Sugar Research Australia

CaneCONNECTION

Winter 2020

CONTENTS

(Cover page) *Coraki, New South Wales, growers Geoff (pictured) and Vicki Pye have been growing soybeans in rotation with sugarcane for nearly 30 years. Read more on page eight.*
Picture by Brad Pfeffer, SRA.

Design: *Catherine Jorissen, SRA.*

WELCOME TO THE WINTER 2020 EDITION OF *CaneCONNECTION*

Welcome to the Winter edition of CaneConnection. A few things have changed since the last edition of our magazine. Social distancing has been the new normal way of living and for many people there has been a sudden induction into the world of video phone calls to stay connected.

On the farm, social isolation on the tractor or in the shed is pretty well par for the course.

For SRA with respect to events and meetings, you would have noticed that many of our usual activities such as the grower updates have been postponed or shifted to an online format. Like everyone, the situation with COVID-19 has meant a rapid shift to digital platforms with webinars and videos to provide you with information about SRA's activities. You can find more about these activities on the SRA website (sugarresearch.com.au), including recordings of our recent webinars.

We also know that it is important to continue our regular communication channels, such as this magazine. With the harvest starting soon, in this edition you will find an update on SRA's work within harvest optimisation, including a closer look at specific activities in the Herbert and Tully districts.

We also provide information on SRA's involvement in collaborative work with other industries on the important issue of community trust of the agricultural sector. You can read more about the early insights from this project, including opportunities and risks for the sector, on page 18.

This edition also provided an update on research that has examined the use of satellite imagery to assist with yield forecasting for our industry, which you can read about on page 16.

Thanks for reading.

Brad Pfeffer

Executive Manager, Communications

ISSN 2203-1111 (Print) ISSN 2203-112X (Online)

1 MANUAL

4 CALCULATORS

27 PAPERS

19 INFO SHEETS

THE NUMBERS BEHIND THE BRAND NEW ONLINE SIX EASY STEPS TOOLBOX

SUGARCANE growers now have access to a new online toolbox to help make nutrient management easier.

SIX EASY STEPS® Toolbox

The new SIX EASY STEPS toolbox on the SRA website has recently gone live, following investment by SRA, the Queensland Department of Environment and Science and CANEGROWERS, and in collaboration with the University of Southern Queensland and Farmacist.

The development was led specifically by SRA Adoption Officer, Gavin Rodman, and Executive Manager for Biosecurity and Production, Barry Salter, with help from a wide range of other industry supporters.

Here's a snapshot of what you can find in the new toolbox.

14 CASE STUDIES

11 BOOKLETS

7 TOOLS

13 WEB PAGES

The Toolbox was developed with investment by SRA, the Queensland Department of Environment and Science, Queensland Department of Agriculture and Fisheries and CANEGROWERS, and in collaboration with the University of Queensland, the University of Southern Queensland and Farmacist.

2019 HERBERT HARVESTING DEMONSTRATION PROJECT - SWEET OUTCOME FOR GROWERS AND CONTRACTORS

Australian Government
Department of Agriculture

BY CAROL NORRIS, ADOPTION OFFICER, SRA

Research dating back to the 1970s has proven that mechanical harvesting results in cane loss out the extractor. These losses can be minimised and converted to additional yield and revenue for the Australian sugar industry, and it is expected that full adoption of Harvesting Best Practice (HBP) has the potential to deliver an additional 1.2 million tonnes of cane and 164,000 tonnes of sugar valued at over $69 million (an additional $2.86/t of cane) for industry.

This significant growth in yield and revenue can be achieved without any increase in area under cane. To raise awareness of this substantial opportunity for the Australian sugar cane industry, SRA and their project partners, including the Department of Agriculture and Fisheries (DAF), embarked on a Rural R&D for profit funded program. The program included an adoption component to strengthen the knowledge, skills and capacity required for practice change in the harvesting sector. Results from 95 fully randomised and replicated green cane trials during the 2017 and 2018 season indicated both cane and sugar yields for the recommended practice were 5.2% and 5% (respectively) higher than standard harvester operator practice.

But how does HBP affect a harvesting contractor's commercial operation? There is widespread acknowledgement in the industry that harvesting contractors are generally trying to deliver the best outcome for their growers in a very constrained environment. There is significant pressure on harvesting groups to harvest at high flow rates to ensure bin allotments are filled and throughput maximised. Growers and their harvesting contractors may be concerned that a reduction of flow rate into the machine will see a spike in harvesting costs greater than additional revenue generated from HBP yield gains.

Understanding the impact of reduced flow rates to contractor harvesting costs is essential to the adoption of HBP. To address this knowledge gap, the DAF harvesting team economists developed a detailed cost comparison model, expanding on work done on the BSES Harvest Haul model. The cost comparison model was used to perform cost evaluations for nine of the 2017 and 2018 project green cane trials. Results from these evaluations across the industry indicated the increased cane and sugar yields generated by the recommended practice increased grower gross revenue by $181/ha (4.8%) but reduced ground speeds increased the average cost of harvesting by $61/ha (excluding any additional incentive payments to the harvesting contractor). Subtracting the additional harvesting cost (including fuel and levies) from the gross grower revenue indicated an average net benefit of $120/ha for the trials.

SHOW ME THE MONEY!

In 2018, following a fact finding trip to the Isis mill area, a group of innovative Herbert growers and contractors wanted

to validate research outcomes in an average day-to-day harvesting scenario. "Show me the money!"

In response the 2019 season had the SRA / DAF harvesting team, with support from Wilmar Sugar, Herbert Cane Productivity Services Limited and Herbert River Canegrowers deliver the industry's first month long commercial harvest demonstration round in the Herbert. Two volunteer harvesting groups alternated between commercial (standard practice) and recommended (HBP) settings across their entire contract for one round during the 2019 harvesting season (round three of four rounds or 25% of the growers' crop). This included a total of 12 demonstrations for nine growers between both groups. A full rake was analysed at the mill to compare yield data between commercial and recommended settings.

Results suggested that in a normal commercial operation cane yield per hectare increased by 4.9% and sugar yield per hectare increased by 5.2% (both significant) when the contractors moved from standard to recommended practice. These outcomes closely align to the percentage yield increase observed across the 95 field demonstration trials conducted in 2017 and 2018.

However, while yield gains remain important, a key objective of the program was to understand the cost implications for the harvesting contractor, and resultant net revenue benefit for the grower (after compensating the harvesting contractor to move to recommended practices). The harvesting team's DAF economists used their cost comparison model to complete the trial costings. Each analysis of the 12 demonstrations identified the full spectrum of costs (machinery depreciation, labour, fuel, maintenance, etc.), drawing upon demonstration data and requiring a substantial amount of operational information to be collected from the respective harvesting operations.

Total grower revenue was calculated using the five-year average sugar price ($418/t), yield and CCS results (for each trial), together with the cane payment formula specific to the Herbert. Net grower revenue included total grower revenue less harvesting costs (including fuel) and levies. Actual harvesting costs and levies were $37/ha ($0.07/t) higher for the recommended setting due to higher yields, reduced harvester ground speeds and lower extractor fan speeds. Despite the higher harvesting costs, recommended settings obtained significantly higher total revenue ($150/ha, +4.7%). This resulted in an overall net benefit of $114/ha (+4.4% higher net revenue to the grower after taking into account the $37/ha increase in harvesting cost), in adoption of recommended settings. The table below compares the increase in grower revenue, change to harvesting cost and grower net benefit after compensating the harvesting contractor to move from standard (commercial) practice to recommended (HBP) practice.

Field trials have consistently demonstrated the production and revenue gains of HBP, but the work undertaken by the harvesting team's DAF economists on the Herbert demonstrations proved the critical information required to support the decision making process between the grower and his harvesting contractor when planning their harvest.

The 2017/2018 field trials and the Herbert commercial demonstration project has identified there is now a need to move from field trials to a directed and well-structured strategy to link the awareness of research outcomes to the actual ability to convert identified losses into yield gains. To address this gap, the SRA/DAF harvesting team is now focused on:

- Delivering a decision support tool to assist growers and harvesting contractors in their decision-making process when planning their harvest,
- Mentoring and supporting growers and harvesting contractor's through knowledge building workshops and field days, leveraging off group and peer to peer learning,
- The development of an affordable operator training program in harvesting best practices,
- Further investigation into the cost and implications to the milling and transport sectors, with a particular focus on cane supply logistics and milling efficiencies. ■

***(Over page)** The 2019 season had the SRA / DAF harvesting team, with support from* Wilmar Sugar, Herbert Cane Productivity Services Limited and Herbert River Canegrowers deliver the industry's first month long commercial *harvest demonstration round in the Herbert.*

The harvesting team extend its sincere appreciation to the participating harvesting contractors – Dwayne and Damien Morelli and Mark Chiesa for participating in this pivotal demonstration. Finally, our grateful thanks go to Wilmar Sugar, Herbert Cane Productivity Services and Herbert River Canegrowers. Without their crucial input and support this project would not have been possible.

For more information contact:

Phil Patane
(SRA Harvesting Adoption Officer and Project Leader)
M 0431 818 482
E PPatane@sugarresearch.com.au

Carol Norris
(SRA Harvesting Adoption Officer)
M 0459 861 482
E CNorris@sugarresearch.com.au

Brendon Nothard
(DAF Senior Agricultural Economist)
M 0475 973 226
E Brendon.nothard@daf.qld.gov.au

Table 1: **Herbert commercial demonstration vs 95 Industry Field trials (2017-2018)**

OUTCOMES	2019 HERBERT HARVESTING COMMERCIAL DEMONSTRATION PROGRAM	2017 2018 95 INDUSTRY (HARWOOD TO MOSSMAN) FIELD TRIALS
Per Hectare	Recommended Practice	Recommended Practice
% Yield Increase (tph)	+4.9%	+5.2%
% Sugar Increase (tsh)	+5.2%	+5%
Increase in Grower gross revenue	$151	$181
Increased cost to harvest at HBP	<$37>	<$61>
Increase in Net Grower Benefit	$114	$120
**Cost increase per tonne*	*(0.07/t)*	*(0.22/t)*

TAKING THE NEXT STEPS WITH HARVEST EFFICIENCY

For Tully grower Brian Dore, the numbers behind harvest optimisation are fairly obvious.

Like most growers and contractors, he had seen the trial data and been to workshops that described the data of harvest optimisation.

However, grabbing that information and using it in the paddock required careful consideration.

The Dore family run a John Deere CH570 and cut a contract that runs across 1200 hectares, ranging from 110,000 to 130,000 tonnes depending on the season. About half of the cane is that of Brian and his two brothers, Jamie and Greg, with the remainder being contract work.

"With the size of our contract, we felt our harvesting parameters were set in stone until we could see a full cost/benefit analysis," Brian Dore said. "We've cut this size area for about seven years and any changes would also mean changes to scheduling and putting on more men."

"It's not just a matter of slowing down the machine. Do that and everything changes, so we needed to understand what that means."

This led Brian to working with SRA on an in-field harvest losses trial.

The trials also helped the Dores identify the impact of crop presentation (row profile, field conditions and varieties), harvester machine setup and operator performance.

For example, the graphs presented here are from a relatively sprawled sugarcane crop of Q231$^{\phi}$ which was part of the trial. The graphs indicate how harvester fan speed effects the total harvestable material left in the field, and associated cane loss and sugar loss.

As the fan speed increases the total harvestable material left in the field (extraneous matter, sugarcane juice and billets) also increases (Figure 1). The total harvestable material left in the field includes material coming from the primary and secondary extractors of the harvester.

The total harvestable material left in the field has associated cane (billets) and sucrose (juice) losses which are shown in Figure 2 and Figure 3 respectively. As the fan speed increases cane losses also increase (Figure 2). Likewise, as the fan speed increases, the sugar loss increases (Figure 3).

As harvester fan speeds were increased so too has the total harvestable material left in the field and associated cane and sugar loss.

Operating sub-optimal harvester fan speeds will also increase the percentage of extraneous matter being sent to the mill which has significant impacts on CCS, transport costs and milling processes. Depending on sugarcane crop presentation, harvester machine setup and operator performance there is a balance between effective harvester cane cleaning and cane and sugar losses.

Brian Dore sees that there is an opportunity to use such information and bring it together with economics to help the industry determine that balance or the 'sweet spot' for harvest optimisation.

This work is currently underway, with SRA developing a Harvesting Predictive Model that will assist in decision making around harvesting parameters and provide information on the benefits and costs attributed to the grower and harvesting group.

Further development would be required to further extend that model into a broadscale tool for the entire industry.

"The economics of harvesting best practice are critical to decision making. The model would incorporate harvesting cost change estimates linked to harvester settings such as labour, repairs and maintenance and fuel costs."

It will be tested with industry this harvesting season, on a small scale.

In terms of the tool and its future refinement, development and release, Brian Dore said this would be valuable in helping move forward harvest optimisation for the industry.

"This helps pull it all together," he said. "We are all facing different varieties, different cutting conditions, different crop classes. All of those factors come in to play. As a contractor, I'm looking for information on what the pour rate should be on particular blocks and then how much time to schedule for particular blocks. ■

(Over page) Tully grower and contractor Brian Dore says there is good data behind harvest optimisation, but implementing change is complex and requires consideration of a range of factors

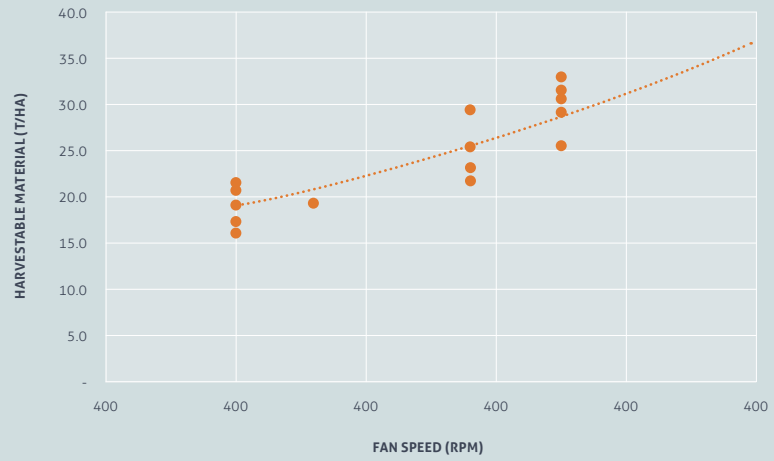


Figure 1: *Total harvestable material left in the field at different harvester fan speeds*

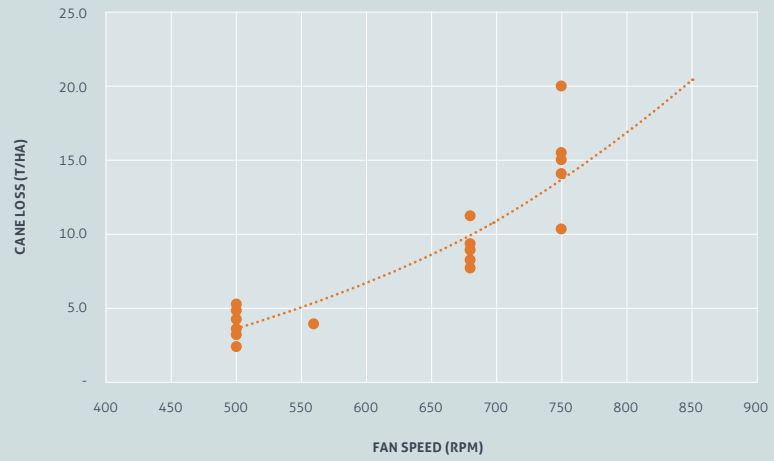


Figure 2: *Sugarcane loss at different harvester fan speeds*

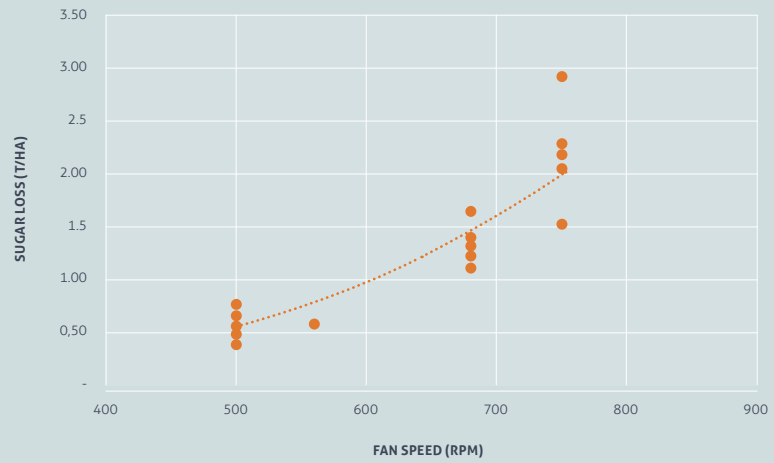
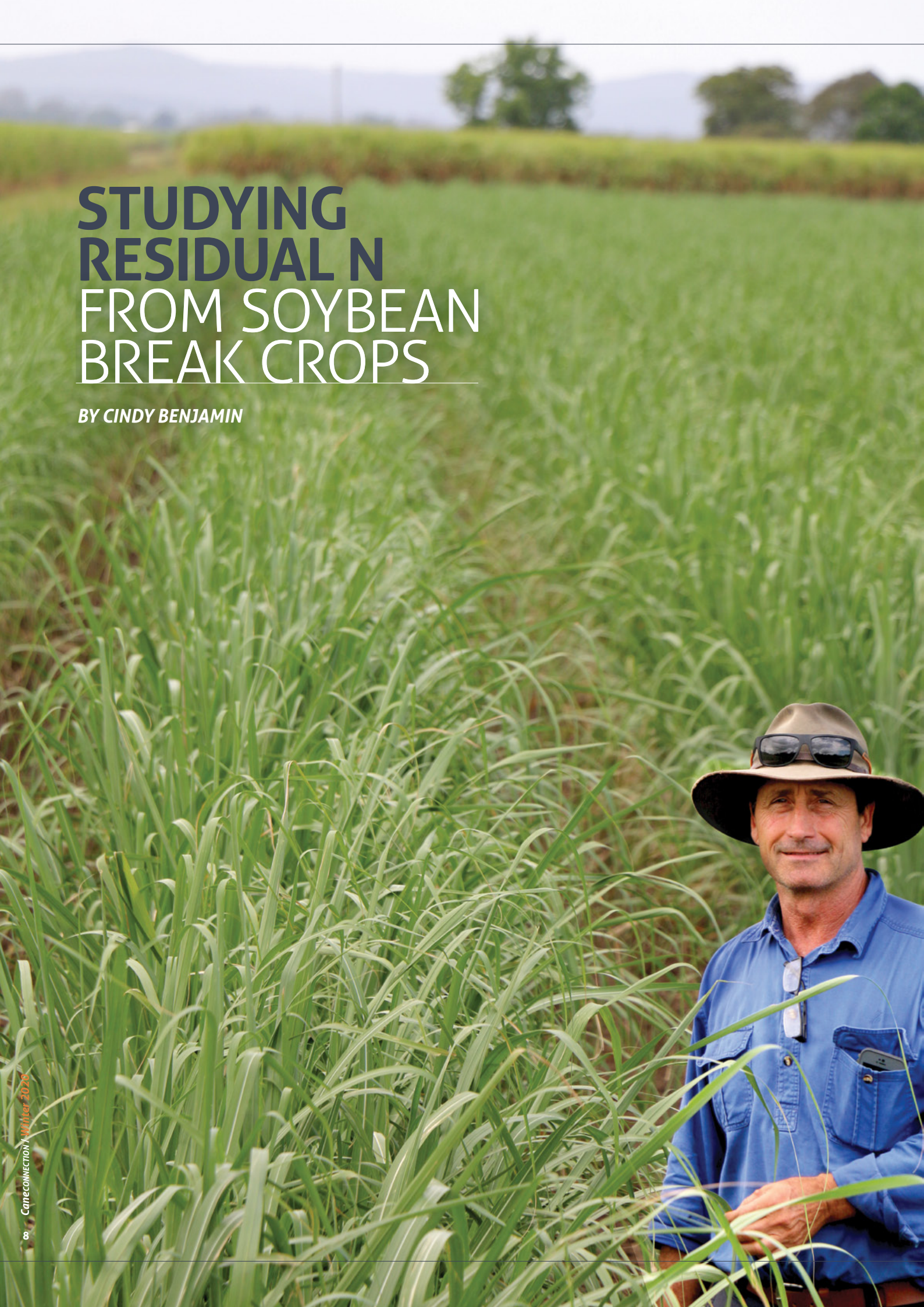


Figure 3: *Percentage of sucrose loss at different harvester fan speeds*

STUDYING RESIDUAL N FROM SOYBEAN BREAK CROPS

BY CINDY BENJAMIN



Soybean crops grown for green manure can fix up to 300kg N per ha but the availability of that nitrogen (N) for future crops varies considerably.

In New South Wales, Northern Rivers growers were concerned that much of the fixed N from soybean crops may not be present in the soil at the end of the winter fallow period when the next cane crop is planted.

To investigate, Dr Terry Rose from Southern Cross University conducted field trials to assess the real N benefits to subtropical cane from soybean break crops. In the 2016–17 summer Dr Rose collected data on N fixation, measured at mid podfill, in 12 soybean crops on five cane farms.

Before the soybean crops were sown in December 2016, soil cores were taken and soil properties, including mineral N content, were analysed to a depth of one metre. At podfilling stage crop samples were taken from three 1m lengths of row selected at random within each crop.

The plant material was dried, weighed and finely ground before calculating the amount of N derived from the atmosphere (%Ndfa). To do this, weeds collected at the sampling points were used as the non N-fixing reference and plants of each variety used in the trial (Asgrow, Manta and Richmond) were grown in an N-free environment to provide the other reference data needed to calculate %Ndfa in the shoots of the trial soybean crops at the time of termination.

In this trial, soybean dry matter yields at mid podfill ranged from 3.4 to 12 t/ha, with shoots containing 91 to 343 kgN/ha. The lower end of this range was from paddocks where wet conditions early in the crop resulted in low plant counts and poor crop vigour. These results are comparable with findings from earlier trial work by Dr Natalie Moore and others that established a shoot N accumulation range of 130 to 420 kgN/ha for crops grown in the Northern Rivers district from 2009 to 2012.

The amount of N in the shoots that was derived from the atmosphere ranged from 30 percent in the crops that were poorly established (and likely poorly nodulated) up to 90 percent in high biomass crops.

RECOVERY OF SOYBEAN RESIDUE-15N THROUGHOUT THE SOIL PROFILE

Soil depth	% recovery of 15N		
	Clay field 1 (Coraki)	*Clay field 2 (Coraki)*	*Sandy field (Ballina)*
0-100mm	52.9 ± 2.7	44.3 ± 2.6	21.4 ± 2.4
100-300mm	6.7 ± 0.3	11.3 ± 0.7	12.1 ± 4.6
300-600mm	4.9 ± 0.2	4.0 ± 0.4	19.4 ± 1.7
600-900mm	3.7 ± 0.4	1.6 ± 0.2	2.0 ± 1.1
Total recovery	**68.3 ± 3.4**	**61.3 ± 2.3**	**54.9 ± 4.8**

"If we disregard the poorly established crops the results show that the amount of N fixed from the atmosphere and stored in soybean shoots at mid podfill stage ranged from 100 to 290 kgN/ha," said Dr Rose. "Importantly this does not account for N stored in the root systems."

Many of the soybean crops were not harvested in 2017 due to flooding, and therefore acted as green manure crops. The second part of the trial was to investigate the movement of fixed atmospheric N in the months between soybean harvest (or green manuring in the 2017 year) and planting the next cane crop in September.

To do this Dr Rose grew soybean plants of the same three varieties in a glasshouse environment where they were fed urea fertiliser enriched with the stable 15N isotope. These plants were harvested during late podfilling and the shoots were used to replace the residue from the paddock-grown crop in three 0.6 m by 0.6 m boxes placed 0.3 m into the soil in three of the trial paddocks.

In spring, prior to cultivation for the following sugarcane crop, soil samples were taken from inside the boxed areas and analysed for the presence of 15N isotope. By this time, all the soybean residue in the boxed areas had decomposed.

"At the end of the winter fallow period we recovered 55 to 68 percent of the 15N isotope applied," said Dr Rose. "The unrecovered portion was lost either through leaching below the 900 mm testing depth or volatilisation into the atmosphere."

"The highest loss of 45 percent occurred on the lighter soil type, which also received higher rainfall than the other farm," he said. "Interestingly, around 20 percent of the recovered 15N on the light soil was located in the 300 to 600 mm depth zone, suggesting that leaching was the key loss pathway."

Rain received after cane planting may have leached this remaining N below the cane root zone.

Where a soybean crop is harvested for grain, much of the fixed N is removed from the field, leaving stubble with a C:N ratio of around 65:1 compared to the more readily broken down green manured material with a C:N ratio of 12:1. This may protect the fixed N from the large losses measured in this trial, albeit that less N will remain in the paddock due to the removal of the bulk amount in the harvested grain.

Alternatively, there may be potential to grow a winter cover crop to use the fixed N soon after green manuring.

GROWER PERSPECTIVE

Geoff and Vicki Pye hosted two of the strip trials on their property 'Oakland' at Coraki, where they have grown soybeans in rotation with sugarcane for 29 years.

Geoff follows a six-year cropping cycle, cutting cane three times before planting soybean as a break crop before returning to cane. Crops are grown in raised beds in a controlled traffic system with 1.8 m wheeltrack/bed width.

***(Left)** Coraki growers Geoff (pictured) and Vicki Pye have been growing soybeans in rotation with sugarcane for nearly 30 years.*

"The old cane stool is destroyed using discs and a rotary hoe and we add lime and ameliorants and laser grade if needed, then the beds are formed and the soybeans planted," said Geoff. "After the soybeans are harvested the stubble is left until spring when we strip till in the beds to plant the cane."

Geoff has found Asgrow to be a reliable soybean variety that meets human consumption grade, is tolerant of waterlogging and is not prone to weathering at harvest.

"We use the rule of thumb established in previous research that suggests we can count on 60 units of N per 2.5 tonne of grain harvested per ha being available for the following cane crop," said Geoff.

Geoff and Vicki have also participated in winter crop trials and were impressed with the benefit these crops can have on soil tilth particularly. Geoff said their peat soils are always easy to work but the winter cereal crops improved the friability of their heavy clay soils.

"The problem lies in logistics really," he said. "Growing a cereal crop requires some additional machinery to be able to plant into the soybean stubble. We have thought about the possibility of broadcasting oats seed when the soybean crop starts to drop its leaves so the oats can establish underneath the soybeans."

Geoff believes this would achieve soil benefits but may come at a cost in terms of weed control, which is usually a high priority between soybean harvest and planting the next cane crop. ■

KEY MESSAGES

- **Losses of 32-45% of soybean residue N can occur over the winter fallow period when soybean is green manured, so growers should not discount the total amount of soybean residue-N from estimated N fertiliser requirement of the following cane crop.**
- **Opportunities for green manure or cash crops grown over winter should be considered for future research to minimise N losses and add diversity into the cane system.**

(Above left) *Three 0.6 m by 0.6 m boxes were placed 0.3 m into the soil in three of the trial paddocks and 15N enriched soybean shoots were used to replace the residue from the paddock-grown crop. In spring, prior to cultivation for the following sugarcane crop, soil samples were taken from inside the boxed areas and analysed for the presence of 15N isotope.* ***(Top right)*** *Winter cover crops could be an option for growers wanting to utilise the N fixed by soybean crops.* ***(Above)*** *Researcher Dr Terry Rose, Southern Cross University, said over 32 per cent of the fixed N returned to the soil when soybeans are green manured is lost before the following cane crop is planted in Spring.*

INDUSTRY LEADERS COLLABORATE TO PROMOTE SUGARCANE IMIDACLOPRID STEWARDSHIP PROGRAM

Public and private organisations have collaborated to develop and promote a new best-practice training program for sugarcane growers that targets the safe and sustainable use of liquid imidacloprid products such as Confidor® Guard Soil Insecticide and Nuprid® 350SC.

The program aims to encourage the correct placement of imidacloprid in the field to ensure maximum performance against cane grubs, and the strategic use of the product to ensure longevity of the product.

By getting these use aspects right, research trial data indicates that benefits may also flow to nearby waterways and the Great Barrier Reef.

With the support of SRA and the Queensland Government's Department of Agriculture and Fisheries (DAF), Bayer and Nufarm have worked together to create an instructional video, training package and an application slot depth measurement gauge for use in ratoon cane applications. Initially, the group will train 750 growers in the Mackay Whitsunday and Wet Tropics regions with the eventual aim of the materials reaching all Australian sugarcane growers.

The program is based on several years of research work conducted by SRA and DAF.

Emilie Fillols, Senior Researcher with SRA based at their Meringa Station said: "Growers should first consider if they need to treat their blocks for cane grubs, which is a decision based on a risk assessment. If treatment is necessary, achieving an application depth of 100 mm or more is essential to reduce imidacloprid loss via runoff. Three years of field trials in the Wet Tropics and the Burdekin have confirmed the critical importance of application depth in preventing loss of imidacloprid."

Nick Matthews, Market Development Agronomist with Bayer said that Confidor Guard and Nuprid 350SC liquid imidacloprid are critical tools to control cane grubs, however, they need to be used correctly.

"Bayer has worked hard to prepare a relevant and easily accessible training video and presentation. Our first goal is to train all retail agronomists, and then work with the relevant productivity services organisations and other organisations to train their agronomists. While the minimum depth message is simple, achieving this in field in all areas poses many challenges. Our training video and materials cover a wide variety of machine types and situations."

For Dave Rumbold, Regulatory Lead ANZ with Nufarm, a practical contribution to the success of the program has been the Confidor Guard and Nuprid 350SC Depth Gauge. One thousand of these sturdy tools will be made available, free of charge, to growers, agronomists and contract applicators. "These tools will allow growers to easily measure slot depth across several locations in their blocks to ensure they are achieving the minimum depths for efficient treatment," he said. ■

KOVACICH FAMILY – FOCUSING ON SOIL HEALTH, PROFITABILITY, TECHNOLOGY AND SUSTAINABILITY

BY SOIL HEALTH OFFICER, TERRY GRANSHAW, BURDEKIN PRODUCTIVITY SERVICES (BPS)

Follow the Burdekin River upstream 30km and you are in the heart of North Queensland irrigated agriculture. You will also meet a family who has been farming this land since it was first developed about 40 years ago. Ivan, Cy and Boz Kovacich, a family farming business, moved from Home Hill to Mona Park after purchasing an initial 120 hectares in 1989.

The first 10 years were farmed using the traditional farming practices they had implemented on their alluvial soils at Home Hill but without a legume (dolichos) break crop.

The emphasis during the fallow was on controlling native weeds with cultivation or herbicides. The sodic alkaline soils were low yielding and traditional tillage methods were becoming increasingly difficult. A good soil tilth was hard to achieve without using monumental amounts of diesel and plenty of steal.

In 2002, Cy first spoke with his father, Ivan, about planting six dual rows of cane at the edge of a paddock, on a wider wheel spacing that aligned with the cane harvester. Ivan responded with "yeah, you can try it, but if you do, you're doing the whole paddock."

This resulted in 90ha of dual row on 1.8m centres being planted that season. It was a steep learning curve during that time. Twelve months later, the plant crop yielded over 200 tonnes of cane per hectare, something that had not previously been achievable on this farm. It became obvious that compaction was a major constraint.

Around the same time, they bought their first GPS guidance system, and planted their first soybean break crops. The idea was to mimic the practices of the old farm to improve soil health without multiple, heavy tillage operations. During the transition period, one of the tractors had its wheels widened to match the new row spacing and they relied on hiring implements.

Over time, the wheel spacing of all machinery has been adjusted and GPS guidance installed to achieve a completely controlled-traffic farming system. Cy and Boz have purposely built implements to suit their controlled traffic farming system in their own workshop. This reduces the need to hire equipment and improves efficiency as farming operations can be completed when soil moisture is optimal. Rate controllers have been added to fertiliser boxes, chemical applicators, and planters to ensure application accuracy.

Ratoons are harvested, stoolsplit, touched up with a bed sweeper and re-shaped if needed. This has reduced the need for expensive laser levelling. A quick brush over is completed every 10 years rather than at the end of every crop cycle.

The Kovacich family expanded their farming area to 370ha in 2007. They also contract and harvest 75,000 tonnes of cane. The harvester originally had a flipper roller on the elevator before an elevator extension was purchased to enable bins to be better filled on their controlled traffic farming system.

After seeing the results of controlled traffic and legume rotations, Cy started experimenting with a longer fallow and a combination of cash crops. This required changes to the original sugarcane rotation and machinery purchases and modifications to fit these cash crops into their minimum tillage, permanent bed, controlled traffic sugarcane farming system.

Stubble management, grain transport and marketing presented plenty of new challenges. However, they were committed to perfecting the inclusion of cash crops. Tillage operations have been reduced to two wavy disc operations straight behind the harvester, one pass with a bed re-shaper and an implement that creates a small v-shaped furrow in the wheel tracks to widen the top of the bed to one metre. This allows legume crops to be planted at optimum row spacings and improves irrigation efficiency.

A lot of time and money has also been spent on improving irrigation infrastructure. Every farm has access to channel and underground bore water. Recycling pits have been designed to capture and reuse irrigation water. This provides water security for sugarcane and cash cropping.

The Kovacich family has seen incredible soil health and productivity improvements from the changes made to their farming system and focus on timeliness of operations. Plant cane rarely yields below 200 t/ha, the average farm yield is 120 to 130 t /ha, with their cycle often including fourth and fifth ratoon crops. They continually search for opportunities to improve farming practices. Cy is currently experimenting with other fallow management options to identify whether he can realise even greater soil health and economic benefits.

Cousin Casey Kovacich purchased a farm closer to the coast and implemented a similar farming system to Cy and Boz. This farm has already seen improvements in the short time it has been operating under the new system.

The innovations don't end with farming practices and equipment modification. Casey and Boz, with assistance from another family member Lee, have created their own farm recording app. The app is designed specifically for sugarcane and rotational cropping; helping capture, store and analyse farm records in a customised format.

The Kovacich family are farming pioneers in Mona Park and are at the forefront of new-age farming. Attention to detail and timing is paramount. Boz once told me: "all you needed to farm successfully in the past was sunshine, water and soil whereas farming these days has become a science and focussing on the most limiting factors that directly affects your business operations and profitability are key."

I often ask growers and researchers "how do you put a dollar figure on soil health?" Cy's answer sums it up perfectly: "it's priceless!" ■

The Soil Health Project of the Herbert and Burdekin regions is supported by HCPSL, BPS, Queensland Department of Agriculture and Fisheries, University of Queensland, University of Southern Queensland, Wilmar, and SRA.

To see a video of Terry speaking with Cy, hover your smartphone's camera over the QR code.

(Over page - Top) *Permanent beds.* ***(Middle left)*** *Soil Health Officer and article author, Terry Granshaw, with Cy Kovacich, Mona Park.* ***(Middle right)*** *Boz, Casey and Cy Kovacich.* ***(Bottom left)*** *Wavy disc.* ***(Bottom right)*** *John Deere tractor widened to 3.6m.*

A ONE-STOP GUIDE TO WHOLE-FARM NUTRIENT MANAGEMENT

THROUGH THE HELP OF THE RP161 PROJECT AND HERBERT CANE PRODUCTIVITY SERVICES LIMITED, DARYL LARSEN IS SEEING BENEFITS TO HIS FARM AND OVERALL MANAGEMENT.
BY ADAM ROYLE, HCPSL

Originally a grazing property in the heart of the Herbert sugarcane growing region, the Larsen farming enterprise moved to sugarcane when Alan Larsen planted his first billets in 1990.

Fast forward a decade, at the ripe old age of 17, Alan's son Daryl Larsen took over the family farm after his father's passing. Jump forward a further two decades and Daryl has not only expanded the farming enterprise but signed up to a new whole farm management project called Complete Nutrient Management Planning for Cane Farming (or "Herbert RP161").

Farming over 450 hectares comes with a substantial investment in fertiliser and soil ameliorants so for Daryl being able to better predict, manage and keep records of these inputs is extremely important.

This is the primary reason he decided to join the Herbert RP161 project in early 2019. Twelve months on and Daryl says his experience with doing the project has changed the way he manages his nutrient applications.

"Soil testing has been a big part of my farming operations for a while now, but the project has brought it all together in a number of ways," he said.

Sugar Research Australia · HCPSL Herbert Cane Productivity Services Ltd. · Australian Government · Queensland Government

"In the past I used my soil tests to work out my fertiliser for plant and younger ratoons, but once the crop got past a few ratoons all the blocks got lumped together. Having a whole-of-farm nutrient plan means I can now manage blocks individually if I need to. I now know what each block needs, how much it needs and when it needs it, and that's made a big difference to the way I manage my farm. It also helped me understand which blocks I could manage in a similar way and which blocks needed to be managed differently.

"I know a lot of the focus is on N and phosphorus, but for me it's about supplying all of the nutrients that my crop needs to be able to better utilise the N and phosphorus that I do apply.

"Ameliorants and micronutrients have been much easier to manage since doing a nutrient management plan. I not only know what nutrients my blocks need to grow a crop but also how much it will cost me, what return I might expect and in turn how much I'm prepared to invest for that return prioritising my investment."

Daryl recently went through a Reef protection regulation compliance audit and explained how the nutrient management plan, developed by Herbert Cane Productivity Services Limited (HCPSL) extension agronomists, helped him provide records for his fertiliser applications.

"Apart from knowing what I need to order and when I need to order it, the nutrient management plan allows me to record my actual applications and any variations in one location and that's been a game changer for me. During a recent compliance audit I could provide 90 percent of what they were asking for in one document, it took a lot of the stress out of the process for me."

Before leaving Daryl to get back to his farming duties we asked him what he would say to another grower who might be considering doing a nutrient management plan under the Herbert RP161 project.

"I admit I was a little sceptical at first but once I saw what it could achieve on my farm and for my farming operations I couldn't imagine being without it. I would recommend it to any grower who wants to have an easy and effective plan to manage their fertiliser applications.

"I know I have mentioned the nutrient management plan a lot, but the project is more than just that. HCPSL and their extension agronomists have always been there to chat about anything relating to my farming operations."

If you'd like any more information about the Herbert RP161 project give HCPSL a call on 07 4776 1808 and talk to one of their extension agronomists. ■

The RP161 project is funded by the Queensland Government's Reef Water Quality Program and the Australian Government Reef Trust in partnership with HCPSL and SRA.

For more information contact:
HCPSL: T 07 4776 5660
Farmacist Mackay: T 07 4959 7075
Farmacist Burdekin: T 07 4782 2300

(Above left) *HCPSL extension agronomist and Herbert RP161 whole farm nutrient management team leader Adam Royle discusses farming activities with second generation sugarcane farmer Daryl Larsen.* ***(Above)*** *HCPSL Extension Agronomist Shannon O'Brien (left) presenting a 'hands on' N loss activity with Herbert RP161 growers during a Farming 4 CASH® workshop.*

(Below) UNE Professor Andrew Robson says new yield-forecasting technology offers significant potential for the Australian sugar industry.
(Over page) HCPSL collecting in-field measurements as part of the project.

VIEW FROM ABOVE HELPS WITH YIELD FORECASTS

The Australian sugarcane industry is used to wild variations in the weather.

This year alone has seen seasonal conditions swing from severe drought in some regions to flooding.

Such climatic variation is not new to the Australian sugar industry, but it is becoming increasingly common – and the cost can be profound.

Unpredictable weather not only hampers growth and management, it also complicates mill planning for how much cane is available to be harvested and crushed. The logistics of scheduling rolling stock and labour to support processing - and the finalisation of sales, pricing and marketing strategies - can be a major challenge for the industry.

But there's light on the horizon.

Funded by Sugar Research Australia, the Applied Agricultural Remote Sensing Centre (AARSC) at the University of New England (UNE) has joined forces with UNE's Computation Analytics Software Informatics to develop an innovative tool for forecasting sugar yields and crop health.

The SugarMaps platform builds on a decade of research and extensive industry testing. It uses satellite images dating back 15 years as well as corresponding productivity information.

After analysing how crops performed under a variety of conditions, the AARSC team developed an algorithm for each growing region that correlates annual crop growth patterns with yield. Best of all, it has been shown to be highly accurate, even during fluctuating seasons.

"Extreme weather events are occurring with greater frequency across Australia, and the yield forecasting methodology we have developed offers a degree of certainty that has been shown to exceed the accuracies of traditional methods," says AARSC founder and director Professor Andrew Robson.

"Last season, extreme drought conditions impacted many of the sugar growing regions, yet we were still able to predict sugarcane production four months before harvesting commenced, achieving an average of 93 percent accuracy across 12 regions.

"As well as providing regional yield forecasts, SugarMaps provides a standalone platform that delivers crop health and derived yield maps for tens of thousands of sugarcane crops. Forecasts can be immediately updated following natural disasters, and SugarMaps enables growers to make more informed on-farm decisions about the planting of different varieties, as well as how they might tackle problems like water-logging, drought, nutrient deficiency and disease."

Professor Robson's team of international experts has validated the technology with sugarcane growers and mills in all major sugarcane growing regions, spanning up to 100,000 individual crops. He said the ongoing support and engagement from industry is a clear demonstration that the outcomes and accuracies are hitting the mark.

Third-generation sugarcane grower Brian Dore, who supplies the Tully mill, has used satellite imagery provided by the AARSC team to "get a handle on the variables" so he can address them.

"No two years are the same, and having the science to back up our decision-making is very important, rather than shooting from the hip," he said. "Variations in yield of 10-15 percent might not sound like a lot, but when you are working on slim margins, 10-15 percent can add up to a lot of tonnage. Accurate data is vital, so you know what's coming, and SugarMaps will be a great tool to have in our toolbox."

From a mill perspective, SugarMaps provides crucial benchmarks.

"We can have a difference in rainfall of a metre from one end of our growing region to the other, which makes advising the mill challenging," said Greg Shannon, cane productivity manager with Tully Sugar, which has contracts with 220 sugarcane growers across 34,000 hectares and operates one of the largest single train sugar mills in the country.

"I've combined AARSC forecasts with my physical assessments of crop growth, so it's not just me running around a paddock with a cane knife and scales. It's the most accurate data we've ever had and gives me a great deal of confidence in recommendations. I think it will be of real interest to corporate sugar producers and growers all over the world."

At Bundaberg Sugar, the responsive capabilities of SugarMaps has similarly impressed cane supply manager Rob Powell.

"We use the SugarMaps data to validate our crop estimate (currently generated by our field officers and growers) and to consistently monitor the crop and guide re-forecasting throughout the harvest season," he said.

"SugarMaps will enable us to better understand what's currently out there and monitor the vigour of the crop, which helps to streamline our operations and maintain efficiencies. Some growers are using the platform to achieve greater consistency across their paddocks - using it to monitor crop yield variations across their farm and provide real feedback on nutrient application, water logging, and sub-surface drainage.

"In the future, I can see us using the satellite imagery to monitor crop development, growth, yield and crop estimates, to determine what cane is yet to be harvested throughout the crushing period."

With the lion's share of Australia's sugar exported, accurate yield data is vital for mills to budget, price and market their raw sugar.

"The cost of not meeting contractual forward-selling obligations can be great," Professor Robson said. "In 2010, when wet weather prevented a number of growing regions from completing their harvest, Queensland Sugar Limited reported that 5.5 million tonnes of cane was left in the paddock. This cost the industry $105.5 million.

"We've developed a means of accurately predicting sugar yield in Australia's changing climate. This is fundamental to every agricultural and horticultural industry, not just sugar. We've also produced yield mapping for macadamias, avocados, mangoes, carrots and peanuts. It enables growers to improve management of their assets, respond to natural disasters and even combat biosecurity threats.

"The world is seeing an explosion in agricultural technology. SugarMaps is distinctive in that it has been developed with direct industry engagement and data support from the start. It includes years of calibration and validation research and a strong understanding of the industry and the technologies being used. It's not just another platform offering free 'pretty pictures'; it gives growers and mills access to the exact outputs they want, in the format they have helped design ... and it's accurate."

SugarMaps has been validated in partnership with sugarcane millers, productivity services staff, consultants and sugarcane growers under real farming conditions. Industry partners are now reviewing a prototype of the platform, ahead of its formal commercialisation later this year. ■

For more information, contact Professor Andrew Robson on
T 02 6773 4085
E andrew.robson@une.edu.au
W *une.edu.au/research/research-centres-institutes/applied-agricultural-remote-sensing-centre*

RURAL INDUSTRIES ON TRACK WITH TRUST - KEY DRIVERS, RISKS AND OPPORTUNITIES REVEALED

The Australian sugar industry is partnering with other agricultural industries to help build community trust in and engagement with the broader agricultural sector. Through a research project into the drivers of community trust, it has been revealed that trust and acceptance are high, but there are other areas of uncertainty that provide risks and opportunities for the sector.

The *Community Trust in Rural Industries Program* is a partnership involving ten Rural Research and Development Corporations (RDCs) - including Sugar Research Australia; the National Farmers' Federation (NFF) and the NSW Department of Primary Industries. This initiative is designed to drive cohesive and consistent responses to the community trust issues shared by all agricultural producers.

SRA's Dr Harjeet Khanna, General Manager, Research Funding Unit, said the research has given the sugar industry insight into the drivers of community trust and acceptance across the sector.

"The first round of research indicated that trust in rural industries is high—Australians believe primary producers play an important role in society and are a vital part of Australia's history. The community also highly values the food and fibre produced by rural industries," Dr Khanna said.

"The key drivers of trust were identified as environmental responsibility, responsiveness and products of rural industries. This means the community sees rural industries as stewards of the land and sea, and expects us to use resources responsibly and sustainably.

"The community wants to know it is being heard and understood by rural industries, and seeks ongoing reassurance that their concerns are being addressed.

"This is something we are already very familiar with in the sugar industry. The industry has always been innovative and shown strong environmental stewardship – but there is an ongoing need to engage the community in the great work that is happening right across our industry."

Dr Khanna said the project would help all rural industries work together on community trust issues.

"There is opportunity for industries to respond productively and consistently. The research showed that one industry acting irresponsibly negatively affects their opinion of all rural industries. Having available guidance on best-practice approaches and calling out irresponsible operators will empower industries to build trust in their own industries and in the sector," said Dr Khanna.

The research uncovered a number of topics that large sections of the community were uncertain about, meaning they do not have strong views one way or another or have gaps in their knowledge around Australian rural industries. Some of the top areas of uncertainty included whether rural industries listen to and respect community concerns, responsible water use and rural industries' run-off causing environmental damage to coastal areas.

Notably, most of the topics the community wants more information on or is uncertain about relate to the two key drivers of trust - environmental responsibility and responsiveness.

According to the Program's lead researcher, Chief Executive Officer and Co-founder of Voconiq (a CSIRO spin-off company), Dr Kieren Moffat, trust is crucial for industry and business because it translates expectations and experience into acceptance.

"There are big implications for any industry, sector or individual business when the community questions it or its practices. Trust is the vehicle to acceptance and what is required to avoid this risk. It's what enables an organisation or industry to be given the benefit of the doubt when things go wrong, it provides a license for innovation and flexibility to experiment, and a general freedom to operate," said Dr Moffat.

"The Community Trust in Rural Industries Program is uncovering what's affecting trust and acceptance of rural industries, and where there are clear opportunities for industries to take action, which we have now identified as environmental responsibility, responsiveness and products of rural industries.

"We are also seeking to understand how food and fibre industries relate to each other in the minds of the community, and see how these interrelationships affect trust and acceptance, so we can understand the preconditions for sector wide risk through the actions of specific industries within it," said Dr Moffat.

"The findings show that the pathway to building and maintaining community trust is to be genuinely responsive to community attitudes, particularly around environmental sustainability and resource use. The key is to demonstrate responsiveness through action, and there are huge opportunities for industries who do this," he said.

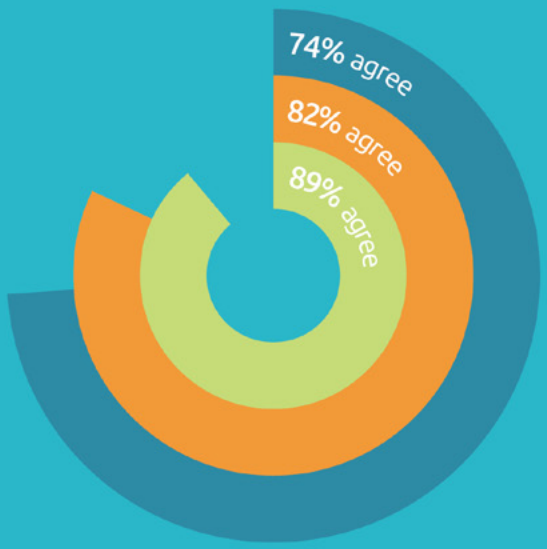
Over an initial three-year period, this community research will provide insights on cross-sector issues and best practice approaches - the first round of results and analysis has just been completed. Ongoing engagement will be conducted to make research outputs available as an input to food and fibre industries developing their own strategies.

Years two and three research will seek to benchmark the results of the first year, but also examine certain areas in more depth and detail as required. ■

Driving export revenue and regional jobs

Australians strongly believe that:

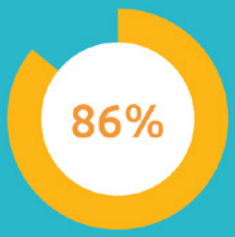
- Australia's rural industries play an important economic role through the export of products to overseas markets
- Australia's rural industries play an important economic role through creating significant employment in regional areas
- it is important that health and safety of farm workers is prioritised



Rural Industries are Important

of Australians agree fishers, farmers and foresters play an important role in Australian society

of Australians agree rural industries contribute significantly to the Australian economy

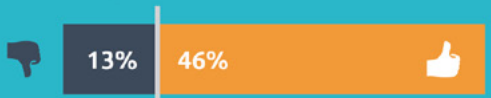


of Australians agree rural industries are important to our way of life in Australia

of Australians agreed that if they hear about a rural industry acting irresponsibly it negatively affects their opinion of all rural industries

Trust and Acceptance are High

Trust is high and distrust is low



46% of Australians trust rural industries, 13% distrust

Acceptance is high, rejection is low

62% of Australians accept rural industries, only 11% reject

For more information on the project, please contact Virginia Johnstone, project manager,
E virginia.johnstone@seftons.com.au

The Program is a jointly funded initiative of AgriFutures Australia, Australian Eggs, Australian Pork Limited, Cotton Research and Development Corporation, Dairy Australia, Fisheries Research and Development Corporation, Sugar Research Australia, Grains Research and Development Corporation, LiveCorp, Meat and Livestock Australia and the NSW Department of Primary Industries. National Farmers' Federation is also a project partner and AgriFutures Australia is the managing agent.

It involves community research by Voconiq amongst a sample of more than 6000 Australians over a three-year period to provide insights on cross-sector issues and best practice approaches. Of the 7329 surveys that were completed, 6461 were included for analysis after data cleaning.

WHAT'S IN A BLOCK? USING TECHNOLOGY TO FIND THE ANSWER

THE SRA ADOPTION TEAM IN THE SOUTHERN REGION HAS BEEN WORKING WITH LOCAL INDUSTRY TO BETTER UNDERSTAND AND MANAGE PROBLEM AREAS ON FARM. *BY HANNAH RUSSELL, SRA.*

Would you buy and use a second-hand tractor without knowing the hours used or what condition it is in? Would you use that tractor for work on your property without checking the oil or its ability to perform the work it's supposed to?

It's the same situation with your sugarcane block. Although years of experience can tell you where the poorly performing areas are and perhaps why, how well do you really know your farm? For example, survey data has shown that compaction in blocks is a major issue in the Southern Region. Could plough pans at 250-300mm under the surface be your problem? How are these variables affecting your yield?

Understanding the variability in your blocks and across your farm may be the first step to improving your productivity. Block characterisation surveys can help with this.

THE WHAT

Block characterisation involves using electromagnetic (EM) mapping to identify block variability. When using EM38 technology, a source of current is passed over the soil surface without making physical contact. The feedback given from the soil is then converted into colourful maps which may suggest variability in the soil such as moisture and clay content, salinity, organic matter and iron content.

It is recommended that the EM maps are ground truthed by taking soil samples from targeted areas of the paddock. Typically, soil samples are taken from a high apparent electrical conductivity (ECa) zone and a low ECa zone.

The soil test results may help explain the differences between your ECa zones and may deliver a solution.

THE WHY

What are you going to do with that information? EM mapping can add value to the farming operation through understanding the block and potential solutions to any underlying issues.

One grower, Isaac Schmidt, had a portion of his farming land surveyed as part of the *Testing Today's Technology* project in September 2019.

"It was quite interesting to see how the system worked to identify different parts of the paddock, take the samples and get the results back," said Isaac. "Not just the regular soil testing, but also the top 20cm and at depth as well."

One particular result of the mapping and soil testing process was beneficial for Isaac: the variable rate gypsum application. Tidal flooding had left some areas of the block more saline than others, and using the variable rate map, Isaac was able to strategically apply his gypsum.

"If I had done a soil test and collected one sample over the paddock, it may have come back and said to apply a certain amount of gypsum and you would have just applied that over the whole paddock. It means that if I'm spending the money, I can put more on where it needs it and none where I don't need it," he said.

"I think for blocks that you have problems with, it certainly would be worthwhile. Certainly, for any sort of problem blocks where you can see big differences across the block for no particularly obvious reasons, it would be worth getting them done."

TESTING TODAY'S TECHNOLOGY: THE PROJECT

Under the *Testing Today's Technology* project, two service providers were used: Trimble and Vanderfield. The two services each surveyed the same three sites in cane growing areas around Bundaberg, Childers and Maryborough.

For a cost of $40 +GST/hectare at the time of survey in September 2019, Vanderfield utilised a DualEM 21S EM sensor to measure changing ECa at multiple depths in the soil profile. As the

sensor was suspended at 25cm above the ground, the process resulted in maps with the following readings:

- DualEM 50cm = 0 to 25cm of soil profile depth
- DualEM 100cm = 0 to 75cm of soil profile depth
- DualEM 150cm = 0 to 125cm of soil profile depth
- DualEM 275cm = 0 to 250cm of soil profile depth

Elevation data was also collected through a GPS system and transformed into a map.

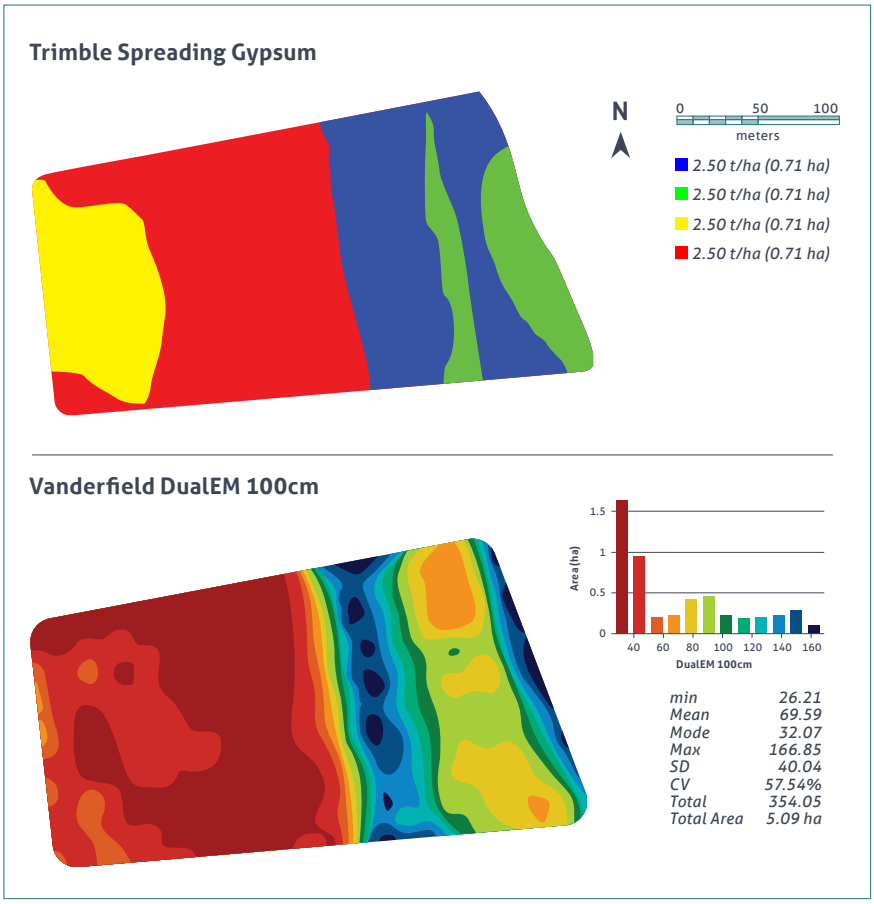
Vanderfield offered a short follow up afterwards, which included discussing the EM process, running the results through a water flow simulation software to indicate drainage patterns, and walking the block to assess soil at the highest and lowest ECa zones.

Vanderfield offers a more in-depth interpretation of results for an additional fee of $500 +GST for a half day consultation and $1,000 for a full day consultation. Vanderfield also recommends ground-truthing the EM maps by taking soil cores which may be taken through your local agronomist or Vanderfield at a per hour and day rate.

Trimble used a Soil Information System with a dual EM sensor and has a series of five steps. During the *Testing Today's Technology project*, the first four steps were completed over one day.

1. Define paddock boundary with RTK GPS and feed results to the on-board computer.
2. Collect variability and elevation information every metre with dual EM surfer and GPS.
3. Collect data from probe at locations identified by the on-board computer. The probe measures tip force, sleeve resistance, moisture and electrical resistance.
4. Collect two soil cores at each location as defined by the computer after considering EM map and probe data. Soil cores are collected at 0-600mm and 600-1200mm.
5. Results are obtained from the EM maps, probe data and soil cores and converted into maps.

At the time of the project surveys in September 2019, this service was priced at $140 + GST/hectare with a travel fee of $120+GST/hour to and from the location of the service provider (in this case, Ayr). For an area of less than 15 hectares, there was a fixed price of $2,100 + GST.



Owing to Trimble's system of completing the EM and elevation maps, taking probe data and taking soil cores all at once, Trimble was able to offer several data layers of both surface and subsurface mapping, including compaction, pH, plant available water, chloride and organic matter. Included in the price was an account to their online database of the results and a follow up with the Trimble representative. This included an overview of the results and a series of maps to assist productivity improvement such as variable rate gypsum applications and drainage solutions.

The aim of the *Testing Today's Technology* project was to provide information on block characterisation survey technology and to showcase two service providers that have the capability to conduct the surveys within our region. Vanderfield and Trimble both utilise EM technology, but each has a different approach and range of services associated with it. There are also other companies that provide a similar service. You are encouraged to make your own enquiries into the services and choose which one is suitable for your situation. ■

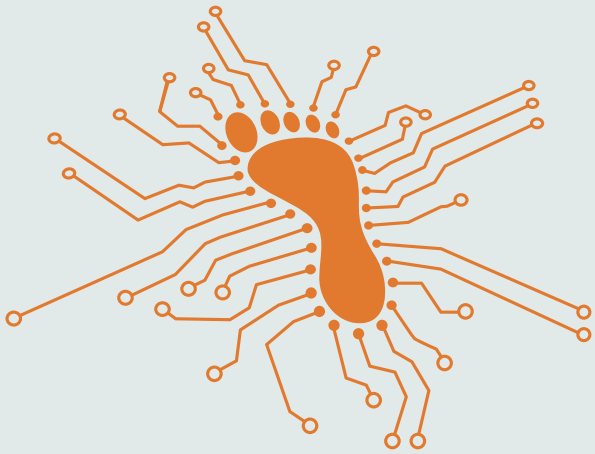
More information regarding the technology may be found in the *Precision Agriculture for the Sugarcane Industry* manual by Sugar Research Australia and the following sites:

vantage-wa.com.au

vanderfield.com.au/images/EM_Mapping_Summary.pdf

This project was funded through the Queensland Government Reef Water Quality Program via the Burnett Mary Regional Group.

(Over page left): *Trimble's Soil Information System.* ***(Over page right):*** *Vanderfield's DualEM sensor suspended above ground.* ***(Above top):*** *Trimble's variable rate gypsum prescription.* ***(Above):*** *Vanderfield's DualEM 100cm map.*



PROTECTING YOUR DIGITAL FOOTPRINT

CYBER SECURITY IS NOT JUST AN ISSUE FOR LARGE BUSINESSES. CYBER SECURITY – OR PEOPLE ATTACKING YOUR COMPUTER AND DATA – CAN ALSO BE A RISK FOR SMALL BUSINESSES SUCH AS CANE FARMS. IN THIS ARTICLE, *SRA IT MANAGER ADAM O'HALLORAN* EXPLAINS CYBER SECURITY AND SOME STEPS YOU CAN TAKE TO REDUCE RISK.

It's common for small businesses and families to believe that cyber security is something that they don't need to worry about. After all, their computer just has old files, emails and photos, right? If a hacker wants to read productivity data from five years ago, then let them!

IT'S ALL ABOUT THE MONEY

Cyber attacks are conducted by criminals with the intention to do one of three things:

1. Obtain money

The primary reason for an attack is to gain access to your machine and your files and make them both unavailable until you pay them money to regain access (which may not eventuate with payment). The most common method is ransomware. If an application of this type is installed, you will lose access to all your files and any recent backups and files that are attached in a connected device (such as an external drive).

2. Steal your identity

Identity theft is the opportunity for a criminal to obtain enough information about you, to conduct fraudulent transactions, especially credit card fraud.

3. Gain access to people that you know

If criminals obtain your email credentials (your email address; username and password), they will access your email account and send an email intended to gain access to their data or their identity, to everyone you have contacted via email.

IT'S VERY EFFECTIVE

The nature of the attack is to write a script to attempt one of the three types of attacks (or more than one) that notifies them if a copy of the script was successful – anywhere in the world. The federal government estimates cybersecurity incidents cost Australian businesses $29 billion each year.

Almost one in three Australian adults were affected by cybercrime in 2018.

WHAT SHOULD I DO?

If you are running a small business, then engage the services of a company that has experience in increasing your security. They will work with you to ensure that your business is not exposed to known risks.

Your home computer is equally at risk, but there are some simple steps that you can take:

1. If you are not running a new computer, such as Windows 10, then now is the time for an upgrade. Some computers can be upgraded, but most should be replaced.
2. Keep your computer software up to date. Ensure that your computer applies updates automatically. If you are asked to restart your machine to apply updates, do it straight away.
3. Be suspicious of emails that are asking you to perform tasks, such as follow links; entering your details or downloading software. No company will ask you to 'confirm your details'. It is unlikely that any of these emails are legitimate.
4. If you receive an email from a company that you use (such as a bank), but the email doesn't look right (it's asking you to do something), then you can always call them and ask if this is their email.
5. Google, Facebook, Instagram and many other online companies provide an option to enable 'Two-Factor Authentication'. This is a very simple process that means your account cannot be accessed without your mobile phone.
6. Save your files to a secure cloud location, such as Microsoft OneDrive, Google Drive or Dropbox.

WHAT SHOULD I DO IF I THINK SOMETHING HAS HAPPENED?

If you believe that this is an emergency, call your local Police, or dial 000. To report a cyber issue, go to the Australian Cyber Security Centre's page: ***reportapp.cyber.gov.au*** ■

Contact Adam O'Halloran
aohalloran@sugarresearch.com.au
07 3331 3316.

FALL ARMYWORM ON THE MARCH

Fall armyworm (*Spodoptera frugiperda*) is now considered established in Australia. It has been detected at several sites in Queensland and in the Northern Territory and Western Australia. According to the Queensland Department of Agriculture and Fisheries, suspect moths have been confirmed at several locations by DAF entomologists as fall armyworm, including near sugarcane regions at the Burdekin, Mackay and Bundaberg. The situation continues to change quickly, but at the time of writing it had not been confirmed in sugarcane in Australia.

Fall armyworm is an invasive pest and its caterpillar stage feeds on more than 350 plant species, and impacts cultivated grasses such as maize, rice, sorghum, sugarcane and wheat, as well as fruit and vegetable and cotton crops. Fall armyworm is native to tropical and subtropical regions of the Americas, and since 2016 has spread to Africa, the Indian subcontinent, China and South East Asia.

Adult moths are highly mobile and can fly long distances (up to 200km). This pest is also prolific, reproducing at a rate of several generations per year. Australia's climate and the production of suitable hosts are favourable for fall armyworm to establish and spread. Australia's environment and native flora may also be impacted.

DAF Queensland is continuing to undertake surveillance across key farming areas. The National Management Group has determined that it is not technically feasible to eradicate fall armyworm from Australia.

SRA and industry partners have worked with the Australian Pesticides and Veterinary Medicines Authority (APVMA) on emergency use permits for selected insecticides to control fall armyworm. At the time of publication, two of these permits had been approved. Please continue to check the SRA website for the latest information.

These permits allow a person to use the specified insecticide product(s) on sugarcane in the manner specified in Queensland and New South Wales.

Correct identification of the insect is essential to ensure that the target pest is fall armyworm. Overuse (or use when not required) of these products could potentially lead to insecticide resistance and have a detrimental impact on natural enemies or beneficial insects and the environment.

Before considering the use of any of these chemical insecticides you should always check the APVMA website (apvma.gov.au/) and the individual product label for more detailed information before considering which product to use. ■

If you suspect fall armyworm, report immediately to the Department of Agriculture and Fisheries on 132 523.

Please continue to visit the SRA website for updated information on fall armyworm.

At time of publication, there have been no confirmed detections of fall armyworm in sugarcane but growers should remain vigilant with plant cane and when we head into the spring period.

In the field with the toolkit, BPS Trainee Extension Officer, Tahlia Kinrade. ***(Bottom left)*** *SRA Burdekin Farm Manager, Jeff Blackburn, discussing soil health with Adoption Officer, Jai Kaartinen-Price.* ***(Bottom right)*** *Ready for action – Soil Health Extension Toolkits.* ***(Right)*** *Training advisors in the use of the Sugarcane Soil Health Extension Toolkit in the Herbert.*

sugarcane SOIL

CREATING DISCUSSIONS, GENERATING CURIOSITY, & PROMOTING SOIL HEALTH: SUGARCANE SOIL HEALTH EXTENSION TOOLKIT

DR DANIELLE SKOCAJ, PRINCIPAL RESEARCHER, SRA

Soil health describes the physical, chemical, and biological condition of soil, the impact of management practices and environmental conditions on soil properties, and the functional ability of soil to support plant growth and sustain environmental quality.

The Soil Health Project of the Herbert and Burdekin Regions has designed an extension tool to create discussions between growers and advisors, generate curiosity and encourage greater interest in sugarcane soil health.

"The Sugarcane Soil Health Extension Toolkit provides a practical assessment of soil health," said Project Chief Investigator, Dr Danielle Skocaj.

The toolkit will primarily be used by advisors working alongside growers. "Growers are able to work with their advisors to measure soil health and monitor changes over time using this toolkit."

The project has established and sampled twenty paired sites in the Herbert and Burdekin regions to measure the long-term impacts of different farming practices on a range of soils chemical, physical and biological properties.

The aim of these paired sites is to identify meaningful indicators of sugarcane soil health. A subset of these soil health indicators forms the basis of the Sugarcane Soil Health Extension Toolkit.

This toolkit contains a range of instruments to measure soil physical (bulk density, moisture content, compaction, water infiltration and dispersion) and chemical (soil pH, electrical conductivity, and sodium) properties. Measurement of these soil chemical properties also provides an estimate of the soil exchangeable sodium percentage. This can be used to indicate if a soil is sodic. The toolkit can also provide an indication of soil biological activity by measuring labile carbon and earthworm populations.

Measuring these soil properties provides growers and advisors with the ability to assess the impact of different management practices on soil health and understand differences between soil types and management history, relatively quickly and easily. Soil physical measurements are completed in the field while soil chemical and biological measurements can be completed in the field or back at the shed, office, or laboratory once soil samples have been collected.

Use of the Sugarcane Soil Health Extension Toolkit is not intended to replace traditional laboratory soil testing services. However, it can help identify potential soil constraints requiring further investigation or management intervention and monitor changes over time. For example, if the toolkit indicates a soil may be sodic, mapping of soil electrical conductivity (e.g. EM survey) can be completed, more site-specific soil sampling undertaken, and the results used to develop a prescription gypsum application.

Field evaluation of the toolkit has started in the Herbert and Burdekin cane growing regions and will soon commence in the Wet Tropics and Central regions in collaboration with the Wet Tropics Soil Health Project and Soil Health Project – Central Region.

In the Burdekin, SRA Farming Systems Adoption Officer, Jai Kaartinen-Price and Burdekin Productivity Services Trainee Extension Officer, Tahlia Kinrade have been busy 'road-testing' the toolkit. They believe a key feature of the toolkit is that you get the results almost immediately as measurements can be completed in the field.

"We have already identified differences in soil health indicators from the use of different soil amendments and had some growers involved in taking measurements," Jai said.

Tahlia said: "The toolkit contains everything you need, including detailed operating instructions to complete each measurement, and is easy to transport."

The development of additional resources, including training videos and interpretation guides is underway. Feedback received from advisors during the field validation phase will be used to identify further refinements to the toolkit before larger scale release and use.

Please contact your local trusted advisor for more information or to register your interest in having the toolkit assessed on your property. ■

For more information on soil health, visit the Soil Health Toolbox on the SRA website: *sugarresearch.com.au/soilhealth*

The Soil Health Project of the Herbert and Burdekin regions is supported by HCPSL, BPS, Queensland Department of Agriculture and Fisheries, University of Queensland, University of Southern Queensland, Wilmar, and SRA. Validation and use of the toolkit is also occurring in collaboration with the Soil Health Project – Central Region, which has assistance from Farmacist, Plane Creek Productivity Services, Sugar Services Proserpine, Central Queensland Soil Health Systems, Wilmar Sugar, Queensland Department of Agriculture and Fisheries, UQ and USQ. Another collaborator helping validate and fine-tune the toolkit is the Wet Tropics Soil Health Project, which has assistance from T.R.A.P Services, Tully Sugar, MSF Sugar, Tully Cane Productivity Services, Queensland Government Department of Agriculture and Fisheries, WTSIP, UQ and USQ. These two projects are supported by the Department of Agriculture, through funding from the Australian Government's National Landcare Program, and SRA.

(Over top right) UAV multispectral imaging assisting research in understanding N uptake by sugarcane across the growing season. (Below) One of the Northern NSW trial sites.

RESEARCH PROGRAM TARGETING IMPROVED NUE IN SUGAR INDUSTRY

BY MARGUERITE WHITE

Sugarcane research into increased N use efficiency (NUE), and options for improved profitable use of N (N), have been the focus of three research projects of the More Profit from N (MPfN) Program.

The research effort has seen ten projects across the sectors of sugar, dairy, cotton and horticulture collaboratively generate greater knowledge and understanding of the interplay of factors that affect optimal N formulation, rate and timing, the contribution of soil mineralised N to the N budget of a crop, and how enhanced efficiency fertiliser (EEF) formulations can better match crop N demand.

For the sugarcane industry, three research projects have been led by the NSW Department of Primary Industries (NSW DPI), Queensland Government Department of Environment and Science (QDES) and the Queensland Department of Agriculture and Fisheries (DAF), financially supported by the Australian Government Department of Agriculture, Water and the Environment as part of its Rural R&D for Profit program, SRA and project partners.

In March, the projects were involved in a series of Fertiliser Australia workshops to extend the outcomes of their research directly to regional agronomists and fertiliser resellers.

They have also worked extensively with local productivity services organisations and agronomy consultants to conduct local trials and communicate the ongoing research at shed meetings, trial tours and industry service provider workshops.

This article provides a summary of one of the projects and future editions of CaneConnection will feature other activities in this program.

Project: The role of PCU and accounting for soil supplied N in NSW sugarcane

NSW DPI, Chief Investigator: Dr Lukas Van Zwieten

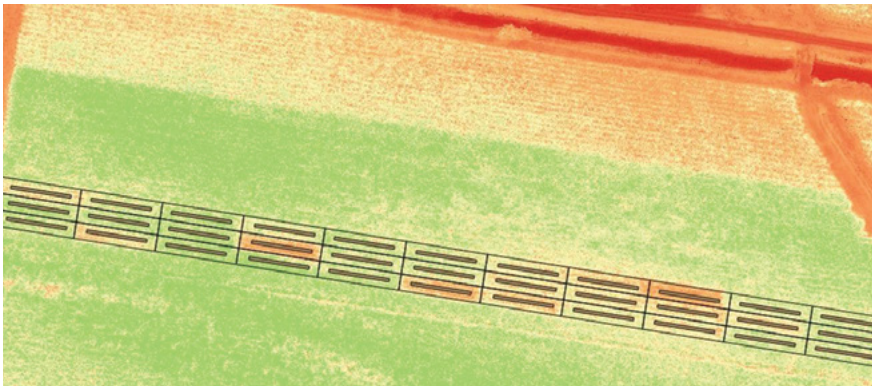
Partners: Southern Cross University and Sunshine Sugar

THE ISSUE

The Australian sugarcane industry is well aware of the ongoing need to develop and adopt sustainable production practices. As sugarcane has large production potential, N remains a key factor in driving productivity and profitability. However, crop NUE remains generally below 40-60 percent of applied fertiliser, with N loss pathways including nitrate (NO3-) leaching and run-off, and through gaseous losses by denitrification.

OBJECTIVES OF THE RESEARCH

- To determine the extent of subsoil (deep) N reserves in northern NSW cane fields, both mineralised and potentially mineralisable N (PMN), to allow future refinement of the SIX EASY STEPS application rates.
- To develop new tools (mid infra-red (MIR)/ near infra-red (NIR)) to rapidly and inexpensively predict PMN in sugarcane soil.



- To assess the potential of controlled release polymer coated urea (PCU) to better match soil N supply with crop demand, therefore benefiting yield in both one and two-year cane crops, by;
- delivering yield and N uptake response curves between urea and controlled release urea (5 rates) from 4 field trials.

METHODS

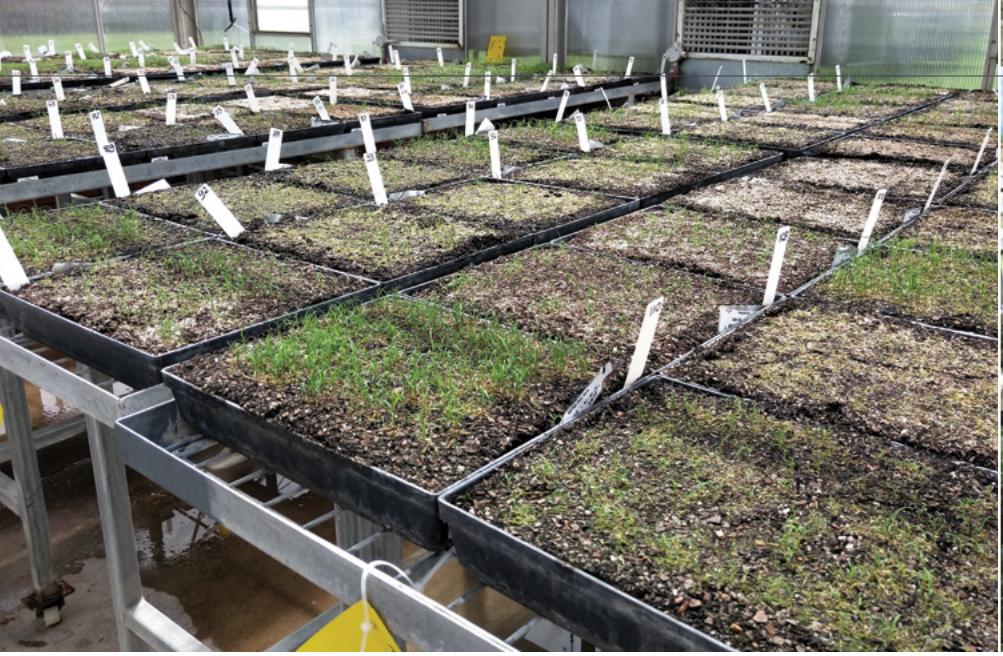
- 1m cores (3 per field) taken from 27 cane fields in NSW and analysed for Carbon, N, pH and mineral N as well as PMN at 0-20cm and 20-40cm.
- N release measured from PCU 90 and PCU 270 mesh bags placed on row, at stool splitter fertiliser placement depth, in a non-fertilised area over a 24 month period to obtain an N release curve.
- Four field trials conducted at Stotts Creek (Tweed Catchment), Pimlico and Coraki (Richmond Catchment) and Woodford Island (Clarence Catchment) to investigate PCU blend effect on yield and N leaf content (%) over time versus standard practice urea application.
- Unmanned Aerial Vehicle (UAV) multi-spectral imaging used to monitor plot performance. Green Normalised Difference Vegetation Index (GNDVI) is a vegetation index for estimating photo-synthetic activity and is a commonly used vegetation index to determine water and N uptake into the plant canopy.

OUTCOMES FOR INDUSTRY

- Some sugarcane farms in NSW have significant stores of N fertiliser (up to 300 units of N), being made up of mineral N and PMN prior to planting or the ratoon crop, allowing refinement of N fertiliser application.
- A rapid test based on MIR spectroscopy has been developed for NSW sugarcane soils that can reasonably predict PMN across 14, 56 and 300 days.
- Results suggest minimal benefits of slow release PCU (either 90 day or 270 day release) in the dry years that the field trials were conducted. Better climate forecasting (particularly in-crop rainfall predictions) would enable farmers to make decisions on N application.
- UAV based multispectral imaging has assisted research trials on assessing crop N uptake throughout the growing season. GNDVI shows promise at 160 days after ratoon emergence for estimating leaf N content (and possibly yield). ■

RECOMMENDATIONS

- **Slow release PCU is likely to have an impact where high rainfall directly after fertilisation results in loss pathways for urea. This needs a modelling approach to predict best response based on season, and better climate forecasting.**
- **Deep soil N and mineralisable N should be considered in calculating soil N supply to crop, with considerations within the SIX EASY STEPS.**
- **A better quantification of residual N in soil (after harvest) from PCU is still required. This would be taken into consideration with the above point.**
- **Because 56 and 300 day PMN are much greater than 14 day PMN (standard method), it would be an important step for industry to start looking more in-depth at whole season soil N supply.**



IN THE FIELD WITH THE CENTRAL PLANT BREEDING TEAM

BY CLARE GERSCH, ADOPTION OFFICER, CENTRAL REGION

With several months of dealing with COVID-19, I have recently either been working from my home office or in the field with SRA's Central Region Plant Breeding Team: *George Piperidis, Chris Tom and Ann Boe.*

This time of the year is critical to the growing of the potential new varieties that as a grower you may see in about twelve years' time. Prior to me helping the team, the sugarcane seed - or fuzz - produced at the SRA Meringa station had been germinated by the team at the Mackay station's facilities.

These trays of mass seedlings in the glasshouse needed to be planted into individual pots for hardening off before going to the field.

It was an interesting experience planting out the different, tiny, and fragile individual plantlets. As the trays came out of the glasshouse there were noticeable differences between the trays. Each tray of seedlings has a label identifying the parents and each of these seedlings in a tray is genetically different.

At this stage the seedlings within each tray are very similar in appearance but the trays or families do appear different. I started asking questions to George about the seedlings.

George, can you please explain what I am looking at with a tray of X x Y?

All the crosses for SRA's selection programs are made at our Meringa station and one of my tasks each year is to select which bags of seed (crosses) for starting the selection program in the Central region. I use all the parent information that is available to select the seed, including disease ratings and how they performed previously as a parent and as a variety. Each tray contains seedlings from a different cross, and each seedling is a unique individual that has the potential to become a commercial variety in about 12 years' time, but the chances are very slim. Not many make it through to the end.

Some of the codes of the parents are SRA canes but some of the codes start with other initials what does this mean?

Before a variety is released commercially (with an SRA number), its given name is what we call the seedling code, which provides information on where it was first planted as a seedling and in what year. For example: QC05-316 was first planted in Central (C) in 2005 (05) and '316' is just the selection number from the 2005 seedlings. Q stands for Queensland, 'C' for Central, but could be 'N' for north, 'A' for Ayr, 'K' for Kalamia (joint program with Wilmar) or 'S' for south. By the way, QC05-316 was released last year as SRA21$^{\Phi}$.

Please can you explain the international exchange and some of the countries the parents are from.

We have a variety exchange program with several overseas countries, including Mauritius, USA, Brazil, Argentina, Colombia and more recently Japan. We import about 40 or 50 varieties from overseas each year but they have to go through strict quarantine and testing period before being released to the regions. Varieties from overseas have proven to be very important parents in our breeding program.

Some of the codes are actually popular current varieties like Q240$^{\Phi}$. Are there other parent canes that growers may be familiar with?

Commercial varieties are also used as parents, even before they are released commercially, they make their way to Meringa to be used in crossing. Some really promising parents that growers would be familiar with are Q208$^{\Phi}$, Q209$^{\Phi}$, Q183$^{\Phi}$ and Q253$^{\Phi}$. ■

(Above left) *Seedlings in the glasshouse.*
(Above right) *Clare Gersch, Chris Tom, and Anne Boe.*

RESEARCH PROJECT INVESTMENT

PROJECT TITLE	PROJECT NUMBER	R&D PROVIDER(S)	CHIEF INVESTIGATOR	END DATE
Key Focus Area 1 (Variety Development)				
Exploiting introgression for the development of productive & regionally adapted varieties for NSW	2013/022	Sunshine Sugar	Roy Parfitt	30/06/2020
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
Validating root system traits for enhanced nutrient capture in challenging environments	2018/002	CSIRO	Anne Rae	01/09/2021
Impact of stool architecture on ratooning: extending current trial to 4R to strengthen correlations	2018/004	CSIRO	Donna Glassop	01/03/2021
Genetic analysis and marker delivery for sugarcane breeding	2018/005	CSIRO	Karen Aitken	30/06/2022
Validating high-throughput phenomics technologies for sugarcane clonal selection	2019/002	SRA	Sijesh Natarajan	30/09/2022
NIR calibrations for fibre quality	2019/001	SRA	Roy Parfitt	30/06/2021
Key Focus Area 2 (Soil health, nutrient management and environmental sustainability)				
More profit from N: enhancing the nutrient use efficiency of intensive cropping and pasture systems	2015/907	CRDC	Multiple	30/06/2020
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	Danielle Skocaj	01/08/2022
Unravelling the impact of climate and harvest time on N fertiliser requirements	2017/009	SRA	Danielle Skocaj	04/03/2022
Seeing is believing: managing soil variability, improving crop yield and minimising off-site impacts in sugarcane using digital soil mapping	2017/014	UNSW	John Triantafilis	01/10/2020
Implementation of root system diagnostics to deliver a field-based measure for root health	2018/003	CSIRO	Anne Rae	01/08/2021
Greenhouse gas emissions from sugarcane soils: strategies for increasing NUE and reducing environmental pollution	2018/007	QUT	Peter Grace	30/06/2021
Establishing sugarcane farming systems to improve soil health	2018/008	SRA	Barry Salter	01/03/2023
Development of commercial molecular biological assays for improved sugarcane soil health and productivity	2018/009	SRA	Rob Magarey	30/06/2020
SIX EASY STEPS Tool Box development for refined on farm nutrient management	2018/013	SRA	Barry Salter	01/05/2020
Complete nutrient management planning for cane farming (**Funding provider:** Queensland Government DES)	2016/804/ RP161	SRA/Farmacist	Jayson Dowie	30/12/2020
Improved water quality outcomes from on-farm N management (**Funding provider:** University of Queensland)	2016/805/ UQ_NESP	SRA	Danielle Skocaj	10/12/2020
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 / SRA	Barry Salter	31/12/2021
Improving NUE for sugarcane crops with constrained yield potential	2015/065	SRA	Danielle Skocaj	15/06/2020
Australian sugar industry soil health benchmarking in the Central region of Qld - increasing profit and transforming soil health practices through cooperative industry research, extension and adoption	2019/903	Various	Phil Ross	31/10/2021

PROJECT TITLE	PROJECT NUMBER	R&D PROVIDER(S)	CHIEF INVESTIGATOR	END DATE
Key Focus Area 2 (Soil health, nutrient management and environmental sustainability) *continued*				
Australian sugar industry soil health benchmarking in the Wet Tropics region of Qld - increasing profit and transforming soil health practices through cooperative industry research, extension and adoption	2019/904	Various	Marguerite White	31/10/2021
Key Focus Area 3 (Pest, disease and weed management)				
Soldier fly management	2015/804	SRA	Kevin Powell	31/12/2019
Feeding behaviour of Soldier fly	2017/808	SRA	Kevin Powell	11/12/2019
Modern diagnostics for a safer Australian Sugar Industry	2017/809	SRA	Nicole Thompson	01/06/2022
Solving Yellow Canopy Syndrome	2014/049	SRA	Gerard Scalia	31/12/2020
Identifying new-generation insecticides for canegrub control as contingency for loss of amenity with the existing product	2016/003	SRA	Kevin Powell	01/01/2020
Keeping our chemicals in their place - in the field	2017/008	SRA	Emilie Fillols	01/07/2021
Moth Borers – how are we going to manage them when they arrive?	2018/010	SRA	Kevin Powell	01/08/2021
RSD detection at the sugar factory – disease detection blueprint	2019/003	SRA	Rob Magarey	30/06/2022
Leaf sucrose: The link to diseases, physiological disorders such as YCS and sugarcane productivity	2015/016	SRA	Gerard Scalia	01/06/2020
Investigation of biotic causes of yellow canopy syndrome.	2016/064	UQ	Andrew Geering	01/02/2020
Key Focus Area 4 (Farming systems and harvesting)				
Assessment of new management strategies for marginal soils	2015/007	SRA	Barry Salter	31/12/2019
Sugar from space: improved data access, yield forecasting and targeted N application for the Australian Sugar industry	2016/062	UNE	Andrew Robson	15/05/2020
Understanding interactions between basecutters and other forward-feed components with the cane stalk, and determining practical strategies to minimise damage as harvester speed increases	2016/952	Norris ECT	Chris Norris, Phil Hobson	01/05/2020
Southern Sugar Solutions	2017/012	DAF	Neil Halpin	01/01/2021
Development of commercial molecular biological assays for improved sugarcane soil health and productivity	2018/009	SRA	Rob Magarey	01/06/2021
Smarter Irrigation for Profit Phase 2	2019/901	Cotton Research and Development Corporation	Multiple	20/06/2022
Harvester losses assessment by real-time Machine Vision Systems	2019/004	University of Southern Queensland	Cheryl McCarthy	01/01/2022
Adoption of practices to mitigate harvest losses - Phase 2.	2019/951	SRA	Phil Patane	01/05/2020
Key Focus Area 5 (Milling efficiency and technology)				
Online analysis systems to measure the available nutrients in mill mud	2016/019	SRA	Steve Staunton	01/09/2020
Reducing boiler maintenance costs and deferring capital expenditure through improved technology	2016/020	QUT	Floren Plaza	01/06/2021
Investigations to mitigate the effects of juice degradation in factory evaporators on sugar recovery and quality, corrosion and effluent organic loading	2017/007	QUT	Darryn Rackemann	01/03/2022

PROJECT TITLE	PROJECT NUMBER	R&D PROVIDER(S)	CHIEF INVESTIGATOR	END DATE
Key Focus Area 5 (Milling efficiency and technology) *continued*				
Pan design and operational changes to suit Australian pan stages operating on low pressure vapour	2018/012	QUT	Ross Broadfoot	01/11/2022
Evaluate the performance of the falling film tube evaporator at Bingera Mill	2019/201	Bundaberg Sugar	Neil Sichter	22/05/2020
Evaluate the suitability of the fixed element crystalliser for widespread adoption in Australian sugar factories	2019/202	Sunshine Sugar	Daniel Rojo	22/05/2020
Reducing surging in shredders	2019/204	MSF Sugar	Peter Chohan	30/06/2020
Australian Sugar Industry Training – Development of factory training modules – Phase 2	2019/006	QUT	David Moller	30/06/2022
Strategies to minimise impacts of processing existing soft cane varieties, and industry cost/benefit analysis	2019/005	QUT	Floren Plaza	01/05/2021
Key Focus Area 6 (Product diversification and value addition)				
Biorefineries for Profit – Phase 2 (R&D for Profit Round 4)	2019/902	QUT	Ian O'Hara	30/03/2021
Key Focus Area 7 (Knowledge and technology transfer and adoption)				
Productivity improvements through energy innovation in the Australian sugar industry	2017/011	AgEcon	Jon Welsh	01/07/2020
Pathways to water quality improvements in the Myrtle Creek sub catchment (**Funding provider:** Queensland Government Department of Environment and Science)	2017/810/ EHP17066	SRA	Phil Ross	17/05/2020
Cane to Creek 2.0. **Funding provider:** Partnership between Australian Government Reef Trust, Great Barrier Reef Foundation with support from SRA.	2018/803	SRA	Belinda Billing	31/03/2021
Optimising productivity, variety recommendations and mill operations through analysis of mill data	2016/032	SRA	Jo Stringer	01/02/2021
Sugar milling R&D capability development program	2018/015	QUT	N/A	30/09/2023
Reviving GrubPlan to ensure appropriate use and application of imidacloprid for control of cane grubs	2019802	SRA	Phil Ross	30/1/2020
Complete Nutrient Management Planning for the Russell-Mulgrave and Lower Barron catchments	RP222C	SRA	Daryl Parker	31/10/2021
Key Focus Area 8 (Collaboration and capability development)				
Combining controlled release and nitrification inhibitor properties to deliver improved fertilizer N use efficiency in high risk environments	2016/101	UQ	Chelsea Stroppiana	31/03/2020
Development and modelling of novel controlled release fertilisers for improved nutrient delivery efficiency	2016/102	UQ	Ian Levett	01/09/2020
Integrated standardised competency based training for Sugar Milling operations	2017/013	QUT	David Moller	01/12/2019
Re-evaluating the biology of the sugarcane root system: new knowledge allows for assessment of production impacts and implications for yield decline	2017/101	Southern Cross University	Anders Claassens	01/09/2021
Microwave sensors for sugarcane sugar analysis	2017/102	UQ	Scott Thomason	01/09/2021
Characterising N use efficiency in sugarcane	2018/102	UQ	Anoma Ranagalage	01/06/2022

Sugar Research Australia Limited
ABN 16 163 670 068

Brisbane Office 50 Meiers Road Indooroopilly QLD 4068 Australia
Postal Address PO Box 86 Indooroopilly QLD 4068 Australia

T 07 3331 3333
E sra@sugarresearch.com.au
sugarresearch.com.au