Sugar Research Australia™

Our quarterly magazine bringing research to the field

CaneConnection

Summer 2015

Contents

Cover photo: Tully region grower David Marsilio is impressed with the ability of tissue culture to allow him to access new varieties sooner at his farm.

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Mulgrave grower Andrew Greenwood says peanuts have been a valuable legume rotation crop for his sugarcane.

Welcome to the Summer edition of *CaneConnection*

With the harvest complete for most regions, this issue takes a look back at some innovative and modern farm practices being used on farms that help deliver improved outcomes for growers and millers.

In this issue we meet with Tully growers Mario Raccanello and Chris Condon and look at ways they have gone about working with their harvester operators to improve harvest efficiency on their farms. Both are getting positive results and see that there is an ongoing opportunity for the industry to reduce the losses associated with mechanical harvesting.

In this theme, we also have a look at work conducted by the Isis mill where they have painstakingly dissected a cane bin by hand to reveal the exact levels of clean cane compared to extraneous matter. The results were somewhat surprising even for themselves, and have been communicated to the local industry at Isis.

In this issue, we also meet Mulgrave grower Andrew Greenwood (pictured above), who is having impressive results with his cane by using a legume peanut rotation.

We also look at some of the latest advances from SRA-funded research. CSIRO researcher Dr Chris Stokes from Townsville is leading a project looking at improving the water use efficiency of sugarcane. This project is also investigating how the future climate might impact cane production, particularly if there are higher levels of carbon dioxide in the atmosphere. This research is expected to have important implications for the much talked about expansion of the industry in northern Australia, especially if this expansion is in to more marginal conditions.

This edition also provides useful updates on new soldier fly trials, the results that growers are getting through the use of tissue culture, as well as takes a close look at new weed and herbicide trials following an SRA field walk at Gordonvale in October. Tully Productivity Services Limited are working one-on-one with growers to encourage greater adoption of tissue culture, which is helping growers access new SRA varieties sooner.

We also read about some important collaborative research through the Rural Research and Development for Profit program, looking at projects on improving the extension of research, and the better use of climate forecasting.

This magazine is about sharing a mix of stories that is aimed to provide information useful to you as a member of SRA. As always, if you have any thoughts on how you would like to improve this magazine, please call me on (07) 3331 3340 or email bpfeffer@sugarresearch.com.au.

Brad Pfeffer

Communications Manager, SRA

The SRA research spray hood with two tanks and side nozzles.

Looking for new weed management systems

Weed management is one of the important factors that contributes to a successful farm management plan. With continued scrutiny on diuron, how do some of the alternative herbicides stack up in the Wet Tropics?

By Phil Ross

Paul Rossi farms in the Aloomba area just south of Cairns. He came along to the recent SRA herbicide trial farm walk looking for ideas on how to improve his weed control strategy.

"I farm on a 1.8 m single system and find that in our humid climate, trash breaks down pretty quickly. By out-of-hand stage weed seedlings are often germinating through the broken-down trash," he said.

"I spray my inter-rows with glyphosate using a spray hood to control hard-to-kill weeds like Guinea grass, Vasey grass, sour grass and Navua sedge. I follow this up with a residual/knockdown mix using Irvin legs at out-of-hand during November or December. Sometimes I'll need to go again in January or February, using a small inter-row tractor if vines are a problem. I'm looking at ways to avoid that third spray.

"I'm modifying my spray hood with a second spray circuit and side nozzles so that if necessary I can treat the rows at the same time I use glyphosate on the inter-row.

"I'm also interested in seeing what options I have for a late applied spray to give me longer control after out-of-hand, especially for varieties like Q208$^{\phi}$ which take a while to close in. This is even more important when you have increased your row spacing."

Two trials at Aloomba and one at Tully have compared some alternative options to diuron and have also compared two dual tank spray systems; the QDAF dual tank sprayer and a spray hood fitted with side nozzles.

Above: Aloomba farmer Paul Rossi with SRA Weed Agronomist Emilie Fillols.

Above: The QDAF dual spray leg.

Wet Tropics growers check out herbicide trials

Pre-emergent

Growers from Tully to Gordonvale, and far northern Advisors recently had the opportunity to have a look at SRA's pre-emergent herbicide trials in ratoons on Greg Clarke's farm at Aloomba (near Gordonvale, just south of Cairns) and on Harkam Singh Mavi's farm at Midgenoo (near Tully). The main weeds on the Aloomba site are spiny spider flower, Guinea grass, awnless barnyard grass, blue top and pink convolvulus, while the main weeds at Tully included Guinea grass seedlings, bluetop and square weed. The trials included the below treatments:

Product	Active	Product rate (kg or L/ha)	Water rate (L/ha)	Weed control 6 weeks after spray
Barrage + paraquat	diuron/hexazinone	4	300	Excellent
Barrage	diuron/hexazinone	0.9	300	Good
Flame + paraquat	imazapic	0.4	300	Very good
Balance + paraquat	isoxaflutole	0.2	300	Very good
Clincher Plus	metolachlor	2.7	300	Poor
Bobcat i-MAXX	imazapic/hexazinone	3.8	400	Very good
AmiTron	amicarbazone	1.4	300	Very good

Note: *AmiTron is currently going through APVMA evaluation for registration in Australia.*

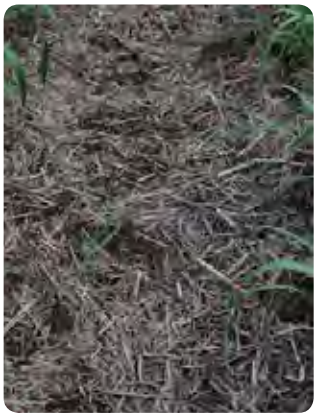
Six to ten weeks after spraying, most of the residuals being tested were still holding back weed germination. Some vines and Guinea grass seedlings were just starting to come through in some plots. Clincher Plus is not performing well in the Wet Tropics. Weed assessments are continuing to check the length of control of each treatment and the weed spectrum controlled.

Above: Control plot with no herbicide applied.

Above: Barrage at 4 L/ha (reference treatment).

Above: AmiTron – a potential new herbicide active.

Above: Balance.



Above: Flame.

Above: Bobcat i-MAXX.

Above: Clincher Plus.

AmiTron, a potentially new herbicide with the active ingredient amicarbazone, is currently not approved for use in Australia. An application is currently with the APVMA for registration for sugarcane.

Checking out the post-emergent trial on Rob Rossi's farm.

Post-emergent

Mulgrave growers also had the opportunity to look at SRA's post-emergent herbicide trials on Bob Rossi's farm at Aloomba (near Gordonvale, just south of Cairns). This trial is looking at various post-emergent herbicide treatments in ratoons to manage Guinea grass stools. In addition to testing a number of herbicides, this trial is also comparing a number of different spray rig configurations.

While spot spraying of Guinea grass in ratoons is a common practice, many growers have asked about the best way to control heavy infestations of Guinea grass, where spot spraying is too time-consuming. As Guinea grass and sugarcane are both grasses, care must be taken to select herbicides that kill or suppress Guinea grass, while minimising phototoxic effects on the cane. This trial is also looking at ways to reduce the amount of residual herbicide by testing two spray rig configurations that combine banded spraying of residuals on rows and knockdowns in the inter-row.

Treatment number	Product	Active	Product rate (kg or L/ha)	Water rate (L/ha)
T1 Banded spray over row – applied early	Rattler + Wetspray 1000	Asulam (400 g/L)	8.5 200 mL/100 L	400
T1 Inter-row sprayed with hood – applied later	Weedmaster Argo + LI700	Glyphosate (540 g/L)	5 300 mL/100 L	100
T2 Irvin leg – sprayed inter-row and base of row	Diurex 900 WG + Daconate + Activator	Diuron (900 g/kg) MSMA (720 g/L)	0.5 3 x 125 mL/100 L	350
T3 Irvin leg – sprayed inter-row and base of row	Balance + Shirquat + Activator	Isoxaflutole (750 g/kg) paraquat (250 g/L)	0.1 1.2 x 125 mL/100 L	350
T4 Irvin legs – sprayed inter-row and base of row	Balance + Daconate + Activator	Isoxaflutole (750 g/kg) MSMA (720 g/L)	0.1 3 x 125 mL/100 L	350
T5 Hood side nozzles to base of row	Balance + Daconate + Activator	Isoxaflutole (750 g/L) MSMA (720 g/L)	0.1 3 x 125 mL/100 L	350
T5 Under hood nozzle – spray to inter-row	Weedmaster Argo + LI700	Glyphosate (540 g/L)	5 300 mL/100 L	100
T6 Dual spray bar centre nozzle to inter-row	Weedmaster Argo + LI700	Glyphosate (540 g/L)	5 300 mL/100 L	100
T6 Dual spray bar side nozzles to base of row	Balance + Daconate + Activator	Isoxaflutole (750 g/kg) MSMA (720 g/L)	0.1 3 x 125 mL/100 L	350

This trial was last sprayed on September 17 and although the Guinea grass stools have more or less yellowed off depending on the treatments, it was too early to know if they will die. In a similar trial last year, glyphosate sprayed to the inter-row combined with a mix of Balance and Daconate to the rows and Balance and Daconate sprayed with the Irvin leg gave the best result. Best results were achieved with the hooded sprayer with side nozzles. However, even though the Balance and Daconate mix gave the best result in this trial for Guinea grass in the row, only about 50 percent of Guinea grass stools died. The rest recovered and continued to grow. The current trial at Aloomba will continue to be monitored to see if the Guinea grass kill is better this year.

Treatment 1: Rattler banded over the rows followed by glyphosate through a spray hood to the inter-rows. Very little phytotoxicity on cane. Guinea grass growth is only slowed.

Treatment 5: Balance + Daconate onto row through side nozzles and glyphosate to inter-rows through shield. Some phytotoxicity to the cane. Strong yellowing of Guinea grass in the row, apparent control in the inter-row (to be confirmed in a few months).

Treatment 6: Balance + Daconate to the row through side nozzles and glyphosate to inter-row using the QDAF dual sprayer. Minor phytotoxicity to the cane, light yellowing of Guinea grass in the row.

Treatment 2: Diurex + Daconate applied through Irvin leg. Minor phytotoxicity to cane. Light yellowing of Guinea grass. Unsprayed plot in background.

Treatment 3: Balance + Shirquat applied through Irvin leg. Moderate phytotoxicity to cane. Unsprayed plot in background. Moderate yellowing of Guinea grass.

Treatment 4: Balance + Daconate applied through Irvin legs. Moderate phytotoxicity to cane. Strong yellowing of Guinea grass.

Ongoing assessments will include assessing Guinea grass stool death, phytotoxicity to the cane and yield comparisons at the 2016 harvest.

For more information on these trials contact Emilie Fillols (0438 711 613) or Phil Ross (0477 318 897).

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A piece-by-piece look into Mr Average cane bin

This season, the Isis Central Sugar Mill has dissected three bins to examine extraneous matter levels.

By Brad Pfeffer

The Isis Central Sugar Mill has taken a back-to-basics approach to get a clear picture of the extraneous material (EM) levels in cane bins being sent to the mill.

In recent years, EM levels entering the mill have steadily increased toward 15 percent, up from an average that in the past was about 7 percent.

In response, across the 2015 season the mill has dissected three bins by hand to look at the exact levels of EM. They wanted to see for themselves what made up the EM levels they were seeing on the near-infra red (NIR).

Each bin required about six people to separate the contents into sound billets, tops, trash, dirt and roots, and dead cane, over three days.

The second of these bins was shown to and discussed with contractor harvester owners and drivers in October and the third bin with growers in November, all with the purpose of starting an ongoing conversation about improving the mechanical harvesting process for everyone involved.

More field days and discussions are planned and the mill is targeting contact with all harvester operators and growers.

According to Isis Chief Field Officer Paul Nicol, the visual representation of what was actually in the bin was startling.

"We aimed to choose a Mr Average bin, and the first bin we dissected had over 14 percent EM, which was 790 kg out of the total of 5610 kg of cane sampled having no value for making sugar," he said.

"It was a time-consuming job, but it was an important illustration of the challenge and the opportunity that can come with improving cane quality.

"If we can reduce EM levels down from around 15 percent to 7.5 percent then we can deliver $400/ha for growers.

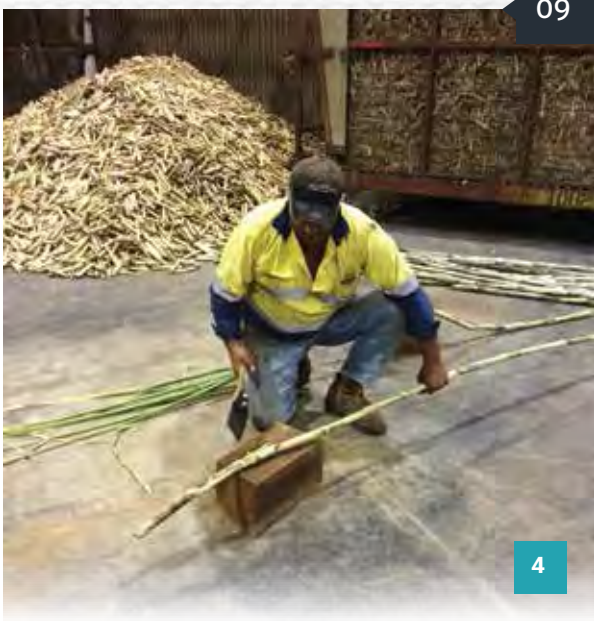
"A reduction in EM to that level would result in about one unit of CCS, which is about $3.60/tonne for the grower. If the crop is yielding 100/t/ha that's $360/ha."

Further gains could be made through improved mill performance, better ratoons leading to more hectares and tonnes, and more tonnes of cane in the paddock.

Mr Nicol said that the dissection of the bin also showed concerning levels of roots and dirt. "This is the source of next year's crop, which impacts everyone down the value chain when it is damaged or lost. Inspections in the field also uncovered significant shattering, which delays ratooning and diminishes stalks per metre."

He said that the Isis region historically would grow plant cane plus four ratoon crops, but for some people this had over time decreased to three ratoons and even two ratoons.

"At two ratoon crops, farmers are not in business. Also, if we can get back to three or four ratoons, then that is 3–4 percent more land under cane production, which is also another 13 days of harvesting for the average group."



1. *A look inside a Mr Average cane bin at Isis mill, with clean cane separated from extraneous matter.*
2. *Stool, dirt, and roots from Mr Average cane bin at Isis mill.*
3. *A meeting of harvester drivers at the Isis mill to discuss the findings of the bin dissection.*
4. *Some visual demonstrations during the meeting.*

The issue also has important ramifications at the mill. He said that the maintenance time for shredder hammers was becoming more frequent, which backed up the argument that the cane supply was becoming dirtier. It was also getting more difficult to attract premiums for sugar, which is crucial for value chain profitability.

Mr Nicol said that improving cane quality was a conversation that all parties needed to have, hence they were talking to contractors as well as farmers and including themselves as the miller. "It is about how we cut the pie and look at it as an opportunity."

He said there was an important role for farmers in field presentation, and there were also issues around harvester ground speed and extractor fan speed.

"We spoke to harvesting contractor drivers and we asked them what was important for them when purchasing a new machine, and the answer was horsepower. It scared us a bit that no one said the machine's ability to produce a quality product."

Mr Nicol acknowledged that there were extra costs associated with slowing down, hence the need for harvester operators to be paid more, but he added that there were other opportunities as well.

For example, he said that the Isis mill had been paying close attention to the ongoing conversation about harvest losses and the suggestions of 15 percent losses occurring in the paddock.

"If that is occurring, this is cane that the harvester has harvested but is not being paid for. It is also an extra 130,000 tonnes plus through the mill."

He added that, perhaps to the surprise of some people, improving cane quality also helped increase bin weight, which had positive outcomes for harvester operators.

Improving efficiency could also better match harvest operations to the demand for bins. "We can supply 10 bins per hour, on average, and we believe if the harvesters can focus on cutting cane for those 10 bins per hour then we can all benefit.

"We acknowledge that we need to work together to work out how we pay for it and how we cut the pie."

SRA is continuing to work with the entire value chain to deliver valued and useful outcomes with mechanical harvesting efficiency.

The most recent call for projects to begin in 2016/17 has had an allocation of $300,000 for projects related to harvest losses, which adds to existing SRA work in this area. Successful projects will be announced in 2016.

SRA is also continuing to seek feedback from growers and millers – including Isis – on their needs for research in this area, including at a local level.

For more information on this Isis work contact Paul Nicol by emailing paul.nicol@isissugar.com.au

For information on SRA harvest losses research contact Development Officer Phil Patane by emailing ppatane@sugarresearch.com.au.

Growers provide insights into harvest efficiency

SRA has identified harvest losses as one of four Impact Areas that requires priority attention and investment for the Australian sugarcane industry. ***By Brad Pfeffer***

SRA has a number of research projects underway in this area.

Your industry-owned company is also working with SRA investors and industry representative bodies to ensure that the industry is able to make further gains in this important area.

Losses from mechanical harvesting can vary, but recent SRA research has shown that losses occur most notably in three areas:

- **Extractor losses (5–25 percent)**
- **Pickup losses (1–10 percent)**
- **Chopper losses (2–8 percent).**

More detail on losses and the way these losses can be minimised is available from the SRA Harvest Best Practice Manual.

Tully growers Mario Raccanello (above left) and Chris Condon (above right) talk about steps they have taken to improve harvesting efficiency on their farms.

Grower observation: Mario Raccanello

Tully grower Mario Raccanello knew there was no mistaking that there had been big changes to the way his cane had been harvested this year when he had trouble putting fertiliser on. "The trash was in the paddock when in the past it would have been in the bin – I've never had so much trouble fertilising," he said jokingly.

This year, Mr Raccanello switched to a new harvesting contractor after missing out on crucial bonus payments for his cane that are on offer from Tully Sugar for presenting a quality product to the mill. Feeling that the main cause was harvester ground-speed, which increased extraneous matter (EM) and dirt levels, Mr Raccanello has switched to a new harvesting contractor. At the start of the season, he had a long conversation with the operator regarding how the cane had been harvested in previous years and that he needed to change to a bonus system that would help improve the quality of his cane going to the mill.

This year he is paying an incentive per tonne for cane that is classified as eights and nines, which are grades that attract a premium payment from the mill. The mill measures parameters such as the fibre, CCS ratio, and EM, and if these align with a high purity level (86.5 percent purity and above) then a score of nine is offered, which Mr Raccanello estimated at being worth about 50 cents per tonne for the grower. He said the bonus is part of a pool and is related to the sugar price, so it can vary. Bonuses are also on offer for low soil percentages.

"So with the incentive per tonne that I am giving the harvesting contractor, I have picked it up in premiums and there is also another 10 c to 20 c/tonne in dirt bonuses being paid by Tully Sugar," he said. "I've then picked up half a unit of sugar, which is a bonus for me." Mr Raccanello pays for the fuel and estimates that this year he is using about 0.1 litre extra per tonne, which he is not concerned about given the improvements he is seeing.

When ***Cane****Connection* visited in early October, about 40 percent of the crop had been harvested and his average speed was 5.6 km/hour with an average crop size of 105 t/ha. Last year, he said the average was 8.4 km/hour with an average crop size of 95 t/ha. He said that about 92 percent of the cane had been classified as eights and nines (EM at 13.1), and he expected this to improve as the season headed to its end.

"Growers can't expect the world and offer no incentives to drivers. We have to be able to talk to the driver and communicate and trust each other."

He added that farmers also needed to look at how they could improve things for the drivers. "If you have long rows, decent headlands and good tonnes per acre, then you will always have someone knocking on your door, which gives the harvesting contractor the opportunity to make money."

He said that a crucial part of the equation for him was the data he was provided from the mill. "The biggest factor is that there has to be a way of measuring all your parameters, which we are fortunate to have here at Tully and that way you can work on some incentive for your harvesting contractor."

Grower observation: Chris Condon

Cane grower Chris Condon believes that achieving harvesting efficiency is a two-way street. Even for a farmer who owns his own harvesting machinery, he knows that achieving an efficient harvest isn't necessarily a guaranteed outcome.

Instead, it has required ongoing communication and a process of improvement where he works together with his harvester driver to look at ways they can both do things better.

"We are paid on the product we present to the mill now, but my angle has always been about putting the best product in front of them," Mr Condon said. "If the harvester isn't doing the job we want, we ask why. We ask: what can we improve with our side of the system to help you do a better job?"

He said that he had experienced bad drivers in the past who were travelling too fast, and believes that some of the problems began in the district after Cyclone Larry (2006), when the yields weren't there and the harvesters started travelling too fast. "And then it kept happening," he said.

For him, the solution has been about collaboration and he is very happy with the relationship with his current operator.

As part of the conversation, he has changed row spacing to 1.9 metres to match the harvester tracks and has ensured that block size and presentation is as good as possible for the harvester. He has switched to 20 tonne haulouts, which are something of a rarity in the district.

He has also invested in a new harvester, with the previous older machine consuming too much down-time in maintenance.

Mr Condon said that it had taken much planning, work, and dollars to develop the farm with laser levelling and to redesign drains and the like to make the longest rows and squarest paddocks possible.

"This also benefits the rest of our farming activities as well, as we're not wasting as much time turning around," he said. "This is obviously not possible for all farms, but we've seen it as an investment for the long term."

"It is a result of conversations with the crew. You want them coming to work every day and being able to make money."

When he runs the numbers over the harvester on its own, he has also seen how challenging the margins are with harvesting.

"Our idea was to buy into the harvester and then cut our own cane at cost, but there have been a lot of times where we have had to chip into the harvester because there is not enough money there. I know how skinny the margins are."

He agreed with Mario Raccanello that a big part of the solution should come down to an individual level, with farmers talking with harvester drivers.

A new collaborative research project is looking to help farmers make better use of existing seasonal forecasts.

Making better use of climate forecasts

The Rural Industries Research and Development Corporation (RIRDC) is leading a new project to improve seasonal forecasting and extension via funding through the Rural R&D for Profit Program, an Australian Government Department of Agriculture initiative to support collaborative, nationally coordinated and strategic research.

The project – 'Improved Use of Seasonal Forecasting to Increase Farmer Profitability' – includes financial contributions from public and private sector partner organisations, including SRA.

Led by RIRDC external research manager Simon Winter, the three-year, $3.5 million seasonal forecasting project aims to enhance forecast use and improve on-farm business decision making.

Mr Winter says this will be addressed in three ways. First, by demonstrating the value of seasonal forecasts in making business decisions. Through case studies, the project will identify what seasonal climate risk information is needed by sector, region and decision type.

The second part of the project aims to help farmers better use existing seasonal forecasts. New tools, information and training could improve understanding of seasonal forecasts and how they can be used in business decision making.

"Often seasonal forecasts can be seen as emphatic, but they are actually the probability of something happening; meaning there is some probability that something else might occur. Understanding this information, what it means and how to use it is necessary to maximise an opportunity that is dependent on climate," Mr Winter says.

The project's third part will be to enhance the forecasts themselves by improving Australia's forecasting model, called ACCESS. By analysing and reducing the main errors that affect the model, the quality of seasonal predictions would improve.

"We need to better understand atmospheric convection in the tropics and the Indian Ocean as this has a major influence on weather systems that affect Australian farmers. We are looking to address this," he says.

Mr Winter likens seasonal forecasts – made on a three to six month time frame – to Reserve Bank minutes. "Both are important for businesses. One gives a sense of the wider economy, the other, the season."

For more information, contact Simon Winter on 02 6239 1693 or email simon@swinter.com.au.

Alan Hurney co-presenting a workshop at Meringa for MSF farm staff and advisers.

SIX EASY STEPS™ meets industry, government and community obligations

Backed by ongoing research, modification of the sugarcane industry's nutrient management guidelines has been occurring for the past 15 years. SRA has been extending those guidelines to the industry through a one-day, grower-oriented short course called SIX EASY STEPS™. ***By David Calcino***

SIX EASY STEPS™ nutrient management not only focuses on immediate sugarcane yields but also on longer-term sustainability. SIX EASY STEPS™ minimises the risk of losses in productivity, profitability, nutrients and soil resources.

This nutrient management program is beneficial to water quality and the general environment, while improving returns to growers. Hence, SIX EASY STEPS™ sits very comfortably with environmental management.

The industry and Queensland and Federal Governments all recognise the SIX EASY STEPS™ Guidelines as the basis of sound nutrient management for the sugarcane industry.

Workshop success in wet tropics

SIX EASY STEPS™ was rolled out across the industry in 2005. In the wet tropics region (Mossman to Ingham), David Calcino and retired agronomist Alan Hurney have so far run 78 workshops. The table shows that almost 80 percent of the area growing cane has been represented at a workshop.

Attendance to date (Mossman to Ingham)
Proportion of region represented at workshops (%)
78
Number of growers
701
Number of other attendees*
98
Number of workshops
64

** Productivity services, agribusiness, advisers, government, CANEGROWERS, milling companies, SRA, NRM and farm workers.*

Future of SIX EASY STEPS™

SIX EASY STEPS™ Guidelines will continue to be modified as new research findings provide improvements to current recommendations.

The national and international focus on water quality on the Great Barrier Reef will intensify. The Australian Government's Reef 2050 Long-Term Sustainability Plan will be a component of that attention and pressure will continue to be exerted on the sugarcane industry to reduce its environmental impact.

SIX EASY STEPS™ provides a sound strategy to improve profitability and long-term sustainability at the same time as minimising environmental impacts. Choosing the correct rate of nutrient and applying it in a timely and safe manner will meet individual and industry obligations to the environment while maximising profitability.

Participation in SIX EASY STEPS™ will also satisfy part of the voluntary, industry-operated Best Management Practice program which all growers are urged to complete.

Recent workshops have been funded through Terrain NRM through a multi-agency partnership.

New YCS trial to answer important questions

A new YCS trial has recently been setup in the Burdekin that will attempt to answer many of the questions that still exist around YCS. ***By Andrea Evers***

Before 2012, the three letters 'YCS' had no particular meaning. Today, everybody in the Australian sugarcane industry understands the meaning of YCS. In particular, growers like Ian Shepherdson, who have battled with YCS for the last three seasons. YCS has taken its toll on Ian's farming operations, which is one of the reasons he has become involved in a new trial that has been developed to attempt to answer many of the questions that still exist around YCS.

"YCS has been very difficult to deal with as a grower because you suffer from low yield for no apparent reason and there seems to be little that can be done. It's a very frustrating beast," explains Ian of his initial experiences with YCS. Ian's farm was one of the first affected by YCS in the Burdekin region back in November 2012. We now know that Ian's farm is located in one of the YCS hotspots.

However, Ian isn't letting YCS beat him. Instead, he is working with the SRA Solving YCS research team to try to find a solution. For three years running Ian's farm has been home to a series of trials that have provided valuable insights into YCS.

Every six months researchers from all YCS projects come together with an independent Science Review Panel to review and consolidate all project findings to revise and better target ongoing research. Following a recent review the Solving YCS research team sought to set some clear questions they believe need to be answered in order to get closer to understanding what YCS is.

A new trial has been implemented at Ian's to help answer one of the most important questions posed: "Can YCS spread to YCS-free planting material in the field?".

To answer this, the trial will explore these related questions:

1. Can YCS be transmitted in seed cane?
2. Is YCS caused by a soil-borne agent?
3. Is tissue culture material YCS free?
4. Is the causal factor water stress?
5. Do well-managed "stress free" plants develop YCS?

Answering these questions will help researchers and industry understand if YCS can be transmitted from plant to plant, depending on plant source and stress factors and provide insight into how that could be occurring by taking measures to exclude possible agents in various treatments within the trial.

"The trial has been set up so that it has the best chance of potentially answering the right questions relatively quickly. SRA researchers worked closely with the Scientific Reference Panel to formulate these questions and to design a trial that would answer these specific questions," said project leader Dave Olsen. As Dave says, "Every result will answer a specific question".

Project details

Impact area

Yellow Canopy Syndrome

Project name

Solving the Sugarcane Yellow Canopy Syndrome

Project number

2014/049

Principal provider

SRA

Project leader

Dave Olsen

Project end date

2017

Trial by design

Frikkie Botha, Executive Manager Research, explains "while the research to this point has allowed us to rule things out, and focus the research efforts much better we still have no understanding of the causal factor(s). Research over the past two years has indicated that YCS expression can be linked to environmental stress. We believe that this trial on Ian's farm will go a long way to provide some important answers."

A lot of thought went into establishing this trial, particularly around the methods and materials used, to ensure that the results would be accurate. A trial of this nature has never been attempted before, which meant that one of the challenges was how to practically set up the trial with the equipment available.

"The setting up of this trial became a meticulously planned logistical operation where many factors had to be taken into account. Our precise planning and execution of the setup of the trial means that the outcome is better than we had originally hoped for," says Dave Olsen.

What's being tested

Ian Shepherdson's farm was a logical place to host a trial investigating transmission of YCS. The block selected for the trial has had severe YCS for the last two years and both Ian and Dave feel confident it will show signs again this season.

In order to explore the interactions between plant and soil and soil-borne pathogens the YCS team has designed large pots (30 cm by 1 m) that allow cane to be grown in the field, experiencing all of the extremes and variables of a cane block while controlling specific elements.

Some pots are filled with a soil-less vermiculite/perlite medium while others are filled with soil from Ian's farm, extracted as a single, unbroken soil core.

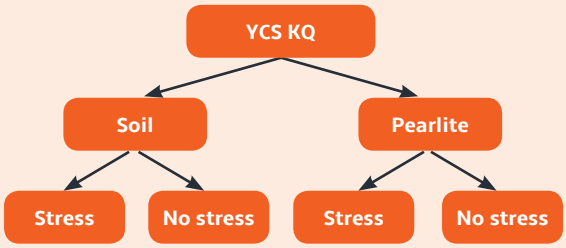
Using these soil cores within a large pot allows the team to manage the irrigation (stress) within the pot while still growing the cane in the same soil and the same environment as the cane block.

The clean cane and cane from Ian's block is planted into both the soil cores and the soil-less medium pots. The pots themselves have been planted into the field at random with the majority of the pot below the ground.

The bottom of the pots are covered with weed proof matting that allows water to drain but keeps the roots and soil/medium separate from the surrounds. The ratooning cane is growing around the pots and will act as the trial control.

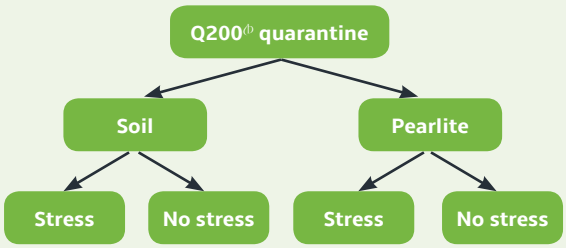
This amounts to 48 pots with different combinations.

Ian's crop (KQ228$^{\phi}$) is one plant source used and potted in soil from Ian's field as well as in a sterile mix of pearlite and vermiculite. Throughout the trial, both will be subjected to different types of stress; water stress and fully irrigated.

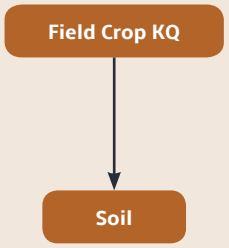


The second plant source used is tissue culture as tissue culture is considered to be a clean plant source. The tissue culture (KQ228$^{\phi}$) came from SRA Brisbane and was raised in Mission Beach which is isolated from any YCS affected cane.

The last plant source used is cane taken from the SRA quarantine site in Brisbane, which had been in quarantine for ten years and considered to be the cleanest cane that you could possibly get. This is important as it will rule out any doubt that this plant may have been infected before it was used in the trial.



Each of the pots were planted in the field in completely random positions with the surrounding crop acting as the control.



In the pot

Another factor that makes this trial so unique is the way in which a solid core was extracted from Ian's field, measuring 30 cm in diameter and 1 m in height. The soil core is inserted into some of the pots.

It was important that this soil is exactly the same as the surrounding soil – the same compaction and infiltration, the soil layers were not mixed or disturbed, just separated from the surrounding soil by the pot.

This was a challenging exercise, and a boring machine was bought into the paddock to extract the cores and insert them directly into the pots.

The pots were then inserted into the ground in a manner that will allow Ian to continue to manage this block as per normal with his farm machinery.

An addition to the pots is a length of pipe that allows for various treatments to be applied directly to the soil at any time.

Above: Extracting the core from the field.

Above: Jane planting the pots approximately 1 m apart and 70 cm into the soil.

Stress management

This block will be furrow irrigated as per Ian's typical irrigation schedule. The cane in the pots however will be irrigated via a drip irrigation in a way that allows the research team to manage the stress in the pot. Previous research has shown that YCS symptoms can be brought on through drought stress in pot trials. This will be attempted in these super-sized pots in the field. The setup also allows the possibility of reducing stress through irrigation to see if the cane can be kept green.

Team effort

Dave Olsen, Angela Zeilstra and Jane Brownlee (who are part of the YCS project team) are passionate about understanding what YCS is and developing effective management strategies for growers.

Angela is excited to be given the opportunity to work with someone like Ian, who she says is incredibly dedicated and extremely generous with his time and machinery.

"Working with Ian is great. He has been part of the team for a couple of years now and understands what goes into setting up and managing a trial that works. He understands that for the research to yield results we need to do things in a certain way."

The feeling is mutual, as Ian is just as excited about the trial and says that over the years he has been able to gain a better understanding of the process required to set up a trial. "I enjoy working with the SRA research team. YCS has become a passion for all of us and I believe that these trials will go a long way to answer some important questions."

The YCS team behind this trial extends beyond the Burdekin. Researchers and pathologists in the labs at Indooropilly are heavily involved and are vital in understanding what is happening to these plants.

The Solving YCS project also connects to researchers at UWS who are looking at micro biological life on the leaves, in the soil, on the roots and in the stalk and trying to understand if these interactions are connected to YCS.

The team also works closely with Dr Frikkie Botha who runs a project looking intently at what is happening, not just inside the YCS plants, but inside the cells of the plants. Frikkie's team can see that these plants are just as abnormal on the inside as they appear on the outside and are working to understand what it all means. This trial will provide a source of samples to further that work.

Tony Chapman continues to experiment and innovate to make gains at his Alloway property.

EXTENSION

Progressive practices create carbon in southern soils

The Chapman family in the southern region have used a number of innovative techniques to improve soil health on their farm, reducing input costs and delivering other benefits. ***By Jarrod Sartor***

Bundaberg farmers Tony and Katrina Chapman, along with their son Mitch, harvest about 15,000 tonnes of cane each year from their 220 ha farm in Alloway.

Over the years they have put many progressive practices to use and improved farm profitability as a result.

The Chapmans run a controlled-traffic, single row two metre spacing system, with most of the drills being 1.6 km long (with headland breaks in between) and all facing one direction.

Tony has implemented progressive practices such as composting, farm planning, and rotational crops and, more recently, sub soil amelioration.

Tony makes his compost from mill mud and any organic matter he can find, as long as it has no glass, plastic or metal in it.

The raw materials are mixed at a 6:1 ratio of organic matter to mill mud using an implement to turn the pile of two materials inside out and upside down.

"We drop the compost as close as we can to where the stool will be, cultivate it, and then fill it in. It is banded and buried in one single day," Tony said.

He feels that composting is an important practice to increase Soil Organic Matter (SOM) for his farm, but acknowledges that it isn't suitable for everyone as he relies on being able to access large volumes of organic matter.

It has taken Tony 15 years to steadily implement his farm plan. He has divided his farm into five colour coded sections (each section representing 20 percent of tonnage and area). The colour-coded farm maps date back to 2010 and are used as a guide for Tony and his employees. The maps give information on what to spray, how much fertiliser to use, what will be fallow next year, and what was fallow last year. This provides accurate knowledge and consistency in his farming system without relying on memory.

As a strong believer of never having a bare fallow after a crop cycle, Tony plans to rotate out of cane for 12 months.

He begins with oats, then moves onto harvestable soybeans and field peas, with plans to include mung beans in the future. He often produces 4 t/ha of soybeans with his cover crop but this is only a secondary goal, as his primary goal is the further increase in SOM.

Walking through the paddock, it is easy to see why Tony is so excited. His original grey podzolic soils have been turned into a minimally compacted, dark, friable, organic rich medium that is teaming with life.

Individually, each practice change should contribute to improvement in sustainability but combining the management practices in a systems approach will create long term profitability and be sustainable in the future.

Since implementing soil health practices, Tony said yields have remained at 90 t/ha; the same as when he farmed using traditional inputs and practices. However, input costs have been reduced and he now has time to earn extra income through planting and harvesting contracting.

The trials taking place inside a climate controlled glasshouse at the CSIRO facility at the James Cook University campus in Townsville.

Project details

Key Focus Area: 1

Optimally adapted varieties, plant breeding and release

Project name

Sugarcane for future climates

Project number

2013/029

Principal provider

CSIRO

Project end date

June 2017

Getting the most crop per drop

New research is looking at ways that future sugarcane varieties can be bred to offer the best performance for future climatic challenges such as increased water stress and increased carbon dioxide levels.

By Brad Pfeffer

Recent seasons in some regions have been an unwelcome reminder for many sugarcane growers of the lost potential of sugarcane when it is placed under water stress.

But new research undertaken by the CSIRO and SRA is looking at ways to adapt upcoming cane varieties to better deal with water stress and the other climate challenges that may occur in the future.

Lead researcher Chris Stokes from CSIRO said that even in irrigated regions, the sugarcane industry continued to lose significant production each year through water stress.

"While a lot of that water stress is unavoidable even in irrigated and high rainfall areas, this research is focused on improving sugarcane varieties so that they are more water-efficient and more productive," Dr Stokes said.

The project is being funded by the Commonwealth Department of Agriculture and Water Resources (*Filling the Research Gap*) and SRA, and is a collaborative project that involves both CSIRO and SRA.

The project is looking at two main opportunities, both of which would assist farmers in dealing with the current and future climate challenges in existing regions, and also for expansion to possible new areas in northern Australia.

These are: the improvements in water use efficiency to reduce crop production losses from water deficit; and also how plant responses to increasing carbon dioxide levels in the atmosphere can be used to further enhance water use efficiency of sugarcane.

The researchers want to discover how sugarcane varieties differ in their patterns of water use and their responses to water stress and carbon dioxide levels in the air.

If they do respond differently, this would indicate a trait (or traits) within these varieties that could be incorporated into future varieties through breeding, with tangible benefits for the industry.

Recent trials have screened about 100 clones in a climate-controlled glasshouse at CSIRO in Townsville, comparing how each of these clones respond in the controlled environment.

If there is a difference in response, this would indicate that some clones are better than others in water deficit or well-watered conditions and they could be incorporated into the plant breeding program for developing new sugarcane varieties.

According to researchers, the work done on this project could also assist in the late-stage selection of clones to determine their suitability for different regions, particularly in the rain-fed areas.

SRA Trait Development Manager Prakash Lakshmanan believes the purpose of the research is about discovering how the industry can maximise productivity of sugarcane varieties under variable water conditions.

"If this system can be implemented in the SRA plant breeding program, more information about the likely performance of new varieties in irrigated and rain-fed conditions can be provided to growers. The impact of such variety release decisions may become apparent in about five years' time," Dr Lakshmanan said.

"We've been working on this issue since 2006 in collaboration with CSIRO, and this work is an excellent example of collaboration between these two bodies to deliver crop improvement for the sugarcane industry."

For more information contact Dr Chris Stokes at chris.stokes@csiro.au or Prakash Lakshmanan at plakshmanan@sugarresearch.com.au.

Dr Chris Stokes from CSIRO says research is looking at how different cane varieties respond to water stress and increased carbon dioxide levels in the atmosphere.

Ecuador congress provides biosecurity insights

The International Society for Sugarcane Technologists (ISSCT) Pathology and Entomology workshop was held from September 14–18 in Ecuador recently. ***By Nicole Thompson***

Perkinsiella saccharicida is a pest in its own right in Ecuador – they are free from Fiji leaf gall disease.

This was the first time that pathology and entomology sections have held a joint workshop, and it was a very full program of presentations and a field visit. There were 59 participants from 14 countries.

SRA was represented by Dr Nader Sallam (member of the ISSCT entomology committee), Dr Peter Samson (entomologist from SRA's Research Funding Unit) and pathologists Dr Shamsul Bhuiyan (recipient of a Sugar Travel and Learning Award (STLA)), Dr Kathy Braithwaite (STLA recipient) and Dr Nicole Thompson (member of the ISSCT pathology committee and STLA recipient).

SRA's attendance at workshops such as this form an integral part of ensuring that our researchers are fully informed about leading advances in biosecurity and other research from around the world – as well as potential new biosecurity threats to our industry. All this helps to form part of SRA's ongoing strategic commitment to protecting the Australian sugarcane industry from biosecurity threats.

The workshop's keynote presentation was delivered by Dr Andy Sheppard (CSIRO), who gave an overview of biosecurity planning. He introduced some of the tools that CSIRO has developed in this area for improving risk analysis, stakeholder decision framework tools, and structured decision making for emergency response.

Dr Edison Silva discussed sugarcane breeding at the photoperiod house at CINCAE, Ecuador.

The joint program meant that participants were able to take part and hear about areas of research outside their areas of expertise, broadening the knowledge of all participants.

I particularly enjoyed the entomology sessions because learning about the potential pest problems that could enter Australia is very interesting and will be important in case of an incursion.

The comprehensive control plans for insects and extensive use of effective biological controls in other countries was very informative.

From a pathology point of view, there were many papers about Sugarcane Yellow Leaf Virus (SCYLV) which is a major problem in many parts of the world. This contrasts with Australia, where it is not considered a major disease.

All presentations by SRA staff were well received, stimulating questions and leading towards new collaborations to advance sugarcane research.

Dr Sallam gave a presentation on resistance screening of moth borers in Papua New Guinea. Dr Samson gave a presentation on detecting canegrub damage by satellite imagery in the Central region. Dr Braithwaite gave two presentations: one on the ground-breaking work on chlorotic streak and the second describing the findings from a recently completed project on Ramu stunt. Dr Bhuiyan gave two presentations: one on nematode resistance screening by SRA and one on sugarcane smut control using flutriafol. I also gave two presentations: one about the variation of downy mildew in Papua New Guinea and a second on developing diagnostics for Sugarcane streak mosaic virus.

The four days of presentations were broken up with a field day in which all participants visited CINCAE, Ecuador's sugarcane research institute established in 1997. For the Australian participants, the photoperiod facility was familiar as it was designed in consultation with Dr Nils Berding, a retired Australian sugarcane breeder.

The Ecuador varieties bred by CINCAE are becoming increasingly popular in Ecuador, with EC varieties making up nearly 40 percent of crop going to mills.

We visited field sites of San Carlos mill and saw the main pest and disease problems of Ecuador: the plant hopper *Perkinsiella saccharicida*, the stem borer *Diatraea saccharalis*, SCYLV and RSD.

The ISSCT Workshops are the only forum of their type for the scientific meeting of sugarcane pathologists and entomologists, and this joint workshop gave us a unique opportunity to interact and meet with new and old colleagues.

The meeting was enjoyed by all participants, and thanks goes to the local organising committee for their excellent organisation.

The destination for the next workshop(s) will be announced at the ISSCT Meeting in Thailand, December 2016.

ISSCT Workshop delegates investigated pest and disease problems in the fields of San Carlos Mill, Ecuador.

New collaborative trials to tackle soldier fly

Adult sugarcane soldier flies – male (left) and female (right).

New trials are looking to provide more information for growers on management strategies for soldier fly.

SRA has started a series of collaborative trials in four regions of the industry to look at management strategies to control the impacts of soldier fly.

The new trials have started over recent months and are in partnership with productivity services in the Bundaberg, Isis, Maryborough and Mackay growing regions, which are some of the regions that face the worst of the soldier fly problem.

The new trials come in response to an independent review in 2014 that looked at the soldier fly problem, along with what activity had taken place in the past, and subsequently made recommendations about what could be done in the future.

The review was also an SRA response to grower and industry concerns about the soldier fly problem.

The review was conducted by retired CSIRO entomologist Dr John Matthiessen.

Significant investment and research has occurred over the last 50 years to identify management options, but impacted growers have still continued to battle significant losses from the pest in some areas of the industry.

SRA Manager for Plant Health, Dr Andrew Ward leads the team at SRA responsible for the research and he said the new trials were about addressing gaps that were identified in the review.

"The purpose of the trials is to look at management strategies – and not just chemical controls – to manage and control soldier fly," Dr Ward said.

"It is also looking at the tolerance of existing cane varieties and new SRA varieties to soldier fly. We want to evaluate new approaches to managing soldier fly.

"Although they are not a major pest of sugarcane as an Australian industry, they do cause significant economic losses to those growers who have to deal with them."

Despite many years of research, management has been by cultural methods with no insecticides registered for their control. Cultural controls work well to prevent infestation of plant cane crops but re-infestation of ratoons is common; often requiring a plough-out and fallow after the second ratoon crop.

The trials at Maryborough, Bundaberg and Isis are looking at varieties and resistance, while three additional trials in Mackay and Bundaberg will look at ways of reducing the fly population.

Soldier flies are a native insect that naturally inhabit grasslands. They cause damage to cane through their larvae attacking the roots. They may also inject a toxin into the plant during feeding, but this has not been proven.

SRA will continue to update growers and millers on the progress of this research through ***Cane****Connection* and our regular eNewsletter.

For more information, contact Dr Andrew Ward on 0401 564 312 or email award@sugarresearch.com.au.

Severely damaged cane ratoons as a result of soldier fly.

Changes to Biosecurity Act and Legislation within the Queensland sugarcane industry

Changes to biosecurity legislation in Queensland have implications for the current sugarcane quarantine areas and the movement of sugarcane.

By James Ogden-Brown

The sugarcane industry has a long history of working with Plant Health Australia (PHA), State and Federal governments to prevent the spread of serious pests and diseases, and to manage incursions or outbreaks.

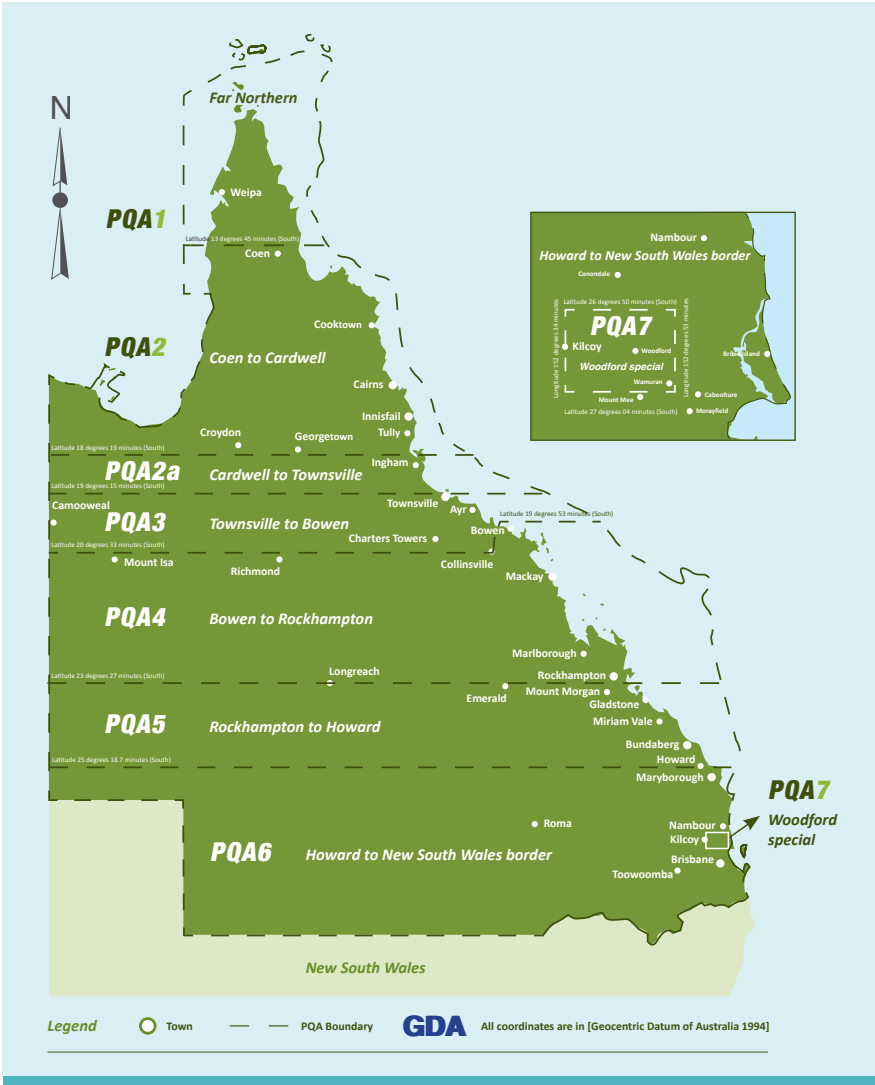
For Queensland, the legislation that supports the sugarcane industry is the *Plant Protection Act 1989*, the *Plant Protection Regulation 2002* and the *Plant Protection (Approved Sugarcane Varieties) Regulation 2003*. Both the Act and the regulations will be replaced with the *Biosecurity Act 2014* and the *Biosecurity Regulations 2016*. Both will commence on 1 July 2016.

Under the Act, individuals and organisations whose activities pose a biosecurity risk will have greater legal responsibility for managing them.

This general biosecurity obligation means they must take all reasonable steps to ensure they do not spread a pest, disease or contaminant.

Some of the current regulatory provisions will not be continued and instead producers will have more freedom to manage their own biosecurity risks without having to follow prescriptive requirements that may not be necessary in their specific circumstances.

However, those regulatory provisions that relate to the pest quarantine areas will remain, but with minor changes to the boundaries and the name which will be "Biosecurity Zones". Individuals or organisations will be required under the regulation to obtain an authority before moving plant material or appliances (machinery) between Biosecurity Zones.



Pest Quarantine Area Boundaries

Some of these boundaries will be combined and moved in the new regulation.

Movement of sugarcane plant material or machinery between Pest Quarantine Areas (PQAs) (Biosecurity Zones)

Be aware that now, and with the future legislation, before moving plant material, soil or machinery which has been in contact with sugarcane between PQAs or the new Biosecurity Zones an approval must be obtained from an authorised person. The inspector will require the following information:

- The full contact details of who is sending the material and the originating PQA.
- The full contact details of who is receiving the material and the destination PQA.
- Which variety or varieties are being moved?
- What part of the plant is being moved? What it will be used for?

Moving plant material approvals must be obtained from Biosecurity Queensland on 132 523. Machinery approvals can be obtained from your local accredited productivity services officer or Biosecurity Queensland.

When approvals are issued they come with conditions which must be adhered to before movement can take place.

When quarantine boundaries work well

Fiji leaf gall disease caused extensive damage and disruption in the Central and Southern region in the 1970s and early 1980s (see Image 1 – in the foreground are Fiji leaf gall diseased plants).

By managing the movement of plant material from infested regions to the northern regions, the Queensland Government and the sugarcane industry has been able to maintain the Fiji leaf gall-free status of the major sugarcane regions north of Proserpine.

This has allowed these northern regions to avoid any direct losses and to have a wider choice of varieties, including some Fiji leaf gall susceptible varieties.

In the Central and Southern regions, the Fiji leaf gall control programs and quarantine restrictions have been so successful that the disease has not been recorded for more than 20 years.

The control programs have involved the approved variety regulations to ensure growers only plant Fiji leaf gall resistant varieties and management of plant movements from areas that are still infested such as Broadwater and Harwood mill areas in New South Wales.

Sentinel plantings (planting plots of a susceptible variety) will commence in the Southern regions of Bundaberg, Isis, Maryborough and Nambour to monitor for Fiji leaf gall.

This will allow the current risk from this very serious disease to be assessed so that the industry can make informed decisions on management of the risk into the future.


1

Exotic pests and diseases

The largest biosecurity threat to our industry are exotic pests such as insect borers (*Sesamia* stalk borer, *Scirpophage* top borer) (see Image 2 and 3). Failure to isolate and eradicate an incursion would be devastating to the industry if these borers crossed our borders.

We only have to look at the effect these pests have had on our neighbour's industry. Ramu Agri-Industries in Papua New Guinea now produces half the tonnes of sugar per hectare that we do here and most of this loss has been caused by borers.

PHA, with the assistance of SRA, CANEGROWERS, the Australian Sugar Milling Council, and Biosecurity Queensland and Sunshine Sugar (NSW) have completed a review of the Industry Biosecurity Plan. This is a document that is used by federal and state governments to prepare for and assist in an emergency response if there is an exotic pest incursion.

PHA is also working with these organisations to produce a Biosecurity Growers' Manual, which will assist industry in understanding the new legislation.

Protecting our industry

The protection of our industry can only happen if all participants do the right thing.

- Ensure that machinery is cleaned to the required standard.
- Plant material moved between PQAs will have restrictions on its movement.
- Ensure approvals are applied for and are in place before any appliances or plant material is moved.
- **Report any suspicious pest or disease to your local productivity services group or the PHA Hotline on 1800 084 881.**
- **Report any illegal movement of plant material or machinery between PQAs to Biosecurity Queensland on 13 25 23.**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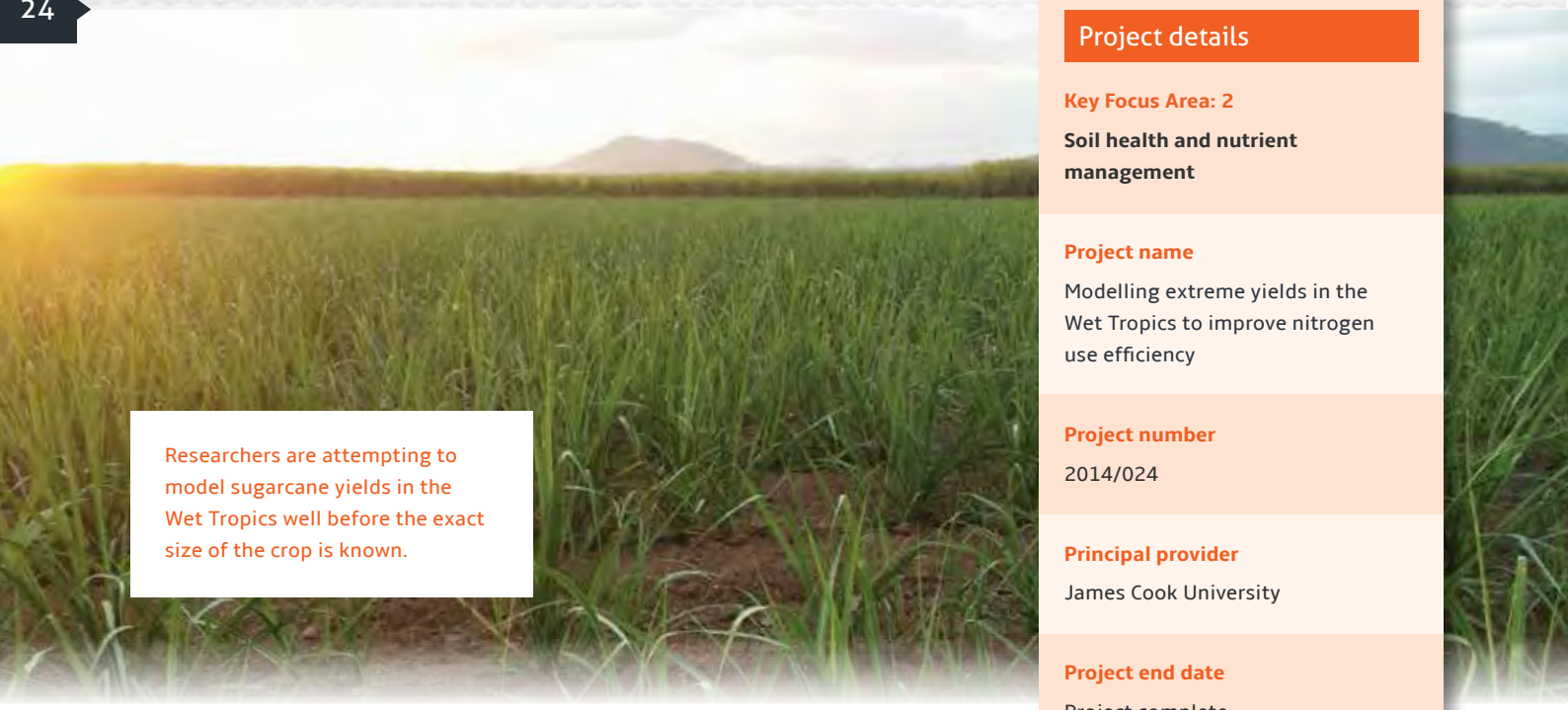


Researchers are attempting to model sugarcane yields in the Wet Tropics well before the exact size of the crop is known.

Project details

Key Focus Area: 2

Soil health and nutrient management

Project name

Modelling extreme yields in the Wet Tropics to improve nitrogen use efficiency

Project number

2014/024

Principal provider

James Cook University

Project end date

Project complete

Early crop forecasts could help improve nitrogen use efficiency

New research in the Wet Tropics is looking at how climate models and the La Nina weather pattern can help predict the size of the crop for the coming year. ***By Brad Pfeffer***

Sugarcane growers, millers, and the greater industry in the Wet Tropics could be a step closer to earlier and more accurate predictions of the size of the coming crop, following recently completed research.

Researchers at James Cook University (JCU) over the last year have investigated a project for the Tully region that looked at modelling the size of the sugarcane crop for the subsequent year.

The researchers undertook the project with the hope of using climate forecasts and models to predict the size of the next year's crop.

By having a more accurate September forecast, this would potentially allow farmers to consider this forecast when making their nitrogen fertiliser application in spring, and therefore increase their nitrogen use efficiency.

The more common attempts at modelling cane yield for the region have usually only started to be acceptably accurate in the early months of the year, and even forecasts in December have been treated cautiously.

But the intent of the research, which was funded by SRA, was to see if crop yield predictions could be brought forward by several months, which would therefore create useful opportunities for crop management.

Chief investigator of the project Dr Yvette Everingham said that having an idea of the crop size in September for the next year could create opportunities to adjust fertiliser rates accordingly.

The research used various climate forecasts and information including the Southern Oscillation Index, as well as historic yields for the Tully region in tonnes per hectare.

The model demonstrated good skill at forecasting extremely low yields as at September 1, but it was challenged to forecast extremely high yields at this time.

"In a La Nina year, we have the skill to say if we are more likely to have a below average crop, or a far below average crop," she said. "In a La Nina year you don't get the radiation and also tend not to have the right combination of rain, temperature and radiation over the growing season," she said.

Therefore the model is currently geared toward predicting lower crops – which in turn would mean decisions around growing and fertilising a smaller crop, milling a smaller crop, and selling it as well, including forward selling.

She said that the model was specific to the Tully region, and research would be needed if it were to be adapted for other regions.

"Tully was chosen because it experiences the largest variability in rainfall in the world, and when you have those large swings in variability this tends to give better predictions."

She has a simple message for growers. "In La Nina years the opportunity exists to reduce the N rate to suit a smaller crop. On the flipside, big crops can still occur when the model predicts a small crop so this uncertainty must be managed."

TCPSL's Jordan Villaruz and Tully grower Mario Raccanello discuss tissue culture. Mr Raccanello observed that he planted this year at relatively short notice, and that in the future greater preparation would help minimise weed problems.

Project details

Key Focus Area: 1

Optimally adapted varieties, plant breeding and release

Project name

Tissue culture – managing impediments to adoption in Tully

Project number

2014/093

Principal provider

Tully Cane Productivity Services Limited

Project end date

January 2017

RESEARCH

Tully growers see tissue culture benefits

A project underway by the productivity services at Tully is helping growers to adopt tissue culture technology, allowing them access to varieties sooner. ***By Brad Pfeffer***

The number of growers using tissue culture to bulk up new and clean varieties for their farms is accelerating in the Tully region, thanks to an extension project being led by Tully Cane Productivity Services Limited (TCPSL).

The project, which is funded by SRA, is focused on helping inform local growers about the benefits of using tissue culture, as well as working one-on-one to help them resolve challenges they face in greater use of tissue culture.

According to Jordan Villaruz with TCPSL, there are a number of benefits that growers are seeing when using tissue culture when compared with the traditional stick planting method.

He said that by using tissue culture, many growers could access new varieties up to a year sooner than they would be able to otherwise.

For example, when a new variety was approved for the region, the traditional process has been that TCPSL would get 300 sticks of a new variety from SRA at Meringa to bulk up in a mother plot before putting into a distribution plot, and then growers would be able to access an allocation of the variety depending on the area of their farm.

Smaller growers may only have been able to access 50 or 100 sticks, which would then require further bulking up at their farm before they would have a sufficient amount for commercial planting.

"But with tissue culture, growers are saving at least one year when propagating a new variety to have it on a commercial scale at their farm," Mr Villaruz said. "We are seeing a strong interest from growers and at this stage our focus is on demonstrating to them the advantages and how to maximise the potential."

"It can help us get varieties from other regions more quickly. If varieties are performing well down south or in the Burdekin for example, we can order them through tissue culture. A good example is Q240(1), which was released in the Central Region and only released here at Tully last year."

He said that one of the key lessons with using tissue culture was that the young plants need to be "pampered".

"When it is young, you have to treat it like a baby. In a short period of a couple of weeks, you can then treat them like normal plants," he said.

This means that growers need to have a plan in place for key management practices including weed control and irrigation.

"We know through this project that the situation is different for different growers and they use methods that work best for them. That might mean irrigation with a tank on a tractor, from a drain, or just from a tap if they have a small block near a farm shed."

The current costs for tissue culture are $1.80 for a small plant and $2.20 for a large plant. According to TCPSL, these costs are expected to decrease if there is greater adoption and the supplier at Mission Beach is able to supply 10,000 or more plants.

Faster access to varieties:

David Marsilio

David Marsilio farms south of Tully and has been using tissue culture for the last three years.

With experience growing watermelons from seedlings, he was already familiar with looking after the young plants, and he says that the step into using tissue culture for sugarcane was an easy one to make.

For Mr Marsilio, it has huge appeal as he is an enthusiastic early adopter of new varieties and is frequently on the lookout across the industry for varieties that might have potential at his farm.

He then works with TCPSL to ensure the biosecurity permits are in place for new varieties and uses tissue culture to bulk up his access to these varieties quickly.

"Of course you don't just pluck varieties out of the sky and I spend a lot of time talking to other farmers and keeping an eye on what is performing well elsewhere," he said.

"Using tissue culture means I don't have to go and get a trailer-load of sticks and it is amazing what 200 plants will plant."

He has used tissue culture to get earlier access to varieties such as Q250^{Φ} and Q253^{Φ}, and he said that both were looking good at his farm in their early stages.

He plants the tissue culture at 60 cm apart and ensures the paddock is clean by treating it with a pre-emergent herbicide. He then waters by hand specifically on the plants and chips the weeds if necessary.

He jokes that chipping is a good exercise and past time. "Some people like aerobics, but I like walking and chipping. It's good for me, and it is only a small area," he said.

"When the plants are small you really do have to treat them like a baby."

Positive first-time experience with tissue culture:

Gerard Dore

Riversdale cane grower Gerard Dore has used tissue culture for the first time this year and believes that it has potential for his farm.

As a former banana grower, he was familiar with using tissue culture, but in recent years he had wanted to see how it was used by other cane growers before trying it himself.

After hearing positive feedback from other farmers, this year he used it to plant Q252^{Φ} and Q253^{Φ}, which TCPSL had informed him may be in relatively short supply as seed material.

Using tissue culture ensured he was able to access these varieties for his farm.

Mr Dore sees that biosecurity is one of the important advantages that comes with the use of tissue culture.

"We have seen here locally with Panama Tropical Race Four the impact this has on the banana industry, and we know that all industries are going to face similar challenges at some stage, and tissue culture is one of the ways we can handle that," Mr Dore said.

"With the old system of having a common seed plot where vehicles come in from everywhere, that makes it hard to keep the area clean. Then there is the extra logistics and labour of doing all that by hand."

Mr Dore said that his future use of the tissue culture would depend on achieving higher stalk numbers than using stick cane. The evidence from TCPSL is that tissue culture generates much more planting material than stick cane.

"If we can achieve the stalk numbers that Jordan says we can then it will be very good," Mr Dore said. "I know it is more expensive to buy the tissue culture, but I am impressed with how simple it was. The stalk numbers will be the critical issue."

A legume cover crop during the fallow can assist in reducing erosion while also improving soil biology and adding nitrogen to the soil.

Fallow management lays a solid foundation

*The steps for growing a good crop start long before the crop is even planted. In this article, SRA Adoption Support Officer **Gavin Rodman** explains some of the fallowing strategies that can help you plan to get the most from your farm.*

1. Planning the next crop

Record keeping is an important first step in successful farm planning as good records will take the guesswork out of managing your farm. Keeping records of all operations performed on an individual block will greatly assist the assessment of current, previous or newly adopted practices.

Soil tests are the only way of identifying the status of nutrients within a soil. These soil tests, along with record keeping, are the basis for developing a profitable and sustainable fertiliser program. An ideal time to conduct the soil test is during the fallow, with one sample per crop cycle usually being adequate. While the results of the soil test taken during the fallow are used to develop a fertiliser program for the following crop cycle, it is also the perfect time to determine if soil ameliorants (such as lime and gypsum) are required.

While taking your soil sample, it may be beneficial to consider the health of the soil. Research has shown yield decline in sugarcane is in part due to a build-up of harmful soil biota as a result of long-term sugarcane monoculture. It has also been shown that a break from sugarcane can reduce the numbers of the harmful biota with this effect increased by using a legume crop. One of these harmful soil organisms is the fungal root pathogen *Pachymetra chaunorhiza* which is responsible for pachymetra root rot. Although soil sampling for pachymetra involves a slightly different method to soil sampling for a regular soil test, it is beneficial to know the spore levels as cane yield can be greatly affected. The only way to treat pachymetra is by planting resistant varieties over a number of crop cycles.

2. Destruction of the previous crop

Traditionally, the stubble of the previous crop was destroyed by cultivation. However, this is no longer the preferred option. An emphasis is now placed on minimising the degree of cultivation and the potential for adverse environmental impacts within the new farming system. The main components of the new farming system include the use of controlled traffic, minimum tillage, and legume crop rotation.

The preferred stool eradication option is to spray out the previous crop with a suitable non-residual herbicide. This spray-out choice has a number of advantages including minimal soil erosion due to zero tillage, minimised offsite movement of nutrients with reduced soil movement, preserved organic matter and moisture in the soil, and also maintenance of the soil structure.

A downside to spray-out us that it may create weed control issues because the effectiveness of residual herbicides can be severely compromised by trash blankets.

3. Land rectification

The fallow period is an opportunity to do jobs that aren't possible during the crop cycle. It is a chance to develop controlled traffic systems and undertake drainage systems and headland management. The fallow period is also the perfect time to amalgamate and realign blocks, allowing for harvesting and farming efficiency by increasing row length.

4. Fallow management

Managing your fallow will involve a number of key tasks. The fallow period presents an opportunity to reduce emerged weeds and their seed banks as some weeds can be knocked out using herbicides that should not be used when a cane crop is present. Fallowing also helps to break pest and disease cycles. It is vital to ensure that the fallow is free of any cane including volunteer cane to make sure that these pest and disease populations can be reduced or eliminated.

A legume cover crop during the fallow can assist in reducing erosion while also improving soil biology and adding nitrogen to the soil. This management option is preferred over a bare fallow due to these added benefits.

5. Fallow versus replant

Fallow periods can bring benefits to the planning and layout of your farm, but they can also lead to improved yields and profits when compared to a replant system. The table below compares the performance of crops planted in 2008, 2009, 2010 and 2011 while demonstrating the differences in revenue per hectare over a crop cycle to third ratoon for fallow plant and plough-out replant systems in the Tully region. These figures were created from commercial yield (tc/ha) and CCS data for Tully from 2008 to 2014.

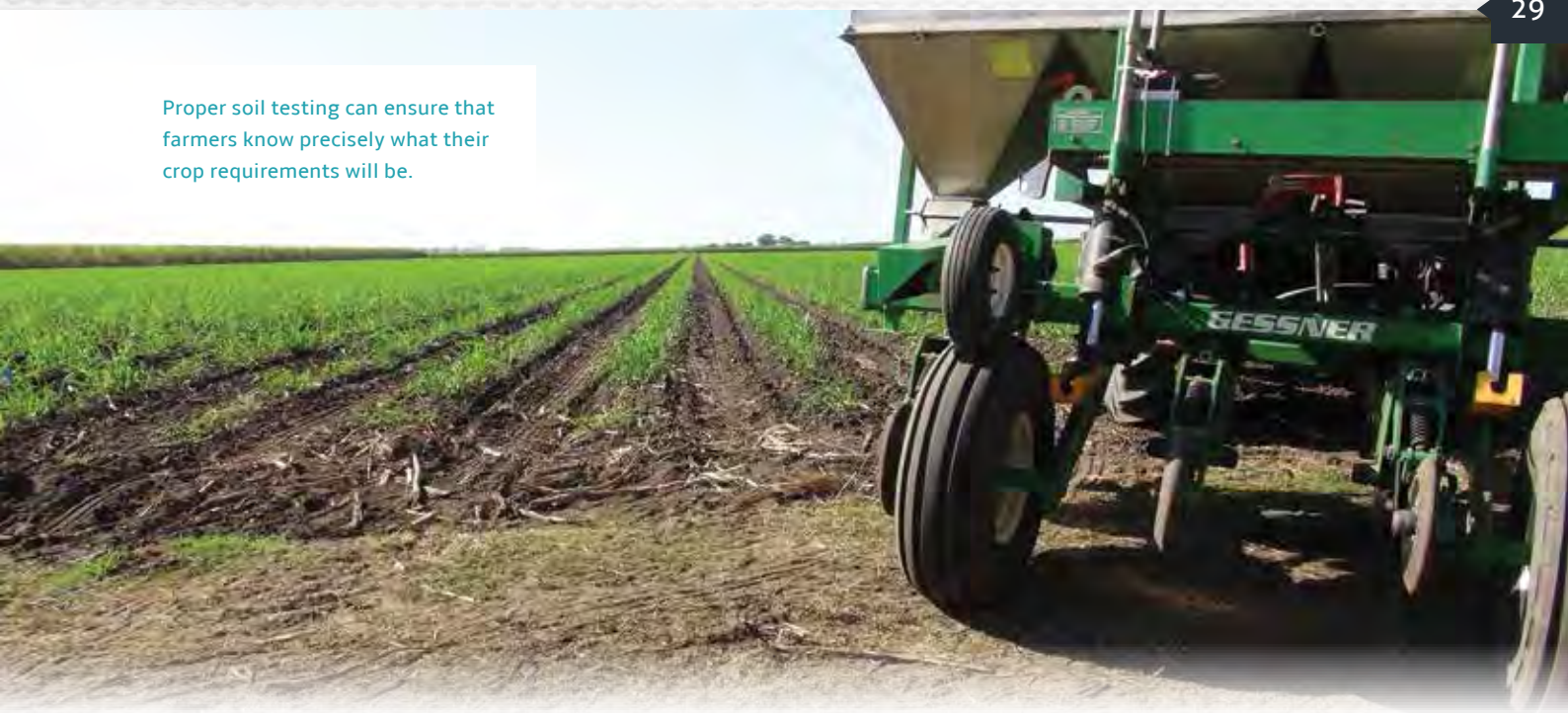
Table: Grower partial net return per hectare for fallow plant and plough-out replant systems to third ratoon comparing crop performance in Tully from 2008 to 2014.

Year planted	Plant	1R	2R	3R	Total $/ha	Four-year difference ($/ha) in favour of fallow plant
Fallow plant 2008	$289	$1,975	$1,316	$647	**$4,227**	**$268**
Replanted 2008	$111	$2,032	$1,291	$525	**$3,959**	
Fallow plant 2009	$212	$1,356	$966	$1,689	**$4,223**	**$860**
Replanted 2009	$20	$1,427	$588	$1,328	**$3,363**	
Fallow plant 2010	$40	$650	$1,535	$1,819	**$4,044**	**$581**
Replanted 2010	-$193	$543	$1,436	$1,677	**$3,463**	
Fallow plant 2011	-$600	$1,587	$1,850	$1,813	**$4,650**	**$471**
Replanted 2011	-$1,040	$1,692	$1,799	$1,728	**$4,179**	

Notes: *Grower partial net return = gross revenue – harvesting and levies – fertiliser costs – planting costs. Crops were planted from 2008 to 2011, with the final planting reaching its third ratoon in 2014.*

Above: Typical equipment used for soil sampling.

Above: Proper soil sampling lays the foundation for a productive crop cycle.



Proper soil testing can ensure that farmers know precisely what their crop requirements will be.

Soil sampling pays dividends

There's more to collecting a soil sample than just filling a bucket with dirt – getting a good result requires planning and a conversation with the people doing the test. ***By Gavin Rodman***

What to test for

A soil analysis result is only as good as the sample collected. The first step in the collection of your soil sample is to understand the type of analysis required. Knowing what you want analysed before you take the sample allows for the sample to be taken correctly. Some soil analyses require different sampling methods to others, so check with your chosen laboratory for the correct way to sample for a particular test.

While soil testing is a major part of a farm's nutrient management plan, it is also important to test for other things within the soil. Pachymetra root rot is a major impediment to production within all regions except the Burdekin. In all regions, testing for nematodes should be conducted if yield loss is unexplained. Both pachymetra and nematode populations can be calculated from a soil sample.

When to test

With soil testing, planning ahead is very important to allow sound nutrient, ameliorant and variety decisions to be made. Taking your soil test early in the fallow allows for the recommended early application of ameliorants such as lime, magnesium or gypsum, and selecting pachymetra-resistant varieties if necessary.

Choosing a lab

Choosing the right lab for your soil testing is an important part of the process.

Australian Soil Plant Analysis Council (ASPAC) accredited labs meet quality assurance standards while National Association of Testing Authorities (NATA) accredited labs must meet the set high standards for the testing methodology of various tests.

Ensure the lab you choose is familiar with the sugarcane industry's approved nutrient recommendation guidelines (SIX EASY STEPS™) and includes the analyses mandated by the Queensland Government's sugarcane industry regulations (organic carbon, Phosphorus (BSES) and Phosphorus Buffer Index).

In choosing a credible and accredited lab for your soil testing, your local productivity services officer will be able to easily interpret the analyses and confidently provide an accurate recommendation.

Table: Results after interpretation of soil analysis on the same sample by four different labs. Example data thanks to TCPSL's case study.

Recommended application rate (kg/ha)	LAB 1	LAB 2	LAB 3	LAB 4
pH (1:5 water)	5.5	5.5	5.5	5.45
N kg/ha	120	120	110	110
P kg/ha	20	20	30	20
K kg/ha	100	100	100	100
S kg/ha	0	0	–	10
Ca (lime) kg/ha	1000	1000	0	0
Mg kg/ha	0	0	–	0
Cu kg/ha	10	10	0	10
Zn kg/ha	0	0	–	10
Si kg/ha	0	0	–	–

Taking the soil sample

Taking a representative sample is important as you want to obtain as accurate an analysis of the area being tested as possible. The following steps describe a general method of soil sample collection.

1

Plan how you are going to sample the block – what sampling pattern will you use?

- 12–15 subsamples is the minimum that should be taken for a representative sample of 5 ha if testing an entire block. 20 subsamples are recommended. Take the subsamples in a regular pattern that accurately represents the whole area.
- For pachymetra or nematode testing, 8–10 subsamples is sufficient.

2

Remove trash, weeds and other plant material away from the sampling spots that will be subsampled.

3

Use a clean plastic bucket to collect the sample along with an auger or shovel that is not galvanised or painted.

4

It is recommended that all sample points be taken from the shoulder of the row, approximately halfway between the centre of the row and the inter-row and at a depth of 25 cm.

- In the case of pachymetra and nematode testing, the samples should be taken from the centre of the row within the root zone at a depth of 25 cm.

5

Once all subsamples have been taken, mix them thoroughly in the plastic bucket.

6

After mixing, place 500 g–1 kg into a clean plastic zip lock bag, fully label the bag with name, farm and block numbers and any other details that are requested *(sometimes the fertiliser applied to the previous crop is asked for)*.

This is the soil sample that will be analysed by your selected laboratory.

Growing a legume fallow crop of peanuts has delivered positive results to his cane for Mulgrave grower Andrew Greenwood.

Rotation crop delivers boost for Mulgrave grower

*Even more than two-and-a-half years into a crop cycle, Andrew Greenwood still continues to see visual benefits to his sugarcane following a rotation crop of peanuts, as SRA's **Brad Pfeffer** discovers.*

Mulgrave region grower Andrew Greenwood believes one of the key aspects of improvement with farming is continuing to try new things.

With this approach in mind, he has employed a range of practices in recent years that have helped him increase productivity at his farms, which are a mix of leased and owned properties south of Cairns with both volcanic red soils and clay soils.

One of his strongest successes has been an emphasis on growing peanuts during the fallow period.

He had previously grown break crops such as Meringa beans and soybeans, but settled on the peanuts as they deliver the same benefit – or more – compared to the soybeans, but also delivered an income. And he continues to be pleased with the results.

For example, last year from a 17 hectare (43 ac) area under peanuts he estimated a gross income of about $77,000 with costs in the range of $25,000.

"We had a very good year and had 58 percent of the crop classified as jumbo, which is what they pay mainly on," he said. "We know they won't do that every year. We achieved 4.5 t/ha, which is average for me, although I know 8 t/ha has been grown and should be aimed for."

Nonetheless, for the coming season he is planning about 28 ha, which will be his biggest crop yet. "I would classify that size area for me on the coast here as high risk, because getting them off can be a real issue with the weather, so we will need a bit of luck.

"Once they are dug you need one week of dry weather before they can be threshed. I am now farming 12 months of the year with always one eye on the weather for the next seven days."

He said peanuts needed to be sprayed for leaf diseases in the wet tropics every 7–10 days from weeks four to 16.

"I have been asked a few times why the cane grows better after peanuts. I do not know, but from observations I can see in a row of cane the spot where the peanuts were grown, because the vigour and colour is so much better than where there was not peanuts, and this is over two and a half years later."

Research from the Sugarcane Yield Decline Joint Venture (SYDJV) has highlighted the value in using fallows and break crops to improve soil health. The benefits include not just increased nitrogen fixated by the legume, but also a break in the nematode cycle.

Being close to the Atherton Tableland means that Mr Greenwood has been able to access affordable second-hand equipment for the peanuts. He has also invested in a GPS guidance system, which has helped with direct drilling the cane after the peanuts with minimal working the ground except for perhaps a coulter to cut the peanut hay.

He also places a strong emphasis on soil sampling and is an advocate of the SIX EASY STEPS™ program for nitrogen fertiliser application. In addition, he chooses his varieties carefully.

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	01/03/2016
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	Peter Allsopp	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
Faster flowering – new opportunities for genetic improvement	2012/024	CSIRO	Anne Rae	Completed
Development and testing of a SNP marker platform in sugarcane	2012/025	CSIRO	Karen Aitken	01/01/2016
Investigation of smut resistance mechanisms in sugarcane	2012/026	CSIRO	Karen Aitken	Completed
SmutBuster II: accelerated breeding of smut-resistant varieties	2012/325	SRA	Mike Cox	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	Frikkie Botha	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

Project Title	Project Number	Principal R&D Provider	Chief Investigator	End Date
Key Focus Area 2 (Soil health and nutrient management)				
Investigating the role of microbes, carbon in soil-plant interaction in Burdekin sugarcane soils	2013/068	Advanced Burdekin Collective Research	Tom McShane	01/12/2015
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	30/06/2016
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	Cameron Whiteing	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
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	01/09/2016
Reducing the maintenance costs of mill rolls	2013/060	QUT	Geoff Kent	01/08/2018
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 Keeffe	01/08/2017
Managing aspects of raw sugar quality in the Australian sugar industry	2014/052	SRA	Eloise Keeffe	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	01/05/2019
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	01/05/2016
A profitable future for Australian agriculture: biorefineries for higher-value animal feeds, chemicals and fuels	2015/902	QUT	Ian O'Hara	30/06/2018

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	Graham Cripps	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	01/05/2016
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/biofertillizers	2014/402	QUT	Jan Zhang	01/04/2016

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