn't grip or grab.

Lorens said these gains were in the order of just a few percent, meaning they were not really observable, and he therefore relied heavily on SRA trials for this information.

"As a grower, we may not be able to see a one percent difference, but we also know that it adds up to a significant impact on my bottom line across the year." ■

"Cutting our own cane, we knew that we would see the benefits straight away,"



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and Water Resources

(Above) Innisfail grower Lorens Riera and Adoption Officer Phil Patane talk harvesting efficiency.
(Over Page) Adoption Officer, Phil Patane, measuring Lorens's Case 8800 for optimisation.

Sensors: where to next for sugarcane harvesters?

SRA researchers have worked collaboratively with the industry and leading technology experts to better understand opportunities for the future when it comes to harvesting sensors.

What's going on in your sugarcane harvester – in front, underneath, inside, and out the back? And can we use modern technology to get this information straight away, in the cab, to help the industry further improve harvesting efficiency?

These were two key questions that formed the premise of a recently completed research project that assessed where sensors could be used to make harvesting easier and more efficient, and which types of sensors might be suitable for different purposes.

The project consulted extensively with the industry to understand their thoughts on harvesting challenges and opportunities, especially around the use of sensors. Researchers spoke to growers, harvester operators and millers in group meetings and via a survey.

Following the consultation, the greatest opportunity identified was using sensors that would help the industry better measure and control extractor loss of cane and sugar.

"The industry already has methods for assessing sugar loss, such as the in-field sucrose loss measurement system," said SRA Program Manager, Dr Peter Samson. "These are proving themselves very effective with extension and adoption, but they have the disadvantage that they are expensive, slow, require significant labour, and don't provide results in real-time.

"The project identified that if we could produce a sensor that provides more data about sugar and cane loss, then

this is a sought-after opportunity for the Australian industry.

"This is not groundbreaking and has already been the subject of extensive research. However, there are new sensing technologies that were not tested in earlier work. It is important to understand that this remains a priority and opportunity for the industry, in addition to other priorities."

Industry consultation indicated that the focus for sensors should be on the measurement of losses, particularly from the primary extractor, automation of basecutter height control, and evaluation of cane supply quality entering the bin.

However, the project recommended that some other important factors such as topping, feedtrain optimisation, chopper box set up and crop presentation should be managed through continuing education, rather than sensing applications.

Sensors to measure basecutter height in relation to ground level are an important opportunity. Focus groups identified that basecutter height adjustment, to minimise dirt in cane from cutting too low and losses caused by cutting too high, is one of the most frequent adjustments a contractor makes in the field.

There are already basecutter height controllers in the industry but they seem to be mostly not in use because of a belief that current systems do not work. A current, simple solution in parts of the industry is a video camera mounted to the back of the harvester so that

the operator can see the ground job, although dusty conditions can impede the view.

Both major harvesting manufacturers offer automatic basecutter height controls, but there is work to be done in improving their use and understanding within the industry.

As part of all this, the project investigated at a range of sensing technologies that could be applicable for the cane industry. This includes near infra-red spectroscopy, spectral imaging, and radar.

The project also noted that there are challenges for sensors fitted inside a harvester. Sensors are sensitive instruments, and the inside of a cane harvester is not a friendly place for sensitive instruments. It is also important that a sensor not impede cane flow.

Dr Samson said all this information would now form a valuable foundation to help guide future research and investigation at SRA.

"SRA is approaching harvesting optimisation from a range of angles – both through research and adoption – and this project has established a strong foundation for the future." ■

(Above and Right) Modern harvesters put a diverse array of data at the fingertips of harvester operators. But a research project has worked with the industry to determine how this can be taken to the next level by collecting extra data that can optimise the harvest.



This project formed part of a larger project called Advancing the sugar industry value chain, which is funded by SRA and the Australian Government Department of Agriculture and Water Resources as part of the Rural R&D for Profit Program.

The final report for this project is available on the SRA website (<http://elibrary.sugarresearch.com.au/handle/11079/16450>).

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MICRO GRIDS: Powering the future of irrigated sugarcane

Using a combination of renewable energy, battery storage or mechanical storage could be the most cost effective and efficient way to power irrigation on sugarcane farms, according to a new report.

The study, commissioned by SRA and conducted by AgEcon, looked at opportunities for energy innovation in irrigated sugarcane and found that new energy technologies could deliver reduced per megalitre (ML) pumping costs and lower carbon emissions.

Study co-author, Janine Powell, a research economist with AgEcon, said the research findings were important because the energy used to power irrigation is one of the fastest growing costs for growers.

"In Queensland, electricity costs have increased by about 400 percent since the year 2000," Ms Powell said.

The study found the cost of energy to power irrigation on cane farms can account for about one-third of the total cost of growing cane and 22 percent of the carbon emissions of raw sugar.

"Growers are looking for ways to improve their bottom line and minimise their impact on the environment," Ms Powell added.

"Our analysis included an examination of current energy use on irrigated sugarcane farms and plans to explore the feasibility of implementing new energy technologies in the future to reduce costs and improve sustainability."

AgEcon surveyed the energy use of 115 irrigated farms across ten regions.

The survey results indicated the most energy intensive irrigation systems were the high-pressure overhead or "water cannon" systems pumped from a ground water source. In this scenario, irrigation accounted for 33 percent of the variable costs compared to 10 percent for furrow irrigation pumped from river water.

The survey results added to a meta-analysis of other available sources on pumping and irrigation by region. The Burdekin, Mackay and Bundaberg regions had the highest energy use of irrigation water with just over half of the industry's irrigation water transferred in the Burdekin.

Ms Powell said this highlights the importance of resourcing future energy productivity solutions.

"Our study found that with a 15 percent electricity price increase, the gross margin for farmers who used high pressure overhead water pumped from a bore, was reduced by 9 percent," she said.

"Farmers who have optimal irrigation systems and good water use efficiency metrics in this situation could consider new energy technologies to reduce pumping costs and improve overall energy efficiency".

“In Queensland, electricity costs have increased by about 400 percent since the year 2000”

Mackay district irrigator Wayne Vickers agrees that the industry needs to be looking into new ways to reduce both the cost of irrigating and the impact on the environment.

Mr Vickers grows 170ha of irrigated cane and uses low pressure overhead and furrow systems pumped from the Pioneer River near Marian.

“I jumped at the opportunity to participate in the case study as input costs, especially electricity, are always increasing and we need to be constantly looking at ways to be more efficient while maintaining productivity and managing our effect on the environment,” he said.

Ian Dart, who is responsible for innovation and cost reduction strategies for Bundaberg Sugar, says while Bundaberg Sugar uses a combination of high and low pressure overhead, flood and drip irrigation systems they were also keen to find out how pumping costs can be reduced.

“We are constantly looking at ways we can innovate, but until this point switching to a renewable energy source like solar has not been cost effective nor reliable enough to consider,” he said.

The AgEcon survey results suggested that a lack of knowledge around energy,

renewables, investment feasibilities and a perceived lack of cashflow are the main limiting factors for investment into new energy technologies.

“Analysing the impact of your irrigation system on your bottom line and how exposed you are to energy price increases is a useful exercise in determining how feasible a change in power source might be for your farm,” Ms Powell said.

Micro-Grids

The energy technologies most applicable to sugarcane irrigators will likely be pump-site “micro-grids”, said study co-author Jon Welsh, a research economist with AgEcon.

“Micro-grids are clusters of generators which are operated as single controllable entities,” Mr Welsh explained.

“For example, a pump-site micro-grid might include a renewable energy source such as solar panels, combined with a lithium-ion battery for storage as well as being connected to power from the electricity grid.

“The power sources are controlled by drive systems to ensure voltages are stabilised at the load source.”

Mr Welsh said with prices of flow and lithium-ion batteries forecast to be reduced by almost 60 percent in the next decade or so, the potential for irrigation farms to adopt these technologies was becoming more feasible.

“These kinds of solutions can provide a hedge of current energy sources used on farm,” he said.

Mr Welsh added that advanced battery storage systems could facilitate the integration of renewable power generation into existing irrigation systems through their ability to manage frequency variations and handle peak loads.

“There is real potential for new energy technologies to reduce per ML pumping costs, thereby increasing industry competitiveness and improving sustainability. ■

(Over Page) Mackay grower Wayne Vickers discusses energy solutions with Janine Powell, AgEcon.

(Below Left) Wayne Vickers's centre pivot.

(Below Right) Mackay district grower Wayne Vickers says the industry needs to be looking at new ways to reduce the cost of irrigating, and the impact on the environment.



The full AgEcon report “Opportunities for Energy Innovation in Irrigated Sugarcane” is available on the link:
https://sugarresearch.com.au/wp-content/uploads/2018/01/Energy-in-irrigated-cane_2017x.pdf

BMP adoption: what's the economic impact?

Adrian Darveniza has implemented a range of new practices as part of Smartcane BMP adoption, with these the subject of a recent economic analysis.

An economic analysis of BMP adoption has shown Adrian Darveniza the impact of improved farm practices to his bottom line.

Like many farmers, Adrian had read the magazine articles, been to field days, and spoken to extension officers about the benefits of practices such as fallowing, widening wheel spacings, and fine-tuning nutrient and herbicide applications.

From that experience, he knew the benefits were real, and over the years the family has always sought out best practice and innovation. The family farm, which is located on the footstep of the South Johnstone mill with about 240 hectares of sugarcane, has been familiar with seeing new technology and ideas adopted quickly.

Adrian returned to the farm in 2003, and took over as manager in 2010. Building on the previous work of his father, Adrian has implemented a range of best management practices that have seen the farm gain Smartcane BMP accreditation.

The changes included moving from a 1.5m to 1.8m wheel spacing, moving from plough-out/replant to include a bare fallow at the end of the crop cycle, following the SIX EASY STEPS for determining nutrient requirements,

and working with the Department of Agriculture and Fisheries (DAF), Queensland, on constructing a dual-herbicide sprayer.

The transition of sugarcane growers towards BMP adoption was the subject of a project funded by SRA and investigated by DAF (and Lifecycles) to evaluate the economic (and environmental) implications of Smartcane BMP adoption. The project examined six farms in different areas to provide a snapshot of the economic impact of BMP adoption.

Analysis of the Darveniza farm showed an annual improvement in farm operating return of \$160/ha, or about \$38,000/year, as a result of lower operating costs and productivity increases after BMP adoption.

The economic analysis indicated that the biggest contributing factors to the farm's operating costs were:

- Fertiliser costs down by \$103/ha (a 64 percent contribution to the overall change in operating costs);
- Fuel, oil, and labour down by \$19/ha (12 percent contribution);
- Herbicides down by \$19/ha (12 percent); and
- Planting and harvesting down by \$14/ha (9 percent).

While making various BMP changes, Adrian also shifted to wider row spacings. "For us, it wasn't a big expense shifting to wider row spacings," Adrian said. "We already had a high-rise tractor that was on 1.8 metres, so everything else was easy to widen."

Between the wide rows and the dual herbicide sprayer (which is now a triple herbicide sprayer) he is spending less time driving back to the shed.

"Previously, I was probably getting about 4 hectares of spraying done at a time, while now it is 7ha, so I know I have to take something to eat or I'll be getting hungry," he said.

"The economic analysis showed me the sprayer is saving me money and time, and giving a better kill with the weeds. The glyphosate in the middle of the row kills everything and does a magic job on weeds like Singapore daisy and sedges, as it floods regularly here and we have a relentless problem with weeds.

"The glyphosate is killing the weeds that normally laugh at the normal Gramoxone / diuron mix."

Adrian has converted the sprayer to three tanks: one spraying the inter-row, one

The case study at the Darveniza farm also included an environmental analysis, conducted by Lifecycles, finding that BMP adoption can result in economic and environmental outcomes and can add value to farming businesses.

The environmental analysis indicated that following the BMP changes, fossil fuel use decreased by 28 tonnes over the crop cycle, mostly off-farm due to less fertiliser being produced at the factory and supplied to the farm. The analysis also indicated that carbon footprint was reduced by 23 percent overall. In addition, after BMP adoption the risks of nutrients and chemicals potentially entering waterways reduced by 17 percent and 48 percent respectively.

Caleb Connolly, an agricultural economist from DAF, said: "I encourage growers who are considering BMP changes to make a start and seek expert advice. Adrian's journey shows that ongoing changes may become more manageable as you get the ball rolling and build on your existing knowledge and connections with advisors.

"Sometimes the degree of economic and environmental benefits after transitioning to BMP can be sensitive to changes in cane yield, so it's important to consider unique farming business circumstances and find what works for you.

"DAF's Farm Economic Analysis Tool (FEAT) is one tool that's available to help you consider the economics of your farming business."

To access FEAT and explanatory resources, visit www.daf.qld.gov.au/plants/field-crops-and-pastures/sugar/farm-economic-analysis-tool. The six project case studies can be downloaded from www.publications.qld.gov.au/dataset/best-management-practices-for-sugarcane.

spraying the row, and one over the top of everything.

"We have some vines and weeds that grow very fast and germinate before the grasses. To catch them with the Irvine legs we would have to spray early – but then the grasses haven't germinated, which would mean a second pass or returning later with the boom.

"This way we can wait for the grasses to germinate, and clean up the weeds that are too high. We just switch on the over-the-top tank as we need it."

Modifications to machinery were necessary to enable the practice changes on Adrian's farm. The cost of implementation for Adrian's particular circumstances were only \$2200 or about \$9/ha.

Research has indicated that cane yields can increase considerably in response to a well-managed fallow period. Adrian has progressively improved his fallow management and is now trialling legumes as a break crop. He has had good results with mill mud, which he said was easier with the mill being almost on his doorstep and reduced his fertiliser costs overall.

SRA acknowledges the funding contribution from DAF Queensland towards this research activity. ■

(Over Page) Adrian Darveniza has seen the positive impact of Smartcane BMP Adoption at his farm, backed up by an economic analysis through DAF Queensland. (Below) Adrian with his tri-herbicide sprayer.





PNG biosecurity research puts Australia on the front foot

A long-standing collaboration with researchers in Papua New Guinea has broadened Australia's understanding of important diseases that pose a possible biosecurity threat to Australian sugarcane.

Sugarcane is almost everywhere in Papua New Guinea (PNG).

You see it in gardens, roadsides, creek banks, grasslands, and in commercial paddocks.

PNG is the original home of sugarcane, so it is not surprising that it is prolific there. It is also unsurprising that these conditions also mean that it is home to several exotic biosecurity threats that we don't have in Australia.

Because of this nearby biosecurity risk, Australian researchers have had a long relationship with PNG researchers to ensure that our industry is on the front foot should an exotic incursion ever occur.

This has been the particular focus of a recent research project that has looked at diseases including Ramu stunt and downy mildew, both of which are in PNG.

Partnering with PNG's commercial sugarcane producer, Ramu Sugar Limited, SRA researchers have learnt valuable information about these pathogens, including their differences to the usual types of pathogens that we currently face in Australia.

For example, SRA scientists now know that there are at least four variations of the downy mildew fungus, and two variations of the Ramu stunt virus.

"Normally with diseases such as red rot or Fiji leaf gall here in Australia, there is very little variation in these pathogens," said Dr Rob Magarey, who is one of the researchers on the project and SRA's Leader for Disease Management. "But with PNG being the home of sugarcane, it also has many genetic species of cane, which also provides the opportunity for variation in these pathogens."

Understanding this variation is crucial to ensuring a better response should these pathogens hit Australia. If an outbreak occurs and if we can understand which variation of the pathogen it is, this could then allow for a better management response and also a better understanding of resistance ratings of our sugarcane varieties.

Dr Nicole Thompson (Principal Researcher, Disease Management) has led the work on downy mildew, while Dr Kathy Braithwaite (Senior Researcher, Disease Management) has led the work on Ramu stunt.

Both of the pathogens can severely impact yield, as the researchers observed through their trials and work in PNG.

Downy mildew can reduce yields by 30-50 percent in susceptible cane. About half of Australian varieties are susceptible, although it is a pathogen that has previously been successfully eradicated from Australia.

Ramu stunt can kill susceptible cane and nearly wiped out the PNG industry in the 1980s. However, SRA researchers have learnt that most Australian varieties are resistant to Ramu stunt.

"Both pathogens are potentially devastating, although the risk from both downy mildew and Ramu stunt is less than it is for some other pathogens. Downy mildew is transmitted by spores over a short distance, unlike smut spores that can travel thousands of kilometres. With Ramu stunt, the main issue would be transmission via planting material, which is a lower risk because of our strong quarantine in Australia," Dr Magarey said.

"Ramu stunt is transmitted by a planthopper, and although Australia has this planthopper in the Torres Strait, it is relatively low risk that Ramu stunt would

Sugarcane growers and millers can learn more about biosecurity risks and management in the publication *Biosecurity Manual for Sugarcane Producers*, available on the SRA website or in hardcopy by contacting Adoption Officer, Matt Reynolds, on (07) 4963 6803.



come into Australia. However, it is vital that we are equipped with strong knowledge that would allow us to manage it if we have to."

Low risk does not mean no risk.

This has long been the approach of the Australian sugarcane industry with biosecurity, and is typified by the industry's readiness and fast approach to the smut incursion on the east coast in 2006. Preparation for a possible smut incursion, far ahead of time, allowed for a swift and coordinated approach to smut.

The research has also looked at moth borers, which Dr Magarey said posed a significant risk for Australia. This includes variety resistance screening, as well as a separate project that is looking at knock-down insecticides. This project is looking at a range of other issues such as accurate identification.

SRA acknowledges the funding contribution from the Queensland Department of Agriculture and Fisheries toward this research activity. ■



(Over Page) The project team rating a Ramu Stunt resistance trial. (Top Left) Sugarcane leaf with downy mildew symptoms. (Top Right) SRA staff Rob Magarey, Andrew Greet, and Judi Bull setting up a downy mildew pot trial in PNG. (Above) Moth borer damage with larvae.



China trip delivers valuable research insights

A recent trip to China has given an insight into variety development and nematode research for Australian sugarcane industry researchers.

Australian sugarcane researchers have been given new knowledge and insight into sugarcane research and development in China, following a recent trip to the country.

In November 2017, SRA Researchers Dr Shamsul Bhuiyan and Dr Priyanka Wickramasinghe were accompanied by CSIRO scientist Dr Karen Aitken for a visit to research facilities in the Yunnan province.

Situated in the country's Southwest, Yunnan shares a border with Vietnam, Laos and Myanmar and is the second largest sugarcane production area in China, with cultivation of about 300,000 hectares and production of around 1.8 million tonnes.

The purpose of the trip was two-fold: to meet with Chinese scientists to develop collaborative research on sugarcane nematodes; and to run a workshop on sugarcane nematodes for the Chinese. In addition, it also presented the chance to discuss sugarcane breeding and in particular introgression, a breeding

technique that brings in traits from wild relatives of sugarcane into commercial varieties.

The travel was sponsored by the Office of Overseas Training Management, Department of Human Resources and Social Security of Yunnan.

The trip involved the Australian scientists visiting facilities including the Biotechnology and Genetic Resources Institute (BGR), the Yunnan Academy of Agricultural Science (YAAS), the Yunnan Sugarcane Research Institute (YSRI), and the Yunnan Agricultural University.

"The visit was a valuable learning experience for Australia and allowed us to observe one of the most diverse collections of wild sugarcane germplasm and its associated introgression breeding programs," Dr Bhuiyan explained. "Introgression is playing an increasingly important role in the Australian sugarcane breeding program, so it was useful to gain valuable insights into the successes and challenges faced by our Chinese counterparts."

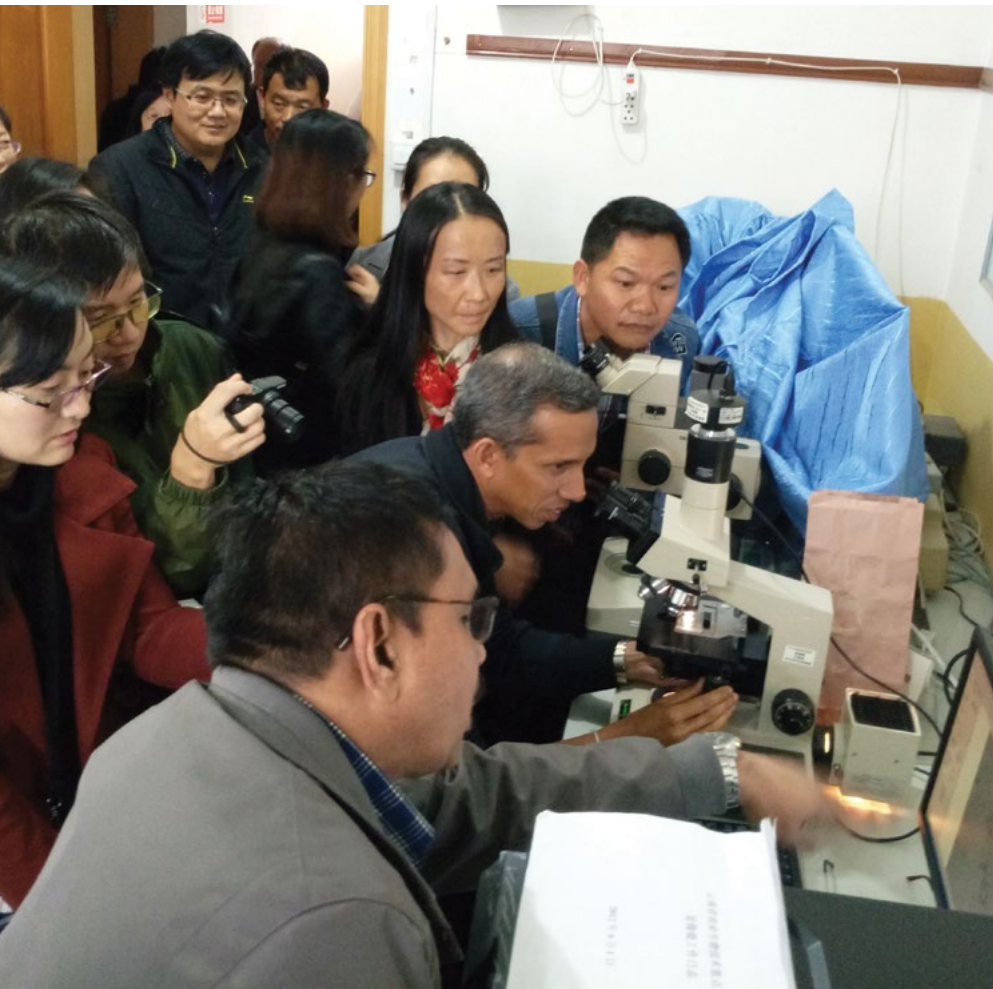
At the YSRI, they saw more than 2000 sugarcane germplasm accessions that are maintained there.

In addition, while at the Yunnan Agricultural University, they heard that the University has more than 800 lines of sugarcane plant material in their collection, belonging to wild relatives of sugarcane.

"Most of the accession lines were collected from Tibet, Nepal, and Myanmar, from high altitude of approximately 1800 metres and higher," Dr Bhuiyan said. "Those accessions have been tested for their growth and flowering at altitude, high latitude, and for cold tolerance."

"They explained to us that, recently, YAU developed a new variety from the cross of introgression material and commercial canes, with high sugar and cold tolerance traits."

"Lack of diversity in breeding programs is one of the factors that impacts productivity worldwide."



“The visit was a valuable learning experience for Australia and allowed us to observe one of the most diverse collections of wild sugarcane germplasm and its associated introgression breeding programs...” Dr Bhuiyan explained.

“But viewing these germplasm collections was a reminder of how much untouched diversity is still available for exploitation.”

A major focus of the trip was on sugarcane nematodes, which included a training workshop for about 50 scientists in Kunming.

Recently, Australian researchers, through SRA-funded research, discovered a new beneficial bacteria called *Pasteuria penetrans*. It is a natural parasite of root-knot nematodes, and its presence could help contribute to improved productivity for growers and millers. The key message around this discovery is that *Pasteuria penetrans* can be encouraged by adopting

a controlled traffic and minimum till farming system.

This bacterium was one topic of discussion, as well as molecular marker screening, management of nematodes, and diagnosis of sugarcane nematodes.

“In conducting soil sampling in the field, it was interesting to note that the Chinese face large numbers of root-lesion nematodes and spiral nematodes, both of which are the most common nematodes in Australian sugarcane fields,” Dr Bhuiyan said.

“We will investigate further collaboration and partnership with the Chinese with fundamental research into nematodes and variety exchange.” ■

(Over Page) With flowering sugarcane plants at YSRI – Dr Cai Qing, Dr Shamsul Bhuiyan (SRA), Dr Karen Aitken (CSIRO), Prof Zhan Shaosong, and Dr Priyanka Wickramasinghe (SRA). (Top Left) A practical session with SRA Researchers Dr Priyanka Wickramasinghe and Dr Shamsul Bhuiyan on nematode extraction and diagnosis at the BGRI nematology laboratory. (Top Right) Seedlings from the various stages of the introgression breeding selection program in the field.

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Soil health: fitting all the pieces together

A keen interest in improving soil health has seen Tully grower Ray Zamora continue with a broad range of trials on farm. BY BRAD PFEFFER

Tully district grower Ray Zamora knows that some of his most productive farm workers are too small to see.

That's because they're underground, working on a microscopic level and helping to improve the overall health of his soil.

What's more, these workers don't take sick days, don't need overtime pay, and work 24 hours a day. This is why he has developed a keen interest in sugarcane soil health over the last decade and is taking all the steps that he can to improve the health of his soil.

Ray's father changed the row spacing from 155cm (five feet, four inches) to 180cm about 15 years ago, and when Ray took over about 10 years ago he widened the rows further to 190cm and also implemented zonal tillage and GPS guidance.

He was keen to have the row widths match the harvesting equipment and therefore further protect the stool and reduce compaction. He also hopes to go from zonal tillage to zero till soon.

"I expect that going to zero till will make a huge difference here, especially given the rainfall we experience at Tully. I want to be able to cut my plant cane in the first round, or whenever I want to. So to have the GPS guidance, wide rows, and zero tillage will all be a no brainer to achieve that outcome," he said.

The 110 hectares under cane, near Euramo, is on the floodplain adjacent the Murray River. This has the benefit of bringing in fertile soil, but it also creates a relentless weed problem, and in wet years with flooding early in the year, the crops suffer, especially if the previous season ran long.

To further improve soil health, he has a strong focus on cover crops, which are not only providing a valuable rotation to the sugarcane, but also helping suppress weeds during the peak season and reducing the reliance on residual herbicides.

For example, when CaneConnection visited in mid-January, he had a crop of ebony cowpea that had created a weed-free carpet over a fallow block.

"It is on pre-formed beds and when it was half-grown I did a FusiladeForte® (active: Fluazifop-P) spray because there was a fair bit of grass in the paddock, and that tidied it up beautifully. The plan after that is to roll it down and direct-drill a mix-species cover crop, and then direct-drill plant the cane a few months after that," Ray said.

"I am breaking the sugarcane monoculture. Nowhere in nature does one crop grow on its own."

He has also worked on a number of innovations through his own on-farm research and collaborations with RegenAg, Terrain NRM, Project Catalyst, and SRA.

This year he is trialling a mixed species companion crop trial through Project Catalyst, where he has sown sunhemp, sorghum sudangrass, soybean, and guar beans in the inter-rows of his cane.

"The idea is that we want to capture as much plant diversity as we can, and make the most of the available sunlight. I'm hoping the other species of plants will put their roots down and feed the biology."

He has also planted his own trial looking at skip rows planted to other species, where alternate rows are not planted to cane, but instead are planted to crops such as soybean.

While it is something relatively new and has not been the subject of rigorous trials, Ray said the concept was to use half the inputs (as half the area is planted), but with hopefully 70 percent of the yield. He said he hoped that the inter-rows planted to other crops would provide a yield benefit when they return to cane in future years.

The SRA work that Ray is involved with includes water quality monitoring as part of the SRA-funded project Protecting our Chemicals, which is run by SRA Researcher Belinda Billing.

"Once I started looking at my soil biology, I wanted to use less chemicals wherever I can, because I want to encourage the good biology to grow. So the less chemicals, the better."

With all this interest in soil health, Ray was also supportive of the recent Soil Health Masterclass held in Far North Queensland recently as part of an SRA-funded project.

At the masterclass, presentations included soil biology, fungi, bacteria, and nematodes, along with practical tips for improving soil health on farm.

"It is great to see SRA on the soil health bandwagon," he said.

He said while it was hard to measure the impacts of his work and on-farm research, he measured his results through his productivity figures and lower input costs.

"In 2015 and 2016 we topped the district in those years, and to me that is validation that we are doing something right.

Being a low farm, the dry years suit us, but you still have to have things in place to get that production. It doesn't happen by itself."

He said the recent season saw production drop back in 2017, but it also had the advantage of an earlier finish, which has set up the coming season well for the district to plant cover crops and for good establishment of ratoon crops before the wet season. ■

For a short video of Ray's cowpea crop, visit the 'media' section of the SRA website.

"Once I started looking at my soil biology, I wanted to use less chemicals wherever I can, because I want to encourage the good biology to grow. So the less chemicals, the better."

(Over Page - Top Left) Ray in a fallow crop of ebony cow-pea. (Over Page - Top Right) Ray on farm earlier this year with a Project Catalyst mixed species inter-row trial. (Over Page - Bottom) Ray Zamora inspects soybeans planted in his skip-row trial.



Making your life easier with nutrient management plans

**"Always plan ahead.
It wasn't raining when
Noah built the ark."**

RICHARD CUSHING

Planning is a large part of successful farm management. For growers to achieve the best results on their farm under a range of conditions and circumstances, planning is a necessity. In some cases, planning involves going through a formal process and in other cases it is an informal process that is not always documented.

One of these formal processes is the whole farm nutrient management planning process. These whole farm nutrient management plans assist with maximising profitability and complying with regulations by rationalising fertiliser recommendations to make applications more practical.

Factors that influence nutrient management:

APPLICATION OF MILL
BY-PRODUCTS

AVAILABLE
EQUIPMENT

WEED AND PEST
MANAGEMENT

POSITION IN THE
LANDSCAPE

WEATHER / CLIMATIC CONDITIONS

NUTRITIONAL
REQUIREMENTS

CROP CLASS

PREVIOUS
BLOCK
HISTORY

SPECIES OF COVER
CROP GROWN

SOIL TYPE

SOIL TEST RESULTS

COVER CROP
DURATION

SOIL
AMELIORANTS
APPLIED

HARVESTING/
RATOONING DATE



Given there are so many factors that can influence individual block recommendations, one function of the whole farm nutrient management plan is to rationalise and finetune recommendations to a practical number of blends and rates across the farm incorporating many of the factors that influence nutrient management.

Farmacist, through the EHP funded project RP161, is working with over 160 Burdekin growers to develop their whole farm nutrient management plans. ■

(Over Page) Burdekin grower and RP161 participant, Richelle Kelly discussing nutrient management plans with Alice Warner from Farmacist. (Above Left) Heidi Hatch (Farmacist) is going through nutrient management plans with RP161 grower, Stephen Fabbro. (Above Top Right) Jayson Dowie and Heidi Hatch from Farmacist on farm during fertiliser application. (Above Bottom Right) Evan Shannon from Farmacist with Richard Kelly on his farm.

The RP161 whole farm nutrient management planning process includes:

- ① Benchmarking current nutrient practice spatially.
- ② Collecting and spatially positioning all relevant soil test data to allow for site specific nutrient requirements across the farm.
- ③ Conducting a full farm nutrient plan considering varieties, crop classes, soil types, soil chemical analysis, limitations and previous block history (mud, legumes and ameliorants). Farmacist then develops a block by block plan in accordance with the industry accepted SIX EASY STEPS program providing what fertiliser blend to use, what rate, when to apply, and product placement. This data is then uploaded into a free spatial program such as google earth for their records.
- ④ Assisting the grower with a fertiliser box calibration to ensure the correct amount of fertiliser is actually being applied.
- ⑤ Farm visits are conducted to ensure all other factors that lead to efficient N use are under control (irrigations, pests and weeds etc.) As full farm management is required in making a nutrient plan work.
- ⑥ Collect and spatially map nutrient application data in accordance with reef regulations.

All of this data is provided to growers in electronic and hardcopy to satisfy compliance records.

For more information about RP161 or how you can become involved, please contact the Farmacist Burdekin office on (07) 4782 2300.

Watch out for the revised SRA Australian Sugarcane Nutrition Manual, which will be available within the next couple of months.

DNA test a technological leap for the sugar industry

The importance of testing for soil pathogens is already well understood and established, and current research is looking at the application of new technology for our industry to deliver improvements and efficiencies.

What's hiding in your soil? Whether it is something good or something bad, there is no way to spot these microscopic organisms with the naked eye.

If it is pathogens down there causing damage to your cane, there's also every chance that you won't get a clear picture just from looking at yields and productivity. For *Pachymetra*, root-knot nematode, and root-lesion nematode, the impact is variable and may only be a few percent.

You might attribute the dip in yield to wet weather at harvest or a mistimed herbicide application – but it also could be one of these microscopic organisms eating the top off your yield.

And when the sugar price is only around \$400, every tonne counts.

The only clear way to get a handle on these pathogens is via a soil sample and assay of your blocks. Typically, these samples are collected with the help of local productivity services organisations and then scientists at SRA's laboratory at Tully analyse the results.

Conducting these tests to understand your soil is vital to knowing where you stand and then adopting management practices to minimise any problems.

SRA Leader for Disease Management, Dr Rob Magarey, said that the results of these assays have the potential to surprise farmers, as evidenced by past work on *Pachymetra*.

"We've had farmers remark that a 'crop has been growing poorly for a while and I never knew why, until now,'" he said.

"This highlights that unless farmers specifically look for the disease they may never know what yield losses they are suffering because of *Pachymetra*. This could make all the difference between profit and loss."

As part of a new project, SRA is investigating technology that could modernise and add value to the way these tests are conducted. Called PREDICTA, the technology could replace the manual method (counting the number of spores in a soil sample) by using DNA-based testing.

This technology is already well-established in the Australian grains industry and the South Australian Research and Development Institute (SARDI) is a major commercial provider of PREDICTA assays.

Over the last two years, Dr Magarey has been working with SARDI on understanding and refining how this technology could be applied to the Australian sugarcane industry.

The PREDICTA technology offers a range of advantages and opportunities. For example, current nematode assays are reliant on the nematodes being alive and therefore confidence in the result can be reduced in some situations.

"There has always been an element of uncertainty as to whether the counts you have reflect reality, or if the nematodes were killed by the heat," Dr Magarey explained. "Even an hour at 45 degrees can kill nematodes, which is not unreasonable in a car in North Queensland."

Working with SARDI, Dr Magarey said SARDI can now successfully assay for the



three pathogens – two nematode species and *Pachymetra* – from 500gm of soil.

“This was a major breakthrough, because a 1gm sample typically used for DNA studies doesn’t tell you enough and might not have any representation of what is actually in the paddock.”

Working with SARDI’s expertise, facilities, and experience, Dr Magarey also worked on calibrating the test and comparing it to the current manual assay.

The results with the nematodes was near-perfect. For *Pachymetra*, the PREDICTA results were slightly less sensitive than the manual count, but still able to detect *Pachymetra* at levels that were below the economic threshold.

“In other words, if *Pachymetra* is there at levels that you need to know about, then the test will tell you,” he said.

With the proof of concept complete, the next step will be to refine further details in bringing it to industry, which is currently part of a research proposal that is under consideration for funding by SRA.

Importantly, the project will need to ensure that SRA and productivity services organisations continue to have a good understanding of where these pathogens are occurring. History has shown the value of these organisations having their finger on the pulse of pathogen problems.

The economics of the new test also need to be assessed. In that context, future work may look at what other organisms could be added to the test to add value and make it more cost effective.

For example, the use of PREDICTA in the grains industry was recently expanded to 19 different diseases.

Dr Magarey said this work also had significant potential to link with current investments in soil health by SRA.

SRA will continue to keep the industry updated on the progress of this work and any changes that may occur in the future. Currently, the manual assay process is unchanged and ongoing. ■

(Over Page and Above) Inside the South Australia Research and Development Institute laboratory.

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More information on management options for both nematodes and *Pachymetra* is available in the “pests and diseases” section of the SRA website.



Regular testing keeps Pachymetra from rearing its ugly head

Ongoing vigilance is the key to keeping on top of Pachymetra for Tully grower George Henry.

George Henry is a firm believer in regular Pachymetra testing at his farm.

Each year he has tests completed through collaboration with Tully Sugar Limited and SRA, and even though the results show his counts remain less than 10,000, he still sees that it is an issue to be vigilant about.

"My counts are low and I aim to keep it that way, particularly as many of the varieties I grow are rated as intermediate to Pachymetra," George said.

His farm is relatively new country that has been growing cane for about 20 years, which he attributes as one of the factors behind the low count. He also feels that his soil biology is working well through controlled traffic farming, which he says is helping reduce his Pachymetra risk.

While his variety decisions are based primarily around productivity, he said testing was important for making informed decisions.

"My main variety is Q208(b) and it is about 50 percent of my farm, and I do not want that at all. We have a variety management

plan in place for the farm and the target is a 30 percent maximum for any one variety, even though I've had to go over that for the moment," he explained. "We are working to reduce that percentage."

He is also growing SRA3(b), Q240(b), Q253(b), and SRA1(b), and also tested Q241(b), but since removed this variety from his farm. He is also trialling SRA1(b) and SRA7(b).

Pachymetra has been identified as an important focus for productivity improvement in the Tully district and is an issue that is continually being worked on in collaboration between TSL and SRA. TSL have conducted two surveys in the past five years, one in 2013 and one just completed in January 2018 which is currently being analysed by SRA.

The two most popular varieties in the Tully district – Q208(b) and Q200(b) – are both intermediate-rated varieties and represented 62 percent of the crop in 2017.

The previous survey, in 2013, showed an increase in all sub-districts since the previous survey in 2004, and Cane Productivity and Development Manager,

(Above) Tully grower George Henry is vigilant about minimising the Pachymetra risk at his farm.

Greg Shannon, said growers are all urged to get a soil test prior to planting, especially if they are planting varieties that are not rated as resistant.

Greg said that because Q208(b) is rated as intermediate for Pachymetra, this is one of the reasons that it is so important that the district work together in ensuring a strong future for the variety.

To do that, the district is reducing the reliance on Q208(b) and bringing other varieties into the mix, just as George is working to do at his own farm.

"One of our goals is to keep a strong future for Q208(b), and the only way to do that is drop our reliance on it to a lower percentage. We have already dropped it from 48 percent to 43 percent and the goal is to get it to 30-35 percent just to recede any chance of it being taken down by a disease like what has happened in the past," Greg said.

Greg gave two examples as Q250(b) and Q253(b) as new varieties that are increasing rapidly, partly because they are being fast-tracked based on local data from both the Tully Variety Management Group and commercial mill results. ■



DNA technology gets to the root of the matter

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Roots make up a large part of the sugarcane plant, but they are difficult to research and not very well understood. However, an early-career research project has looked at the application of DNA technology to make understanding roots simpler for the Australian sugarcane industry.

It was during a chance encounter at an SRA workshop in 2016 when Dr Johann Pierre had the idea of using DNA-based technology to better understand sugarcane roots and productivity.

Dr Pierre was already working with CSIRO on an SRA-funded project that was improving the understanding of the roots of sugarcane. Through this project, he had experienced first-hand the challenges of assessing sugarcane roots. Washing, measuring, and analysing the roots of about 70 cane plants from a glasshouse consumed almost four months of work.

In that process, the washing of sugarcane roots also destroyed some of the finest roots, which are vital for water and nutrient uptake for the plant and represent about 90 percent of the root length. This manual process also does not give an indication of whether roots are alive or dead.

"At the workshop, I met SRA Researcher Rob Magarey, who explained the technology used by the South Australian Research and Development Institute (SARDI), which was already being used to understand roots and pathogens in other crops," said Dr Pierre, who is a Post-Doctoral Fellow with CSIRO. "I took it from there to apply for an early-career researcher award through SRA to

investigate this technology's application for the Australian sugar industry."

Through the ECR project, Dr Pierre has presented a fast and efficient method for understanding live sugarcane root mass in soil samples.

An assay on root health could present several opportunities for the industry. One of these is that roots – the mass of them, and if they are alive or dead – can act as a barometer for soil health.

Having that information on the roots underground could provide growers with the evidence needed to change practices above-ground.

There is some further work to occur before the test could be brought to the industry (see article page 24-25).

With the root assay, further work needs to occur on developing field sampling strategies and methodologies to reduce the variability of assay results and determine the optimum sampling protocol. Currently, soil cores are collected, which is a laborious process that needs improvement, Dr Pierre said.

It may also be able to link with current work underway using the DNA-based technology to assess for pathogens.

Dr Pierre said it was an opportunity for a technical jump forward. "The diagnostic tool developed by this project could contribute to robust and practical decision-making for the sugar industry in the high priority area of soil and root health," he said.

It could also be used in the Australian sugarcane breeding program. While not used currently in sugarcane, root traits have been considered in other crops in breeding for drought tolerance, for example.

It is also hoped that this work will link with SRA's current investments into soil health, including a large project underway led by researcher Davey Olsen.

The work also came with significant support from SARDI (both time and financial) and in particular from Dr Alan McKay and Dr Danièle Giblot-Ducray.

"I am grateful for their generous guidance and support and for adding so much value to this work," Dr Pierre said. ■

(Above) Research is investigating ways to use DNA technology to investigate sugarcane root health.



Adding local information to variety management

The Tully region is working together to assess new varieties in a range of conditions, to help the local industry improve variety management decisions.

Millers, growers, productivity services, and SRA are working together in the Tully district to improve variety selection across the region.

The heart of this work is the Tully Variety Management Group (TVMG), which is adding local data and grower observations to produce a local variety guide for new varieties coming through the pipeline from SRA.

Cane Productivity and Development Manager at Tully Sugar Limited, Greg Shannon, said the group has 10 trial sites across the mill area (six for observations and small mill maturity testing and four for germination observations), and is working with a group that varies in number but consistently attracts around 35 growers, representing a large percentage of the district's productivity.

Like most districts, conditions such as rainfall, soil type and pest/disease pressure are highly variable, even sometimes within a short distance. This is especially the case at Tully, which means the local trial sites provide growers with greater information about new varieties, and can help speed up commercial variety adoption.

Greg said the trials assessed factors including maturity curves and crop

characteristics for the different district zones, and soil type, and also raised important issues for consideration such as Pachymetra root rot awareness. If it takes up to five years to fully adopt a variety, the work of this group is designed to speed up the rate of adoption by one or two years by adding to the information already provided by SRA from Final Assessment Trials (FATs) such as yield, tonnes, disease resistance, and harvest management.

The local information is then presented in a small "Tully New Variety" guide lift-out designed to compliment the existing SRA Wet Tropics Variety Guide, as well as shed meetings across the district three times each year. Then, of course, there is the regular talk among the group itself as they watch new varieties progress through the trials. This "Tully New Variety guide" was published for the first time in 2017, after three years of local trial work.

"We have a long approved list of varieties, like everywhere else, but we are refining that long list with our recommended varieties list. We are trying to find the right place for all varieties, but we are also trying to avoid situations where growers are planting too much of the wrong variety and losing money," Greg said.

"It's a process that happens already, but we are adding science and rigour to it and hopefully taking some mystery out of which variety to plant when there are now so many to choose from.

Euramo grower Peter Jackson said the purpose of the trials and the group was about the "industry commercial reality".

"The results of the SRA FAT are useful, but they can also be different to what we experience on the ground," Peter said. "Growers are making decisions with different country and in different parts of the district, so this is helping provide us with information that is on the ground and relevant."

He said the group was helping to avoid situations that he recently experienced while working to reduce his dependence on Q208(b).

"I planted 40 acres of a particular variety, as we had a real concern with the amount of Q208(b) in the ground, and for me personally I have now ploughed that other variety out. The group is working on the information to help us avoid these situations.

"For example, we think Q250(b) and Q253(b) are promising varieties at Tully based on what we have seen over the last few years."

Alf Nucifora farms at the top of the Murray River said he valued the interaction of the group and also how it helped him choose varieties.

"It is a great opportunity for the farmers to put the varieties into a range of conditions and compare them to the standards," he said. "With the help of Greg and the other farmers, that information then gets passed on quickly."

"The group is now well-recognised in Tully and has come a long way since it started in a different incarnation in 2007."

Following on from the local trial work, TSL provide a "whole of farm variety planting" process based on current variety status and performance and using the local variety guide to fast track the adoption of the most promising new varieties. TCPSL also provide the local guide, with the SRA guide at the seed plots.

Other districts are doing their own work on ground-testing varieties through activities such as strip trials or similar work to the TVMG.

Greg added that there were significant benefits for the mill as well, and he thanked the support of the TSL board and in particular the outgoing General Manager, Barry Dun and new CEO Shunjie Guo both who are very supportive of this collaborative approach to improving productivity and cane quality.

"For example, we know from our 2013 survey that Pachymetra is a real soil health issue for us here in Tully and it results in yield loss and cane quality issues such as higher soil levels going into the mill," Greg said.

"Through the variety work, we have an opportunity to fast track the better varieties plus talk about a range of agronomic issues, and it has become a real vehicle for positive engagement between Tully growers and Tully Sugar."



(Over Page) The group checking out Tully Variety Management Group information: Alf Nucifora, Greg Shannon, George Henry, Peter Jackson, and Jason Jackson. (Above) Discussing varieties in the field at Peter Jackson's farm. (Right) Greg Shannon with TSL catches up with Alf Nucifora, George Henry and Peter Jackson to discuss variety management decisions.



Examining lime application for improving soil acidity, crop yield and CCS

A field trial in collaboration with a subgroup of growers from the Central Queensland Soil Health Society will examine the impact of fine lime application upon yield, CCS and soil amelioration.

BY BEENA ANIL-BISWAS, ADOPTION OFFICER, MACKAY, AND NICK HILL, RESEARCHER, MACKAY.

Within Australian agriculture, soil acidification is a serious land degradation issue, with over 50 million hectares of agricultural land affected nationally. Often called a “silent hunger” it is a process by which the pH of a soil decreases slowly overtime, acidifying the soil and causing a gradual reduction in yield which can go unnoticed and be attributed to other factors.

Soil acidification is a natural process that is accelerated via crop removal and the use of nitrogen fertilisers which cause an increase in the level of hydrogen ions within the soil, measured and expressed via the pH scale. Ideally the pH of a soil should be maintained at above 5.5 in the topsoil. Once the pH falls below these values the increase in acidification will affect crop yield.

The acidification of a soil causes a change in chemical processes, such as increasing the solubility and availability of aluminium and manganese to toxic levels which can then impact upon root growth, nutrient uptake and plant development.

The combined impact is poor root development and plant growth, resulting in lower yields. Acidification can also negatively impact microbial activity in the soil, lessening the rates of nutrient cycling via mineralisation and reducing legume nodulation and the associated inputs of nitrogen into the system.

Also, soil acidity negatively impacts upon the structure of a soil, reducing the infiltration of water and increasing rates of erosion and associated transportation of soil. As pH of the upper section of the soil profile falls below 5.5, acidification moves down through the soil profile, negatively impacting the lower sections of the profile. While surface acidity can be relatively simple to address and have considerable benefits to plant health, subsurface acidity is more difficult and expensive to treat.

The use of agricultural lime is considered the most effective method of addressing soil acidification. A major consideration when applying lime is its Effective Neutralising Value which is directly influenced by particle size and Calcium Carbonate (CaCo₃) content. Fine lime, with its reduced particle size and associated increase in surface area, is known to have a greater rate of impact upon the pH of a soil when compared to coarse lime with a comparable CaCo₃ content.

To quantify the benefits of fine lime for Central region growers, SRA Research and Adoption Officer Nick Hill is involved in conducting a cooperative trial with Central region growers Allan McLean and Richard Prior, who are members of the

Central Queensland Soil Health Systems (CQSHS) group. The CQSHS is a grower-driven group undertaking research and trial work addressing soil health issues in Central Queensland.

The trial site is located in Kuttabul, north of Mackay, and was established post-harvest 2017 in second ratoon Q242(b) and will conclude prior to plough-out (fourth ratoon). The trial is a paddock scale randomised strip trial comprised of four treatments: three rates of lime surface applied to the trash blanket and a zero control, with all treatments replicated three times.

As per standard on-farm practices, an annual application of 0.33 t/ha will be applied and compared with 1t/ha and 2t/ha applied once in 2017. Over the life of the trial the impact of the treatments will be assessed annually via:

- identifying changes to the soil pH at the surface; 0-20cm, and subsurface; 20-40cm, 40-60cm and 60-80cm;
- yield;
- CCS; and,
- A cost benefit analysis for each of the different treatments (*see Table*)

| FINE LIME APPLICATION RATES | FREQUENCY OF APPLICATION | ANNUAL ASSESSMENT – ALL TREATMENTS |
|-----------------------------|--------------------------|---|
| 0.333t/ha | Annually | Soil analysis: pH at surface (0-20cm) and subsurface (20-40cm, 40-60cm and 60-80cm) Harvest: Yield, CCS Cost benefit analysis |
| 1t/ha | Once | |
| 2t/ha | Once | |

Trial outcomes will be communicated through building on the existing CQSHS group network, working closely with extension officers from Mackay Agricultural Productivity Service (MAPS) and associated MAPS regional farming groups. ■

*(Over Page) lime being applied as part of the trial.
(Below) Growers Allan Mclean and Richard Prior are eager to learn more about an assessment of different approaches for fine lime application.*



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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 |
| 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 | 30/06/2019 |
| 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 |
| 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 the 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, nutrient management and environmental sustainability) | | | | |
| Strategies to manage soil-borne fungi and mitigate sugarcane yield decline | 2013/101 | CSIRO | Paul Harvey | 01/06/2018 |
| Boosting N-use efficiency in sugarcane through temporal and spatial management options | 2014/045 | USQ | Bernard Schroeder | 01/03/2018 |
| Improving NUE for sugarcane crops with constrained yield potential | 2015/065 | SRA | Danielle Skocaj | 30/06/2018 |
| 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 |
| 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 | 30/06/2018 |
| 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 |
| SIX EASY STEPS – continuing perspectives in time and space | 2017/004 | USQ | Bernard Schroeder | 01/02/2022 |
| Measuring soil health, setting benchmarks and driving practice change in the sugar industry | 2017/005 | SRA | Dave Olsen | 01/09/2022 |
| 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 | 30/06/2019 |
| 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 |
| 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 | 01/07/2021 |
| 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 |
| Field ready, optimised precision weed identification sensor system | 2015/055 | USQ | Steve Rees | 1/4/2019 |
| Delivery of remote sensing technology to combat cane grubs in Queensland cane fields | 2015/038 | SRA | Kevin Powell | 01/07/2021 |

| PROJECT TITLE | PROJECT NUMBER | PRINCIPAL R&D PROVIDER | CHIEF INVESTIGATOR | END DATE |
|--|----------------|------------------------|---------------------------|------------|
| Key Focus Area 4 (Farming systems and harvesting) | | | | |
| A non-pneumatic cane cleaning system with no cane loss | 2014/035 | QUT | Floren Plaza | 01/06/2019 |
| Increased harvest recovery: reducing sugar loss and stool damage | 2014/048 | SRA | Joseph Bonassi | 01/05/2019 |
| 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 |
| 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 | Chris Norris, Phil Hobson | 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 and Queensland Government Great Barrier Reef Innovation Fund (Reef Trust 4)) | 2016/807 | CANEGROWERS and SRA | Barry Salter | 01/05/2021 |

| | | | | |
|--|----------|---------------------|------------------|------------|
| Key Focus Area 5 (Milling efficiency and technology) | | | | |
| Real time harvest and transport system | 2014/037 | QUT | Geoff Kent | 01/07/2018 |
| Improving mill efficiency through rapid analysis methodologies | 2014/051 | SRA | Steve Staunton | 01/09/2017 |
| Managing aspects of raw sugar quality in the Australian sugar industry | 2014/052 | SRA | Steve Staunton | 01/08/2017 |
| Investigation into modifying pan boiling techniques to improve sugar quality | 2015/013 | QUT | David Moller | 30/05/2019 |
| Increasing capacity to undertake cane preparation research through modelling and experimentation | 2015/018 | QUT | Geoff Kent | 01/05/2018 |
| Online analysis systems to measure the available nutrients in mill mud | 2016/019 | SRA | Steve Staunton | 01/03/2020 |
| Reducing boiler maintenance costs and deferring capital expenditure through improved technology | 2016/020 | QUT | Floren Plaza | 01/07/2020 |
| Evaporator liquor brix sensor | 2017/003 | Wilmar | Robert Stobie | 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 |
| 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 | Stuart Norris, Rob Crossley | 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 (Collaboration and capability development) | | | | |
|--|----------|-------|----------------------------------|------------|
| 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 |
| 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 |
| Delivering a novel DNA-based diagnostic for root health to the sugar industry | 2015/402 | CSIRO | Johann Pierre | 01/12/2017 |
| 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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