



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



CaneConnection

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Welcome to the Autumn edition of *CaneConnection* magazine

In our cover story for this edition, we take a look at the results of a survey conducted by ABARES and funded by SRA and the Queensland Department of Agriculture and Fisheries, looking at cane farm productivity and profitability.

This includes some observations from northern NSW grower Kevin Twohill, pictured on our cover in his ratoon cane in December 2015. He shares his thoughts about the importance of productivity in relation to a sustainable business operation. The survey highlighted a number of important issues and it will be one of a number of resources that will be used by SRA to help inform research investment decisions in the future.

In this edition, we also look at a newly-funded research project that is part of fast-tracking a new sampling and analysis method for Ratoon Stunting Disease. The new method is hoped to deliver significant labour savings for productivity services organisations.

This edition also looks at a number of other research activities occurring through SRA and chats with some growers who are using research and best practice activities to boost their bottom line.

You will also receive within the magazine SRA's latest updates on Yellow Canopy Syndrome and varieties and plant breeding. We hope you find this magazine useful and if you have any comments please contact me on 0419 175 815 or bpfeffer@sugarresearch.com.au

Brad Pfeffer

Communications Manager, SRA

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Dr Anne Rae explains her research to fellow researchers recently.

Project details

Impact Area:

YCS

Project name

Sugarcane root systems for increased productivity; development and application of a root health assay

Project number

2015/002

Principal provider

CSIRO

Project leader

Dr Anne Rae



Roots project aims to fill missing link in YCS research quest

Researchers are taking a look under the ground – into the roots – in the search for answers on the mysterious Yellow Canopy Syndrome. By Brad Pfeiffer

A new research project looking at the roots of sugarcane plants is hoping to shed light on the Yellow Canopy Syndrome (YCS) mystery.

The SRA-funded project is being led by CSIRO and is part of SRA's integrated research investment into solving YCS. The Scientific Reference Panel, which helps inform and guide SRA's YCS research, identified the need to look closely at the roots of cane impacted by YCS, as they saw that this was a gap that was not being covered by other YCS research projects.

While other SRA-funded YCS projects are looking at some aspects of the roots, this new project began in late 2015 and is delving further into the plant underneath the soil.

Plants that are thought to have YCS have often shown poor root health, although it is not yet known whether YCS may cause poor roots, or if poor roots cause YCS.

The CSIRO project is hoping to add to the information being gathered in the other YCS research projects.

Also, it is hoped that it will deliver long-term beneficial information about sugarcane roots that could deliver productivity outcomes in the future.

Dr Anne Rae with CSIRO Agriculture is the lead investigator of the project and said that the project would conduct a range of experiments based on analysing the roots and their performance and the impact on growth and plant health.

"Root systems play many important roles including anchorage, water uptake, nutrient uptake, and interaction with soil microorganisms," she said. "And the YCS research program has been identified as an area where greater information about the roots could be useful.

"Sugarcane is very large and dense, which makes it hard to see what is happening under the ground, and therefore there is a big gap in our knowledge that we are trying to fill."

The objective of the project is to provide a baseline description of healthy sugarcane root systems and identify specific constraints that affect root development and root health.

The research will use both pot and field trials and look at a wide range of sugarcane varieties and conditions.

Research in other crops has shown the importance of root traits upon their productivity. For example, deeper roots in maize can allow for better growth by accessing subsoil moisture, and vigorous early root growth in wheat allows for more efficient uptake of nitrogen.

As the project progresses, it is hoped to determine whether information about the roots can be used to diagnose or monitor for YCS. It will also help provide a baseline to the other YCS research projects.

Dr Rae is working on the project with post-doctoral researcher Dr Johann Pierre. Dr Pierre has previously worked in an SRA-funded project to support the safe deployment of GM sugarcane varieties. For more information contact Dr Anne Rae by emailing anne.rae@csiro.au.

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

Alternatives to diuron in the Wet Tropics: *Wrap-up of the 2014–2015 trials*

A series of trials in Far North Queensland is assessing the performance of pre-emergent herbicides in trash blanketed ratoons, across a range of environmental conditions. Four trials were carried out in 2014–15 and three trials have been established for 2015–16. Results from the trials in 2014–15 are summarised in this article and tables. By Phil Ross, Adoption Officer, Mackay

As well as comparing the performance of the herbicides, the trials aimed to assess the consistency of effectiveness over the range of environmental conditions. The herbicides tested were:

Treatment	Active(s)	Product rate kg or L/ha
Barrage – full rate	diuron 468 g/L and hexazinone 132 g/L	4
Barrage – low rate	diuron 468 g/L and hexazinone 132 g/L	0.9
Flame®	imazapic 240 g/L	0.4
Balance®	isoxaflutole 750 g/kg	0.2
Clincher Plus	metolachlor 960 g/L	2.7
AmiTron®	amicarbazone 700 g/L	1.4

Water rate 300 L/ha for all herbicides. Shirquat (paraquat 250 g/L) at 1.2 L/ha added to Barrage full rate, Flame® and Balance®.

AmiTron® is as yet not released for use in Australia. Arysta LifeScience is planning for APVMA registration in 2016.

Key Messages

SRA Weed Agronomist, Emilie Fillols, says that these trials highlight that herbicide performance can differ greatly depending on environmental conditions and weed species present. "Spring and early summer of 2014 was very hot and dry in the Wet Tropics and this would have influenced herbicide performance compared to more favourable weather conditions," she said.

"At our Tully site, it was about two months after spraying before sufficient rain fell to incorporate and activate the herbicides. Also, at the Mossman site, there was alternating very hot and dry weather and flooding events, which were very challenging conditions for herbicides and for the weeds."

"Knowing what weeds to expect in your paddock is important. For example, if you have a mix of grasses, broadleaves and calopo vine, you could use imazapic (e.g. Flame) to control the grasses and broadleaves but you would have to follow-up with a knockdown spray suitable for calopo, for example Actril® DS. Likewise, isoxaflutole, (e.g. Balance®) is generally good on grasses and broadleaves or legume vines but has trouble controlling square weed. A follow-up knockdown spray of Agtryne or Actril® DS might be necessary."

"Our later trials are showing that Bobcat® i-MAXX (imazapic plus hexazinone) will probably be another














alternative for diuron based herbicides in the Wet Tropics; giving control of a broader range of weeds. AmiTron® is also promising, although this product is yet to be approved by the APVMA."

"Our second series of trials are being assessed now and we will see if their performance differs this season compared to last season."

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

	Edmonton	Edmonton	Tully	Mossman
Rainfall across the assessment period (Dec, Jan, Feb)	Low (375 mm)	Low (375 mm)	High (800 mm)	High (1250 mm)
Drainage	Well drained schists and volcanic, loam	Well drained schists and volcanic, loam	Well drained alluvial	Poorly drained clay with seasonal waterlogging
Spray date	17/9/2014	19/11/14	26/9/14	27/11/14
Time from spraying to sufficient rainfall for incorporation (days)	80	17	63	9
Dominant weed types	Vines Calopo, red convolvulus	Vines Calopo Broadleaves Square weed	Grasses Awnless barnyard grass Broadleaves Blue top	Grasses Sour grass Broadleaves Square weed
Minor weed types	Broadleaves Square weed, ludwigia, sicklepod, spiny spider flower Grasses Green summer grass, couch	Grasses Sour grass, Guinea grass, summer grass, green summer grass	Vines Pink convolvulus Sedges Navua sedge	Vines Calopo Sedges
Barrage or Velpar® K4™ DF® at 4 kg/ha (reference treatment)	The high rate of Barrage or Velpar® K4™ DF® gave consistently good control of all weed species across all sites. Reduction in weed coverage was between 95-100%, compared to the untreated plots, for more than 13 weeks after the first incorporating rainfall.			
Barrage or Velpar® K4™ DF® low rate 0.9 kg/ha	The low rate of Barrage or Velpar® K4™ DF® did suppress broadleaf and vine germination for about four to five weeks after the first incorporating rainfall, with weed reductions between 60-70%; but effectiveness declined rapidly after this or as soon as heavy rainfall occurred. It was variable in its effectiveness against grasses, with little control of them at the Tully site.			
AmiTron®	AmiTron® gave good control of vines, broadleaves and sedges for seven to nine weeks after the first incorporating rainfall, achieving a reduction in weed coverage of between 80-95%; except at the Mossman site where weed coverage was reduced by about 60%. The effectiveness of AmiTron® declined after seven to nine weeks with the reduction in weed coverage compared to the untreated plots falling to 50-65% after about 13 weeks after the first incorporating rainfall. The AmiTron® label is likely to include recommended mixtures to give better grass control than with AmiTron® alone.			
Flame®	Flame® controlled broadleaves and grasses well for eight to nine weeks after the first incorporating rainfall, at the Tully and Edmonton sites, achieving about a 90% reduction in coverage from these weed types. It did not control calopo vine well, but did control red convolvulus very well. Its effectiveness on grasses and broadleaves declined after eight to nine weeks, with about 70% reduction in coverage 13 weeks after the first incorporating rainfall. Flame did not perform well on the Mossman site, which experienced hot, dry conditions followed by waterlogging.			
Balance®	Balance® gave good control of grasses and vines at Edmonton and Tully for about five weeks after the first incorporating rainfall, until heavy rain started to fall. It is possible that the herbicide was leached below the weed seed depth. It did not control square weed well. At the Mossman site the herbicide did not work well at any stage, again probably due to the extreme weather conditions.			
Clincher® Plus	Clincher® Plus failed to control any of the weed species at all sites. This is because metolachlor must be applied to moist soil AND be incorporated within 24 hours of application. As all sites were dryland, these conditions were not met.			

Note: Bobcat® i-MAXX was not registered at the time of these trials. It has been added in 2015-16 trials.

Treatment	6 weeks after incorporation	12 weeks after incorporation
Barrage or Velpar® K4™ DF® at 4 kg/ha (reference treatment)		
Barrage or Velpar® K4™ DF® low rate 0.9 kg/ha		
AmiTron®		
Flame®		
Balance®		
Clincher® Plus		
Untreated		

Note: Photos from Edmonton (Site B) where herbicides received incorporating rainfall 17 days after spraying.

Flowering project targets the right information on arrowing

Research from the CSIRO has taken a close look at sugarcane flowering in the hope of delivering information that can assist the SRA sugarcane breeding program.

For many farmers, arrowing is something they would prefer to avoid given its potential to limit their yield and CCS in some climates and situations.

But for sugarcane breeders, flowering is an essential process that forms the basis of creating new sugarcane varieties through the SRA plant breeding program.

Without flowering, there would be no start to the 12-year journey of a new sugarcane variety that begins at SRA research station at Meringa and eventually leads to locally-adapted varieties for each region of the industry.

With that in mind, a recently completed research project through the CSIRO has studied sugarcane flowering, with the objective of delivering information and tools for sugarcane plant breeders.

In addition, it was also hoped that by better understanding flowering then researchers may be able to identify ways of limiting flowering in field-grown crops.

Chief investigator Dr Anne Rae said the project had two aims: to understand how the genetics of the cane plant influenced flowering; and to see if that flowering process could be short-cut by applying hormones or growth chemicals to the cane.

"There has been a lot of work understanding the genes that affect flowering in other species such as rice, for example," she said.

"We wanted to transfer that learning to sugarcane and see if there were any triggers that we might be able to manipulate."

Manipulating flowering by being able to make arrows appear on demand could allow for more crosses – which would also mean more potential for the breeding program.

And if arrowing could somehow be induced twice in a year – instead of just once – then other research processes could also be accelerated.

"For instance if you are bringing in new genes through introgression or a genetically modified trait then if you could make the plants flower twice per year then you could do it twice as fast," she said.

The Australian sugarcane industry has already invested in highly successful technology to assist with the flowering process and to improve variety development.

The SRA Meringa research station has three photoperiod facilities, which use artificial environments to trick the plants into flowering when the breeders want.

Prior to that, breeders were limited to crossing varieties that happened to flower at the same time, as well as facing the limitation that hot weather can greatly reduce flowering or some varieties had a low tendency to flower.

Project details

Key Focus Area: 1

Optimally-adapted varieties, plant breeding and release

Project name

Faster flowering – new opportunities for genetic improvement

Project number

2012/024

Principal provider

CSIRO

Project leader

Dr Anne Rae

At Meringa, sugarcane plants are usually induced to flower between mid-February and mid-March, but several days of high temperatures (above 32 degrees) can greatly reduce flowering, which further underlines the importance of the photoperiod facilities to induce flowering.

This new research by CSIRO and funded by SRA has improved the understanding of flowering.

"Through the work of the scientist on the project, Dr Donna Glassop, we have a better understanding of the genes that are responding to day length and lead to flowering. That means there are genes we could possibly tweak and manipulate in the future."

The second part of the project that used hormones on the plants also delivered useful information. "We were not able to make the plants flower earlier, but we did control the developmental pattern of the plant to contribute to more flowering-like behaviour. We pushed it in that direction, so we were pleased with that result given the complexity of the work."

Dr Rae said the project also delivered important information that crossed over with a number of other important research endeavours.

"We now have a large resource of information that could be used in the future in both directions for flowering, turning it on and turning it off," she said.



Denis Pozzebon has planted a lot of native trees around his home and loves his garden.



Continued innovation delivers in the Burdekin

Burdekin cane grower Denis Pozzebon says trialling new technology and innovation has led to positive outcomes and improved farm management practices. By Belinda Billing, Adoption Officer, Burdekin

Denis Pozzebon is a second generation sugarcane farmer managing 128 hectares of irrigated cane at Mount Kelly in the Burdekin region.

In November 2015, he received his Smartcane Best Management Practice (BMP) accreditation. He acknowledges that while he uses industry-recognised best management practices across his farm, for Mr Pozzebon improving the way he farms is a passion and there is always more to be done.

His father Ugo immigrated to Australia from Italy in 1954 and hand cut cane until he could afford to purchase his own property and bring his wife over from Italy.

Ugo worked hard and utilised the best farming practices of his time. Denis grew up farming with his father and says Ugo's values of innovation and adopting the best technology and practices have rubbed off.

"Dad always told me that we should stay with the times, think ahead, take that

leap forward if you see something, and go to new technology. I tinker a lot with technology, and I do a lot of that in the original shed dad built in about 1975," Denis said.

For Denis, many of the improvements he has made to his farming system have been through sophisticated use of GPS and precision technology.

He bought his first GPS in 2007 after borrowing a friend's GPS-equipped tractor to plant legumes and set up an AB line for the subsequent plant cane.

He still uses the same AB line, and was so impressed that he purchased his own GPS.

"At that time I was just using the GPS to drive straight, but I could see there were other benefits to the technology, particularly record keeping," he said.

At the same time, Denis began working with independent agronomists Tony Crowley and Peter McDonald to have his farm EM mapped.

The maps were validated with GPS-referenced soil tests and they provide the foundation for Denis's farming system.

"I was one of the first to have my farm mapped, and the maps, with the soil tests, are probably my most important information," he explained.

It was around this time that Denis also purchased Farm Works, a software program that allows him to keep electronic records, import maps and a range of farm management data.

The program now holds records dating back to 2007 for land preparation, nutrition and weed management as well as a range of EM and yield maps.

Another important purchase occurred in 2010 when, with support from the Australian Government's Reef Rescue program (now known as the Australian Government Reef Programme), Denis was able to purchase a variable rate controller for his fertiliser box.

He was interested in trying variable rate management across the different zones identified through the EM mapping process he had undertaken and was able to use the controller to easily and accurately change rates across blocks. With a bit more effort, he was able to implement variable rates within some blocks.

“At the time, I thought that varying rates within blocks with different yield and soil attributes was the way to go. Now I use the information I have to apply my ameliorants, such as gypsum, at variable rates and even-out my yield across blocks rather than adjusting my fertiliser rates all the time,” he explained, adding that he has been able to use the accumulated data over the years to refine his nutrient management to three management zones, based on clay, silt and sandy soils.

He has also found that it is much more economical to apply the expensive gypsum at high rates only in the sodic areas where it is needed rather than spreading it across entire blocks.

“I used to try and work with multiple management zones with lots of fertiliser rates and blends, but having all the data on there in the electronic form meant that I was able to sit down and look at all of the maps and the soil tests and that showed that the results were almost the same across three groups. I now manage these zones differently for fertiliser, irrigation and harvesting.


“I have different fertiliser rates for each zone, and on the sandy soil I split the application. I have soil moisture probes in each soil type to guide the irrigation management and I harvest the sandy soils green. I do still do soil testing in the fallow times and I use my EM maps to guide where I get the tests taken,” he said, adding that he continues to plant fallow crops and uses only minimum tillage.

More recently Denis has acquired variable rate controllers for his chemical applications. He has controllers on a flat boom spray and his shielded sprayer. The controllers improve accuracy of application, allow for sections to be automatically shut off to prevent overlapping or spraying outside the block when turning around and entering. It also automatically adjusts as the driver speeds up and slows down.

Denis says that the technology has made farming easier and the combination of data and precision technology allows him to invest his money and time where it is most required. As an early adopter of precision agriculture, Denis has spent a good deal of money paying for experts to come and teach him how to use the equipment, as well as many months of his own time figuring things out. He is now regularly called upon to support others who are just now adopting the technology.

He says that many farmers now have GPS systems and could be getting more from them. “The GPS can go a long way to keeping records for you. You just need to set it up right and enter your activities before you leave the shed.”

Denis will continue working to refine his farming system and helping others to adopt the new technology. “I enjoy spending time with other growers who are trying new things and improving their farms. We can always learn from each other.”



Denis has a weather station on farm and can read the weather data on his phone.



Long-term strategy delivers results for Heidke family

The Heidke family of the Hummock area have made a number of long-term investments including lateral irrigation and fallow management options. These have delivered efficiencies and productivity to their business. By Brad Pfeffer

Bundaberg farmers Alwyn, Mark and Brett Heidke take a long term view of their farming business.

With the farm having been in the one family since 1876 when cane was first grown on the property, across five generations (and a sixth currently running around their feet), the Heidkes say that planning ahead and making investments and decisions around a long-term approach have proven valuable for their operation.

This has seen them gradually introduce new practices including lateral move irrigation, fertigation, potatoes as a rotation crop, changing row directions, improving drainage, soil testing and management, and changing row widths of their crop and some of their machinery.

All were gradual changes that required planning and investment, but according to Mark Heidke, the benefits add together to make for an efficient and productive farming system.

The potatoes were first introduced when the sugar price was at about US8c/pound and the family was looking for cash-crop fallow options that wouldn't take too much cane from production.

With large areas of rich volcanic red soil being common in the area, sweet potatoes are common and surround the farm on most sides, but potatoes are a less common crop in the region.

After a lot of work getting the crop right, Mr Heidke said they have now successfully broken the sugarcane monoculture and there were greatly improved results in the subsequent cane crops.

After the final crop of cane, which is usually the third or fourth ratoon, they plant a cover crop of corn that is mulched back into the soil before the potatoes. The potatoes also usually receive gypsum, lime and compost.

"It is a marriage that works but it has taken many years to get it right," Mr Heidke said. "And the improved soil health is helping the number of ratoons. We continue to monitor soil health and if we know there is an issue at the first, second or third ratoon we can use the stool splitter and apply fertiliser and Confidor in one pass.

"The main objective is breaking the cycle of cane. Even on our black soil where we don't grow potatoes and have to replant, there is a great shortfall where you are not giving the ground a break. Even if we long fallow it for 18 months and plant a cover crop, the difference over four years is substantial."

Farming system delivers strong result

The Heidke family of the Hummock area in the Bundaberg district grow about 50-60 percent of their cane to KQ228[®], with other varieties including Q240[®] and Q208[®] making up the remainder.

And the results of not just the varieties, but their entire farming system, and the weather, appear to have yielded a good result in 2015.

"Across the whole harvesting group we were nearly 10-15 percent up on the crop, and had a good season except for some work chasing storms at the end," Mark Heidke said.

"We had some really good results with CCS, mainly because we cut later, and I think we had a couple of 18s and averaged 16.5 for the season, which was really good."

The Heidkes typically harvest about 12,500 tonne of their own cane and said tonnes this year were about 120 TCH.

They are hopeful that 2016 will produce a similar result. At the time when *CaneConnection* visited in January they had received good rain and 100 percent water allocation. "It is only early, but so far we have a good crop started and established."



They have taken a similar long-term approach to using lateral move irrigators, which cover about half of their area.

"It is true that the up-front capital cost is huge, but we have also looked at it over an eight-year period that considers firstly labour, then electricity prices, and then water efficiency," he said.

He said the more-common winch method of irrigating required much more labour in moving them, they were more expensive to operate, and were less water efficient in a region that is prone to being windy.

"Our power costs are about 50 percent lower, and we can water at night and in the wind as the water is just going straight down and not blowing away."

He added that there were yield advantages to the crop, perhaps as much as 10-20 percent in some areas.

"We can practically give the farm 50mm in six days, and in the peak time that's what you need to do. It is in December, January and February that you are putting your tonnes on and dollars in your pocket."

He said it took three years of work in some cases to be ready to install laterals, including work on pipes, pump stations, and changing row directions. "I know it is a big call to be looking five years ahead or more, but we feel that in sustainable farming you need to do that," he said.

That said, they continue to be strategic about their investments and have current plans for further laterals on hold while the Australian dollar is low relative to the US dollar.

They are also starting to use the laterals for fertigation, particularly if there is an exceptionally large rainfall event and they need to top-up nitrogen to the crop. They feel this allows for a much greater uptake of nutrient for the crop and avoids runoff.

Running a contract harvesting business as well, they also see that the harvester has a huge influence on future crops.

"Row width plays a big part in that, and we have seen narrow row configurations where the stool is getting squashed like a steamroller."

Visit www.sugarresearch.com.au to see the CaneClip with Mark Heidke.

Above: (Top) Mark Heidke with one of the lateral irrigators on the family farm. (Bottom) Alwyn Heidke on the property in January 2016.



ABARES survey reveals financial performance of Australian cane farms

A new survey has looked at the financial performance of Australian cane farms and provided useful information to help guide industry decisions and research and development requirements.

The financial performance of Australia's sugarcane farming businesses has been studied in a new survey conducted by ABARES and commissioned by Sugar Research Australia (SRA) and the Queensland Department of Agriculture and Fisheries (DAF).

It is the first in-depth survey that has studied productivity and profitability of the Australian sugarcane industry since 2008. It has surveyed small, medium and large sized farms in terms of production (tonnes) and area (hectares).

The survey provides a good snapshot of sugarcane farm performance, taking into account a range of factors such as farm location, size, and inputs such as water and electricity.

The survey involved in-depth face-to-face interviews with more than 170 farmers in early 2015, looking at financial performance in 2013/14.

"We know that the survey was conducted in a period of relatively low production due to the environmental impacts

associated with several bad years of floods and cyclones, and the survey report recognises that," SRA Executive Manager for Investor Relations, Leigh Clement, said.

"However, it showed that despite the environmental and economic challenges that the industry faced, the top ranked 25 percent of sugarcane farm businesses had an average rate of return of 4.5 percent in 2013/14, not including capital growth in their land.

The survey also highlighted the challenges faced by the smaller and less profitable farms, with some of these enterprises transitioning away from sugarcane production or to retirement. The bottom 25 percent of farms had a negative 9 percent rate of return, relying on off-farm income to survive.

By comparison, a similar recent survey of horticultural producers by ABARES revealed the top-performing horticultural farmers achieved a 10 percent rate of return and the low-performing farms had a negative 11 percent return.

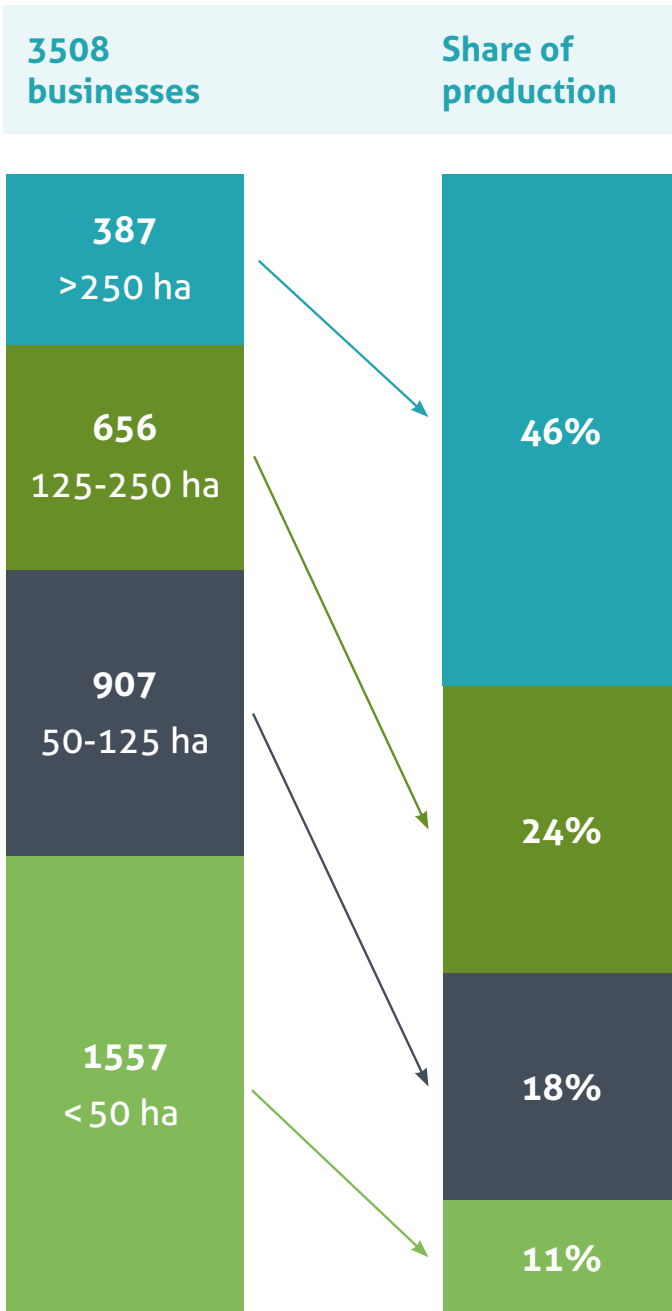
The survey also looked closely at sugarcane farm costs and correlated this information back to costs per tonne and per hectare.

Sugarcane farms greater than 125ha generally had positive returns and farms greater than 250ha had an average return on capital of 3.3 percent, which ABARES said is comparable to grain farms with similar capital investment.

However, the survey revealed the impact of lower sugar prices and higher farm costs, with average income declining from \$89,700 in 2013-14 to \$70,000 in 2014-15.

The survey also showed a comparison of costs across regions, breaking these down into specific items.

The Burdekin region, where most of the crop is irrigated, had the highest costs at \$4190 per hectare. Costs in other regions were in the low \$3000s per ha.



The ABARES survey provides SRA with a baseline to measure future trends regarding sugarcane farmers' return on investment, as well as a way of measuring the rate of practice change.

The survey already indicated a solid rate of positive change with management practices among the industry's farmers, with 47 percent having made changes to farming practices, techniques or methods in the two years to 2015.

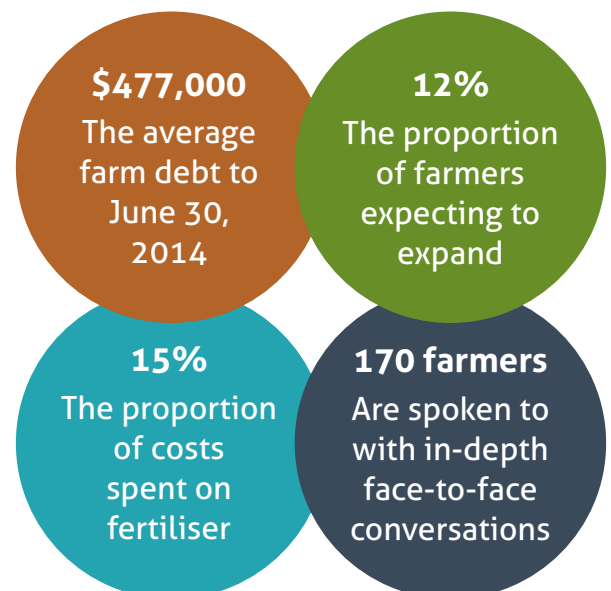
"It showed that the number one reason for practice change was because of research and development outcomes," Leigh Clement said.

"The survey showed that there is a strong current of innovation in the Australian sugarcane industry, and it also provides useful data for organisations such as SRA to target our investment in a way that benefits sugarcane growers and millers."

The survey will be used for a range of purposes, including to help guide industry investment in research, development and extension through SRA. It will also compliment SRA's existing annual grower survey, and both of these surveys will be used to inform SRA performance reports.

The full survey can be read at www.agriculture.gov.au/abares.

Fast facts – by the numbers



Region	Total cash costs \$/ha (excluding finance)	Total cash operating margin \$/ha (before finance)
NSW	\$2040	\$270
FNQ	\$2490	\$680
Herbert	\$2310	\$580
Burdekin	\$3220	\$720
Mackay	\$2200	\$710
Bundaberg	\$2470	\$240
All	\$2490	\$600

Improved season sparks major turnaround for NSW

Northern NSW grower Kevin Twohill says productivity is the key to profitability for his business, which echoes the findings of a recent ABARES survey into sugarcane farm profitability. By Brad Pfeffer

Tweed Valley cane grower Kevin Twohill hopes that 2016 is a year where improved prices align with good yields.

For the last six years, Mr Twohill has been in the same situation as most northern NSW growers where there has been a run of difficult years of low yields caused by unfavourable weather. Then, in 2015, many growers grew their best crop in years, only to see prices well short of where they would like them to be.

But with a recent recovery in the sugar price, along with Sunshine Sugar's forward pricing strategy, and healthy looking ratoons, Mr Twohill said he is hopeful that 2016 could be a good year for the local industry, building on the good yields experienced in 2015.

For Mr Twohill, the numbers at his own farm are a demonstration of the challenge that was faced in recent years – and the recovery. In 2012 he cut about 7500 t of cane, from the same area that in 2015 produced just under 19,000 t, at an average of about 125 t/ha. This includes ground that is both owned and share-farmed, and about one quarter of that cane was two-year-old.

"The low yields in 2012 were across the board for the Condong mill area, where we cut under 300,000 t, whereas in 2015 we were back up to 550,000 t," he said.

The average yield at Condong was 70 t/c/ha in 2012, whereas in 2014 it was 118 t/c/ha and in 2015 estimated to be 122 t/ha (175 t/ha for two-year cane and 105 t/ha for one-year).

With a greater proportion of one-year old cane than the two other NSW sugar mills, the recovery on the Tweed has been slightly faster, but Mr Twohill said that ultimately it was throughput in terms of tonnes was crucial to maintain productivity and profitability in the business.

For Mr Twohill, his statement is echoed by the numbers that were produced from a recent survey released by ABARES that stated that smaller farms faced significant challenges in 2013/14.

According to the survey, the 2013/14 average farm cash income was highest in Far North Queensland averaging \$120,300 per farm and lowest in NSW, where there is a higher proportion of smaller farms, averaging \$38,100 per farm.

However, Mr Twohill said that the NSW region had posted a significant recovery in yield in 2014/15, which was also indicated by the ABARES survey but not collected in the final survey because of its timing.

"In 2015 the expectation was for about \$30/t of cane, and hopefully next year with the forward selling program at the mill we are looking at hopefully \$500/t/sugar or better," Mr Twohill said.

Sunshine Sugar CEO Chris Connors said that they were hopeful of good crops in 2016 and 2017, based on the current state of the crop in the ground and that there were positives to look forward to for the mill and the growers.





New project to improve extension services

A project conducted by RIRDC will independently examine Australia's agriculture extension process. SRA is a participant in this project.

Led by RIRDC business development manager Vicki Woodburn, the 18-month \$1,715,000 project will examine Australia's extension system, a system that has the potential to improve productivity and profitability across Australia's farming and fishing sectors.

Ms Woodburn says one of the goals is to create an online 'hub' that consolidates and organises existing knowledge, tools and resources.

"There is a lot of 'noise' around extension at the moment," she says. "With the ongoing withdrawal of government investment in extension activities, some people feel the system is in crisis.

"So the second major goal is to independently look at the system and see what is working, where problems are emerging, and make recommendations on ways we can improve it."

For example, the project will consolidate existing knowledge to draw out what works and why in relation to business financial performance, responsiveness to markets, natural resource challenges, on-farm practice improvements and adoption of new technology.

It also aims to understand what lessons can be shared across Australia's agricultural industries. "This is particularly useful during this time of change where some industries are already using a greater portion of private extension services than others; and some have, or are trialling, new technology-driven approaches that could be relevant for other sectors."

Ms Woodburn says the target audience is those making investment decisions, such as a farming systems group or the private sector.

"We are aiming for cultural change in how we invest and plan extension programs. Australia has extensive knowledge and expertise on extension options, implementation and needs, but it is not effectively being used to inform decision making about optimising extension delivery."

For more information contact Vicki Woodburn on 02 6271 4124 or email vicki.woodburn@rirdc.gov.au

Above: This collaborative research project is looking at the many ways that industries are looking to improve extension services to farmers, helping to deliver important information to them.



Andrew Jakins and Bruce Quinn from Isis Productivity Services inspect the new variety SRA1[®].

Growing interest in SRA1[®]

Like any new variety, growers and millers have a keen eye on how the new variety SRA1[®] might perform once they get it into the paddock and the mill.

It is still six months until the new variety SRA1[®] is in the ground on growers' farms in the Childers region, but the local productivity service officers are already noticing that the variety is growing well in the bulking up phase.

The new variety is the first to be released under the new system of naming sugarcane varieties since the formation of SRA in 2013. The Q number system has now been replaced with the SRA prefix, acknowledging the investment that SRA makes on behalf of sugarcane growers and millers in developing new varieties. SRA1[®] and SRA2[®] were approved for release last year in the southern and the NSW growing regions. SRA3[®] was approved for release in the Herbert.

SRA1[®] is resistant to brown rust, mosaic and smut, with intermediate resistance to Pachymetra root rot, Fiji leaf gall, leaf scald and red rot. It has produced high yield and high CCS in SRA variety trials in the Southern region and NSW, with good ratooning ability (measured up to fourth ratoon).

"The consistency of SRA1's high productivity in variety trials is remarkable," Alison Jensen from SRA Bundaberg said.

The variety was ranked within the top five clones in 26 out of 29 variety trial crops harvested in the Southern region and nine out of 13 harvested in the NSW region.

SRA1[®] is also being trialled in other regions and early results from the northern and central regions are encouraging. The variety does have low fibre content and further milling tests will be carried out in 2016, prior to bulk commercial production.

"So far it covers in and germinates very well," Bruce Quinn from Isis Productivity Limited (IPL) said.

For Isis growers, IPL expect to have about 500 tonne of SRA1[®] available for growers for spring planting and no restrictions on the volume available for growers. Mr Quinn said there had been good interest in SRA1[®], as well as Q252[®], which would be available in the Isis region this year also.

IPL bulks up approved-seed sources of varieties for distribution on three growers' properties, with the pictured SRA1[®] being grown on Graham Webb's farm at Farnsfield. Mr Webb is the main plot holder for IPL and has been working with them in this way since 2002.

SRA1[®] has been release as a year-old variety based on the excellent results achieved in NSW one-year old trials. Plant two-year old results will be collected this year from four two-year old trials and be available to growers prior to planting in 2017.

In NSW, Sunshine Sugar has planted SRA1[®] in the distribution plot for 2016 and reported that it has good early growth. They reported that in the early stages, even though SRA1[®] was planted 10 days later than Q242[®], it had soon caught and passed Q242[®] which is also a strong germinating variety.

Growers wanting to know more about these or other varieties can log on to QCANSelect™ or contact their local productivity services organisation.

A second ratoon block with soldier fly damage, in the paddock adjacent to the trial site at Finch Hatton. Notice the multiple gaps and small stools in the paddock, and also the absent trash blanket, as burning it is seen as a control method in the region.

Investigating soldier fly control and management

Although soldier fly are not a major pest, they can cause significant yield losses for the farmers who have them, especially in the Mackay, Bundaberg, Maryborough and Childers regions. By Jarrod Sartor, Adoption Support Officer, Mackay

Soldier fly are native insects that inhabit grasslands and can cause serious damage to sugarcane crops. Soldier fly larvae feed on of the root systems of the cane crop. This feeding can result in poor germination at planting, but more commonly causes weak ratooning.

Affected stools have fewer shoots and growth is usually poor with damaged blocks appearing weak and 'gappy'. Soldier fly can live in a wide range of soil types from red volcanic soils and heavy clays to sandy alluvial soils.

Adult flies emerge from late March to July. Each female emerges, mates, lays eggs and dies within 1-2 days. Eggs hatch within 1-3 weeks depending on soil temperature. Larvae feed within 15cm of the soil surface in the sugarcane rows. Once they begin to feed on the sugarcane roots the soldier fly larvae seldom move, unlike cane grubs who often burrow around in the soil.

Recently, new methods to control and manage soldier fly are being investigated by the SRA Plant Health group and their leader Dr Andrew Ward. These trials are taking place in both the Bundaberg and Mackay regions and are looking at

varietal resistance and new approaches to manage soldier fly with insecticides aimed at prolonging the number of ratoons obtained in fields at high risk of infestation.

The trials in the Mackay region are looking at several insecticides applied at fill-in and their efficacy at reducing soldier fly population. Each chemical has been applied at two rates. Because these chemicals are not registered for control on soldier fly in sugarcane, the cane will not be crushed but will be assessed for its vigour and yield through-out the crop cycle as well as how long infestation can be delayed by using each product.

Though it is not certain how effective these products will be, these trials are exploring a number of potential control options that have not previously been investigated and if successful could provide future control and management options for soldier fly.

These trials are important to growers effected by soldier fly because there is currently no insecticide registered for control of the pest. However, natural predators like ants, wireworms, ground

beetles and fungal diseases can limit soldier fly population.

Current management practices also help to reduce soldier fly numbers and their impact on the crop include:

1. Taking out affected blocks early in the harvest season
2. Having a grass-free break from cane, i.e. A long herbicide fallow under trash after spray-out of old ratoons, or a short fallow followed by a non-grass crop such as soybeans.
3. Planting the next crop after the soldier fly's flight period (after June).
4. Planting sugarcane using minimum tillage following the herbicide fallow. Keep cultivation for the break-crop minimal but adequate to establish the next crop; extra cultivation does not effectively control soldier fly but will harm the natural predators.
5. Growing varieties with vigorous root systems that ratoon quickly.
6. Harvesting affected plant and early ratoon crops when conditions are favourable for ratooning.



Project details

Key Focus Area: 3

Pest, disease and weed management

Project name

Pre-commercial evaluation of PCR diagnostic for RSD and development of a case for full implementation

Project number

2015/078

Principal provider

SRA

Project leader

Dr Nicole Thompson

Project end date

2017

SRA works to deliver improved RSD diagnosis

A new way of sampling and diagnosing Ratoon Stunting Disease is currently being evaluated by Sugar Research Australia.

The Australian sugarcane industry is a step closer to a more accurate and cost-effective way of sampling and diagnosing Ratoon Stunting Disease (RSD), thanks to new research projects funded by Sugar Research Australia.

The new project builds on existing recent research that has developed a new way of sampling and testing whether sugarcane fields are infected with RSD, and throughout this year the project will investigate whether this new method can meet the industry's requirements and whether it will be possible for SRA to implement on a large scale in the laboratory.

It is hoped that this could then see the new RSD sampling and testing method widely adopted for 2017.

This new project stemmed from the successful research of Dr Anthony Young (USQ) and Dr Catherine Nock (SCU), where the researchers implemented a new method of sampling for and diagnosing for RSD.

The new method is able to use samples of small punches from a sugarcane leaf-sheath, as opposed to the current method of removing whole stalks of cane from a particular field and then pumping xylem sap from them to create a sample. This means that a more representative sample from the field can be tested.

This change in practice, if implemented, would present a significant labour saving for productivity services organisations and others who are collecting the samples.

The new test is significantly more sensitive and it's hoped that it can detect RSD in sugarcane as young as two months old, whereas the current test in commercial use can only detect RSD at six to eight months old.

This improvement would help even-out the workflow of sample collection by spreading it over a longer time and it would also provide the benefit of being able to sample young cane – a far easier task than collecting samples from within mature paddocks.

Dr Nicole Thompson with SRA is leading the project in collaboration with Dr Anthony Young (USQ) and said that the next 12 months had four main objectives.

- To authenticate the results of the new testing method;
- To determine the sensitivity of the tests throughout the season;
- To determine and optimise the number of samples that can be processed each day in the laboratory; and
- To develop a business case for full implementation in 2017, if the trials are successful.

This work is being done with the support and involvement of productivity services organisations across the industry.

Dr Thompson said there was a challenge in that while the new test was well-suited to collection in the field, it was not yet an efficient high throughput process in the laboratory. The existing method can process a far greater number of samples each day in the laboratory than the new method – although the project seeks to greatly improve that efficiency. However, one of the key advantages of the new method is that only a single sample is processed for each field, as opposed to many samples using the existing technique.

“We want to be able to provide better information about sampling, processing, and accurate costs,” she said.

Dr Thompson said that employing management strategies for RSD was based solidly on diagnosing the presence of the disease, which emphasised the importance and the potential of this research.

Accurate detection of RSD allows growers and productivity services organisations to implement effective management solutions for RSD.

The simpler sample collection process for the new test is likely to stimulate greater testing and awareness of the disease and provide a more accurate picture of the extent and seriousness of the disease in all cane growing regions.

Dr Young, who was previously the Extension Officer at Harwood, NSW, has credited the enthusiasm of the Productivity Services Companies for helping to drive the project.

“Most of the Prod Boards have tried the new technique, and we’ve found RSD in some places that were thought to be free from the disease. Our team has had a lot of support from the end users who would be happy not to have to pump stalks in the future,” Dr Young said.

The new test will not replace existing control measures of clean seed, fallow management and disinfecting planting and harvesting equipment, but it may help inform decisions about the future of RSD management.

This new SRA project is an acceleration of the existing project under Dr Young and Dr Nock, and is part of the SRA Board’s emphasis on the priority Impact Area of Adoption.

The SRA Board has identified four priority Impact Areas for the Australian sugarcane industry, being Adoption, solving Yellow Canopy Syndrome, Harvest Losses, and conventional and genetically modified plant breeding.

For more information contact Dr Nicole Thompson by emailing nthompson@sugarresearch.com.au.

Ratoon Stunting Disease – what is it?

1

RSD is caused by a bacteria that is highly contagious. For example, it can spread for many metres down a row by any implement that cuts the stalk or contacts the freshly cut end of a billet or sett.



Above: Healthy stalk (top) compared to the red dots in nodes of RSD infected stalk (bottom).

2

RSD is generally present in fewer than 5 percent of fields in Australia, although in some districts RSD incidence is much higher.

3

Yield losses range from 5-60 percent depending on the susceptibility of the variety and the weather. The average loss is 15-20 percent.

4

The keys to controlling the disease are planting disease-free seed and preventing reinfection by disinfecting planting and harvesting equipment.

5

Some varieties (e.g. Q200[®] and Q208[®]) have partial resistance to RSD.

Burdekin grower Paul Sgarbossa on his property in February 2016.

Coordinated effort controls RSD

Burdekin grower Paul Sgarbossa shares his views on disease control methods and the success that the district has had controlling Ratoon Stunting Disease. By Brad Pfeffer

Burdekin farmer Paul Sgarbossa has seen first-hand how vigilance and coordination can help control pests and diseases in a sugarcane growing district.

Farming on the southern side of the river near Home Hill, Mr Sgarbossa has been a Board member of the local productivity services, BSES, and local CANEGROWERS.

He has since retired from these roles, but through his extensive industry representation he saw how a coordinated approach helped to drastically reduce the problems associated with Ratoon Stunting Disease (RSD) in the district.

The use of approved seed, careful hygiene, and coordinated testing has all helped reduce the occurrences of RSD.

He also said that it required continued vigilance. With this in mind, he said that a new sampling and testing method (see previous pages) could be beneficial for ensuring the industry continued to keep RSD at bay.

"The Burdekin has always had a good approach to controlling problems like leaf scald, RSD, and sugarcane smut," Mr Sgarbossa said. "We try and flood the region with treated sugarcane and most growers try and take some every year. In the end, it is very cheap insurance."

He emphasised that hygiene was critical. "It is very important for proper clean down and sterilisation of harvesting and planting machinery, and also to ensure there are no volunteer stools in fallows or on headlands."

Mr Sgarbossa said that Burdekin Productivity Services (BPS) continued to be vigilant regarding RSD and continued its surveillance of new areas.

"RSD is a serious issue that we need to stay on top of. It is important that every grower hold some resistant varieties, so if RSD does arise then you have a better chance of battling it when it does come along," he said.

Growers can find out more about the disease-resistance ratings of sugarcane varieties through their local productivity services organisation or by using the online tool, QCANESelect™.

In the Burdekin region, the three main varieties grown are KQ228[®], Q208[®] and Q183[®].

According to QCANESelect™, Q208[®] is classified as resistant to RSD, KQ228[®] is classified as susceptible, and Q183[®] is classified as intermediate.

Emerging varieties, Q240[®] and Q252[®] are classified as resistant, while Q253[®] is classified as susceptible.

Regarding the new RSD sampling and testing method that is currently being evaluated, the work to fast-track this process came in response to demand from productivity services organisations.

Rob Milla from BPS said he was extremely supportive of fast tracking the new RSD testing procedure and that it would create a huge labour saving.

"All our field staff who collected the samples for Anthony (Young) found the procedure very simple and fast, and more importantly, with the improved accuracy of testing, there is a higher level of confidence in the data collected," Mr Milla said.

Below: Water quality benefits of the improved farming system.

Practice	Water quality benefit
Trash blanket	Reduction in sediment losses through soil erosion Reduction in reliance of herbicides for weed management
Minimum and zonal tillage	Reduction in sediment losses through soil erosion
Controlled traffic farming	Reduction overall farm runoff and losses of inputs
Fallow cropping	Reduction in sediment losses through provision of cover during the fallow Potential reduction in herbicide use through better weed management

Improve water quality with the improved farming system

Sugarcane farmers using an improved farming system are not only seeing benefits to their production, but also improved water quality outcomes. By Belinda Billing, Adoption Officer, Brandon

For many years sugarcane agronomists have been promoting what is commonly known as the Improved Farming System. This is the management system developed through the Sugarcane Yield Decline Joint Venture (SYDJV); a 14 year research program led by Dr Alan Garside and conducted by a range of research agencies. The project began in 1993 and ran until 2009, combining research and extension as the work progressed.

The research identified a number of practices that could be adopted as a full system to improve all aspects of soil health and address the problem of yield decline. Sugarcane growers who have adopted this system are seeing long-term benefits with increased numbers of ratoons, maintenance of higher yields across ratoons, and dollar savings.

Another less well-known benefit of the Improved Farming System is the overall reduction in rainfall run-off leaving the farm and improvement to water quality when compared to conventional farming. The reduction in rainfall runoff is a result of the increase in soil water holding capacity achieved through reduced compaction with controlled traffic farming. A four year water quality

study conducted in Victoria Plains by the Department of Natural Resources and Mines found an average reduction in runoff of 17 percent on a 1.8m controlled traffic system, compared to 1.5m system.

This reflected an earlier rainfall simulation study on a 2m dual row controlled traffic system in North Eton which found significantly reduced runoff at both one and 21 days with a simulation of a one-in-10 year rainfall event (100mm/hr). The trial was able to record and sample natural rainfall which showed a similar reduction in runoff.

Both trials also showed a longer period for the Improved Farming System to begin running off and lower rates of peak runoff. This means that soil managed under this system has much greater infiltration.

A reduction in overall run-off benefits both the grower and the environment. The grower benefits from increased water holding capacity in their soils. This means, in dryland crops, that more rainfall from every event is held in the soil and made available to the plant. In a fully irrigated system the grower gets more value out of the irrigation water applied.

High levels of runoff can also result in increased losses of applied nutrients and herbicides through poor incorporation and the early onset period to runoff.

Another recommendation of the Improved Farming System is to maintain soil cover through a trash blanket and fallow cropping. The trash blanket conserves soil by preventing erosion through rainfall runoff. It also provides protection against weeds, reducing the amount of herbicide that needs to be applied. The four year water quality study at Victoria Plains showed a dramatic difference between sediment lost in runoff from the bare plant cane and ratoons that were protected by the trash blanket. This was also a reflection of cultivation, with no tillage conducted in any ratoons.

A further reduction in lost sediment can be achieved by maintaining cover throughout the fallow period. The improved farming system recommends fallow cropping to achieve this, which provides a break from the monoculture of sugarcane. All of these practices are recommended in the Smartcane BMP, which aims to improve farm sustainability, profitability and productivity.



Taking the mystery out of precision spraying

Tully region growers Brian and Jamie Dore are integrating GPS technology with their spot spraying, delivering useful results. By Phil Ross, Adoption Officer, Mackay

Jamie and Brian Dore farm in the Tully region and are active participants in Project Catalyst and the Federal Government's Game Changer program.

Both programs encourage and support growers to develop innovative and practical improvements to their farming systems, to improve profitability and improve water quality in adjacent waterways.

Brian and Jamie, with assistance from their agronomist Charissa Rixon (T.R.A.P. Services), have developed a system of creating a weed map as they spot-spray.

Jamie Dore says the system evolved out of the need to better control Hamil grass stools in ratoons. "Like other growers, we spend a lot of time spot spraying with a hand gun," he said.

"We also use a high-rise spray tractor to put down residuals and knockdown herbicides. Our high-rise is fitted with GPS and a variable rate controller so we thought that if we knew where the patches of Hamil grass were we could put down a higher rate of residual on these areas of high seed load."

Jamie says the system integrates GPS technology across the spot-spraying operation and the subsequent main spraying operation high-rise sprayer:

- The spot-spray tractor is set up to record the GPS coordinates of the spot-spraying:
 - > The hand-gun is fitted with a switch which triggers whenever the hand-gun is operated; and
 - > This signal is sent to the GPS unit which records the location of each spot-spray; the coordinates are stored in the GPS as a data file.
- This file is downloaded from the GPS unit onto a USB.
- This data file is then downloaded to a computer and a weed map is created using Trimble Farm Works™ Mapping and GIS (Graphical Information System) software.
- Using the Farm Works™ software, the identified hotspots of Hamil grass are prescribed a higher rate of residual herbicide than the remainder of the block; each logged point is currently expanded to a 20m buffer zone to ensure that enough of the higher seed bank is treated with the higher rate.
- The weed map is saved in Shapefile format which can be read by the controller in the high-rise tractor.
- After harvest, this file is then uploaded, via a USB, into the GPS/spray controller of the high-rise spray tractor.
- The operator selects the prescription relevant for the block being sprayed and the controller does the rest, applying either a higher rate or lower rate of residual herbicide to different parts of the block.

The change in rate is achieved by changing the water rate per hectare, at a constant travel speed. Jamie says that more sophisticated direct injection metering systems are available which would allow the amount of herbicide to be varied whilst maintaining a constant water rate; but they don't consider it economic to go to this level of technology yet. Direct injection metering systems are also more suited to liquid formulations of product and are not suitable for Wettable Granule or Dry Flowable formulations.

Although Jamie and Brian are very capable users of GPS and variable rate controller systems, they also use a consultant agronomist to set up their weed and nutrient plans. Charissa Rixon (T.R.A.P. Services) creates the weed maps from the spot-spray tractor's data file.

This requires a good knowledge of the Farm Works™ Mapping software and the GIS software, in this case Manifold®.

"I help Brian and Jamie decide on what herbicides to use and at what rate we'll apply them. Usually we'll have two rates programmed into the controller; a base rate and a higher rate where Hamil grass was mapped. Usually we'll use isoxaflutole (Balance®) at the out of hand stage in the ratoon crops from first ratoon onwards and then switch to imazapic (Flame®) immediately after harvest for the second ratoon onwards."

Because the farm is spot-sprayed each season, the distribution of Hamil grass infestations can be mapped from year to year. So we'll be able to see if we need to adjust the buffer zone where we are putting out the higher rate,

and we'll also be able to see if new infestations are occurring in areas that were free of Hamil grass previously," Charissa says.

This mapping technology is also used to develop nutrient plans. Nitrogen rates are varied across the farm using a twin compartment fertiliser applicator fitted with variable rate controller. At this stage only the N rate is varied with the second blend of other nutrients remaining relatively constant for the particular blocks being fertilised with that blend.

This innovation is supported by the Australian Government's Game Changer project, Terrain NRM and Project Catalyst.



Images (clockwise from top left):

The simple switch on the handgun triggers the GPS to log the point of spot-spraying.

The programmed controller on the high-rise now knows where to change the herbicide rate.

Ready for action.



Optimising CCS at harvest

Farm management decisions for maximising profit don't always mean spending extra money.

By Roderick Fletcher, Adoption Officer, Meringa

Variety selection is complex, with many considerations around risk and reward. Selecting varieties for specific sugar maturity profiles, and planting and harvesting them for optimal CCS maturity at the time of harvest can make a significant difference to your farm profit.

Varieties have distinct sugar accumulation curves. Consequently, it is important to grow a range of early-, mid- and late-season varieties to ensure high CCS is maintained throughout your harvest schedule. In the example (Figure 1), harvesting an early-sugar variety late in the season, or a later-maturing variety early in the season, can cost as much as 3.5 CCS units.

Information to help with decision-making on variety selection can be found in QCANESelect™ or the SRA Variety Guides.

SRA has developed the electronic information and decision-making tool QCANESelect™ that makes finding the best available variety maturity profile information easier.

SRA also publishes variety guides as a convenience for those unable to access online information. In QCANESelect™, you can find a combination of information tools that are derived from either analysed mill data, SRA trial information, or information provided by local variety development groups.

The Tully Variety Management Group (TVMG) is working closely with SRA on sugar maturity profiles for new varieties. The group is led by Greg Shannon (Cane Productivity Manager at Tully Sugar Limited (TSL)) who since 2013 has been conducting site-specific fortnightly CCS maturity trends on new varieties over four to six sites in the Tully region. All sites include commercial standards e.g. Q208[®]. The sites are planted by growers who are part of the TVMG.

"Tully Cane Productivity Services Limited (TCPSEL) and TSL are supportive of this work as the information is then fed back into QCANESelect™ recommendations, allowing both TSL and TCPSEL to give growers the best advice on new SRA varieties, using local data," Mr Shannon said.

"This is building better information profiles for new varieties in the region to fast-track their adoption."

In the Tully region, Farm Manager at Mackay Farms, Warrami, Bill Boyge explained variety selection maturity planning he does for the farm given the recent extended harvest seasons due to the amount of tonnes in the region.

"Late season varieties are standard, Q208[®] and Q200[®]; mid-season varieties are usually my plant, first ratoon and varieties that I am trialling," he said. "I'm really looking for something to add to my early varieties and after considering some of the information I've reviewed, I'm looking to Q250[®] to replace some of my KQ228[®]."

Mr Boyge receives his information from TCPSEL, and also uses QCANESelect™.

"I find it very useful even though I'm very new to computers. I like to print out information from QCANESelect™ and put it in a folder I keep for varieties."

Figure 1: Generic example of early, mid and late seasonal sugar profiles for varieties Q231[®], Q200[®] and Q183[®] compared against the mill average. It shows the varieties milled CCS recorded over harvest duration.

Maximise the tonnes of sugar per hectare by selecting varieties by seasonal sugar profiles

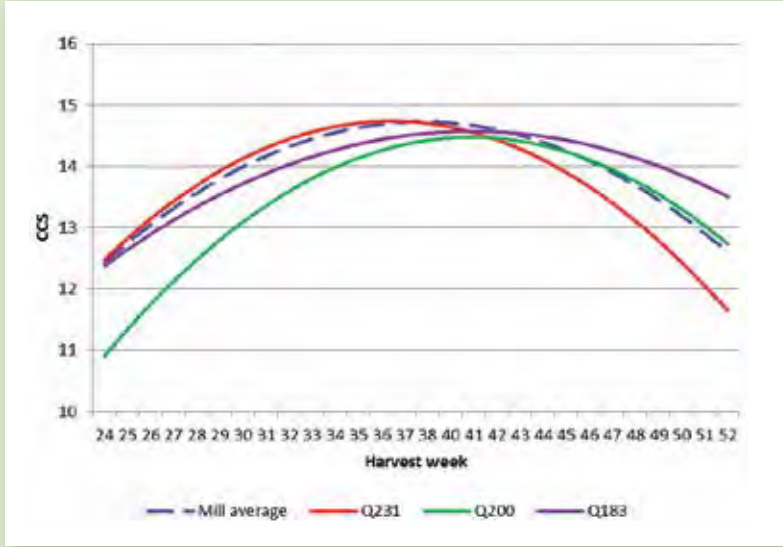


Figure 2: Suggested Harvest Period Table for northern coastal region which can be generated from the Variety Information Page on QCANESelect™. This table is often used and important for new varieties with no mill data.

Always plant a mix of early-, mid- and late-season varieties to maximise the CCS of harvested cane throughout the harvesting season

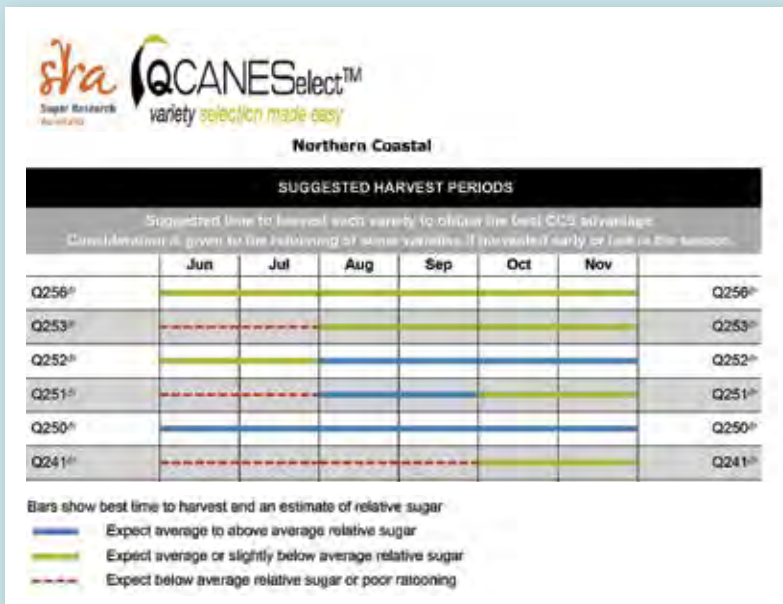
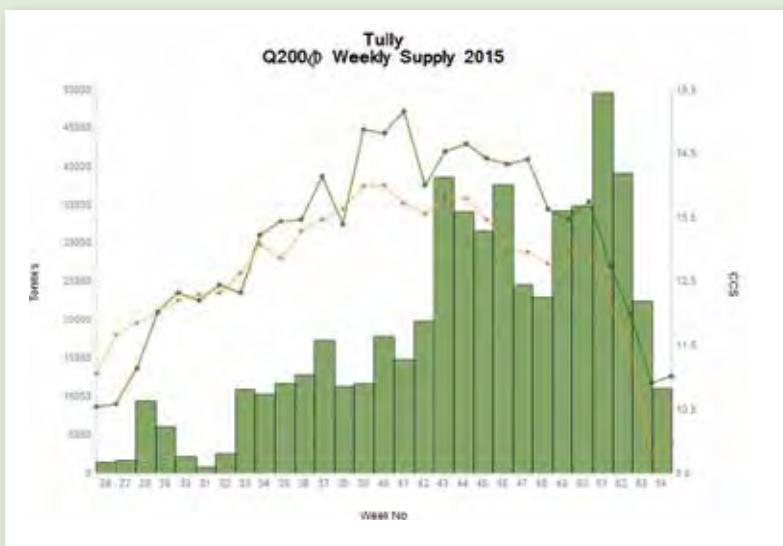


Figure 3: Graph showing weekly CCS against weekly supply in 2015 of Q200[®] across whole of Tully mill area. It shows growers are harvesting Q200[®] at the right time to maximise their profits. (Note that Tully had an abnormal season in 2015 where harvesting continued in Tully till January). This graph was generated using the regional reporting page on QCANESelect™.





Jake McLagan, Bill Boyge and Rod Fletcher stand in front of some six month old Q250[®] that Bill is trialling.

Understanding maturity

The process of maturity happens during the growing season as internodes along the stalk fill with sugar. However, full maturity of cane (ripening of the upper internodes) happens only when appropriate climatic conditions are reached.

The factors that most easily enhance ripening include both temperature and moisture levels and generally limit stalk elongation. Since sunlight and temperature are typically related, both the intensity and duration of sunlight are part of the ripening process.

Typically, times of the year that promote ripening are stress-induced by either cool or dry and sunny conditions. Conditions that see CCS drop are overcast, wet days and higher temperatures promoting vegetative growth and suckering.

For this reason, graphs of maturity curves often start lower and then increase over time during the harvest season. Depending on weather factors at the conclusion of the harvest season, the curve may fall toward the end of the season or it may simply flatten out following the peak when cane fully matures.

Managing adverse weather conditions can be extremely difficult. However, in irrigated areas, at least the moisture portion of the ripening process can be altered.

Typically, drying off the crop prior to harvest provides the stress to allow for rapid maturation of the upper internodes. The soil depth, soil texture, soil water holding capacity, amount of solar radiation, age of the cane and other factors all affect the length of the drying off period prior to full maturation.

Fully mature cane has levels of brix and sucrose content that vary considerably from region to region, depending upon the varieties grown, climatic conditions, available nutrient levels and other growth/maturation factors.

These same factors also alter the maturity pattern throughout the harvest season resulting in differing patterns throughout the industry.

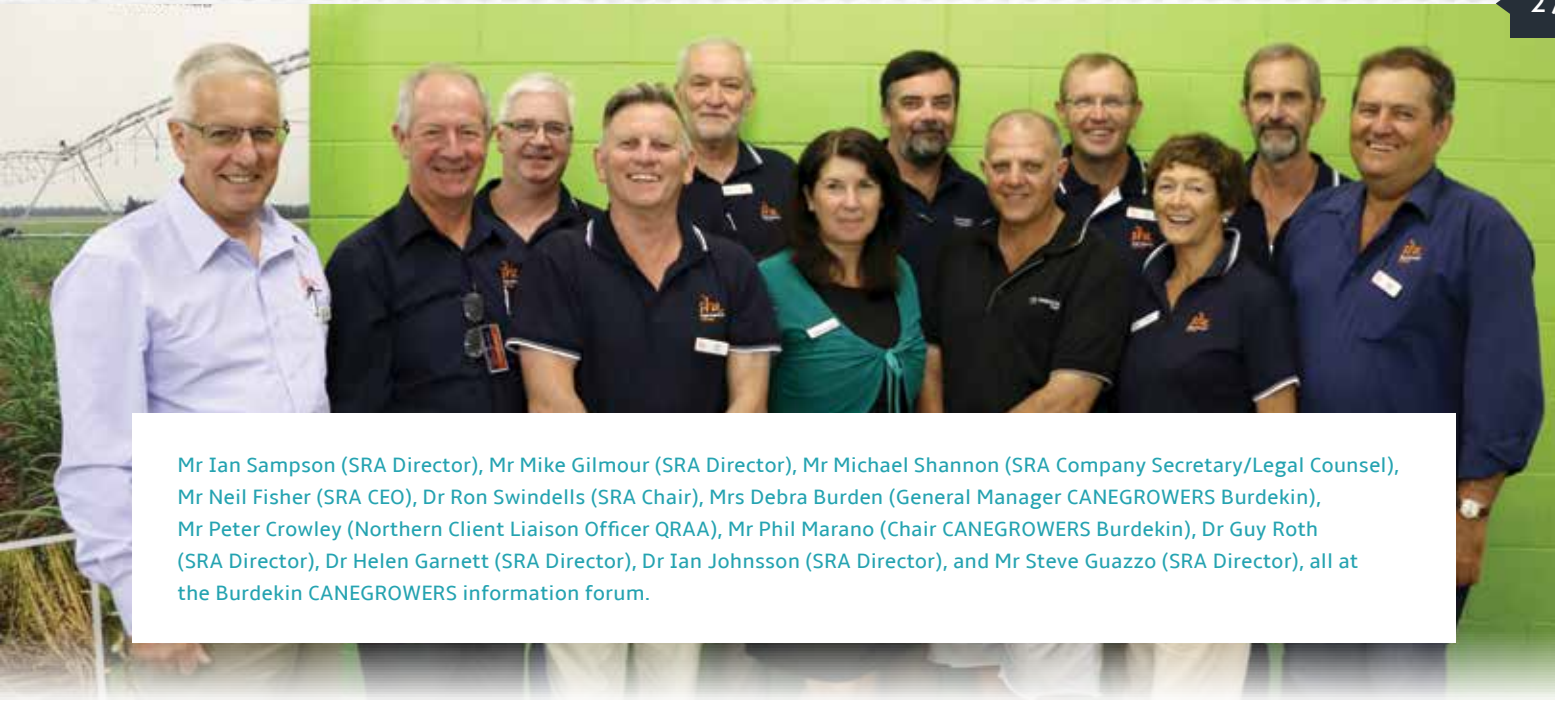
Flowering is also part of the cane stalk maturation process. Flowering is initiated when day-length gradually decreases to less than 12.5 hours. In Australia, initiation generally occurs in mid-February.

For flowering to occur, the plant must have reached some level of maturity and the appropriate climatic conditions experienced.

High temperatures in mid-February can stop flowering. As a general rule, flowering is greater in the northern region. Some varieties flower profusely while other varieties rarely flower.

The northern breeding program will penalise varieties that flower heavily as flowering limits further growth of stalks which can reduce tonnages in northern regions with warmer winters.

Sucrose levels in the stalk often will increase slightly due to the cessation of stalk growth.



Mr Ian Sampson (SRA Director), Mr Mike Gilmour (SRA Director), Mr Michael Shannon (SRA Company Secretary/Legal Counsel), Mr Neil Fisher (SRA CEO), Dr Ron Swindells (SRA Chair), Mrs Debra Burden (General Manager CANEGROWERS Burdekin), Mr Peter Crowley (Northern Client Liaison Officer QRAA), Mr Phil Marano (Chair CANEGROWERS Burdekin), Dr Guy Roth (SRA Director), Dr Helen Garnett (SRA Director), Dr Ian Johnsson (SRA Director), and Mr Steve Guazzo (SRA Director), all at the Burdekin CANEGROWERS information forum.

SRA Board visits the Burdekin

In February, the SRA Board met with investors, industry stakeholders, and SRA staff in the Burdekin, as part of a regular commitment for the Board to meet regionally with the industry.

These regional visits are an important opportunity for the SRA Board to hear directly from growers and millers about their priorities and needs for Sugar Research Australia. The visits also present a valuable opportunity for the Board to get a first-hand update on important research activities. SRA thanks all those who attended the events.



Above (clockwise from top left): SRA Director Dr Helen Garnett and SRA Chairman Dr Ron Swindells hear from SRA Researcher Jaya Basnayake about water stress trials being conducted by SRA. Burdekin grower David Defranciscis and SRA Researcher Julian Connellan discuss recent collaborative research into nitrogen application in the region. SRA Board members hearing directly from investors on farm in the Burdekin. Burdekin grower Bruce Davies (right) talking with SRA Chairman Dr Ron Swindells. A full house at the Burdekin Canegrowers office at Home Hill for the information forum.

Total Research Investment

Project Title	Project Number	Principal R&D Provider	Chief Investigator	End Date
Key Focus Area 1 (Optimally-adapted varieties, plant breeding and release)				
Maximising the rate of parental improvement in the Australian sugarcane breeding program	2008/319	SRA	Xianming Wei	01/06/2016
Australian support for the International Consortium for Sugarcane Biotechnology (ICSB)	2010/002	SRA	Frikkie Botha	01/07/2016
Maximising genetic gain from family and within family selection	2011/343	SRA	Roy Parfitt	01/12/2016
New germplasm to develop more productive varieties with enhanced resistance to nematodes, pachymetra root rot and smut	2011/344	SRA	Barry Croft	01/05/2016
Development and testing of a SNP marker platform in sugarcane	2012/025	CSIRO	Karen Aitken	01/06/2016
SmutBuster II: accelerated breeding of smut-resistant varieties	2012/325	SRA	Roy Parfitt	01/06/2016
Improving the accuracy of selection in sugarcane breeding trials through accounting for site variability	2012/351	SRA	Xianming Wei	01/05/2016
Exploiting introgression for the development of productive and regionally adapted varieties for NSW	2013/022	NSW Sugar	Roy Parfitt	01/05/2020
Sugarcane for future climates	2013/029	CSIRO	Chris Stokes	01/06/2017
Applying the genome sequence for variety improvement: validation and implementation	2013/030	CSIRO	Karen Aitken	01/08/2018
Developing cytogenetic and molecular tools to improve selection for soil-borne pathogen resistance in wild hybrids	2013/358	SRA	Nathalie Piperidis	01/05/2016
Phase 1: advancing yield, disease resistance and ratooning by exploiting new sources of genetic variability from wild relatives of sugarcane	2014/053	SRA	George Piperidis	30/06/2017
Optimising productivity and variety recommendations through analysis of mill data	2014/054	SRA	Joanne Stringer	01/08/2016
Field assessment and further development of high-sucrose sugarcane	2014/069	UQ	Luguang Wu	31/10/2017
Sugarcane root systems for increased productivity; development and application of a root health assay	2015/002	CSIRO	Anne Rae	01/07/2018
Impact of stool architecture on ratooning ability	2015/004	CSIRO	Anne Rae	01/07/2018
Leaf sucrose: the link to diseases such as YCS and enhancement of sugarcane productivity	2015/016	SRA	Gerard Scalia	30/06/2018
Generation of a high throughput SNP marker chip for introgression of resistance genes from wild germplasm into sugarcane, targeting smut, pachymetra and nematodes, to generate more resistant varieties faster	2015/025	CSIRO	Karen Aitken	30/06/2018
Selecting high value chromosomes from wild introgression material to deliver more resistant varieties faster	2015/026	CSIRO	Karen Aitken	30/06/2018
The Sugarcane Hub, development of a interface between the sugarcane genome sequence and sugarcane genetic data to allow researchers to identify genes that underpin important agronomic traits	2015/027	CSIRO	Karen Aitken	30/06/2017

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Key Focus Area 2 (Soil health and nutrient management)				
Quantifying the effects of microbial additions to sugarcane soils on crop productivity	2013/069	Bio Active	Jayson Dowie	01/05/2016
Ameliorating clay sub soils to improve crop yields	2013/072	DAG	Glen Grohn	01/01/2016
Strategies to manage soil-borne fungi and mitigate sugarcane yield decline	2013/101	CSIRO	Paul Harvey	31/07/2017
Regenerating a soil food web capable of improving soil health and reducing losses from soil-borne pests and pathogens of sugarcane	2014/004	Biological Crop Protection	Graham Stirling	30/06/2017
Role of controlled release fertiliser in Australian sugarcane systems	2014/011	CSIRO	Kirsten Verburg	15/07/2017
Modelling extreme yields in the wet tropics to improve nitrogen use efficiency	2014/024	JCU	Yvette Everingham	01/08/2015
Boosting N-use efficiency in sugarcane through temporal and spatial management options	2014/045	USQ	Bernard Schroeder	01/10/2017
Assessment of new management strategies for marginal soils	2015/007	SRA	Barry Salter	31/12/2019
Improving NUE for sugarcane crops with constrained yield potential	2015/065	SRA	Danielle Skocaj	30/06/2019
Decision support for informed nitrogen management: soil nitrogen mineralisation test and the assessment of soil crop N contribution to crop N requirements	2015/069	DSITI	Phillip Moody	30/06/2018
Spatially explicit estimation of Achievable Yield Potential – an improved basis for fertiliser management	2015/070	CSIRO	Rob Bramley	01/07/2017
Improving management practices of legume crop residues to maximise economic and environmental benefits	2015/074	DSITI	Weijin Wang	30/06/2018
How much N will that crop need? Incorporating climate forecasting into nitrogen management in the Wet Tropics	2015/075	JCU	Yvette Everingham	30/06/2019
Key Focus Area 3 (Pest, disease and weed management)				
Rapid detection of ratoon stunting disease	2013/001	CSIRO	Amalia Berna	01/06/2016
Mass production of the Adelina disease to better manage greyback canegrubs	2013/356	SRA	Nader Sallam	30/06/2016
Innovative approaches to identifying the cause of chlorotic streak and new management strategies	2013/357	SRA	Barry Croft	01/06/2016
Development of controlled-release formulations of imidacloprid for canegrub control	2014/006	SRA	Andrew Ward	01/04/2016
Solving Yellow Canopy Syndrome	2014/049	SRA	Dave Olsen	30/06/2017
Developing an alternative herbicide management strategy to replace PSII herbicides in the Wet Tropics area	2014/050	SRA	Emilie Fillols	01/01/2018
A Novel Polyphasic Framework to resolve Yellow Canopy Syndrome Paradox	2014/082	UWS	Brajesh Singh	31/12/2016
Validation of LSB-PCR diagnostic for ratoon stunting disease and characterisation of non-Lxx strains of Leifsonia associated with sugarcane	2014/086	NSW Sugar	Anthony Young	30/06/2017
Review of the sugarcane Industry Biosecurity Plan (IBP) and development of a Grower Biosecurity Manual (GBM)	2014/088	PHA	Rodney Turner	01/03/2016
Delivery of remote sensing technology to combat canegrubs in Queensland cane fields	2015/038	SRA	Nader Sallam	01/07/2018
Sugar industry productivity and data recording spatial data hub for research and extension	2015/045	Agtrix Pty Ltd	Robert Crossley	28/02/2018
Securing Australia from PNG biosecurity threats	2015/046	SRA	Rob Magarey	02/08/2017

Project Title	Project Number	Principal R&D Provider	Chief Investigator	End Date
Key Focus Area 4 (Farming systems and production management)				
Implementing a framework for farmers to engage in the use of precision technologies	2012/013	USQ	Troy Jensen	Completed
Developing targeted, seamless weather/climate forecasting systems for critical early season harvest periods	2013/004	USQ	Roger Stone	01/06/2016
Developing remote sensing as an industry wide yield forecasting, nitrogen mapping and research aide	2013/025	UNE	Andrew Robson	01/10/2016
Product and profit – delivering precision to users of precision agriculture in the Australian sugar industry – yield monitoring	2014/028	USQ	Troy Jensen	19/07/2016
A non-pneumatic cane cleaning system with no cane loss	2014/035	QUT	Neil McKenzie	30/06/2016
Too wet to forget – reducing the impact of excessive rainfall on productivity	2014/046	SRA	Barry Salter	01/07/2017
Increased harvest recovery: reducing sugar loss and stool damage	2014/048	SRA	–	01/07/2017
Modernisation of furrow irrigation in the sugar industry	2014/079	USQ	Malcom Gillies	01/07/2017
Demonstration of GPS-guided laser levelling and its associated productivity response	2014/094	Mulgrave Central Mill	Matt Hession	01/02/2018
Bio-prospecting for beneficial endophytes of sugarcane	2015/051	AgResearch	Stuart Card	01/07/2018
Sensors for improved harvesting feedback: a feasibility study	2015/080	SRA	Eloise Keefe	14/02/2017
Incorporation of Australian Crop Data and Industry characteristics into a Tool to Facilitate Informed Harvest Decision-making for the Australian Industry	2015/094	NorrisECT	Chris Norris	01/09/2016
Key Focus Area 5 (Milling efficiency and technology)				
Determine the optimum tube dimensions for Robert evaporators through experimental investigations and CFD modelling	2012/054	QUT	Ross Broadfoot	01/09/2016
Improved modelling of wet scrubbers	2012/055	QUT	Anthony Mann	01/05/2017
Determination of factory processing procedures to better manage sugar quality issues	2012/057	QUT	Ross Broadfoot	01/09/2015
A retrofit to a mill to reduce its operational and maintenance costs	2013/059	QUT	Geoff Kent	01/08/2017
Reducing the maintenance costs of mill rolls	2013/060	QUT	Geoff Kent	01/08/2019
Real time harvest and transport system (under contract)	2014/037	QUT	Geoff Kent	01/09/2017
Improving mill efficiency through rapid analysis methodologies	2014/051	SRA	Eloise Keefe	01/08/2017
Managing aspects of raw sugar quality in the Australian sugar industry	2014/052	SRA	Eloise Keefe	01/08/2017
Investigation into modifying pan boiling techniques to improve sugar quality	2015/013	QUT	David Moller	01/06/2017
Increasing capacity to undertake cane preparation research through modelling and experimentation	2015/018	QUT	Geoff Kent	01/05/2017
Develop a blueprint for the introduction of new processing technologies for Australian factories	2015/043	QUT	Ross Broadfoot	01/09/2017
Key Focus Area 6 (Product diversification and value addition)				
Process for making bagasse paper pulp	2012/053	QUT	Thomas Rainey	01/04/2018
A profitable future for Australian agriculture: biorefineries for higher-value animal feeds, chemicals and fuels	2015/902	QUT	Ian O'Hara	01/04/2019

Project Title	Project Number	Principal R&D Provider	Chief Investigator	End Date
Key Focus Area 7 (Knowledge and technology transfer and adoption)				
Pachymetra awareness project for Condong mill area	2012/064	CANEGROWERS	Doug Irby	01/12/2015
Increasing farm business intelligence within the sugar industry	2014/001	AgProfit	Matthew Bryant	30/06/2017
Measuring the profitability and environmental implications when growers transition to Best Management Practice (as defined by the new Canegrowers Smartcane BMP)	2014/015	DAF	Mark Poggio	30/05/2017
Improving industry returns through harvest best practice	2014/091	NSW Sugar	Ian McBean	30/06/2017
Understanding the impact of harvester speed on subsequent ratoon performance in the Burdekin	2014/092	BPS	Robert Milla	30/06/2017
Tissue culture – managing impediments to adoption in Tully	2014/093	TCPSL	Jordan Villaruz	01/01/2017
Sugar industry productivity and data recording spatial data hub for research and extension	2015/045	Agtrix	Robert Crossley	28/02/2018
Pre-commercial evaluation of a PCR-diagnostic for Ratoon Stunting Disease and the development of a business case for full implementation	2015/078	SRA	Nicole Thompson	30/06/2017
Key Focus Area 8 (Capability development, attraction and retention)				
Modification of lignin biosynthesis in sugarcane for the production of cellulosic ethanol	2010/068	QUT	Patrick Bewg Heather Coleman	Completed
Climate forecasting to improve sugarcane nitrogen management in the wet tropics	2011/062	SRA	Danielle Skocaj	01/06/2016
Biodegradable polymer nanocomposites derived from natural fibre and starch	2011/071	QUT	William Gilfillan William Doherty	01/07/2015
Enhancing sugarcane for decreased water content and increased sugar content at harvest	2011/072	QUT	Anthony Brinnin Mark Kinkema	01/05/2016
Production of furanics and chemicals from bagasse and molasses	2012/074	QUT	Joshua Howard William Doherty	01/04/2016
Identifying and overcoming limitations in crop models with respect to drought tolerance and climate change	2013/076	JCU	Yvette Everingham	01/10/2015
Investigating the utility of mill mud for soil health conditioning and nutrient use efficiency on sodic soils within the Burdekin	2013/077	USQ	John Bennett	01/09/2016
Effect of organic nutrients on sugarcane growth, microbial activity and greenhouse gas emissions	2013/078	UQ	Susanne Schmidt	01/09/2016
Sugarcane for water limited environments: characterization of a selected sugarcane germplasm for transpiration efficiency and high biomass production for the sugarcane growing regions in Australia	2014/102	UQ	Sijesh Natarajan Shu Fukai	01/06/2017
Exploiting soil microbe associations with sugarcane roots for resistance to canegrubs	2014/104	UWS	Andrew Frew	14/09/2016
Investigation of genetic control of sugar accumulation within the sugarcane culm (stalk)	2014/107	UQ	Patrick Mason	01/06/2018
Soil nitrogen dynamics – a microdialysis approach to quantify nitrogen cycling in sugarcane soils	2014/108	UQ	Scott Buckley	01/07/2018
Statistical data mining algorithms for optimising analysis of spectroscopic data from on-line NIR mill systems: improving system calibrations for quality measures and variety discrimination	2014/109	JCU	Justin Sexton	30/05/2018
Reduction of post-harvest deterioration of sugarcane	2014/401	SRA	Anthony O' Connell	01/08/2016
Enhancing sugarcane growth and yield by biocontrol agents/biofertilizers	2014/402	QUT	Jan Zhang	01/04/2016

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