

*Cane*CONNECTION

Summer 2019

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(Cover page) Examining soil health, including beneficial fungi, at the Abergowrie property of Lyle Glenwright.

Design: Catherine Jorissen, SRA.

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WELCOME TO THE SUMMER 2019 EDITION OF *CaneConnection*

Sugarcane soil health is once again a hot topic in this edition, as we visit a number of growers who are modifying their farming practices to boost soil health and productivity. We talk with farmers about their experience with legume rotation crops, using bio-solid, widening row spacing, reducing compaction, and the results they are getting. You can also access more information and videos on the Soil Health Toolbox via sugarresearch.com.au.

On the same topic, we also meet with researchers from the University of New South Wales working on an SRA-funded project looking at digital soil mapping technologies.

At another end of the research spectrum we also provide a run-down on a project that has been working with the Indonesian sugarcane industry on sugarcane streak mosaic virus, and learn how this project has provided a benefit to both the Australian and Indonesian sugarcane industries.

On page 24 you can also read about cutting-edge research that is assessing the potential for unmanned aerial vehicles to enhance the sugarcane breeding program. There is a lot of buzz about drones in agriculture and how they can be used to assist farmers, and in this article we explain one of the practical ways that they could add value to the Australian sugarcane industry.

Along with this magazine, you'll find the 2020 edition of our Sugar Snaps calendar, which features some of the stunning entries from our Sugar Snaps photo competition earlier this year. I'm sure it will look great on the shed or office wall.

Brad Pfeffer

Executive Manager, Communications

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24,000



THE SIZE IN HECTARES OF LAROONA STATION, WHICH THE GLENWRIGHT FAMILY RUN IN CONJUNCTION WITH A CANE AND CATTLE FATTENING PROPERTY AT ABERGOWRIE. [PAGE 10](#)



20 minutes

THE TIME IN WHICH AN UNMANNED AERIAL VEHICLE CAN USE ON-BOARD SENSORS TO ASSESS A PROGENY ASSESSMENT TRIAL. [PAGE 24](#)



10,000

THE APPROXIMATE NUMBER OF POINTS WITHIN A 40 HECTARE Paddock THAT CAN BE ASSESSED USING REMOTE-SENSING DIGITAL SOIL MAPPING TECHNOLOGY SUCH AS A GAMMA-RAY SPECTROMETER OR DUALEM421. [PAGE 8](#)

BY THE NUMBERS



\$50M

THE ESTIMATED LOSS TO THE INDONESIAN SUGARCANE INDUSTRY FROM SUGARCANE STREAK MOSAIC VIRUS. [PAGE 14](#)

PROSERPINE YOUNG FARMERS LEARNING TOGETHER

BY MOLLY O'DEA, ADOPTION OFFICER, PROSERPINE

A group of young people involved in the agriculture industry near Proserpine have come together to form Proserpine Young Farmers (PYF). The group aims to provide a channel for under 40s involved and interested in agriculture to come together to share, learn and connect.

The group has been successful in obtaining funding through the Queensland Government Department of Agriculture and Fisheries *Enhanced Extension Coordination in the GBR Project*.

Through this funding, the group is planning a variety of farm tours to learn about a range of practices. We want to see how others tackle issues, come up with solutions and improve their businesses, both profitability and sustainability. This includes several tours to local farms, one tour to the Burdekin in December 2019 with a focus on automated irrigation, and

one tour to the Mackay region in Autumn 2020 focusing on fallow management. We also have a range of other activities in the pipeline including pricing and marketing workshops with Wilmar Sugar, and business and succession planning workshops.

Recently the group visited PYF member, Justin Blair's, farm. This farm is BMP accredited, growing cane on 1.8m beds with dual rows. We looked at the sprayer which Justin has been using to trial switching nozzles on/off, to allow him to band spray and blanket spray. We also viewed his bed former, wavy discs, and fertiliser box which he has installed cameras on to allow him to view the inside of the box from the tractor, and Stool Zippas to help close the slot and prevent fertiliser loss.

Justin also has a range of other things happening on the farm, including



having an Enviroscan capacitance probe and tensiometer installed by local productivity services, Sugar Services Proserpine, to help learn more about irrigation requirements and soil moisture.

SRA, as part of the *Pathways to Water Quality Improvement in the Myrtle Creek Sub-catchment* project, has just installed water quality samplers in one of Justin's paddocks. Justin has applied Bobcat i-MAXX herbicide as a band spray on part of the paddock and as a blanket spray on the other part to see the difference in water quality run-off during the coming wet season.

The Blair family is also diversifying and have a native Australian fingerlime business, Myrtlevale Fingerlimes. We were lucky enough to taste test the fingerlimes as we learnt about the process they have gone through, including trialling several varieties. ■

(Below) Rebekah Pace, Briannan Pace and Shannon O'Brien (HCPSL) are working together to improve their nutrient management and other farming practices. (Over page) Ground prep for planting earlier this year.

NEXT GENERATION SETS THE PACE OF SUSTAINABLE MANAGEMENT

YOUNG OR OLD, EVERYONE PITCHES IN AT PACE FARMING IN THE HERBERT, WITH THE FAMILY OPERATION CONTINUING TO LOOK FOR WAYS TO IMPROVE THEIR SUSTAINABILITY AND PROFITABILITY. BY BRAD PFEFFER



It's a family operation at Pace Farming near Bambaroo at the Southern end of the Herbert district.

Running a large-scale business, they grow cane over about 900 hectares, also grow watermelons and pumpkins across part of their fallow, grow legume manure crops for the remainder of their fallows, and also run a significant pineapple farm at Rollingstone. This all means the work rarely stops, and everyone is always pitching in.

This was exactly the case when CaneConnection visited in August this year. The family was in the thick of planting, with fourth generation growers Rebekah and Briannan busy fixing a busted hydraulic hose so they could finish the job.

Their father Allan (third generation) was also busy in the shed, cousin Jeffrey (fourth generation) was in the paddock on the rotary hoe, and grandfather Roy (second generation) also continues to help out on the tractor.

For Rebekah and Briannan, they always wanted to come back to farming.

Both women are in their early 20s. Briannan came straight back to the farm after high school, and Rebekah had a short stint at university looking at other options before deciding that the farm was where she wanted to be. There is no job on the farm that they bat an eyelid about having a go at.

"Like a lot of kids, we always spent our school holidays around the farm," Rebekah said. "Whether it was picking pineapples or working in the cane, we always enjoyed it, so it made sense to come back."

Briannan said that they had the benefit of learning from decades of experience from their father and grandfather, but she also said that they were continuing to innovate and bring new ideas into the business.

This year, Rebekah and Briannan have jumped into a project called Complete Nutrient Management Planning for Cane Farming (also known as "Herbert RP161"), developed through the Queensland Reef Water Quality Program, and delivered by Herbert Cane Productivity Services Limited (HCPSL) and Farmacist in the Herbert region.

Through this project, they have been given comprehensive information on soil tests and EM mapping, all linked back to Google Earth, and an easy to follow nutrient management plan, along with an array of other useful information to help them improve productivity and sustainability.

"I enjoy the education I'm receiving through the project and having Shannon (O'Brien) from HCPSL step us through the technology and information," Briannan said. "We've had the privilege of learning from our grandfather, and father, and now technology is changing quickly and we are seeing a bit of everything."

Through their involvement in this project, they are looking forward to refining their nutrient management across the farm and seeing the effect upon their productivity and profitability.

Their improvement to nutrient management follows the adoption of a range of modern farming system and innovative practices in recent years, including long-time use of controlled traffic, legume fallows, and reduced tillage.

They have begun a zonal till system for mill mud and ash. By using a zonal applicator, it helps reduce transport costs from the mill and gives them access to a method of improving soil health that had previously been out of their reach.

HCPSL Extension Agronomist, Adam Royle, said the project was primarily focussed on nutrient management, but it also included discussion about a range of productivity issues occurring on each farm.

"Quite often we've visited growers to talk about soil test results, and we discuss a range of things over half a day, as the grower has several issues they've been thinking about for a long time. We talk about these ideas, from a technical standpoint, to see whether they stack up before they make change," he said.

"Our focus is on nutrients, but everything from farming systems to herbicides to pests and diseases comes into play."

He said these full range of factors had a crucial relationship with nutrient use.

"As we've found with the Pace family, we can help identify those factors, looking at soil maps, EM mapping, to get the best outcome.

"An example is that growers may have traditionally taken soil samples from their poorer growing patches of the paddock. It is human nature to want to fix the poorer performing areas.

"But we want to make sure we continue to do things right where the cane is going well, so it can continue making money, which means sampling from the high performing areas too.

"The project takes a step back and looks at the whole picture, rather than just one factor like nitrogen."

Shannon O'Brien said the Pace family had a strong history of soil testing, but the project was bringing all the information together in a format that they could use, both in a hard-copy book and the Google Earth data that can be looked at from their phone, anywhere on the farm.

"It's a really nice step into the world of precision agriculture," Shannon said. ■

The RP161 Nutrient Management project is delivered by Farmacist, MAPS, and HCPSL and funded through the Queensland Government Reef Water Quality Program and Australian Government Reef Trust.

For more information contact:

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(Below) The project is working closely with local productivity services organisations in each region including, for example, Greg Shannon (pictured), Tully Sugar Limited Cane Productivity and Development Manager. (Over page) The dots on this graphic represent individual farms in one region of the Australian cane industry. The colours represents groups of farmers that are of a similar size (hectares) and yield. The groups such as blue and yellow are target areas for extension strategies.

USING MILL DATA TO IMPROVE PRODUCTIVITY

THE WEATHER PLAYS A BIG ROLE IN GROWING A GOOD CROP, BUT A RESEARCH PROJECT CURRENTLY UNDERWAY IS HELPING PROVIDE THE INDUSTRY WITH VALUABLE INFORMATION TO IMPROVE PRODUCTIVITY AND PROFITABILITY IN ALL DIFFERENT SEASONAL SITUATIONS.
BY BRAD PFEFFER

There's an old farming phrase through the grains industry that says some of the farmers with good crops are lucky because they have square rain clouds over their farm.

For these 'lucky' farmers, on their side of the fence their crop is motoring along, but on the other side of the fence their neighbour's paddock is still waiting for a planting opportunity.

Of course, there are no square clouds and rainfall doesn't stop at the fence-line. In most cases, the soil type and weather conditions between these farms is identical, but farm management practices are making a key difference.

For the cane industry in the Wet Tropics, a better analogy than "square clouds" might be for "square umbrellas", but the point of the saying is the same. That is, that well-informed and effective management decisions can improve production, and help reduce the impact of the weather and 'luck'.

In recent years, an SRA research project has looked at using productivity data that is collected by milling companies to assist the industry, especially by developing innovative tools and methods of summarising the data.

We know there are productivity differences across most mill areas. Although some of this regional variation is explained by extreme weather events or disease incursions, this project is helping growers to identify factors that they can control to increase productivity/profitability for industry.



In essence, the project has looked at the key drivers of productivity in different regions and is working to broaden the adoption of improved farm practices by working with local industry.

For example, the research project has looked at factors such as clean seed uptake, variety selection, ratooning length, Pachymetra sampling and levels of infection, and numerous others, while comparing these to yield and size of production.

This research is led by SRA Biometrician Dr Jo Stringer and follows an earlier demonstration of the project in the Herbert region. The project is now moving to other regions of the Australian sugarcane industry, including most recently at regions such as the Burdekin and Tully.

A key finding was that tonnes of cane per hectare is not related to the size of the farm, or the sub-district where the farm is located.

Specifically, it wasn't the weather or a change of soil type that happened to coincide with the headland.

Dr Stringer said that the research is working closely with productivity services groups in these regions to identify the best strategies for improving production, and to ensure extension strategies were targeted effectively.

"The findings have been different in different regions," Jo Stringer said. "One of the big factors in the Herbert was that we identified the need to increase the uptake of clean seed.

"Through the work of Lawrence Di Bella and Herbert Cane Productivity Services Ltd, clean seed use went from about 800 tonne (per year) to about 2000 tonnes. HCPSL have recently bought another farm and harvester to continue to increase clean seed use.

"We also were able to talk to growers about losses from Pachymetra, with data showing a 15 percent decrease in cane yield when they used a susceptible variety in consecutive crop cycles."

She said in the Burdekin her work with Burdekin Productivity Services identified the value of current research and extension activity into improving soil health. It also provided the local industry with valuable information about productivity losses associated with back-to-back planting of varieties.

For example, the research found that Q183^ϕ followed by Q183^ϕ in the Burdekin maintained yield, while planting KQ228^ϕ after KQ228^ϕ or planting Q208^ϕ after Q208^ϕ was associated with lower yields.

At Tully, Jo Stringer is working closely with Tully Cane Productivity Services Ltd Manager, Peter Sutherland, Tully Sugar Cane Productivity and Development Manager, Greg Shannon, and Tully CANEGROWERS Manager, Peter Lucy.

The project has worked closely with Tully industry to develop a tool to automate farm productivity reports that will provide valuable information to growers and also help inform extension strategies.

Greg said that it was another tool in the toolbox to ensure the region was

delivering effective extension programs and that extension officers were providing the right advice.

"We have detailed local variety information through the Tully Variety Management Group, but this project is adding more data around tonnes of sugar, percentage of varieties, percentage of resistant varieties to Pachymetra, ratooning length, and recommendations on which variety to grow on a particular soil type, he said.

"We have developed an automated process that has sped things up in terms of developing variety management plans for example and gives us valuable information to talk to the growers."

Dr Stringer said the project was focussed on collaboration within local regions to work specifically on outcomes that would deliver the optimum local impact.

"Through this project we identify the key drivers of productivity and profitability, and once we identify those drivers that allows us to build targeted extension and adoption strategies." ■

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

For more information contact Dr Jo Stringer on jstringer@sugarresearch.com.au (07) 3331 3337.





(Above) UNSW PhD student Ehsan Zare setting up the gamma-ray spectrometer. (Middle right) Associate Professor John Triantafylis in the field as part of the Seeing is Believing project. (Far right) Students are a vital part of the project. Here, Xuyue Zhao and Mahi Mousavifarde are using soil cores to help validate and ground truth the digital soil maps being created as part of the project.

UNDERSTANDING THE SOIL THROUGH DIGITAL MAPPING

A UNSW RESEARCH PROJECT IS WORKING IN MULTIPLE CANE-GROWING REGIONS TO CREATE LOCAL DATA BASES ON THE USE OF TECHNOLOGY SUCH AS GAMMA-RAY SPECTROMETERS AND EM INSTRUMENTS, TO HELP THE INDUSTRY BETTER UNDERSTAND OUR SOILS.



Put your smartphone's camera over this symbol to take you straight to a video explaining this project.

HOW MANY SOIL TYPES DO YOU HAVE ON YOUR FARM?

HOW MUCH VARIATION IS THERE WITHIN A SINGLE BLOCK?

Depending on where you are and the size of your blocks, there's a fair chance you have several different soil types and they change several times within just a few hundred metres.

So the answers to these questions could easily be a big number – and also a number that is difficult to know with 100 percent accuracy.

Most of the time, soil sampling and testing is the answer, and for about two decades parts of the industry have been using electromagnetic (EM) mapping to better understand soil types and more efficiently manage their inputs.

However, the use of this technology is not widespread, and there are opportunities to use new and emerging technology to accelerate the potential for growers around digital soil mapping (DSM).

Current research is underway that is examining the latest advances in DSM technology, and working with industry to make this technology more accessible for the industry and manage their farming practices according to soil types and properties.

This research is led by Associate Professor John Triantafylis from UNSW Sydney through an SRA-funded project called "Seeing is believing: managing soil variability, improving crop yield and minimising off-site impacts in sugarcane using digital soil mapping".



The project has been working in multiple cane-growing regions to create local databases on the use of technology such as gamma-ray spectrometers and EM instruments. As well as using these sensing instruments, the research team also uses in-field verification via soil coring to validate their work.

When CaneConnection caught up with the project team, which included multiple PhD students and staff from Herbert Cane Productivity Services Limited (HCPSL), they were mapping a field at Lannercost Extension.

The sensors attached to a ute as it drives over the field. They are being used to collect data across multiple paddocks, and to predict cation exchange capacity, exchangeable calcium, and exchangeable magnesium, among other soil chemical properties.

John Triantafylis said that these sensors could be used to make as many as 10,000 points within the 40ha area, creating maps of the soil variation that are much more detailed than could be achieved with manual sampling. When calibrated against soil cores – say about 50 in a paddock – this allows them to create a digital soil map of the paddock.

“There have been previous soil surveys done in the past, so part of our research is comparing the new digital soil maps with the traditional soil maps,” he said.

He explained that these traditional soil maps were generally simple and developed based on limited soil data, and then this data was extended to larger areas using aerial photographs and interpretation to create maps.

“Clearly, while these maps weren’t designed for precision agriculture, this project aims to test these maps and compare them to the accuracy of the digital soil maps. While it may not seem like a fair comparison, the traditional soil maps may be of sufficient accuracy and provide farmers with some confidence to allow them to be used and therefore serve as a stop-gap until digital soil maps can be created.”

However, he said the real prize was developing local capacity, such as within productivity services organisations, to extend advanced digital soil mapping technology within each region.

This is already occurring in parts of the industry, including the Herbert, where HCPSL have been collaborating with UNSW on this project. HCPSL also offer fee-for-service for EM mapping for growers but not yet the creation of digital soil maps. A similar service is offered by other providers in some other regions.

Michael Sefton from HCPSL said EM mapping was particularly important for the southern area of the Herbert district, which did not have detailed soil maps.

“For some of those growers, in conjunction with soil tests, they have taken the next leap in the farming system and have gone to variable rate lime and gypsum application to remediate problems, in particular on sodic soils,” Michael said. “There are costs savings with the variable rate application, and we are still to quantify the benefits in yield.

“Moreover, the ongoing collaborative work with UNSW gave HCPSL the confidence to purchase our own instrument and

proceed with our own EM mapping projects.”

John said there was significant potential for using the maps for precision agriculture.

“Through our work, we hope to show that variable rate applications are efficient, more economically sound, and potentially provide industry case studies which show that we are continuing to demonstrate there’s no excess fertiliser getting into groundwater, streams and rivers,” he said. “It is foremost a potential tool that could help farmers more accurately apply the SIX EASY STEPS nutrient management guidelines.”

He said ground-truthing was important, which was why they had worked extensively over the last two years in Proserpine, the Burdekin, the Herbert and Mossman.

“The project is called ‘seeing is believing’ because we know it is important for growers to be able to see something working in their own region to ensure the results are meaningful.” ■

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**To see a video of this project at
work in the field, visit the media
section of sugarresearch.com.au**

(Below left) Richard Hobbs, HCPSL, discusses soil health and biology with grower Lyle Glenwright. *(Below middle)* Lyle Glenwright has a healthy worm population in his soil. *(Below far right)* Beneficial fungi in Lyle's soil.

BUILDING SOIL HEALTH ONE STEP AT A TIME

LYLE GLENWRIGHT IS MUCH MORE COMFORTABLE FATTENING CATTLE, BUT AFTER RECENTLY JUMPING INTO SUGARCANE FARMING, HE IS ALSO LOOKING AT HIS SOIL HEALTH AND FATTENING UP A NICE HERD OF WORMS AS WELL. *BY BRAD PFEFFER*



Put your smartphone's camera over this symbol to take you straight to a video with Richard Hobbs talking soil biology.

When Lyle Glenwright started digging in his soil and finding handfuls of earthworms, he thought he'd done something wrong.

The first thing he did was call HCPSL agronomist, Richard Hobbs, to tell him about the problem.

Richard's response was excitement rather than concern: "They're not a problem," he explained. "Worms are a sign that the soil biology is going well."

For Lyle, having grown up in the beef industry, he is far more comfortable breeding cattle than growing cane and digging up soil, but now he is learning to treat the worms and other beneficial organisms in his soil with as much care as his livestock. That way, he can put the soil biology to work to grow better crops of cane.

Lyle has been growing cane in the Herbert region for three years, moving to the property when his family purchased it to diversify their 24,000 hectare cattle breeding property, Laroona Station, at Charters Towers.

Lyle explained that the original purpose for the 600ha property at Abergowrie was to use it to fatten young cattle bred at Laroona for the live export market. The property already had 400ha of pasture, and they initially planned to turn the 200ha of sugarcane into pasture as well.



They have stuck with their plan of sending their cattle, which are mostly Brahman, down to the Abergowrie property for fattening. However, once Lyle got his feet on the ground he decided he wanted to give cane farming a go as well.

"The property is a good seasonal hedge for conditions at Charters Towers," he said. "We also figure that having cattle and cane will help us ride the ups and downs in both markets."

Being new to cane, Lyle wanted advice on how to get the most from his paddocks. This led him to Richard Hobbs (HCPSL) and a whole range of practices that are improving soil health on the property.

They are converting from 1.63 metre rows to 1.8 metres to support a controlled traffic farming system, moving to zonal tillage, and planting legume cover crops.

The Glenwrights are also applying biosolid from the city of Townsville. Having the two properties means that they can carefully manage the sustainable use of this product.

"In the wet season here at Ingham, the biosolid goes up to Laroona, and vice versa," he said. "We're soil testing blocks after they're harvested, before the cane is ploughed out, then spreading the biosolid at 110 tonnes per hectare, and then testing again afterwards to get the recommendations for our sugarcane fertiliser program."

Richard Hobbs said all these factors were working together to improve soil health, and there were already plenty of signs that things are going well.

"We can see Lyle has good populations of worms, and there is hyphae from beneficial fungi which is helping to naturally improve the structure of these heavy clay soils," Richard said.

"The more we can do that with less horsepower, cultivation and fuel, the better the soil health and the cheaper the crop is to grow.

"There has been a lot of work busting up old compaction to wipe the slate clean before starting the conversion to 1.8 metre rows. As they move to 1.8m, some of that heavy compaction from the old interrow is of course where some of the cane rows are, so removing the compaction is important to get the paddocks back to square one. This also means rebuilding soil health.

"After that, their aim is to go through with minimal cultivation. Normally with soil like this you would need 6-8 tillage operations to get the new cane crop in, but now by using a bedformer the aim is to get that down to three or two."

Richard added that every time a grower saved a pass with machinery, it was helping improve soil health.

"Steel destroys carbon. By reducing tillage, Lyle is helping conserve labile carbon in the soil, which is what we need to improve soil health and produce better crops of cane," he said.


Lyle said they had seen a positive response to using the biosolid upon pasture at Charters Towers, but it would take a couple of years before he could make a call on how it performed in the cane.

He also added that he had a few doubts about moving to 1.8 metre rows, but said that so far it was working well.

"This isn't the best cane growing area here, so I was worried if we got a bad strike the weeds would be a real problem. You can ask half a dozen people and get half a dozen different opinions, so in the end I talked to Richard and gave it a go. I'm just a cowboy, so I need advice on row spacing, nutrition, and growing legumes," he said. ■

Richard Hobbs is part of collaborative project on soil health in the Herbert region. This project is funded and supported by SRA, HCPSL, BPS, Queensland Department of Agriculture and Fisheries, Wilmar, the University of Queensland and University of Southern Queensland.





The RP161 Nutrient Management project is delivered by Farmacist, MAPS, and HCPSL and funded through the Queensland Government Reef Water Quality Program and Australian Government Reef Trust.

For more information contact:

HCPSL: 07 4776 5660

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Farmacist Burdekin: 07 4782 2300

FARMING SYSTEM IMPROVEMENTS DELIVERING PROFITABILITY & SUSTAINABILITY

Dino Poletto has a mantra when it comes to adopting new practices: **"You must maintain productivity. If you don't, you're history."**

Farming with his son Terry near Giru in the Burdekin, the Polettos grow about 30,000 tonne of cane each year and are enthusiastic about improving practices at their two properties.

Two years ago, they started growing soybeans and mungbeans as cash crops and to improve soil health. They have adopted GPS and a controlled-traffic system around their 1.6 metre row system, and have continued to reduce

fertiliser and chemical inputs as well as reduce cultivation.

Dino said they focused their farming system on being efficient with their inputs because their main goal is to ensure their business is sustainable.

He added that part of this approach meant they needed to ensure they were using the best possible science to optimise their nutrient application, and that they were doing everything else right on farm to ensure their inputs were working effectively.

With this in mind, they have been involved in a project run by Farmacist in

the Burdekin called Complete Nutrient Management Planning for Cane Farming (also known as "RP161"), developed through the Queensland Reef Water Quality Program.

Through RP161, the Polettos receive detailed information about nutrient management through soil samples, as well as about a range of other productivity issues.

"Farmacist have been very helpful. They take a soil sample, give us an evaluation, and help us with exactly what we need, and that's what we go by," Dino explained.

Christian Lago is a third-generation farmer with 520 hectares of cultivation, including lease country, near Brandon.

After gaining an understanding of nutrient management through an earlier version of the RP161 project (known as RP20), he jumped at the chance to continue to improve his nutrient management with the assistance of Farmacist, through RP161

“The biggest thing that I have learned is that the cane will only grow as far as the most limiting factor allows,” Christian said. “We need to balance nutrition with good farming practices and the result is a good crop of cane.”

“We are giving the plant what it needs, when it needs it. We are sampling right across our farms, as before this project we would usually sample the poorer areas to find out what was lacking. We want to understand those good areas and keep working on things that put more money in our pocket. When prices are down, it becomes even more important to be doing everything we can.”

Christian has been working with Alice Warner from Farmacist, and Alice said



the project had helped Christian look at practices including EC mapping, which has assisted with gypsum and lime application.

“The program is tailored to Christian’s farms and his unique challenges,” Alice explained.

Christian said Farmacist had also helped with his second crop of soybeans, which he hoped would bring in additional income and boost soil health. This year was his second crop, planted in late July, with plans to harvest mid December. Depending on the weather, he may

aim for another crop of beans before planting cane in April/May 2020.

“It is new to us, so we are ironing out the kinks,” he explained.

Christian said the RP161 project encouraged positive practice change with growers. “It is a learning experience working together. With farming, every year is different, but as a general trend I believe we are seeing better results.” ■

(Above) Christian Lago and Alice Warner, Farmacist, in a crop of soybeans earlier this year, with the Pioneer Mill in the background.

“We find it very successful and helpful because science is the most important part of anything and farming is no different. They are providing us the information on the science.”

The project has helped the Polettos reduce their nitrogen rates and maintain production, which Dino described as a win.

“Otherwise we can’t afford to stay in the industry. It is the difference between survival and going under.”

He said the program was delivering a benefit for him as a grower, while also delivering environmental outcomes.

“The Great Barrier Reef is a thing of natural beauty and it must be protected,” he said. “Farmers also have to make a living, and this project is helping us find that sweet spot.”

The project has been running since 2016 in the Burdekin, and it has worked across more than 210 farms over more than 23,000 hectares.

Farmacist agronomist, Heidi Hatch, said that the program provides a legacy and a pathway forward well after the completion of the project.



“Growers really appreciate the nutrient plans and spatial recording of their data,” she said. “Having all of their soil test and electrical conductivity (EC) data easily accessible through a simple geographic information system (GIS) platform allows them to easily see all of their historical and current information in one place allowing them to make informed decisions.

“Tailoring nutritional plans to their farm makes it personal and relevant not only for the project year, but identifies a

strong platform that growers can use going forward.

“The tools provided as part of the program such as moisture probes, EC data and soil tests have been well received and growers are using them to get a better insight into improving other aspects of farm management.” ■

(Over page) Dino Poletto on the tractor planting earlier this year. (Above) Evan Shannon and Heidi Hatch with Farmacist checking out the planting job at the Poletto property.



PROTECTING AUSTRALIA FROM BIOSECURITY RISKS

INVESTMENT IN BIOSECURITY RESEARCH IS A VALUABLE INSURANCE POLICY FOR THE INDUSTRY TO PROTECT AGAINST EXOTIC THREATS. IN THIS ARTICLE, WE TALK WITH SRA RESEARCHER DR ROB MAGAREY ABOUT ONE OF THESE COLLABORATIVE RESEARCH PROJECTS.

The Australian sugarcane industry is now better prepared to manage an outbreak of the exotic disease, sugarcane streak mosaic (SCSM), should it ever occur.

SCSM (caused by sugarcane streak mosaic virus) has been identified as a potential high-risk disease for the Australian industry because of its prevalence throughout Southeast Asia, including Indonesia, and the severe impacts that it can cause to production.

SCSM is an entirely different disease to the existing mosaic virus that already exists in Australia (sugarcane mosaic), and is much more severe, with the exotic disease causing an estimated A\$40-\$50 million in losses to the Indonesian industry.

Until recently, both the Australian and Indonesian industries only had a limited understanding of SCSM, which added to the risk for Australia from this disease.

However, through a project funded by the Australian Centre for International Agricultural Research (ACIAR), SRA scientists have collaborated with the Indonesian Sugar Research Institute (ISRI), the Indonesian Fibre Crops and Sweetener Research Institute (IFCSRI) and the University of Bogor to improve both countries' understanding of SCSMV.

SRA Leader for Disease Management, Dr

Rob Magarey, led the project and he said that because SCSM is so widespread in Indonesia, this made the research valuable for both countries.

"SRA continues to take a proactive approach with biosecurity risks, knowing that our industry cannot afford to wait for diseases to strike before preparations are made," Dr Magarey said. "Once the horse has bolted, it is too late to shut the gate.

"The disease does not kill, nor severely restrict the yield, of individual plants or portions of a crop, which makes its appearance in the paddock less dramatic. However, because it affects whole crops, actual yield losses are very significant. Through our research, losses have been shown to vary between 17-26 percent, depending on crop class."

Previous to this project, there was limited information on how the disease spreads, where it occurs in Indonesia, how to detect the virus, the resistance of our varieties, and the most effective integrated disease management strategy (IDM).

Through this work, with extensive trials and field surveys within Indonesia, these questions now have answers.

The research team determined that SCSMV is largely spread through diseased planting material, which has resulted in the virus making its way into more remote parts of the Indonesian Archipelago.

Specific surveys of commercial fields and garden canes in Sumatra, Sulawesi and the eastern Archipelago highlighted the presence of SCSMV in many commercial fields, especially on Java, but also in such places as West Papua - a sugarcane production expansion area relatively close to Australia. It was found in greater than 80 percent of the 931 crops surveyed in SCSMV research.

The project also worked with Indonesian growers on extension programs to help Indonesian growers manage the disease.

"Project impacts so far have included a better understanding by Indonesian farmers of how the disease is likely to affect their crops, and the recommended IDM options to reduce yield losses," Dr Magarey said. "The Indonesian industry now has the ability to test planting material for the presence of the disease, enabling better selection of disease-free planting material.

"The essential elements of effective disease management include: disease-free planting material, varietal resistance and termination of heavily-diseased crops.

"The Indonesian industry is facing the challenge that most of their commercial varieties are susceptible to the disease, with only a few rated as resistant, leaving farmers with few options - disease-free nursery material a key strategy. However,



For more information on biosecurity visit the SRA website sugarresearch.com.au

If you've spotted anything unusual on your farm, please call the Exotic Plant Pest Hotline on 1800 084 881.

many nurseries are also affected by the disease."

Dr Magarey said that a better understanding and management of the disease in Indonesia potentially could reduce the likelihood of it reaching the Australian sugarcane industry.

"In addition to that, our industry now has important tools that we can use, should we ever need them," he said.

"Through our work, we have a better understanding of pathogen variation, and we have developed optimised molecular and serological tests for detecting the virus in planting material."

He added that the project also examined variety resistance. "There may be some variation in varietal resistance to SCSMV in Australian varieties, although further testing is needed to confirm this variation."

He said that a next step would be to update the Australian industry's contingency plan for this disease, incorporating the findings from this research project. ■



(Over page and above) The research team preparing a sugarcane streak mosaic yield loss trial in Indonesia. (Top right) Sugarcane streak mosaic. (Middle right) One of the trials assessing the transmission of sugarcane streak mosaic virus. (Bottom right) One of the survey teams in the field, including SRA staff Ms Lisa Derby and Dr Nicole Thompson.

(Below) HCPSL Agronomist Richard Hobbs talking legume rotations with Brenden Accornero.

The project, *Measuring soil health, setting benchmarks and driving practice change in the sugar industry*, is funded and supported by SRA, HCPSL, BPS, Queensland Department of Agriculture and Fisheries, Wilmar, the University of Queensland and University of Southern Queensland.

To see a video of Richard Hobbs talking sugarcane soil health and biology, visit the media section of sugarresearch.com.au



USING LEGUMES TO BOOST SOIL HEALTH AND PRODUCTION

BY RUNNING MULTIPLE FARMS SPREAD OVER THE HERBERT REGION, THE ACCORNERO FAMILY HAVE LEARNT THAT THEY NEED TO ADJUST FARMING PRACTICES IN A WAY THAT BEST SUITS THEIR OWN CONDITIONS AND BUSINESS.



Growing about 35,000 tonne of cane on several properties across the Herbert Region, Stephen Accornero and his son Brenden are long-term growers of a range of fallow crops.

After more than 30 years of experimenting in different seasons, locations and crops, they now feel they have struck a workable rotation pattern on most of their farms, aiming to improve overall farm profitability and build soil health to lift cane production.

Brenden Accornero said one of the key lessons the family had learnt was that every farm was different, and that it was important to find the balance right between getting an income from the crop, improving soil health and boosting cane production.

"The main emphasis with the soybeans is soil health, as we know we are going to run into challenges with the weather and harvest," Brenden said. "If we harvest them, that's a bonus. With rice, we spread our risk, and we also use a different line of chemicals to avoid herbicide resistance, but being a grass it's also not providing the same rotational benefit (as legume crops such as soybeans)."

HCPSL Soil Health Officer Richard Hobbs has been working with the Accornero family in assessing and improving their soil health as part of a major project on this topic, which is working with growers in multiple regions to assess the improved farming system practices that were initially developed through the Sugar Yield Decline Joint Venture.

Richard said that legume crops were the ideal rotation to break the sugarcane monoculture.

"With crops like maize and rice, the grass-on-grass crop after cane is a drawback, but the legumes break the monoculture and provide additional nitrogen for the next crop of cane," Richard said.

"At the same time, we have limited chances to harvest a crop from legumes here in the Herbert with the risk of crops sprouting from late rain, meaning most of the crops are green manure, sprayed out and incorporated into the soil. It is through their soil health benefits that they pay off.

"Sunflower is another crop being looked at more around here as green manure, including by Stephen and Brenden, to break the monoculture and help break up the soil with its deep taproot."

Growing legumes is one of the key recommendations provided by the Sugar Yield Decline Joint Venture, along with minimum tillage, green cane trash blanketing, and controlled traffic.

Richard said that the Accorneros had made other changes to their farming system, but had approached these in a way that best suited their farms being spread across the district.

Brenden explained that they were generally time-poor, as the farms are located in different parts of the district and this requires intensive management.

"We're in the ute or truck a lot of the time," Brenden explained. "We tried 1.8 metre rows and the weeds beat us, so we ended up going to 1.72 metres which is helping

us improve our row profile and shape but giving the cover to help with the weeds.

"We also need to put machinery on trucks to move between farms, so us cultivating 2 rows at 1.8m would entail 3.6m wide loads and would require us to obtain oversize escorts to move machinery between farms or duplicating machinery for each farm. So we found the 1.7m works best for us in several ways."

Having a diverse spread of farms means they also grow a range of varieties, including Q208[®], Q240[®], Q250[®], Q253[®], Q242[®], Q138, Q183[®] and Q231[®].

"Each farm is different, so we are choosing varieties that suit each particular area. In the heavy soil we are aiming for good tonnes and reasonable sugar, but in other areas we know we will never get massive tonnes, so we are also looking at ground cover to reduce weed pressure, while at the southern end we are looking at salinity and sodicity and a few other soil health problems as well," Brenden said.

Richard said the Accornero family were an example of adopting principles of the Sugar Yield Decline Joint Venture, but also doing it in a way that best worked for them.

"There's no hard and fast rule that works for everybody," Richard said. "We look at where people are at, where we can make an improvement, and approach things steadily.

"Through this project, we are getting the data about improving soil health, but also about specific issues and seasons. We know that what works one season might not work six months later." ■



LEGUMES IMPROVING SOIL HEALTH AND FARM PROFITABILITY

BY SAM RYALLS



A series of short videos have been produced to share the host growers' experiences of growing legume crops in the Burdekin. To watch these videos and for soil health information visit our Soil Health Toolbox via sugarresearch.com.au or put your smartphone's camera over the QR code. This site provides practical resources and grower experiences to help you make informed soil health decisions, with consideration for location, your current and potential farming system and economic outcomes.

Burdekin growers had an opportunity to hear a range of perspectives on growing legumes in the sugarcane farming system at recent Legume Agronomy Workshops. At each of the four events the host growers shared their personal experience in growing legumes and the significant benefits to sugarcane productivity, soil health and longer-term business profitability.

One of our workshop host growers, Paul Villis, has been farming in the Burdekin since 2005, managing 400 ha for Jurgens Farming near the Kalamia Mill, including and 40 ha of his own land.

With a background in grain cropping, Paul had the advantage of looking at the sugarcane farming system with fresh eyes. And in doing so, he quickly identified the potential to improve the farming system and overall farm profitability.

One of the early steps was growing soy and mung beans between sugarcane crop cycles with the help of equipment borrowed from a neighbour. This allowed Paul to test legume break crops within the sugarcane farming system without substantial up-front capital investment.

The initial plan was to improve soil health – as Paul says, “cane is king” – but these legume break crops now make an important contribution to the farm's bottom line, especially as varieties have improved and the Burdekin has developed mature marketing systems



and agronomic support.

“The positive impact to the following cane crops, I feel there is no comparison, especially in the plant and first ratoon crops,” Paul said.

“At the same time, I am a firm believer if you are going to go to the trouble of growing a break crop then you want to get some value from that crop. We can do that here in the Burdekin, but we also need to do it well, given the costs of growing a crop requiring irrigation.”

They have since purchased their own equipment, as soybeans and mungbeans are now a staple part of their farming system. These crops are grown either after an early plough-out of the final sugarcane crop, to enable the growth of two successive legume crops, or after a late plough-out to get one legume crop in before establishing the next sugarcane crop cycle.

“We try and take out half our fallow blocks early in the season, and half late so that it splits the workload at the end of the year.”

His main advice for growers getting into legumes, especially as a cash crop, was to seek good agronomic support.

“We have an agronomist with great experience in legumes in other regions, and they are really helpful with making sure we correctly time our pesticide applications to ensure we comply with maximum residue levels.

“With cane you have a bit of leeway

with herbicide applications, but with mungbeans especially, you can miss the application window in a blink. Timing is key to a successful legume crop.”

Legumes are one of the key principles for productive and sustainable cane production as recommended by the Sugar Yield Decline Joint Venture, alongside controlled traffic, minimum tillage and green cane trash blanketing.

Paul and Jurgens Farming continue to improve their farming system with a view to improving soil health. They are harvesting crops green where they can, and have looked at different irrigation methods such as sub-surface drip and solid set sprinklers to get the water through the trash blanket.

Through most of the Burdekin, furrow irrigation is most commonly practiced, but getting water to flow along the length of the furrow can be difficult with a thick trash blanket in green blocks.

They have also moved to a strip tillage system and are looking at other ways of improving soil health.

In that vein, they have built their own sub-surface dunder applicator, use GPS guidance for most farming operations, have trialled compost, and changed to banded application of mill by-products.

“Because we are close to Kalamia Mill we utilise the mill by-products as they have great benefits to our soil as well.”

At the conclusion of each event Dr

Danielle Skocaj, Soil Health Project leader, from SRA gave an update on the soil health project in the Burdekin and Herbert regions. Dr Skocaj’s project ‘*Measuring soil health, setting benchmarks and supporting practice change in the sugar industry*’ is verifying and demonstrating the impact of different farming systems upon soil health, productivity and profitability in the Herbert and Burdekin regions.

Based on event feedback, growers particularly enjoyed the presentations on legume agronomy, soil health benefits and other grower experiences.

Growers commented that we can all learn a lot more from each other and that legume fallow crops have excellent potential for improving the sugarcane farming system and overall profitability. ■

(Top left) Soil Health Officer Terry Granshaw discussing legume agronomy with Burdekin grower Paul Villis. (Above) Workshop presenters Danielle Skocaj (SRA), Neil Halpin (DAF), Paul McIntosh (Pulse Australia), Brent Wilson (Landmark), Brock Dembowski (DAF), Caleb Connolly (DAF), Terry Granshaw (BPS).

The SRA Soil Health Project of the Herbert and Burdekin regions is kindly supported by Herbert Cane Productivity Services Ltd, Burdekin Productivity Services, Department of Agriculture and Fisheries, Wilmar Sugar Australia, The University of Queensland and University of Southern Queensland.



ACCOUNTING FOR LEGUME NITROGEN WITH CANE TO CREEK

DEMONSTRATION SITES IN FAR NORTH QUEENSLAND HAVE COLLECTED INFORMATION TO HELP GROWERS ACCOUNT FOR NITROGEN ACCUMULATED FROM LEGUME CROPS. BY BELINDA BILLING

In 2019 SRA's Cane to Creek team has harvested four demonstration sites looking at accounting for legume nitrogen in plant cane. The good news is that the team found the beans were contributing enough nitrogen that growers were able to use only the nitrogen applied at planting.

Demonstrations compared three fertiliser strategies after the legume fallow using a replicated strip trial design:

- Legume nitrogen + planting mixture
- Legume nitrogen + planting mixture + some nitrogen at top dress
- Legume nitrogen + planting mixture + remaining nitrogen at top dress (full SIX EASY STEPS)

The nutrient rates were calculated based on a soil test using the SIX EASY STEPS method, then dry weights were measured

for the legumes grown. To calculate the nitrogen in the legume crop, we used this dry weight (including roots) and multiplied it by the appropriate N% for each species. This N% can be found on the Nutrient Management (SIX EASY STEPS) Guidelines for each district.

The demonstration sites were all in the Mulgrave area and were distributed across a range of soil and climate types and a range of legume crops at varying sizes were grown.

The tables show the results with detail on the legume species and nitrogen inputs, soil type and rainfall, and importantly yield, CCS and economic outcome.

2018/19 provided excellent conditions for maximising legume nitrogen inputs with dry conditions between incorporations of the legume crop and top dressing the plant cane.

Due to the dry conditions and no major nitrogen loss event occurring in the time between legume incorporation and top dressing the plant cane, the plant mix only treatment was the best option when comparing the economics. In wet conditions, or seasons where nitrogen losses may be higher during the incorporation to top dress period, the medium or full rate may be more suitable.

A new version of this project, called Cane to Creek 2.0, will continue working with growers to look at accounting for inoculated legume nitrogen inputs in the coming years with demonstrations across the Burdekin and Wet Tropics.

Cane to Creek 2.0 is funded by a partnership between the Australian Government's Reef Trust, the Great Barrier Reef Foundation with support from SRA. The first iteration of this project was funded by the Queensland Government. ■

MOUNT SOPHIA

SITE 1: SOYBEAN – 7.5T/HA DRY BIOMASS		CALCULATED N CONTRIBUTION FROM LEGUME: 370 KG/HA	
Soil type: Thorpe (Kandosol)		Rainfall between planting and top dress: 211 mm	
Variety: Q253 [Ⓟ]		Planting date: 09/05/2018	
Plant mixture across all treatments: 50 kg N/ha		Top dress date: 24/8/2018	
TREATMENT	YIELD/HA	CCS	\$/HA
T1: 50kg total N/ha applied	88.86 ^A	13.11 ^A	(+) \$109.37/ha
T2: 90kg total N/ha applied	85.16 ^A	13.23 ^A	(+) \$60.63/ha
T3: 130kg total N/ha applied	88.44 ^A	13.06 ^A	\$ -

GORDONVALE

SITE 2: SOYBEAN – 8T/HA DRY BIOMASS		CALCULATED N CONTRIBUTION FROM LEGUME: 372 KG/HA	
Soil type: Virgil (Kandosol)		Rainfall between planting and top dress: 41mm	
Variety: Q240 [Ⓟ]		Planting date: 15/06/2018	
Plant mixture across all treatments: 16 kg N/ha		Top dress date: 27/9/2018	
TREATMENT	YIELD/HA	CCS	\$/HA
T1: 56kg total N/ha applied	122.12 ^A	14.00 ^A	(+) \$95.41/ha
T2: 80kg total N/ha applied	125.14 ^A	13.95 ^A	(+) \$43.57/ha
T3: 110kg total N/ha applied	122.37 ^A	14.07 ^A	\$ -

SANDY CREEK

SITE 3: COWPEA & LABLAB – 5T/HA DRY BIOMASS		CALCULATED N CONTRIBUTION FROM LEGUME: 170 KG/HA	
Soil type: Thorpe (Kandosol)		Rainfall between planting and top dress: 54 mm	
Variety: Q253 [Ⓟ]		Planting date: 25/05/2018	
Plant mixture across all treatments: 16 kg N/ha		Top dress date: 21/9/2018	
TREATMENT	YIELD/HA	CCS	\$/HA
T1: 58kg N/ha total N/ha applied	98.60 ^A	14.64 ^A	(+) \$96.20/ha
T2: 89kg N/ha total N/ha applied	103.54 ^A	14.34 ^A	(+) \$34.40/ha
T3: 117kg N/ha total N/ha applied	102.51 ^A	14.20 ^A	\$ -

BEHANA CREEK

SITE 4: PEANUT – 4T/HA DRY BIOMASS (HARVESTED)		CALCULATED N CONTRIBUTION FROM LEGUME: 65 KG/HA	
Soil type: Liverpool (Tenosol)		Rainfall between planting and top dress: 119 mm	
Variety: Q253 [Ⓟ]		Planting date: 26/06/2018	
Plant mixture across all treatments: 5 kg N/ha		Top dress date: 19/10/2018	
TREATMENT	YIELD/HA	CCS	\$/HA
T1: 50kg N/ha total N/ha applied	121.78 ^A	11.40 ^A	(+) \$29.06/ha
T2: 70kg N/ha total N/ha applied	129.39 ^A	11.59 ^A	\$ -

INTERNATIONAL PARTNERSHIPS STRENGTHEN AUSTRALIAN CANE INDUSTRY

SRA PRINCIPAL RESEARCHER, DISEASE MANAGEMENT, DR NICOLE THOMPSON, RECENTLY ATTENDED THE 30TH INTERNATIONAL SOCIETY OF SUGAR CANE TECHNOLOGISTS (ISSCT) CONGRESS IN TUCUMAN, ARGENTINA. THE ISSCT IS AN ASSOCIATION OF SCIENTISTS, TECHNOLOGISTS, MANAGERS, INSTITUTIONS AND COMPANIES CONCERNED WITH THE TECHNICAL ADVANCEMENT OF THE SUGARCANE INDUSTRY AND ITS CO-PRODUCTS.

The ISSCT congress is held every three years and is an opportunity for members from all sectors of the ISSCT to present research, updates, and for cross-sectoral collaborations. The 30th ISSCT congress was from 2 to 5 September 2019 and was attended by 700 delegates from 45 countries.

I attended the congress as well as the pre- and post-congress agricultural tours. This allowed me to connect with international colleagues who I usually only meet over email, including colleagues from plant breeding and entomology, as well as reconnect with pathologists to get up-to-date information about their respective situations overseas. These international partnerships are vital for assisting the Australian industry with key initiatives at SRA such as variety exchange and also biosecurity work to ensure that the Australian industry is vigilant with potential exotic disease risks.

The two-day pre-congress tour visited research facilities and fields around Tucuman, including the Universidad San Pablo Tucuman campus, the Los Balcanes cane fields, the EEAOC (Obispo Colombres Agroindustrial Experimental Station), INTA (National Institute of Agricultural Technology) and the San Genaro farm. The three-day post-congress tour travelled to the Jujuy area in more remote northern Argentina

and visited the Ledesma company farm, research and milling areas, and the CHACRA experimental station.

The highlight of the pre-congress tour was the visit to the EEAOC to meet with sugarcane pathologists, familiarise myself with the common diseases and pests of Argentina, and to talk about their clean-seed and tissue culture distribution systems. I had met Romina Bertani and Claudia Funes from EEAOC at previous workshops, and it was great to visit them at their own research stations and see the work they are doing.

The highlight of the post-congress tour was the Ledesma farm tour and the visit to CHACRA experimental facility. In CHACRA I was able to meet with Dr German Sarino and see the quarantine facilities: including some SRA/Q varieties we have exchanged in previous years.

During the congress I presented a paper on the development of diagnostic tests for sugarcane streak mosaic virus (SCSMV) which was a result of previous ACIAR-funded research. In my role as a member of the ISSCT pathology committee I helped chair sessions, judge the posters, and facilitated discussion as required. I have also been nominated for, and accepted, the role of chair of the ISSCT Pathology Committee and my term runs from 2019-2022.

The highlight papers of the congress for me were: the sequencing of the sugarcane genome (presented by Angelique d'Hont, CIRAD); enhancing the use of endophytes for control of moth borers in South Africa (presented by Stuart Rutherford, SASRI); Ramu stunt virus variation in PNG (presented by Dimitre Mollov, USDA-ARS); the effect of climate on production of sugar and ethanol in South Africa (presented by Abraham Singels, SASRI); and the release of the first commercial GM variety (Brazil). A plenary session highlight was one that compared sugar beet to sugarcane from multiple perspectives including plant breeding (presented by Phil Jackson), farming (presented by Keith Jaggard), and milling (presented by Boris Morgenroth). This was a very interesting comparison and provoked much discussion from all sectors of the industry. Further information about the congress and the ISSCT can be obtained from issct.org.

Nicole was awarded an SRA Travel and Learning Award (STLA) to attend this congress. ■

(Top left) Damage done by Diatraea saccharalis. (Top right) Clean seed demonstration plot at EEAOC. (Bottom left) Dr Nicole Thompson and CSIRO scientists Karen Aitken and Maria de la Paz Vilas at the pre-congress tour. (Far right) Soil structure and marginal soils in Argentina.



(Below) One of SRA's drone pilots, Johan Deutschenbauer collecting data with the unmanned aerial vehicle.

A NEW EYE IN THE SKY FOR SUGARCANE BREEDING

DRONES ARE STARTING TO BUZZ IN THE SKY ABOVE SOME SRA VARIETY TRIALS, PROVIDING VALUABLE DATA FOR RESEARCHERS TO HELP THEM DELIVER BETTER OUTCOMES FOR INDUSTRY.





These photos are from the same variety trial in the Burdekin, six months apart.

On the left, the crop is six months old and on the right the crop is 12 months old, heavily lodged and approaching harvest.

For sugarcane breeders, the objective of a clonal assessment trial (CAT) like this is to narrow down the 2500 or so potential varieties to about 250 strong performers that can progress to the final assessment trial (FAT) stage.

But collecting data from the tangled crop on the right to assess yield, CCS and fibre can be a significant challenge that has always been part and parcel of sugarcane breeding, especially in the Burdekin.

On top of trying to collect accurate data from large and lodged cane, there is also the potential for errors in measurements due to factors such as paddock variation or other environmental factors that can impact the selection of potential new varieties.

However, SRA researchers have recently begun to explore ways to collect accurate information on variety performance, well before the harvest stage, with the hope of making the process simpler and more accurate, which will lead to improvements in the breeding program.

This is now becoming a reality through specialist equipment such as unmanned aerial vehicles (UAVs), also known as drones, equipped with an array of advanced cameras and sensors.

These tools are being used as one of a suite of measures that is modernising and improving the Australian sugarcane breeding program led by SRA.

This work has been centred on the Burdekin in recent years under the leadership of Dr Jaya Basnayake. Following Dr Basnayake's recent retirement, Sijesh Natarajan has taken on the reins of this SRA-funded research investment, via a new project that commenced earlier this year called *Validating high-throughput phenomics technologies for sugarcane clonal selection*.

"There have always been challenges with collecting data from clonal assessment trials and the conditions we face in the cane industry dealing with a very large biomass crop," Sijesh said.

"Through this work, we are working toward a point where we are collecting much more information about variety characteristics and ensuring that the best possible clones make it through to the next phase of the breeding program."

The drones collect data that is not possible with traditional methods. They are equipped with cameras that can measure different wavelengths of light, temperature, and also make a visual assessment.

Using a pre-programmed flight path, they can cover a 5-6 hectare trial in under 20 minutes, with the thousands of images then stitched back into a detailed picture using sophisticated computer software.

It is hoped that the use of the drones and their cameras will make the process easier and more precise, ultimately leading to better sugarcane varieties for growers and millers.

Sijesh said that one of the critical components of the new project was to determine how the assessments from

the drone compare to the traditional assessments.

"Currently there is only a 40 percent overlap between potential selections from the traditional methods and from the drones. Our statistical predictions indicate that drone-based selection is better, but we need to validate this through experiments," he explained.

"The research has moved from the discovery phase to the validation phase, and we hope that by the end of the current project we will be into the implementation phase."

Overall, he said the project was targeting an increase in yield and improving the rate of genetic gain in the breeding program.

"This work is enabling us to have a greater understanding of the interaction between genotype and the environment, while shifting selection to a method that is more comprehensive and precise.

"It also offers the potential of using the sensors on the drones to look at new variety traits that haven't been considered before.

"Cane as a crop lends itself to taking advantage of this technology and we are working hard at using these tools to deliver a practical outcome for the industry." ■

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NEW PEST & DISEASE SURVEILLANCE TECH TO LAUNCH

THE NATIONAL MULTI-AGRICULTURAL INDUSTRY SURVEILLANCE INITIATIVE IMAPPESTS IS LAUNCHING A TRIAL OF ITS AIRBORNE SURVEILLANCE AND DIAGNOSTICS TECHNOLOGIES IN NORTH QUEENSLAND IN FEBRUARY 2020.

The iMapPESTS: Sentinel Surveillance for Agriculture program aims to rapidly monitor and report the presence of airborne pests and diseases for multiple agricultural sectors, including sugar.

SRA is involved in the program as the representative of the sugar industry and is also contributing important research to improve diagnostics for a range of diseases and exotic pests that threaten sugarcane.

A key feature of the five-year program is the sentinel (pictured), a mobile surveillance unit, that captures a snapshot of airborne pests and diseases in a particular location at a given time. The sentinel features several airborne samplers, onboard power supply, a weather sensor, telemetry and control panel (with remote access) to monitor the unit, as well as automated robotics to change pots on the samplers according to the day or capture criteria.

A prototype of the sentinel has been trialled in South Australia in the grain and wine industries and a second sentinel will be trialled in sugar growing regions in February 2020. The trial for sugar will focus on the optimisation of the sentinel

in a tropical environment characterised by more adverse environmental conditions, before moving down through the industry. By mid-2020 it is expected that several more sentinels will be launched across the country, reporting dynamic pest and disease information to all plant industries.

Key sugar pests and diseases, such as sugarcane planthopper and sugarcane smut, will be targeted during the Meringa trial phase via the on-board pest and spore traps.

After the sentinel captures airborne spores and insects, the samples will be dispatched to the South Australian Research and Development Institute (SARDI) laboratories for identification of target pests and diseases.

The team at SRA, led by Dr Nicole Thompson, is developing extraction methods for plant pests for metagenomics and improving molecular diagnostic tools for the industry. This research will explore and design a toolkit for new pest and disease threats and modernise molecular and morphological diagnostics for priority pests.

iMapPESTS will work with growers to understand the best way to present and share the dynamic information about the pests or diseases the sentinel is detecting in an area at a particular time. ■

For more information, contact Dr Nicole Thompson on nthompson@sugarresearch.com.au or visit the website imappests.com.au

iMapPESTS is supported by Hort Innovation, through funding from the Australian Government Department of Agriculture as part of its Rural R&D for Profit Program and 16 partner organisations including AgriFutures Australia, Cotton Research and Development Corporation, Forest & Wood Products Australia, Grains Research & Development Corporation, Nursery & Garden Industry Australia, Sugar Research Australia, and Wine Australia.

TRIALS TO INFORM FERTILISER OPTIONS



When Kevin Mann first began sugarcane farming in 1980 with his brother, David, one of the first things that they did was get soil tests, leaf tests and water tests.

They wanted to understand the limiting factors on the farm at Osborne in the Burdekin, and Kevin knew that it wasn't going to be a pretty picture.

"The water tests showed we had high rock salt in our underground water supply and it wasn't suitable for growing cane. The soils showed salt as well, while the leaf tests showed that we were doing the best we could with the conditions," he explained.

"So we set about improving things by lasering everything to the right levels, and improving the layout where we could."

Their water is sourced from mostly underground, along with two pumps that can access some surface water, which he blends with the groundwater to bring the salinity down as best he can.

Kevin said he had made changes to irrigate with high inflow volumes of water to keep the water flowing, as well as shortening runs where he could, except in situations where he is restricted by deep gullies or a council easement on the property.

Kevin now farms with his son, Max, and they grow about 15,000 tonne each year on their 140-hectare farm. Max recently returned to the farm after working seven years overseas, as a fitter and turner and hydraulic specialist. This now comes in handy and allows the Mann family to do all their own on-farm maintenance.

Kevin said they faced a limited water situation in some years, which meant

they had reduced ability to grow legume crops for grain on their fallow, although they have in the past grown cover crops such as dolichos lablab.

"We've made the decision to utilise our water for the cane," he said. "The surface water is mostly being used for blending with the underground water to make it more usable. At the same time, there have been years when we have had limited water for the cane.

"This year, we had floodwater across the farm at the beginning of the year and it only lifted the underground table by about eight feet (240cm), and now in October after a dry year it is back to where we were last year.

"There is enough for the cane for two or three years, but we don't want to be pushing things too hard."

The Manns grow the popular local varieties KQ228[®], Q183[®], Q208[®] and Q240[®] and aim for an even split between these four. Crops are typically grown as plant and three ratoons, with a short fallow before planting in April or May.

For the last two years, the Manns have been involved in a project called EEF60, which is assessing enhanced efficiency fertilisers at different application rates compared to standard urea treatments.

Kevin said he had used slow-release fertilisers in the past, particularly on his sandy soils early in the season, as well as trialling different blends, all with the aim of improving production.

Results from the EEF60 project will be communicated throughout 2020 and 2021, as more data is collated

from project sites across the industry, collecting information from different regions, local conditions, and seasons.

These trials will provide information on the effect of EEFs in terms of TCH, CCS, and NUE effect on grower profitability. Environmental losses (run-off and deep drainage) are being assessed at six of the 60 sites.

As well as being a keen trial collaborator, Kevin is also a strong advocate of the Smartcane BMP program and was among the first growers in the Burdekin to achieve accreditation. He now has a system where he records all his farm practices in a notebook during the week, and works with his wife, Amanda, who enters his notes into the computer.

"It's a simple system but it works well," he said. "I was doing it anyway, so the accreditation makes sense. We as farmers know what we are doing on our farms, but the BMP process shows we are doing the right thing and now it's all recorded." ■

(Above) Kevin Mann is looking forward to learning more about enhanced efficiency fertilisers through the EEF60 project.

The EEF60 project is a collaboration between CANEGROWERS, SRA, Burdekin Productivity Services, Herbert Cane Productivity Services Limited and Mackay Area Productivity Services. It is funded by the Australian Government Reef Trust and Queensland Government Great Barrier Reef Innovation Fund.

WORKSHOPS HELP TRIGGER PRACTICE CHANGE

THROUGH AN INVOLVEMENT IN INDUSTRY WORKSHOPS AND PROGRAMS, AS WELL AS SOME HELPFUL NEIGHBOURLY ADVICE, MICHAEL SANTAROSSA IS IMPLEMENTING IMPROVED FARMING SYSTEM PRACTICES TO IMPROVE SOIL HEALTH AND PRODUCTIVITY AND PROFITABILITY. *BY BRAD PFEFFER*



(Over page) Michael in a crop of mungbeans on November 7th this year. **(Right)** Michael Santarossa says the 2020 season is off to a decent start.



Michael Santarossa has had cane around him for his whole life, but it is only in the last three years that he has come back to farming full time.

Farming at Mulgrave just south of Cairns, Michael spent about 20 years in the mining industry before making a staggered return to the family farm in recent years through working with his father Alan on weekends, and then leasing country.

Upon making a go of things full time in 2016, his first step was to regularly attend industry workshops and to gather as much information as possible from his father and their neighbours.

Three years in, he continues to get advice where he can, and is now putting it to use by improving soil health through modified farming practices for the 145 hectares that he farms together with Alan.

This has seen Michael starting the transition to a 1.8 metre row spacing (from 1.6m) and a fallow cropping plan this year.

“Some of this country hasn’t had a break crop in my lifetime,” Michael explained.

“There is no changing the sugar price, so we need to change something with the farming system to get our costs down.

“Most of us have heard the soil health story around compaction and the benefits of fallow crops,” he said. “But it was at the workshops where I saw the science behind these practices and decided that I needed to change something.

“Improving soil health is something that will take at least five years to implement and see benefits across the whole farm, but the early indications from the row spacing is that the cane is performing well.”

A significant amount of this change has also been helped through collaboration

with MSF Sugar on Project Uplift, which works with growers on adopting improved farming system practices including controlled traffic, minimum tillage, fallow break crops, and green cane harvesting and maintaining the trash blanket.

It is supported by the Australian Government Reef Trust Program which offers grant funding for drainage improvements as well as agronomic advice through MSF Sugar. Michael had been interested in adopting the SRA Farming System for some time and noticed that it was gaining greater acceptance in the Mulgrave farming community. When attending Australia’s first Regenerative Cane Farming Forum in Ingham in March 2019, Michael saw the benefits of the system firsthand and joined Project Uplift shortly afterwards.

Michael has received information and guidance from the likes of Cane Supply Field Officer (Mulgrave Mill), Matt Hession, and Project Uplift team members Noel Wright and Nigel Young, to add to information that he continues to receive from his neighbours. The project has also helped him invest in laser levelling, something critical for maintaining production in the Wet Tropics.

When CaneConnection visited in early November, Michael’s mungbeans were progressing well and were headed toward a harvest around mid-December, so long as wet weather doesn’t put a dampener on his plans.

“We will just see how it goes,” he said.

Michael said that mungbeans had the advantage of being a quick crop and would hopefully allow him to beat the wet season. However, he said he was also keen to give peanuts a go, especially for his loamy red soils, which represent part

of the farm.

“There are a couple of farmers who have been growing peanuts here for a long time, but it is also a new industry here in a lot of ways. For someone like me, wanting to put in 5-10 hectares, I can’t justify buying the gear so it is difficult to make the next step.”

He is still keen to give them a try and in the long term sees that GPS guidance is another next step to allow him to continue to improve soil health. These plans are parked for the time being due to the low sugar price.

He grows a mix of varieties including Q208[®], Q200[®], Q250[®] and Q253[®], with an increasing amount of Q240[®] over the last two years.

He said this year’s crop was probably down about 15 percent compared to 2018, mostly due to a very dry finish to 2018, followed by extremely wet weather in the first half of 2019.

“This year has been dry as well through the harvest, but as at early November we’ve had about 75mm more than this time last year, so the cane is off to a good start for 2020.”

He also soil tests extensively to make sure he is running the farm efficiently. “If the crop needs it, we put it on. If it doesn’t need it, then we don’t. We make sure we have all the information to make the right decision, and that’s the advantage of attending industry workshops, to make sure we are being efficient and making the right decisions.” ■





PREPARING AUSTRALIAN AGRICULTURE FOR A DIGITAL FUTURE

The *Growing a digital future for Australian agriculture* project is a collaboration between the Cotton Research and Development Corporation, Meat and Livestock Australia, Dairy Australia, Sugar Research Australia, AgriFutures Australia, Australian Wool Innovation, Horticulture Innovation Australia, Australian Pork Limited, Wine Australia, Fisheries Research and Development Corporation and Australian Egg Corporation Limited with research providers Griffith University, University of the Sunshine Coast, CSIRO and KPMG.

(Left) To achieve the \$100 billion industry goal by 2030 set by National Farmers Federation in 2018, the agricultural industry needs to embark on a digital transformation journey.

Australia stands at the precipice of improved agricultural output through the adoption of digital agriculture, but what is required to kick-start and navigate the process to capitalise on this future prosperity?

The recent Growing a Digital Future in Agriculture National Forum held at Parliament House, Canberra in September brought stakeholders from government, education, agriculture, research and policy together to address the opportunities, challenges and actions needed to allow Australian farmers, foresters and fishers to transform their businesses, livelihoods, supply chains and industries.

While agricultural digital technologies are already well advanced and available in the marketplace, research has revealed that adoption and utilisation remains low across the industry. This is due to many factors, not least a lack of human capability, knowledge and understanding of what digital agriculture is.

To achieve the \$100 billion industry goal by 2030 set by National Farmers Federation in 2018, the agricultural industry needs to embark on a digital transformation journey. This journey began in earnest at the national forum.

The forum marked the release of two practical tools to help Australian agribusinesses adopt digital technologies in a way that adds value to their farming business.

1. THE AUSTRALIAN AGRICULTURAL WORKFORCE DIGITAL CAPABILITY FRAMEWORK AND SELF-ASSESSMENT TOOL

This tool provides the analysis and framework for education providers to develop a curriculum to meet future demand for digital skills in the agriculture industry.

This framework better enables the Australian tertiary and VET sectors to develop and deliver courses valuable for industry and helps individuals decide on the myriad of courses available online globally from learning platforms.

Achieving a practical national framework will also guide ongoing investments and priorities as they relate to up-skilling the agricultural workforce to better adopt technology and lift the digital maturity of the sector.

2. THE AUSTRALIAN AGRICULTURE DIGITAL MATURITY INDEX AND SELF-ASSESSMENT TOOL

To ensure that the journey of digital

transformation is purposeful and effective, it is important to first undertake an assessment of the industry to identify areas of digital strength and areas for development.

The development of the on-line digital maturity index and assessment tool is considered a useful first step for digital transformation. CSIRO has developed a world-first digital maturity index and assessment tool specifically for agriculture, which encompasses five key pillars.

The tool can serve a diagnostic and monitoring and evaluation function for digital transformation. It helps agribusinesses and individual agriculture sectors to evaluate their current levels of digital maturity, identify areas of strength and weakness, as well as assist them in setting goals, and in developing and evaluating targeted digital-improvement initiatives.

Ultimately, this assessment could help the agriculture industry develop a systematic digital strategy that, by design, should transform the industry from one that is ad hoc, to one that is purposeful and impactful.

The national forum was led by CRDC's Innovation Manager Jane Trindall.

"This is a simple to use self-assessment tool which can be used by anyone really in agriculture to get a very quick snapshot of how well their business is prepared for digital technologies and where you can spend time and investment in improving", she said.

WHAT IS A DIGITAL TRANSFORMATION?

Peter Alexander (Chief Digital Officer, Australian Government) addressed the forum with an interesting take on the term 'digital transformation', describing it by saying "it's really just 'transformation', technology is important but it is an enabler.

"What is required for the transformation is rethinking how you are going to deliver your products and services in the future," he said.

"This requires looking at your business in a greenfield way – what would you do (on farm) if you didn't have a legacy, if you could start from scratch, what would you want and what would that look like?" ■



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