

Spotlight

ON COTTON R&D

AUTUMN 2020

World of cotton
in Australia

Rethinking whitefly
management

Water efficiency
still improving





Ian Taylor

In the Spotlight

Welcome to the autumn edition of *Spotlight*.

The Australian cotton industry was the focus of cotton growing countries around the world with the International Cotton Advisory Council's (ICAC's) Plenary Meeting held in Brisbane in December.

In particular, our research was in the spotlight, which as ICAC Executive Director Kai Hughes says, has driven the efficiency, sustainability and productivity of Australian growers. While our growers have achieved yields of up to 2000 kilograms of lint per hectare, the world average is around 850 kilograms. Furthermore, we have one of the most robust research agendas in the world in terms of investment and number of researchers. The world is looking to us for guidance and we, as ICAC members, are on-hand to assist. Australian researchers, most supported by CRDC, featured heavily at the conference.

True to our name as world leaders of sound research, researchers led by QLD DAF's Dr Richard Sequeira have developed a new matrix for silverleaf whitefly management. A new mobile application is also being ground-tested to monitor whitefly. These two developments are a result of consultation with growers and agronomists, as we strive to manage pests in the most efficient and effective way.

Additionally, the ability of our industry to continually improve and adapt is illustrated through our 2019 Grower Survey, in what was a challenging season due to widespread drought. We have provided a snapshot of what it is telling us in this edition, and I would encourage you all to read the report in full, available on our website: www.crdc.com.au/publications/growersurvey.

Cementing our place as the most efficient growers in the world in terms of water use, we have included the results of the most recent irrigation benchmarking survey. It shows our growers are becoming even more productive. Compared to the 2012-13 study, cotton growers have improved water productivity to 1.20 bales/ML, up 0.06 of a bale/ML on previous studies, where efficiency was 1.12–1.14 bales/ML. This is a credit to growers and researchers.

While we continue to make incremental improvements in many areas of growing, farm safety still remains a concern for CRDC. We are pleased to be a part of the formation of a new group of RDCs to focus on bringing the number of deaths and injuries on our farms down.

Recent research for CRDC suggests that, comparative to other high-risk industries, farming is falling behind in terms of WHS. We look forward to everyone involved – RDCs, farmers and staff, working together to make our farms the safest workplaces in the country.

In our last edition of *Spotlight*, we talked about the industry's work in ensuring biosecurity preparedness, and in this edition, we talk about putting this plan into action with the arrival of fall armyworm in the Torres Strait. We would like to assure the industry that together with Cotton Australia, who leads the response, we already have research we can use to address this incursion. Please stay tuned to the Cotton Australia, CRDC and CottonInfo websites for more information as it becomes available. In the meantime, please download the fall armyworm ID guide from the CottonInfo website and be alert for the presence of the moth or larvae as we go about our business.

Last and not least, we pay tribute to Peter Lonergan, one of the industry's most faithful researchers of disease pathology. Peter spent his career working in the cotton industry. His contribution to both the industry and the Narrabri region cannot be understated. Vale Peter.

With recent rain - which we hope continues to all growing regions - have a safe and productive harvest, and hope for bigger things to come next season.

Ian Taylor
CRDC Executive Director



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ON THE COVER: Cliff White, Omnicotton Australia and Renee Anderson, Emerald cotton grower and current Nuffield Scholar at the ICAC meeting last December.

Want to see more of Spotlight?

This edition can be viewed online at: www.crdc.com.au

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Tweets from CQ

QLD DAF technical officer Leisa Bradburn, getting totally hands on with segment picking the CRDC-funded square retention and compensation trial at Emerald.

This season there are a number of sites across the industry including Emerald, Dalby, Brookstead, Goondiwindi, Leeton and Whitton.

The trials aim to understand the impact of early season retention for yield potential of Bollgard 3 varieties particularly as the yield ceiling continues to go up. Research aims to calculate how important those early squares are on crops grown in different environments for final yield and crop maturity.

Picking in Central Queensland started in January, and QLD DAF's and CottonInfo's Sharna Holman says from talking to agronomists, there are varied yield results after a tough, hot season. The grower, whose farm the (pictured) trial is on, finished picking in early February, just before receiving much needed rain in the region. A number of growers are still picking, while others are looking to grow on their fields.



MELANIE JENSON

Yes it's on again! Registrations are open for the 2020 Australian Cotton Conference.

We're here for good!

Save the date, because the Australian Cotton Conference is 'Here for Good'!

The Conference Committee have plans well underway for the most anticipated event on the cotton calendar, with this year's theme 'Here for Good'. The date has been set for August 4 to 6 2020 at the conference's nostalgic home at the Gold Coast Convention Centre, Broadbeach and registrations are now open.

"We really hope the New Year has brought much better conditions for all of you doing it tough on the land at the moment," secretariat Tracey Byrne-Morrison said.

"At times like these, it's even more important that we come together."

"We will be sending out updates and key speaker announcements from now until August, so keep an eye on your inbox, and if you're not signed up to our newsletter, please do.

"For new attendees, we'd like to make mention of ways we make attending easier, such as our child-minding service located in the conference venue, access to nearby accommodation, transport services and all the amazing eateries and restaurants at Broadbeach.

"We offer family and staff rates for delegates and accommodate a range of food options.

"The hashtag for this year is #Cotton20, so we'd love to see people using that as early as possible if they are presenting, attending or a trade exhibit."

The event brings together all sectors of the cotton industry – new and experienced farmers, agronomists, researchers, brands and marketers, students, supply chain partners, industry bodies and cotton groupies who come together to look at the challenges and opportunities facing cotton, share and learn while listening to the world's best researchers, marketers and industry identities.

The conference committee has also put out a call for submissions from researchers for the popular three-minute thesis (3MT) segment. Applications will close April 30.

CRDC is a major supporter of the conference, and R&D Manager Susan Maas has encouraged researchers, and in particular researchers new to the cotton industry to be involved.

"The 3MT are a great way to expand your profile and meet other researchers and our growers," she said.

"For new researchers the conference is the ideal opportunity to gain a better understanding of the whole cotton industry, from growing to marketing.

"The 3MT concept was really popular at the last conference, it's like speed-learning for the audience!

"We have so much research we need to cover so these allow more presentations and information flow."

With over 100 exhibitors, the Cotton Trade Exhibit is the main hub for conference delegates to network and experience the latest product innovations and service offerings.

To subscribe to the newsletter, book or for more information, head to the website.

For more

www.australiancottonconference.com

ICAC brings world of cotton to Brisbane

The eyes of the world's cotton industry were on Australia in December.

THE International Cotton Advisory Committee's (ICAC) 78th Plenary Meeting with the theme Global Leadership: Pushing Cotton's Boundaries was held in Brisbane over four days, with support from CRDC as a major sponsor.

The Sofitel Brisbane was a hive of multicultural activity, discussion, networking and resolutions, all aimed at strengthening the cotton industry across the globe. A trip to the Darling Downs also took delegates and ICAC staff into the field, where they met growers, visited Bayer's laboratory and saw Australian researchers and research at work. They also learned how to distinguish male and female *Helicoverpa* pupae with a hands-on demonstration of pupae-sexing!

ICAC is an association of governments from cotton producing, consuming and trading countries, and is the only global intergovernmental group for cotton and cotton textiles. More than 300 people



NT Farmers Association Simone Cameron with CSIRO's Katie Broughton.



Indian delegates Shyam Prasad, Sanjay Sharan, Alli Rani Padmanaban and Shubha Thakur from the Indian Ministry of Agriculture and Farmers' Welfare.



Delegates from across the globe at the ICAC Plenary Meeting.

attended, from 23 member governments, including representatives from five international organisations and five non-member countries.

There were a range of international guest speakers, along with a contingent of 10 presenters from our world-leading crop of cotton scientists, who shared their latest research and expertise with a very attentive audience. Topics included soil health, plant breeding, energy, climate and resistance management, of which Australia is considered a leader.

"From a cotton point of view, Australia is one of the few countries in the world that is at the cutting edge of cotton research," ICAC Executive Director Kai Hughes said in his opening address.

"Therefore, it is very apt and appropriate that we should be discussing global leadership and pushing cotton's boundaries here in Australia, a country that has taken the lead in this area in so many ways."

With a mission to assist members in fostering a healthy world cotton economy, ICAC continually strives to operate internationally in the interests of the cotton industry. Its role is to raise awareness, provide information, and serve as a catalyst for cooperative action on issues of International significance.

"ICAC membership delivers tangible benefits in the form of increased access to statistics and critical technical information provided by the Secretariat and can lead

to enhanced participation in collaborative interactions in cotton research and development," Kai said.

"Perhaps most importantly, membership provides the avenue for a country's government and cotton industry to fully join with other cotton countries to discuss issues of international scope and significance."

The meeting was opened by CRDC Chair, Richard Haire, who was followed by Dr Steve Hatfield-Dodds, Executive Director of ABARES, within Australia's Department of Agriculture, who identified global megatrends in the cotton industry, along with the opportunities and challenges they would create. These trends are: growth juggernaut; empowered consumers; disruptive technologies; more from less; fractal politics and cascading planetary risks.

"Change and constant innovation will be needed to address these trends shaping agriculture, especially climate change, geopolitical realities and consumer choices," Steve said.

"The challenges should be seen as opportunities requiring intensive research, as well as consumer understanding and engagement."

Cotton traceability was high on the agenda

Presenters highlighted that consumers are increasingly demanding information on the origin and history of the products, putting pressure on retailers to provide

MELANIE JENSON

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transparency. Traceability technologies are expected to establish authenticity of fibre quality, establish fibre origins, quantify fibre purity and track the processing path from fibre to fabric. While some technologies can trace origins and enable quantification of the fibres in a blend, others add markers to fibres and claim authentic tracking of the marker along the value chain.

Implementing traceability technologies

carries a cost for businesses. The Plenary discussed whether governments should have a role in regulating traceability and noted that biosecurity and accurately informing the customers remains important.

Consumers are also conscious of waste created from different fibres, with microplastics a major issue across the world. The meeting heard that during laundering, research shows that

natural-based fabrics release more fibres than polyester. However, cellulose-based materials like cotton biodegrade very rapidly in aerobic aquatic environments when compared to microfibres released by polyester which biodegrade only over many years and eventually may enter the food chain.

Further to issues of sustainability, the circular economy was discussed. Delegates learnt that even though the

ICAC ED says impact of investment clear to see

In contrast to Australia, cotton is grown in countries around the world where literacy levels are very low among farmers. The Committee conducted a World Café conversation on two innovative technology projects: virtual reality cotton training and a soil & plant health digital application (app).

Virtual reality holds great potential for use throughout the cotton supply chain. The soil & plant health app is intended to assist in increasing yields, especially for smallholder farmers with little or no literacy.

Kai Hughes said that the previous (2018) ICAC Plenary Meeting was held in Cote d'Ivoire, Africa, where average yields are among the lowest in the world, averaging about 450kg of lint per hectare in West Africa and 350kg per hectare in East Africa, compared to a global average of just under 800kg per hectare.

"Today, we are in Australia where yields have at times exceeded 2000kg of lint per hectare and where water efficiency is amongst the best in the world," he said.

"But even so as you will no doubt see, Australia has not been spared the effects of climate change and this highlights the need for us to put climate change at the top of our agenda moving forward as well as research into developing drought resistant varieties.

"I have continuously talked about the fact that research is the lifeblood of cotton and those countries that have an effective and strong research base have the most successful cotton industries.

"Australia is no exception to this rule. It's Cotton Research and Development Corporation or CRDC is well renowned



CRDC General Manager R&D and SEEP Chair Allan Williams; Chair of the Organising Committee of Australia and Assistant Secretary in the Agricultural Policy Division of the Australian Government Department of Agriculture Dr Alison McMorrow; and ICAC Secretary General Kai Hughes, US.

for the quality of its research and aims to invest \$20m Australian dollars across 300 projects involving 100 partners in 2019-20 alone.

"But this investment will aim to bring in about \$2b gross value in additional cotton production by 2023."

Kai said the impact of this level of investment over the years can be clearly seen from the statistics on the CRDC website, also citing the fact Australian yields have been increasing by three per cent year-on-year but the level of engagement between CRDC and local farmers.

"In comparison, countries in Africa suffer from little investment in research and development and in many countries, there are few researchers."

As part of the ICAC strategic plan, this year ICAC will start setting up a regional research network for West Africa.

"Perhaps now is also the time when we should be exploring creating a research institute to service African countries or looking at how research organisations in developed countries can collaborate and assist those researchers in Africa in particular.

"We can't only be taking the lead in cotton research but in every aspect of our business from the way we grow or spin our cotton to the way we manage our farms, mills or factories and the way we treat and engage our people and communities," Kai said.

"And now, with so many global challenges to the future wellbeing of cotton covering climate change, water usage, sustainability, traceability, competition from synthetic fibres and so on, now, more than ever, is the time that we need to show global leadership as an organisation and community to tackle these issues."

circular economy is an economic system aimed at eliminating waste and the continual use of resources, virgin fibres are essential for the system to work, as virgin fibres assist in maintaining the strength and the quality of the final product.

From the product back to the paddock, soil health is a focus for ICAC. Healthy soils are the basis of healthy crops and biodiversity enhancement. The Committee was informed about the importance of maintaining soil physical properties, as any decline will take considerable time and cost to correct.

Cost of Production

As shown in analyses commissioned by CRDC, such as the annual Cotton Comparative Analysis, the cost of production remains a major challenge, not just for Australia but globally.

The meeting heard that the introduction of small-scale machinery and Integrated Pest Management can reduce cultivation costs, and that the costs and returns of introducing GM seeds should also be carefully examined. To increase yields, major steps should be made to optimise high density planting and canopy management.

Effects of climate change

Climate change impacts vary around the world and may result in reduced water availability, higher potential water use, increased incidents of extreme weather events and changes to the distribution of pests and diseases. Strategies to adapt to these changes should include international cooperation for increasing



ABOVE: European Union's Michel Fok; Mamdouh Botros, Al Amir Cotton Company Egypt; Maha Abdallah, Egypt; Mohamed Negm, Egypt and Suzan Ismail, Egypt.

ABOVE RIGHT: The ICAC Researcher of the Year, Dr John Yu from USDA receiving his award from ICAC Executive Director Kai Hughes from the US.

RIGHT: ICAC Secretary General Kai Hughes; Dharminder Pathak, Punjab Agricultural University, India, Dr Keshav Raj Kranthi, Head, Technical Information Section, ICAC and Esayas Kebede of Ethio Agri-CEFT, Ethiopia.

yields, improving production efficiencies and adaptive management focused on cotton productivity.

To improve yields, the Committee was informed that there needs to be an improvement in crop resilience to stress, efficient water usage and soil health and that this could be achieved through technologies such as heat tolerant varieties and novel growth regulators. In addition, regionally specific assessments, systems-based approaches and transgenic/digital technologies will be vital.

New cultivars can address production constraints, improve yield and fibre quality, and be targeted for each production region. However, the meeting heard that new cultivars will not solve some major



ABOVE: ICAC's virtual reality cotton training puts you right in the field.

LEFT: Cotton industry people travelled from around the world to attend the ICAC Plenary Meeting in Brisbane last December.

production issues: these need to be addressed by changes in soil and crop management.

Successful breeding programs require stringent processes for production and quality assurance to meet the enormous potential. Increased sharing of information from existing germplasm collections around the world are needed to address the challenges and opportunities.

Australia is a world-leader in resistance management

The meeting heard that two key factors in the success of resistance management plans in both weeds and insect management are that plans are supported by science, and second, that stewardship is supported by an industry extension and communication program.

Innovation in digital technology means new products are being developed that may facilitate long-term suppression of pest populations. Australia is the poster boy in this regard, with robust resistance management plan, screening and extension through entities such as CottonInfo.

The European Union will host the 79th Plenary Meeting in November 2020 in Seville, Spain.

UN puts plant health in focus

FOR the first time in history, the United Nations General Assembly has focused global attention on plant health by declaring 2020 the International Year of Plant Health (IYPH).

CRDC was represented at Parliament House in Canberra for the IYPH launch in February to help garner support across Australia to protect plants from pests and diseases.

The Director General of the UN's Food and Agriculture Organization, Qu Dongyu acknowledged the impact of the terrible bushfires on communities and our unique biodiversity.

"We have a unique opportunity in 2020 to increase global awareness of the important role of plant health for life on earth and to promote activities in favour of preserving and sustaining global plant genetic resources," he said.

"Protecting plants from pests and keeping them healthy, starts with prevention."

Crop protection including management of endemic pests and diseases and biosecurity preparedness, is a key part of CRDC's current (2018-2023) strategic plan, and significant investment has also been made in previous plans.

Australian plant industry research and development corporations are already

collaborating on addressing high priority plant health risks through the Plant Biosecurity Research Initiative (PBRI).

CRDC, Plant Health Australia (PHA) and the six other plant RDCs supported PBRI's symposium last year showcasing current plant biosecurity research. It was the first meeting of its kind in Australia to address biosecurity in this way. The symposium also aimed to help avoid duplication of research on common biosecurity themes and incorporated research by Better Border Biosecurity (B3) New Zealand.

CRDC, in conjunction with PHA, ran an incursion simulation named Exercise Blueprint in August 2019. The simulation focused on the (theoretical) detection of cotton blue disease and how the industry would respond, identifying the robustness of a response.

CRDC's RD&E over many years comes into play when protecting Australian cotton farms from exotic diseases by building knowledge of high priority pests with research looking at ecology, diagnostics and surveillance.

In addition, under the Australian Government Department of Agriculture's Rural R&D for Profit Program, diagnostic capacity for plant production industries will be boosted. It will be providing support



To mark International Year of Plant Health, CRDC's 2020 cotton calendar has been the theme *50 shades of green: the international year of plant health*.

for strategic and collaborative effort for diseases with partners in New Zealand.

The cotton industry's myBMP program's farm biosecurity module has recently been reviewed to reflect the changed responsibilities of growers under biosecurity legislation. Links have also been added to guide growers to Northern Territory and Western Australia biosecurity resources.

CottonInfo kicked off the International Year of Plant Health with its 2020 cotton calendar and monthly blog posts highlighting key factors to protect your plants' health.

For more:

www.planthealthyear.org.au

To report anything unusual:

Exotic Plant Pest Hotline

1800 084 881

Taking recycling world by storm

A young Australian scientist has taken on the most innovative minds around the world to win an international science prize at the Falling Walls event in Berlin late last year.

University of Queensland PhD student Rhys Pirie's glass recycling research was one of three winners at The Falling Walls Lab event hosted by the Australian Academy of Science involving 20 emerging innovators last year with the theme 'Which walls will fall next?'.

As a result of that win, Rhys went on to compete in Berlin where he became the first Australian ever to be awarded the Young Innovator of the Year award.

Rhys's ground-breaking research, co-funded by CRDC, has developed a chemical recycling process for glass that at the moment is destined for landfill, as

due to its different colours and size can't be sorted by traditional recycling methods. The glass can be turned into low-cost industrial feedstock used to make thousands of different consumer products, including fertiliser, tyres and toothpaste. Rhys is also looking at ways in which waste glass could also be used to create a low-cost amorphous silica additive to increase phosphorous fertiliser efficiency.

He says the win in Germany was surreal.

"I don't think I appreciated what a prestigious event it is until I looked at the pamphlet for the competition and saw that one of the judges was the Chair of the



Rhys Pirie has won an international science prize with his glass recycling research.

Nobel Foundation!" he says.

"It definitely took a while to sink in afterwards as well, I wasn't expecting to win."

It's also opened some doors for him.

"From a commercialisation perspective, we definitely had a big response from people in the recycling industry after the conference.

"It's hard to recall exactly how many companies got in touch but I would say at least

a dozen.

"On a personal note, it's been a great addition to the resume and I'm sure that no matter what happens it'll always be a memory that I'll look back fondly on."

Fall armyworm discovery puts all industry on alert

The exotic pest fall armyworm (FAW) *Spodoptera frugiperda* has been detected for the first time in Australia, in the northern Torres Strait and Northern Queensland.

CRDC and Cotton Australia are calling for people to be aware of what the pest looks like and be alert to its presence.

An Insect ID guide to help distinguish FAW from Northern Australian endemic species is available on the CottonInfo website. The guide was developed by QLD DAF's Sharna Holman, CottonInfo Biosecurity Technical Lead, with CSIRO Health & Biosecurity, Bayer, NAQS, Plant Health Australia and Northern Territory Department of Primary Industry and Resources. FAW has a strong resemblance to other species in Northern Australia, so careful inspection is required of any suspect specimens.

FAW is a tropical/sub-tropical pest that feeds on around 350 plant species. It prefers warm, moist conditions, and cannot tolerate cool winter temperatures. However, it is a strong flyer and highly mobile, and in North America can expand its range by around 2000 km each year from Florida to Canada, during the warmer months.

In its native range fall armyworm is often referred to as comprising two

subpopulations that look the same and can interbreed, but differ in their distribution, host plant preference and certain physiological features. The sample identified in Australia has been identified as the rice-strain (R strain) which has a host preference for rice, millet, pasture grasses and not the corn-strain (C strain) that feeds on corn, cotton, sorghum.

There are species of *Spodoptera* already present in Australia which can look similar to fall armyworm. Some are pests, such as lawn armyworm and day-feeding armyworm. *Spodoptera litura* (cluster caterpillar) is native to Australia and is a minor pest in cotton in Northern Australia.

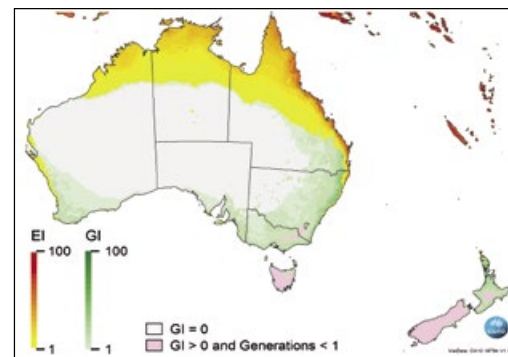
Climate suitability modelling performed by CSIRO and North-West University has shown that FAW can likely thrive in the northern regions of Australia, with the potential to cause economic impact across North Queensland, Northern Territory, Northern WA, and along northern and eastern regions of Australia where it can persist year-round (red and orange shaded areas). In Queensland and NSW, this includes horticultural and sugar cane producing areas.

"During the warmer months, it is likely to migrate southwards, posing a threat to all of the cropping zones throughout Australia (green shaded areas)," CSIRO's Wee Tek Tay said.

"The northern cotton region is likely to face year-round pressure from FAW, while the southern cotton producing areas are likely to face FAW as a summer migratory pest, much like green mirids."

CSIRO has completed considerable work to understand its ecology and how to control it including the presence of resistant genes. Genomic work is also being done on native and invasive FAW populations that are moving throughout the world.

"With the different resistance profiles and host races reported from different populations of FAW in North, Central and South America, understanding the origins of the invasive FAW populations at the global and regional scale will be necessary to help develop management and preparedness strategies for both Australia's agricultural industries and relevant governmental departments," Wee Tek said.



Climate suitability for *Spodoptera frugiperda* modelled using CLIMEX. The yellow-red shaded areas are climatically suitable for persistent populations to develop. Green-shaded areas are suitable for development of one or more generations during favourable seasons.

(Source: du Plessis H, van den Berg J, Kriticos DJ, & Ota N (2017) *Spodoptera frugiperda*. Pest Geography. CSIRO-InSTePP, Canberra.)

"CSIRO in collaboration with partners in China, Europe, Brazil and Africa has been investigating resistance profiles of invasive FAW populations and are planning similar work for the Australian FAW.

"In order to understand whether the invasive FAW is susceptible to Bollgard 3 it will be necessary to understand the origins of the global invasive populations to know whether it carries resistance to Cry2Ab and Vip3A.

"We have also been working with the Department of Agriculture, Water and the Environment and various industries to understand the potential biosecurity threat posed by different pathways of entry."

To report a sighting call the Exotic Plant Pest Hotline 1800 084 881.

For more:

www.cottoninfo.com.au/publications/insect-id-guide-endemics-exotics

Proper identification is important for knowing the insects in your field. Included in this edition is the Endemics to Exotics ID Guide which shows FAW characteristics in detail. Make sure all staff and contractors are aware of what to look out for by distributing the guide and pinning it up in sheds, offices and workshops.



FAW larvae have a pale yellow inverted 'Y' on forehead.



Male moths have mottled forewings.

LYLE J BUSS, UNIVERSITY OF FLORIDA

LYLE J BUSS, UNIVERSITY OF FLORIDA

Register now for Climate and Carbon in Ag conference

VARIABILITY of the Australian weather and climate is one of the most difficult risks to manage for Australian primary producers.

CRDC is aiming to help cotton growers navigate the future by investing in the Climate Research Strategy for Primary Industries (CRSPI), which is a partnership with fellow RDCs and governments aimed at introducing strategies and innovations related to climate and climate change impacts, adaptation and mitigation for primary producers.

The Climate and Carbon in Agriculture 2020 conference, hosted by CRSPI in late March, offers the ideal opportunity for cotton growers and other industry people to better understand climate and what it means for their business.

The speakers will engage participants on both mitigation of greenhouse gas emissions and adapting to our changing climate – from a research, production and business perspective. The focus will be on sharing and collaborating with an exciting mix of speakers, panels and discussion and will host producer discussions and perspectives, while exploring how concepts can be practically applied on the ground. Well known cotton industry researchers Janine Powell and Jon Welsh from AgEcon and CottonInfo will present on energy technologies, while Narromine farmer Andrew Gill will also take the stage as a speaker and moderator. Young farmers Nick Beer and James Traill will represent cotton on grower panels held with delegate researchers, industry advisors and policy makers.

Among the list of speakers are Dr Richard Denniss, Chief Economist and former Executive Director of The Australia Institute; Professor Mark Howden, Director of the Climate Change Institute at the Australian National University and a Vice Chair of the Intergovernmental Panel on Climate Change; John Connor, CEO of The Carbon Market Institute; and Hugh Killen, CEO of the Australian Agricultural Company (AACo).

NSW DPI Director of Climate R&D and CRSPI Chair, Dr Jason Crean, said the conference will showcase what is already being done by producers, some of the tools already available for businesses to use to adapt to climate change and reduce emissions, and to share some new ideas and potential solutions.

“Through CRSPI we’re looking forward to building the resilience of our primary industries by making well informed choices about responding to climate signals and investing in the research that’s going to make improvements in industry productivity and sustainability,” he said.

A recent industry collaboration through the Australian Government Rural R&D for Profit Program’s ‘Improved use of seasonal forecasting to increase farmer profitability’ project has improved the accuracy of forecasting tools and timing of these around key periods of risk for

agricultural applications.

“Research partnerships such as these are continuing to work on prediction tools to enable farmers to easily tap into the science and understand if there are financial or environmental benefits in changing management practices,” Jason said.

The conference will be held at the Adelaide Convention Centre on March 31 and April 1.

For more

www.crspi.com.au/conference

Solar saves costs and emissions

Andrew Gill and his family will save 1.1m litres of diesel, abating 3000 tonnes of CO₂ over the next 25 years on their farm at Narromine in NSW. Not only that, by installing solar to their diesel irrigation pump, they’re saving \$50 a megalitre on pumping costs, equating to \$500 per hectare (at 10ML/ha).

Furthermore, it’s taken just over four years to pay back the \$320,000 investment. The Gills were also eligible for \$85,000 of small-scale technology certificates under the Renewable Energy Target legislation.

“That’s an extra bale of cotton per hectare I don’t have to produce to keep up with someone using diesel or electricity only to pump water, and we’ve paid for our bore already,” Andrew said.

Andrew says with savings like these possible, he is amazed there hasn’t been a bigger uptake of solar on bores in the cotton industry, especially in dry years when river allocations are low and bores are more likely in use.

“My aim in attending CRSPI is trying to get growers to think about the economics and the environment,” he says.

“You can sit on a fence and wait for price of installation and the infrastructure to come down, but if you can save enough money to pay it back in the meantime, why wait?”

“Let’s face it, when it comes to mitigating emissions, the debate often gets stuck around whether you’ll do something as a result of climate change or not, but that is irrelevant from an economic perspective, it’s a win-win.”

What puzzles Andrew is the slow take up of solar on pumps in the cotton



CLARE GILL

industry, given its record as early adopters of technology.

“The cotton industry went from no GM cotton to nearly 100 percent in a few years, and we went from largely using traditional pickers to baler-pickers in two to three years.

“We are not laggards – we are innovators and early adopters with technology but we are not with using renewables on-farm.

“Irrigation is 25 percent of our gross margin, so it is a likely place to start to try to make savings.”

Andrew says as primary industries become more consumer driven, growers must move forward to meet these expectations, which may require engaging a consultant or doing the groundwork yourself.

“From experience, installing solar on pumps can be a bit of minefield in terms of cost-benefit analysis, so make sure you do your research to find the right technology and installer with a good track record.”



Whitefly management takes new turn

Leading industry entomologists have established conclusively that a silverleaf whitefly management system based solely on monitoring adults is no longer fit for purpose and have developed a new support tool for industry.

CROP managers now have a new sampling and decision support package developed for better managing silverleaf whitefly (SLW). The long-term research project involving CRDC, QLD DAF and CSIRO is to bear fruit this season with the completion of the first stage of a new framework.

The first stage of the research involved the development of an interim version

of a new spray decision support tool (DST), which was previously known as the 'whitefly matrix'. The DST is an Excel workbook which includes a data entry worksheet and a visualisation worksheet, available to crop managers for road testing this season (2019-20).

Leading industry researcher Richard Sequeira says the whitefly research program began in 2014 in response to reports from industry which indicated significant inter-regional variability in the usefulness, cost effectiveness and accuracy of existing whitefly management guidelines, which Richard had developed in the 1990s.

CSIRO's entomology team based at the Australian Cotton Research Institute (ACRI) of Tanya Smith and Dr Simone Heimoana, led by Dr Lewis Wilson and guided by Richard, began the task of validating the ecological and population dynamics principles and assumptions on which the existing whitefly management guidelines were based for southern cotton growing areas.

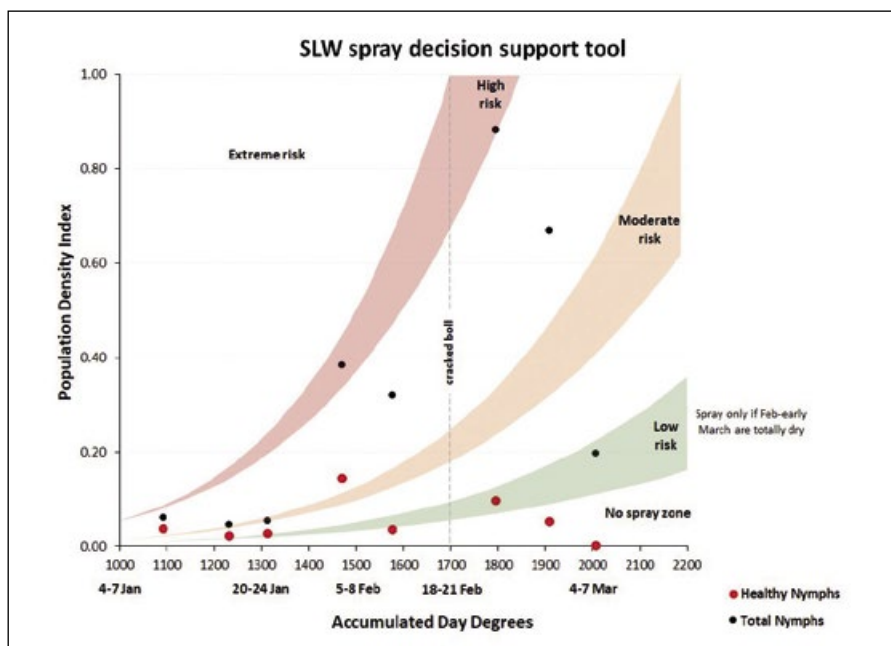
After five years of research from 2014-2019, followed by further collaboration between CRDC, QLD DAF and CSIRO in the 'Improved management of silverleaf whitefly on cotton farms' project, the team led by Richard established conclusively that a whitefly management system based solely on monitoring adults was no longer fit for purpose.

"A new framework based primarily on monitoring whitefly nymphs (juveniles) in the lower canopy (node 11 down from the terminal) and the activity of beneficial insects which are integral to whitefly control is now being developed," Richard said.

"The new (interim) DST is relatively straightforward to use but requires distinction between nymphs that are alive (red eyed nymphs) and those that have succumbed to various sources of mortality.

"Further characterisation of mortality would be informative but is not necessary for making spray decisions.

"A whitefly management system based solely on monitoring adults was no longer fit for purpose."



The use of the interim whitefly DST to visualise actual data from a crop sampled in NSW in 2019 is shown in Figure 1. At around 1475 Day Degrees, the population density index for total nymphs (black dot) was firmly in the high-risk zone whereas the corresponding index value for healthy nymphs (red dot) was indicating around 60 per cent mortality of nymphs. In the absence of mortality, this whitefly population would have put the crop at a high or extremely high risk of severe lint contamination.

The progression of red dots over the season indicated very high natural mortality of whitefly which largely neutralised the lint contamination threat after cracked boll thereby helping to avoid intervention with chemical insecticides.

"A phone app for whitefly sampling which accurately detects the number of healthy large nymphs on a leaf, currently in the final stages of development via another CRDC project (see next page) will eventually subsume the whitefly DST and 'automate' whitefly management in cotton."

The phone app should minimise the need for consultants to develop skill in identifying whitefly nymphs in different states (healthy, parasitised, predated).

"Nevertheless, a basic level of this skill would assist crop managers in better understanding whitefly population dynamics and making more effective whitefly management decisions," Richard says.

How to use the DST

Users of the interim whitefly DST will need to input two key pieces of data: the crop accumulated Day Degrees (DD) at the time of sampling; and the number of healthy nymphs on each leaf at the eleventh nodal position.

Researchers say that extra effort

to estimate the total number of large nymphs on each sampled leaf regardless of their state (including predated, parasitised, dead from unknown causes, healthy) would enable the crop manager to determine the level of mortality contributed by various natural enemies and use this information in the decision-making process.

By way of example, following a crop check and assessment of large nymph numbers on a sample of leaves at the eleventh nodal position, the crop manager inputs the counts for each leaf into the data input sheet of the Excel workbook. It then crunches the numbers and updates a chart which gives the user a real-time visualisation of the whitefly population density in the crop in relation to the risk of lint contamination, and the imperative for intervention (spraying).

For more

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Smartphone applications enter battle against whitefly

The way cotton crop managers monitor and manage silverleaf whitefly and aphids is about to be revolutionised with new technology.

Currently, when monitoring crops, bug checkers must examine each leaf by hand and manually record the presence of each pest. However, a new smartphone application will replace that process by taking a picture of the leaf with a phone, which counts silverleaf whitefly (SLW) nymph numbers, interprets and logs the information automatically.

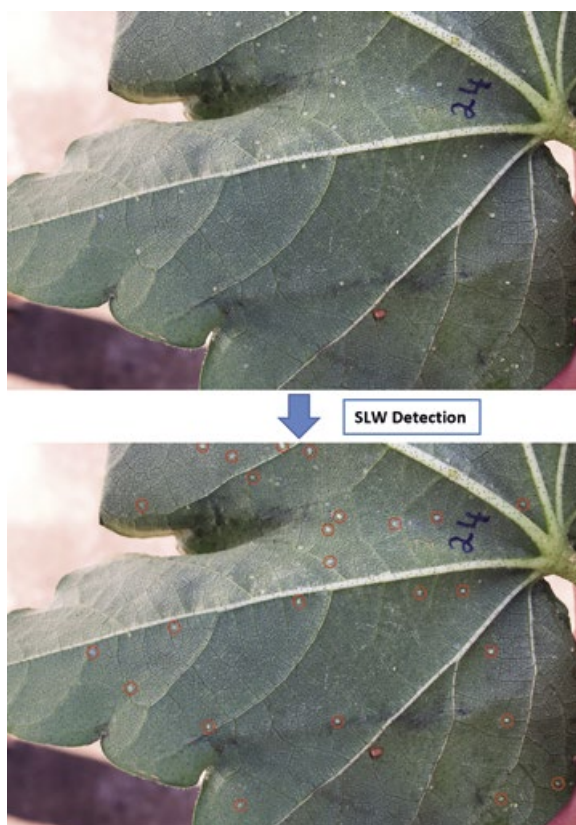
The University of Southern Queensland and QLD DAF partnered with CRDC to develop the app which refines the monitoring process dramatically and reduces the likelihood of human error.

Developed by Dr Derek Long and Dr Alison McCarthy from the University of Southern Queensland in partnership with QLD DAF's Dr Paul Grundy, the app will run a scoring process that counts nymphs and integrates this information with crop development and pest density thresholds to assist the user to make better informed management decisions.

Potentially, nymphs have always been a preferred target for SLW sampling due to their lack of mobility and indication of the next emerging generation. However, their small size and random distribution on the leaf has made them a difficult target hence the current thresholds focused on the winged adults and a presence or absence binomial sampling strategy.

Counting SLW nymphs instead of adults will give a better picture on the impact of beneficial insects and spray applications and will also better assess future population trends, instead of just the current outgoing adult population (see story previous page).

Using image analysis from geotagged smart phone photos also allows users to create maps of where pests may be



How counting whitefly nymphs will look in the very near future by using smartphones.

building more rapidly on particular farms or fields.

It can also allow timely, impartial measurement of the efficacy of insecticides which can often have people second-guessing the results within the first weeks of application.

Three main benefits are anticipated from digitising the insect sampling process for cotton pest management:

- ◆ The sampling process will be faster, enabling larger samples to be taken at the same time.
- ◆ Variability between people conducting sampling will be less as the app is not dependent on experience or a person's eyesight as detection is determined by the app's detection algorithm.
- ◆ The data is logged on a connected smart device, enabling easy sharing of data with clients or (if permitted by the

crop owner) within teams.

Paul Grundy, who is also CottonInfo's Integrated Pest Management (IPM) Technical lead, says the project team is also interested in the potential application for this app in area wide management (AWM).

"While the app can function independent of data connection services, some users may wish to share data within a closed group to assist with AWM strategies.

"For example, growers could be potentially warned through the app that whitefly is flaring in their valley and that they sample more frequently for whitefly or alternatively consider changes to the commencement of application windows for products such as pyriproxifen as part of the industry's resistance management program."

Development of the app started in both glasshouses and commercial cotton farms in the 2018-19 season. A closed beta test is currently underway in this 2019-20 season, and a public demo app for the nymph counting algorithm is planned for release in late 2020.

CRDC and the project team will be looking for a partner/s to take the app forward into a full release, including maintaining the app and integrating it into their services and there will be an Expression of Interest call in the near future. This will be advertised on the CRDC website.

For more:

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Australian cotton growers continue to improve

The NSW DPI Agriculture Water Productivity Benchmarking team has finalised their CRDC-supported water productivity benchmarking results for irrigated cotton for the 2017-2018 season, showing growers are making continuous improvements.

Compared with last time benchmarking was undertaken in 2012-13, cotton growers have improved water productivity to 1.20 bales/ML, up 0.06 of a bale/ML on previous studies, where efficiency was 1.12–1.14 bales/ML.

“It might sound trivial – 0.06 or 0.08 bales/ML – but it’s a significant improvement in water productivity compared to previous benchmarks from five, 10 and 12 years ago” said project leader David Perović.

Whole farm irrigation efficiency (WFIE) has also increased significantly from around 70 per cent in 2006-07/2008-09,

Key figures

- Water productivity (GPWUI) increased significantly, from 1.12–1.14 bales/ML in 2006-07, 2008-09 and 2012-13, to 1.20 bales/ML in 2017-18 (Figure 1).
- It took 0.9 ML of total water (irrigation, rainfall & soil moisture) to grow a bale of lint in 2007-08, 2008-09 & 2012-13, and 0.8 ML in 2017-18.
- The irrigation water component of this total water accounted for 0.6–0.8 ML per bale in 2007-08, 2008-09 and 2012-13, and 0.5 ML in 2017-18.
- Whole farm irrigation efficiency (WFIE) also increased significantly from around 70 per cent in 2006-07 and 2008-09, to 83 and 81 per cent in 2012-13 and 2017-18, respectively (Figure 1).

to more than 80 per cent in both 2012-13 and 2017-18 (see Figure 1).

The work is part of more than 10 years of benchmarking projects monitoring water productivity of irrigated cotton to help facilitate continuous improvement in water use efficiency (WUE) and establish a benchmark, against which growers can compare their performance.

The team, which includes NSW DPI researchers Robert Hoogers in Yanco, Jasim Uddin in Trangie, Iain Hume in Wagga, Peter Regan in Orange, along with Ben Crawley, Daowei Sun and David Perovic in Narrabri, calculated the water productivity of 57 farms consisting of 240 fields, 18,673 hectares and 232,194 bales of cotton, which makes up approximately eight per cent of the industry. The team used surveys and interviews to collect data from 45 growers to calculate a farm water balance using WaterTrack software to calculate a gross production water use index (GPWUI) and whole farm irrigation

efficiency (WFIE), which is measure of how efficient water is being used.

A high WFIE indicates a high efficiency as most of the water is taken up by the crop and not lost through evaporation or deep drainage. WFIE values are also influenced by rainfall, however, and will be higher in drier years because a greater proportion of crop water-needs are met by irrigation. Any comparisons of WFIE across years needs to take rainfall into consideration before making interpretations.

GPWUI on the other hand, which measures bales per ML, is very stable across seasons and regions, and considered the gold standard for water productivity benchmarking as it takes into account all water used at the farm level.

“Our measure of GPWUI includes, of course irrigation water and effective rain, but also soil moisture, and harvested rainfall and water lost due to evaporation and seepage in storage dams,” David said. “These are sometimes left out of

GPWUI calculation and can give the impression that you’re doing better with your water than you really are.”

Long-term trends

The team has also undertaken long-term data analysis to establish long-term water productivity trends back to the 1980s and created an interactive dashboard which growers participating in the benchmarking project can access to compare water productivity results with their peers in their valley or across the whole industry, and to compare the KPIs that related to high water productivity.

The next step for the team is to increase participant numbers and to benchmark water productivity and water use efficiency in both irrigated and dryland cotton. The team also aim to identify practices that growers can implement to improve water productivity.

Growers or agronomists interested in participating in the project, please contact the team via the details over the page.



Grower uptake drives efficiency

The work by the team has found that cotton growers are continuing to improve water productivity. These improvements are attributed to increased yield from better agronomic practices and also reduced water input and reduced farm losses. The GPWUI and WFIE results are presented in Figure 1. Figure 2 also visually demonstrates the increase in efficiency as more water is now taken up by the crop with storage, channels, tailwater drain and field application losses reduced.

"The improvements in water productivity and water use efficiency that we've seen haven't happened by accident!" Daowei Sun says.

"Follow up work to evaluate the importance of water monitoring across the industry has clearly shown that growers, consultants and researchers have been focusing on water productivity improvements.

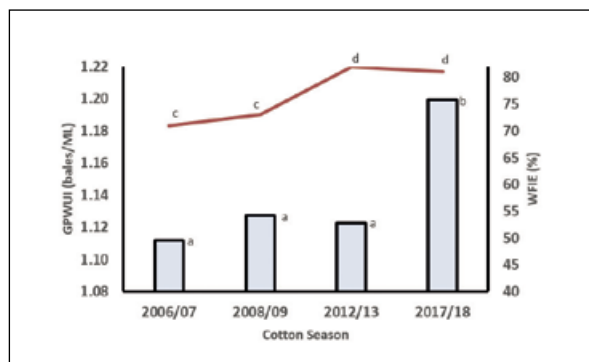


Figure 1. Comparison of the Gross Product Water Index (GPWUI – blue columns) and Whole Farm Irrigation Efficiency (WFIE – red line) over previous Water Productivity Benchmarking surveys. Different letters represent significant differences in analysis or variance.

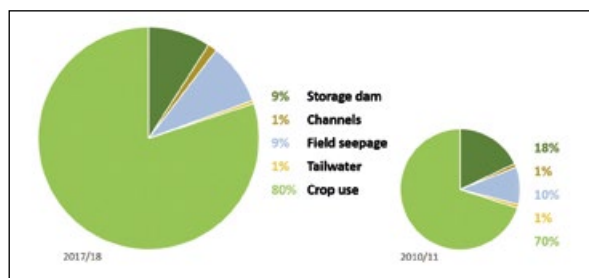


Figure 2. Fate of irrigation water on the farm from research in 2017-18 compared to previous industry data from 2010-11 published in CRDC and CA (2014).



Irrigation research across multiple organisations and departments has given growers the information they need to improve efficiency.

"Water – including availability, reliability and water use efficiency – poses a significant challenge to the cotton farming business.

"Water issues were sitting on the top list of business challenges and improving water productivity was the focus for all the businesses: this makes perfect sense."

Ben Crawley is also CottonInfo's Technical Lead for Irrigation. He says the industry and growers in particular

value water productivity benchmarking activities, that is, measuring water productivity at the farm level in term of bales/ML or \$/ML so they can aim for further improvements.

"People right across the industry are aware that water is our limiting factor, and of the situation of the social licence of water use in the cotton industry," Ben said.

"We found that growers who had a 'bales-per-megalitre' mindset, rather than 'bales-per-hectare' tended to do better in terms of water productivity while 'Dollars-per-megalitre' is another useful way to approach water productivity.

"A standardised and streamlined water productivity measurement is a more efficient way to help growers make informed decisions toward profitable

and sustainable businesses.

"To that aim, our team at NSW DPI is working on identifying strategies to streamline data collection, to make it easier for growers to participate in the next rounds of water productivity benchmarking.

"We are making it an annual process, to get a better handle on seasonal variation, and to monitor good years and lean years.

"We are also putting more of a focus on the drivers and limitation of water productivity, so that growers get more out of participating."

For more

Benchmarking water productivity of Australian irrigated cotton

<https://tinyurl.com/rkfnloc>

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Making farms the safest of places

Over the past 20 years there has been only a small reduction in the number of farm-related and non-intentional injury deaths across the Australian agricultural and fishing sectors.

However, these reductions while welcome, have not been as extensive as those in other known high-risk sectors such as mining and construction, making primary production comparatively the most dangerous industry in Australia.

Recognising the need to explore different approaches to get different results, nine Rural Research and Development Corporations have come together to form the Rural Safety and Health Alliance (RSHA).

"The people who work to produce our food and fibre are the most valuable asset to this sector, so more work needs to be done," said RSHA Executive Officer, Andrew Barrett.

The partners are CRDC, AgriFutures Australia, Australian Eggs, Australian Pork, Australian Wool Innovation, Dairy Australia, Fisheries Research & Development Corporation, Grains Research and Development Corporation and Meat & Livestock Australia.

"This collaboration seeks to leverage the commitment, commonality and resources of the RDC partners to create positive health and safety impact across the sector," Andrew said.

"During 2019 the alliance partners created the RSHA Investment Strategy and Investment Plan.

"The plan identifies a number of priority areas for investment, including leadership, critical risks, behaviour change and adoption, learning and communication.

"This year will see a number of foundational projects commence,



MELANIE JENSON

CRDC is committed to improving the WHS record of farms across Australia through a renewed partnership with fellow RDCs.

seeking to create impact which flows to the on-farm level, as well as addressing strategic change at the system level."

RSHA partners recognise health and safety is a complex challenge, in a sector which is like no other. "We are building strong relationships within the partners, including leveraging the impressive leadership and work of CRDC in the area of health and safety," Andrew said.

"We are collaborating with important stakeholders including the National Farmers Federation, Farmsafe Australia, Safework Australia and state-based regulators."

CRDC has previously invested in RD&E aimed at improving health and safety in Australia's rural industries through the Primary Industries Health and Safety Partnership (PIHSP), the forerunner to the RSHA. The cotton industry has put strategic programs in place in collaboration with Cotton Australia via Farmsafe, myBMP's WHS module, and AgSkilled training program delivering WHS courses.

With the latest WHS injury and fatality data up to 2014, CRDC recently

commissioned a study to update the data, which will inform the industry's sustainability reporting. Along with the dairy industry, the industries are the only two who actively collate WHS data.

The study found that while from 2014-19 the industry appears to have made progress in terms of reducing the number of injuries, fatalities are still occurring. These involved similar factors identified in previous studies: aircraft, vehicles and machinery.

"CRDC is committed to improving the safety of people working on farms," said CRDC R&D Manager Rachel Holloway, who oversees WHS investment.

"We, along with dairy, have led the way in terms of data collection and action around WHS on farms, and we're looking forward to sharing our knowledge with other industries to improve the status of agriculture across the board."

For more

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Industry-driven training to continue

AGSKILLED is a direct partnership between Cotton Australia, the Grains Research and Development Corporation (GRDC) and the NSW Government, which is investing \$14.7 million over three years into the program.

AgSkilled aims to upskill and better prepare the workforce for fast-moving change driven by industry innovation, research and technology through vocational education and training (VET). Flexible training, from single units up to Advanced Diploma qualifications, can be delivered. At the commencement of the AgSkilled program, the partners worked with Tocal College to develop a suite of new, tailored training programs designed to meet the specific and current needs of the cotton and grains industries. These needs were identified through industry networks and an active training needs analysis process directly with growers.

CottonInfo has successfully partnered with AgSkilled to deliver the accredited Cotton Pest Management course, which



has been recognised for its impact. Nine courses and 18 workshops were held. Along with CottonInfo, well-known industry trainer and education facilitator, CSIRO's Trudy Staines, was involved in rolling out the course. The partnership allowed Tocal to develop and deliver the course with the best technical resources and expertise available.

"The partnership between AgSkilled, Tocal and CottonInfo has provided an opportunity for growers and their employees to gain direct access to researchers as well as the CottonInfo Regional Extension Officers," CottonInfo Manager Warwick Waters says.

"This helps build industry networks and awareness of current

CRDC-supported research."

The AgSkilled Report says the program has led to a significant increase in the uptake of accredited training by the cotton and grains sectors in a range of training areas from basic skills to advanced agronomy. As the training is accredited, successful completion is measured against national standards of competency, which means there has been an increase of skills and knowledge in the industry in key areas, including safety. It has also contributed to providing a career pathway for these industries.

For more

www.agskilled.org.au

Get the inside knowledge on all things cotton

IF it's been researched, reported, investigated, monitored or reviewed in the last 25 years and it involves cotton, it's on Inside Cotton!

Maintained by CRDC, Inside Cotton is a digital library of materials relevant to the Australian cotton industry. The library is accessible via the website www.insidecotton.com and includes materials from CRDC, CottonInfo, past Cotton CRCs, corporate publications and the Australian Cotton Conference.

It's free to browse the site and you can search by author, title or subject for the information you're after.

"We would really like to highlight the value of this website to growers, agronomists, agricultural service providers, educators and students," CRDC R&D Program Manager Allan Williams said.

"With hundreds of CRDC-funded research final reports available, there is obviously a lot of really helpful information for crop managers wanting more detailed



Inside Cotton includes information around discoveries we may take for granted today, such as Gary Fitt's report from 1984 outlining the potential use of pigeon pea to attract heliothis.

understanding of research, so they can understand what it means for them in terms of crop management.

"It is also a useful resource for current or prospective researchers to access past research."

With research available as far back as 1984, the research paints an interesting

picture of the history of an evolving industry.

Early *Helicoverpa armigera* studies from the early 80s show an industry beginning to understand and come to accept the challenge of resistance to conventional pesticides, while the latest research reports show how technology is assisting insect management with a smartphone application.

The most recent research reports are also available for download – from compaction, water use efficiency and soil health, to how CRDC is supporting research into alternate uses for cotton fibre in futuristic clothing, gin technology and sustainability reporting.

For more

Inside Cotton

www.insidecotton.com

Cotton growers remain positive and supportive

LAST season (2018-19) was a tough one climatically for most cotton growers. Asked to describe the season in three words, the recurring themes were 'dry', 'hot', 'challenging' and 'tough' – although six per cent of respondents described it as good! Planted area dropped 30 per cent on the previous season to 336,000 hectares of irrigated and dryland cotton. Yield was back to 2.2 million bales, down from 4.5 million on 2017-18, with an irrigated average of 10 bales per hectare, compared to 11.8 bales in 2017-18, which also faced high temperature and low water availability. Dryland cotton averaged 1.2 bales per hectare, down from 2.5 the previous season.

While being a trying season, growers are continually making improvements in the way they manage their farms. Water use efficiency continues to be a focus, with growers generally adopting multiple strategies. Reductions in energy use are being achieved through a range practices, including minimising tillage and field operations, energy benchmarking and audits, installing more energy efficient equipment and the use of solar energy. Cotton growers are also strong supporters of the communities they live and work in, with 90 per cent involved in local community activities.

Positive messages

These are just some of the positive messages coming out of CRDC's annual survey of cotton growers. The surveys gather information about farming practices and growers' views on research, development and extension. This information helps inform CRDC about the benefits of the research it invests in. The 2019 Grower Survey includes baseline information about growers and their farm business including respondents' demographics (region, farm area) and season and farm information (yields, area of cotton). Each survey contains a number of focus areas, and this year that included: water, energy, nutrition and soil, *myBMP*, IPM and crop protection, natural resource management, industry research trials, community and social contribution, and industry sentiment.

In total 219 growers completed the



The latest Grower Survey is available as a PDF or can be viewed on the digital dashboard.

2019 survey. Of those who planted a crop, the average age was 49.9 years.

Climate was a big driver of results. Not surprisingly, 89 per cent said limiting factors for the crop were climate related: mainly hot weather and lack of water, with an average of 115mm of in-crop rain and low allocations.

Efficiency on the rise

The GPWUI (Gross Production Water Use Index) is an index to benchmark water use efficiency and relates total production (bales) to the total amount of water used, from all sources including irrigation water, rainfall and soil moisture. As it is an irrigation-focused index, results across fully irrigated land only were used. The results indicate that across all growers responding to the 2019 survey the GPWUI was at 1.32 bales/ML. This industry average is line with the recent NSW DPI water use efficiency benchmarking study, which showed an average of 1.2 bales/ML across industry.

Growers used several strategies on average to manage limited water.

In these limited water situations, most (73 per cent) planted to water availability. Some growers planted later, while 19 per cent planted both fully and semi-irrigated crops, with some single skip. Nearly 20 per cent stopped irrigating during the season and ploughed crops in.

Nitrogen use changed little from last

season: total N (kg/ha) was 325kg in fully irrigated and 166.7 in partially irrigated. The industry's advised rate is a total of 200 to 250kg/ha applied.

Nitrogen Fertiliser Use Efficiency (NFUE -kg lint/kg N) was 8.8 and 13.1 in partially irrigated. Research has shown the optimum to be in the range of 13–18 kg lint/ha with efficiencies outside this range indicating that N application has not been appropriate for the amount of lint produced. However, lint production may be limited by other factors other than applied N.

Soil surface testing was the most popular method to determine fertiliser rates (70 per cent), with similar levels for semi-irrigated and dryland crops. Petiole and leaf testing were similar across all systems, at around 30 per cent of growers surveyed.

Good news is that growers are increasingly adopting industry recommended thresholds (97 this year compared to 90 per cent in 2016-17) for pest management. The value of integrated pest management is obvious – 96 per cent of growers are preserving beneficial insects.

More growers are reporting that their rotation cropping decisions consider disease risks (88 versus 77 per cent) and rotation cropping decisions consider cotton pest risks scored the same. Where the practices are being used, growers are reporting that these practices are being used on almost all of their cotton crop.

Growers were asked where their business expenses are spent. The majority of business expenses are spent within the immediate local areas of the farm. Growers reported on average 80 per cent of their business expenses are spent locally. This result is consistent with the result reported in 2017. Smaller growers are more likely to spend more of their business expenses in this area (84 per cent of total business expenses). A further 13 per cent of business expenses are spent in adjacent regional centres.

For more

The full survey and digital dashboard are available on the CRDC website.

www.crdc.com.au/publications/growersurvey

Vale Peter Lonergan

The cotton industry has lost a passionate and dedicated scientist with the passing of Peter Lonergan in late January.

A life committed to research saw him spend his career with NSW DPI, starting in Tamworth in 1989 before moving to Narrabri and ACRI just a few years later, where for more than 27 years he worked in the pathology unit. During this time he also became a much loved member of the Narrabri community.

As a Technical Officer Peter worked with Drs Stephen Allen, David Nehl, Alison Sybe and Chris Anderson, to name a few, which gave him a unique insight into diseases and pathogens. He spent 20 years undertaking disease surveys watching disease arrive and evolve across the cotton growing regions.

He was also heavily involved in finding solutions. Peter was admired by fellow scientists for his ability to set up field trials and assessments, and spent 10 years running seed treatment trials.

However it was a combination of skills, acquired knowledge and experience that made Peter so valued by his peers.

"Peter was brilliant in so many ways – from pathogen identification, to his statistical analysis and GPS mapping skills," team mate and friend, NSW DPI pathologist Karen Kirkby says.

"I loved working with Peter because of the way he could explain disease issues:

his knowledge gained over many decades was extraordinary.

"His memory of where a disease was found in a particular field in a particular year was also amazing – he's say 'it was just out from a big tree' or some other landmark – his memory was great.

"I think Peter's legacy to the industry is his involvement in the NSW cotton disease issues and the seed treatment work he was involved in. He worked with Stephen Allen on Bion and its subsequent use.

"His legacy to me was his passion and



dedication to growers: to stick at it even when answers don't come quickly."
Vale Peter Lonergan.

Karen wrote a poem for Peter, we've included some of it here.

"Peter was involved in the bowling club, the jockey club, the football club and the men of league

I should list them all, but that would lead to serious fatigue

He did all this in his own time without a fuss, without a price

Volunteering his time, effort and friendly advice.

"Peter was a quiet achiever, busy storing all sorts of information

Books, journals, newspapers – enough for this entire nation

His famous sky scraping piles crowded on his desk and even the floor

No space unused, so visitors just stood at his door.

"I'd laugh to myself as people went to his door

To ask advice about one disease issue or more

He would wait a few awkward moments, look up and say NO

Then he'd freely give his time, and I would watch them go.

"Peter was a funny man too, practical joker you might say

If there was an opportunity, well – he liked to play."



Fulbright Scholar Shelby Young.

US scholar on vert trail

A chance meeting at an international conference has led a Texan Fulbright Scholar to regional Australia to study Verticillium wilt.

Shelby Young was studying at Texas Tech University in Lubbock when she met NSW DPI cotton pathologist Dr Karen Kirkby at a conference in 2017.

Shelby has since been working closely with Karen out of the Australian Cotton Research Institute at Narrabri, researching Verticillium wilt in Australian cotton. In the US, Verticillium symptoms express quite differently.

Shelby has been collecting data to field validate the disease risk matrix and

pre-season inoculum thresholds recently developed by Karen, and conduct field trials investigating the role nitrogen plays in disease incidence and/or severity. It has been well documented that high nitrogen can increase Verticillium wilt, however no quantitative data on the actual amount nor source of nitrogen is available for Australian cotton.

A CRDC Grassroots Grant through the Lower Namoi Cotton Growers Association has allowed Shelby to work with CottonInfo REO Elsie Hudson to get to know growers in the Lower Namoi and undertake sampling from fields in the region.

Depth and breadth of research on display

Organisers of the Australian Association of Cotton Scientists conference say the turn out, engagement and participation at the event shows the strength of the industry.

“There is a spirit and resilience across all the disciplines and people involved in the cotton industry that positively bristles with hope when given the chance to come together,” chair Oliver Knox said.

“Let’s keep making this happen in the future.”

The biennial Australian Cotton Research Conference was held in Armidale in October 2019, serving as a platform for cotton researchers to present and discuss concepts, key issues and the latest findings in research relevant to the Australian cotton industry and research community.

Over the three days there were 105 research talks addressing weed science, physiology, climate change and adaptation and how research has underpinned the development and delivery of best management practices.

“The conference also encourages networking and collaborations, and a better understanding of the scope of science performed across the breadth of the cotton industry,” Oliver said.

“We also aim to provide researchers with an opportunity to present their research and to promote cross-disciplinary collaboration.”

CRDC is a long-time major sponsor of the conference. The opening address came from CRDC’s Executive Director Dr Ian Taylor, with Paxton Payton of USDA, NSW DPI’s Guna Nachimuthu, CSIRO’s Katie Broughton, CRDC’s General Manager R&D Allan Williams and former CRDC Chair Mike Logan delivering keynote addresses.



Speakers in the Our Future panel discussion: CSIRO’s Dr Stuart Gordon; Cotton Incorporated’s Ryan Kurtz from the US; CSIRO’s Dr Warwick Stiller; Dr Jenifer Ticehurst, ANU; CottonInfo Gwydir Valley REO Janelle Montgomery; CSIRO’s Dr Steve Yeates; and CRDC’s Alan Williams.

Ian Taylor said the cotton industry and CRDC have been supported by an incredible group of scientists, which has kept the industry at the forefront of cotton growing, in terms of output and sustainability.

“Every project in some way goes to this end,” he said.

“From plant breeding, which takes eight to 10 years to bring products to the field, to short-term projects, studies and benchmarking, we aim for continual improvement for the benefit of growers and our cotton communities.

“To see so much wonderful work being undertaken across the three days of the conference is certainly testament to the strength and innovative nature of the cotton industry.”

At the conference dinner the AACS Awards were presented to Drs Katie Broughton and Yui Osanai for their Early Career Scientist Encouragement Award.

Dr Lewis Wilson, Colin Tann and Lily Pereg (posthumously) were made life members and the Scientific Publication Award went to the CSIRO cotton breeding team.

The AACS Annual General Meeting was held on the morning of the final day at which a new executive committee was elected unopposed, with Paul Grundy retaining the president role.

In closing the conference, Oliver announced that CSIRO’s Rob Long will chair the next conference, planned for 2021 in Geelong, Victoria.

Details of the 2019 conference, speakers and abstracts are available at the AACS website.

For more

www.australiancottonscientists.org



Research capacity has been boosted with the purchase of variable rate fertiliser applicators and a cotton picker for key research sites.

To be used by researchers at the Australian Cotton Research Institute (ACRI) near Narrabri and the Yanco Agricultural Institute, the purchases were supported through a joint initiative of NSW DPI and CRDC.

Gessner Industries at Toowoomba was engaged by NSW DPI to custom design and manufacture two variable rate fertiliser applicators suitable for small scale research experiments. Key elements of the design included GPS guidance technology linked to a variable hydraulic drive system capable of delivering low to high rates of granular fertiliser. The incorporation of secondary fertiliser boxes also gives the ability to side band and apply starter fertiliser and urea simultaneously.

“The technology will support current cotton research investments in both

northern and southern NSW,” ACRI Director Rod Jackson said.

“NSW DPI is really excited to have the new research equipment and while it took some time and effort to achieve the final custom design and get both units manufactured, we are 100 per cent happy with the outcome.”

NSW DPI researchers Dr Graeme Schwenke, Dr Guna Nachimuthu, Jon Baird and Hayden Petty put the new machines to work, successfully predrilling fertiliser treatments for the 2019-20 research trials at both ACRI and Yanco. The new machines have already generated significant cost savings as research staff are now able to incorporate all fertiliser treatments in the one pass.

“The machines will also improve our ability to conduct on-farm research as in

the past typically we have had to design nutrition trials with full field length plots,” Rod said.

“Often this is a deterrent for potential collaborators as nil fertiliser treatments usually have a negative impact on grower returns, but now we can reduce the footprint of the research and minimise impacts on collaborators.

“In the past NSW DPI has also had to engage third party commercial contractors to drill fertiliser treatments, which means the range of fertiliser treatments were often limited to what was practical with commercial machinery.

“Research trial establishment and operating costs were also typically higher.”

The second-hand Case IH cotton picker is being modified into a specialised research plot picker. It will replace the old machine at ACRI, which was decommissioned last year. Researcher Jon Baird says the purchase of the new picker will enable safer, and importantly more accurate harvest of research treatments in NSW DPI’s northern research trials.

Growing the North with Nuffield

Luke McKay from Kimberley Agricultural Investments at Kununurra in Western Australia, says growing cotton in the tropics of Northern Australia requires flexibility, understanding and anticipation.

Luke is coming to the end of his Nuffield scholarship, awarded in 2018 with support from CRDC and Cotton Australia. His interests lie in further exploring the cropping and irrigation systems best suited to the tropical north, which has unique challenges from other cotton growing regions in Australia – first and foremost being climate. Luke says the scholarship has provided valuable information by allowing him to visit countries where cotton is grown in similar climates to the Kimberley, in particular Brazil.

“Managing growth in the tropical climate of the North is challenging,” Luke said.

“There is no set recipe to follow year on year for tropical cotton production.

“Growers need to read the crop and

anticipate what it is likely to do against the weather forecast, and decide when and how they intervene with nutrition, growth regulators and irrigation to manipulate growth and development.

“The speed of growth and extremities of rain, cloud, humidity and temperature in the North mean managers need to remain flexible in their planning and implementation.”

Luke’s scholarship has enabled him to learn how planning and decision-making processes affect crop management, biosecurity and area wide management, along with considerations for best management practice in Northern Australia.

As farm manager of Kimberley Agricultural Investment’s (KAI) cropping throughout the Ord River Valley, north of Kununurra, he’s keen to use this information to help grow the industry there and share this information among others across the North to progress the industry.

“Outside the Ord Valley, there are currently operations being undertaken to develop and farm areas of North Queensland, and the Northern Territory industry is gathering momentum,” Luke said.

“My initial research focus was about finding and developing that recipe for



Luke McKay found through his trip to Brazil that there is no ‘set recipe’ for growing cotton in the tropics.

production, but the Brazilian farmers and researchers quite bluntly stated it doesn’t exist.

“Through my research and experience growing cotton in Kununurra, I believe that understanding and anticipating what the crop is likely to do, how you’re able to influence it, and tailoring your management to meet those needs is the first step in taking on the challenge of growing in the North.

“Stay flexible and be constantly assessing the crop,” is Luke’s advice.

He says cotton can be produced on a commercial scale in the North but understanding the risks and your ability to mitigate them is key.

“With a climate that allows year-round growth, crop destruction and fallow management present one of those unique risks.

“Thorough crop destruction is the most important operation for next year’s crop.

“We are confident the cotton industry will grow and be profitable in the North, and my study tour was beneficial in managing our crop and developing plans for expansion in the future.”

Driving support for industry

Emerald farmer Renée Anderson has recently returned from the US as part of Nuffield Scholarship received in 2019.

Renée was recently in California and last October travelled across Europe, the UK and the UN Food security forum. She’s also been to Singapore, Japan, Indonesia and Canada. Her research is focusing on highlighting better management practices that not only improve the social, environmental and economic sustainability of agriculture, but also clearly communicate positive farming practices to consumers and drive broader community support for the industry.

Renée grows mixed irrigated crops, including cotton, chickpeas and popcorn, across her 455-hectare operation.

Having worked in agronomy for 20 years, Renée has seen the barriers to effective adoption of better environmental management practices and consumer communications.

“Urban and rural communities alike have a keen focus on environmental, welfare and sustainability issues, which can directly impact farm management and consumer purchasing decisions,” she said.

“Building the capability of our industry to demonstrate the benefits of modern agriculture, drawing connections between practices, communication and social licence for the industry is critical.”

For more

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For more

www.cottoninfo.com.au/tropical-cotton-production

Interest in cover crops continues to grow

There is a growing interest in planting cover crops in cotton and broadacre systems, providing the potential to preserve soil moisture, improve soil health and manage weeds.





As part of the CRDC project 'Staying ahead of weed evolution in changing cotton systems', the QLD DAF Weed Science team investigated the impact of cover crops on weed suppression.

Research has shown that cover crops can provide a benefit in terms of weed control. However, in order for them to be effective, it is important to start with a clean crop and ensure that the cover provided is adequate and evenly spread.

Similar to findings from grower Jamie Grant in the following case study, research showed that when the cover was not adequate, lower amounts of cover provided a haven for weeds to germinate. A clean crop also provides the cover crop with a head start and improves its ability to out-compete the weeds.

The project also examined the effectiveness of the 2+2 and 0 strategy (two non-glyphosate tactics in crop, plus two non-glyphosate tactics in fallow and zero survivors or incursions). This strategy was found to be effective, and the use of tools such as WEED-IT can provide an effective way to incorporate other herbicides, and particularly follow-up for effective survivor control.

Darling Downs grower Jamie Grant has more than a decade of experience growing cover crops and was a pioneer in including millet in his rotation as a dedicated cover crop. Jamie has modified his machinery and farming style, after much on-farm trial and experimentation.

Jamie Grant: experience and experimentation lights the way

Jamie is a dryland cotton grower near Jimbour, Darling Downs in South East Queensland. His current crop rotation is cotton every second year and a millet cover crop every other year. He has included French white millet as a cover crop in his rotation for nearly a decade and as a result, he has been able to change from cotton every third year to every second.

Jamie said his main reason for including the cover crop is to preserve soil moisture.

“The cover crop increases infiltration from rainfall, prevents the majority of run-off in larger events, and also prevents evaporation of moisture from the soil,” he said.

“Weed management was not a major focus for the inclusion of the cover crop, however the cover from the millet does give an additional benefit in terms of weed control.”

Jamie also highlights the importance of a dedicated cover crop, as compared to a cash crop that is harvested for grain.

Cover crops are useful for weed suppression, moisture retention, soil health and conservation, while providing protection for new cotton crops.



“The main purpose of the cover crop is to preserve moisture and cover,” he said.

“When a crop is allowed to reach harvest maturity, it has taken extra moisture from the soil profile contrary to the objectives of a cover crop.”

Crop choice

Jamie has settled on French white millet as his cover crop, planted in 15-inch (38cm) rows. As the focus is to preserve soil moisture, millet is a short duration crop and can be grown to near maturity in six weeks from planting in October to December. In this time, the millet provides maximum cellulose to give the maximum length of cover from the stubble.

“While growing, the millet only uses approximately one foot or 30 cm of stored soil moisture,” Jamie said.

“The gains in soil moisture has improved fallow efficiency from 30 per cent in fallow to 70 per cent with the cover crop.”

Before the inclusion of the cover crop, the soil profile required approximately 600mm of rainfall to refill. Now the profile is refilled after 300mm. The millet also creates enough cellulose that the cover remains adequate until cotton is planted the following season.

Jamie's own research has shown that legumes tend to break down too quickly to provide the length of cover required, and French white millet has the right characteristics.

“I find that if I plant in October, I generally have 40 per cent cover the following November, when I'm ready to plant cotton,” Jamie said.

“I don't use sorghum as a cover crop, as the wider row spacing does not provide the cover needed, and the gaps in the stubble create a suitable microenvironment for weed germination and growth.

“I also noticed that in lighter rainfall events in sorghum and wheat stubble, the rainfall runs down the stalks of the standing stubble and creates a wet patch at the base.

“This is where the weeds grow and creates weedy patches across the field.

“A good millet cover crop is more even and allows the rain to penetrate the stubble evenly, and the stubble cover reduces weed emergence and the need to spray.”

Cover crops must reach maturity to create the maximum amount of cellulose for longevity. Other crops such as sorghum, wheat and barley take

“When a crop is allowed to reach harvest maturity, it has taken extra moisture from the soil profile contrary to the objectives of a cover crop.”



Jamie Grant and Jeff Werth take a deeper look at soil under cover crops.

too long to reach maturity and as a result use too much moisture.

Managing problem weeds

The main weeds on Jamie's farm include sowthistle, feathertop Rhodes grass and fleabane. Jamie places a high importance on weed control, however says "if you can grow good weeds, you can grow good crops".

Jamie's focus on weed management in the cover crop is to ensure adequate cover across the whole field, as gaps in cover create a haven for weeds.

"I do this by ensuring good germination, with quality seed, and I put as much effort into growing a good cover crop as I do growing cotton," he said.

"Double knocks are still an important part of the herbicide program and controlling weeds prior to crop emergence (both for millet and cotton) ensure the crop can get a head start to out compete the weeds.

"An in-crop spray of MCPA and Starane is always done in the millet to control volunteer cotton, however if a heavy cover crop is grown a spray to control volunteer cotton is not always needed."

Jamie also uses a controlled traffic system (CTS), as he considers minimising soil compaction to be very important, has been using WeedSeeker technology on a large boom for a number of years, and is now using a SwarmFarm robot mounted with a WEED-IT sprayer across his fields.

The big boom is generally used for broadacre spraying, with the relevant herbicide mixture for the weeds present. The WeedSeeker, and now the SwarmFarm robot with the WEED-IT, will be mainly used to control weeds in fallows between rain events, and broadacre sprays on mass germinations. The spray rig is also rotated across the tramlines in the CTS, so that it does not constantly run up and down the same wheel tracks. This allows subsequent sprays to control weeds that were run over by the rig in the previous spray.

Jamie's key learnings and advice to growers considering growing cover crops is to "work it backwards".

"Grow the cover crop that can accumulate the most moisture, and then grow the cash crop that will take the best advantage of the moisture.

"It is important to work out your moisture availability and your crop frequency.

"The moisture holding capacity of the soil will be better with a cover crop independent of soil type.

"The lower the capacity of the soil to hold moisture, the greater the effect evaporation has.

"This increases the importance of having a cover crop."

Growing good cover

Jamie has spent a couple of years determining how to germinate and grow a good cover crop. He also stressed the importance of purchasing quality seed.

“Patience is the key,” he said.

“It is important to do a good job with proper seedbed preparation at planting.

“An example of this when planting millet, is that it does not like to break through a crust while emerging.”

If Jamie gets enough rainfall for planting millet, he checks the forecast to ensure a further heavy rainfall event is not likely to occur within the next seven to 10 days. If rainfall is forecast, he holds off planting until the event occurs. This ensures the millet has the right conditions for germination and a good start.

Jamie finds that putting the effort into the millet crop means he reaps the benefit in the following cotton crop.

“A new tactic I’m considering is intercropping

– planting millet between the cotton on a 60-inch row spacing (152cm), and then spraying the millet out after three to four weeks,” he said.

“This will increase ground cover in the cotton crop, with the benefits of increased weed competition, better rainfall infiltration and reduced moisture evaporation in-crop, for the sacrifice of some surface moisture that will evaporate in summer anyway.”

Jamie said it is also of key importance to let neighbours know what cover crops you have, to minimise the risk of spray drift, which will reduce their effectiveness by either killing areas or impeding growth and creating areas of less than adequate cover.

“Mapping fields with SataCrop is an important tool to do this,” he said.

Effect on soil moisture quantified

Cover crops serve multiple purposes in a cotton rotation, with research underway to quantify the effect on water infiltration and moisture holding capacity of soils.

Research is also underway in the Riverina as part of the ‘Staying ahead of weed evolution in changing cotton systems’ project (see previous article). Researchers at NSW DPI in collaboration with CRDC, GRDC and QLD DAF have run a series of experiments at the IREC trial site near Whitton in Southern NSW to better understand the effectiveness of incorporating cover crops into cotton systems. The aim of this research is to evaluate the benefits that cover crops could provide when incorporated into cotton systems, especially improved water infiltration and water holding capacity of soil.

An experiment looking at cover crop species and rotation types has been completed and is being analysed by a biometrician to gain insight into the soil water dynamics as influenced by the cover crops. Initial results suggest the type of cover used is less important than the amount of cover or biomass that is grown when it comes to influencing on yield.

This season a spray out timing experiment is being conducted to determine how much biomass is required by cover cropping to have an influence on infiltration and water holding capacity. During the winter fallow a cover crop mix was sown and subsequently sprayed out at different growth stages.

NSW DPI cotton research agronomist at Yanco, Hayden Petty says the intent was to achieve varying amounts of biomass into which cotton was planted. This will be compared to a fallow that is the control for the experiment.

“Cover crops offer many benefits to a cotton



HAYDEN PETTY

Research at IREC is giving insight into how soil water dynamics are influenced by the cover crops.

farming system, as research is showing with weed suppression and soil health,” Hayden said.

“After harvest this year we will have fully analysed the data and will be in a position to offer a quantifiable effect on soil moisture.”

For more

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New tool for crop termination on the way

Ultra-high pressure water cutting is making its way onto implements used in the cotton farming system.

This technology, named AquaTill Injeticide, incorporates herbicide with ultra-high pressure water cutting. It's great news for cotton growers, especially dryland growers, as it offers an alternative method of crop termination with minimal soil disturbance post-harvest.

Not only is successful crop destruction important to growers to meet the requirements of the Resistance Management Plan, it's important to the industry as a whole, as ratoon cotton is an over-winter host for pests and diseases. With more herbicide genes being commercialised, ratoon control is becoming increasingly difficult with limited herbicide options available.

The AquaTill technology was first tested on mulched cotton in 2017, in a project with Sundown Pastoral Company's Darren Hart and Greg Butler from the South Australian No-Till Farmers Association and QLD DAF's Paul Grundy, supported by CRDC.

The initial trial found using ultra-high pressure water cutting had potential as an effective crop destruction method, and investigated the incorporation of herbicides for more robust control. CRDC supported this further investigation, working with Greg, Annabelle Guest and the Dryland Cotton Research Association.

The trials (using fluroxypyr) have been successful, and the team found that 'nicking' rather than completely severing the stem was most effective in delivering the herbicide dose and killing the plant.

"We think this is because the fluroxypyr translocates in the vascular tissue that has not been severed and that is why higher control is achieved with just a nick," Annabelle said.

"We have also been working with manufacturers and towards registration of the technology as a new method of herbicide application."

AquaTill Injeticide is the name given to the technology by the manufacturers of the ground engagement rig, a machinery manufacturer in Narromine, Central Western NSW.

A registrant is on board to expand their Fluroxypyr 400 product label to include AquaTill Injeticide as a new method for controlling



MELANIE JENSON

cotton ratoon regrowth. For interested growers, demonstrations will be set up across cotton regions in the 2020-21 season.

Research and collaboration has created a new option for managing cotton post-harvest, using 'injeticide'.

For more

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Giving our industry due credit

Anyone working within, or on the fringes of the Australian cotton industry over the past 12 or so months would be forgiven for feeling a little battle weary. The combined impacts of drought, bushfires and battles over water have brought the industry and its players under increased public scrutiny.

While it is easy to dismiss many of these opinions as coming from ill-informed keyboard warriors and unbalanced and unfair journalists, the pressure remains quite squarely with us as an industry. We must proactively work towards rebuilding the battered public image of the cotton industry and validating our social licence to farm.

This will be a slow process, but it begins with each of us continuing to display professionalism and best practice in our everyday work. Few of our critics would be aware of the level of study, professional development and on-ground research that backs up the decision making of this industry daily. Little do they know approximately 80 per cent of growers are involved in the Australian best management practice program *myBMP* demonstrating a huge commitment to ongoing improvement of its farming and natural resource systems.

But what of the researchers, industry professionals and consultants – the support crew?

For many reasons over the years, the suggestion of compulsory accreditation of agricultural professionals has caused division and anxiety. There have been concerns regarding overregulation, red tape, extra cost burdens to small business operators and lack of recognition of prior learning and hard-earned experience.

While it is easy to list the drawbacks,

CCA Director David Kelly supports the accreditation of ag consultants.



WILL KELLY

Gaining recognition

CCA Director and long-term member David Kelly is an agronomist with MacIntyre Independent Agronomists based in Goondiwindi and recently obtained his CAg accreditation.

David feels that the accreditation gave him the opportunity to gain recognition for the professional development in which he had invested so much personally and monetarily. He also believes that it brings a point of difference to his business. In the future he is hopeful it will give him the ability to take on more diversified work that might require such accreditation as either part of the due diligence of the client, or as a prerequisite to the role.

“It also gives you the incentive to push on with ongoing professional development to retain the accreditation in the future,” he said.

Despite the business advantages that the CAg scheme brings to David, he is keen to encourage anyone who might be interested in accreditation to ‘give it a go’.

“It would be great to see more members of the industry get involved to build the strength and recognition of the program,” he said.

“It is vital that we continue as an industry to build our reputation for professionalism and accountability.

“We need to be an industry in which the wider community can have confidence.”

such an accreditation could form part of the key to revalidating our credibility. Additionally, the lessons learned in other sectors such as banking and finance should lend a warning to those of us providing advice regarding the management of valuable ‘investments’ of

our farming clients.

For many years, CCA has offered its own recognition of members who provide annual evidence of their annual upskilling. These members have been promoted by the organisation as professional and are entitled to use

their accreditation for marketing and branding. This acknowledgement is available solely to CCA members and is mirrored in many associated professional groups including the Soil Society of Australia's Certified Practising Soil Scientist and AgSafe.

In November 2018, a long awaited and overarching 'whole of industry' accreditation was launched by the Ag Institute of Australia (AIA). Rather than duplicating existing programs, candidates are offered the opportunity to build on existing accreditation, through the Chartered Practising Agriculturist (CPAg) scheme.

The scheme enables participants to track their ongoing professional development experiences and activities including research, ongoing study and extension activities. AIA has allocated a continuing professional development (CPD) value to many of these activities, however organisations are welcome to submit events and activities for assessment of their CPD value. Registered CPAg members may use post nominals 'CPAg' (after their name) and the logo in marketing materials.

Taking the program to a completely different level, the AIA's Chartered Agriculturalist scheme (CAG) provides recognition of professionals at a more advanced stage of their career. Successful candidates are recognised for their leadership, commitment to professionalism, accountability and ethical practices and their demonstrated skills and competencies. Successful candidates can use their credentials and the associated post nominals and logo.

CAG accreditation is by application only and requires membership of AIA or another professional organisation such as the Agronomy Society of Australia or Crop Consultants Australia. There are costs in applying for and retaining accreditation. The process of application has been described by CCA participants as the equivalent of filling in a detailed job application.

For more

www.aginstitute.com.au

Learning to fly... the farm

Taking a crash course (not literally of course) in drone operation and imagery is one way people in the cotton industry are harnessing technology.

Workshops in Mungindi NSW, and St George and Pittsworth in Queensland, covered operation, application, legislation and using NDVI mapping. Former cotton grower Meg Kummerow from Fly the Farm developed the training specifically for the cotton industry.

She says the least understood aspect is definitely the legislation governing what you can and can't do when flying a drone – particularly flying beyond line of sight.

"People are also amazed at how much detail can be captured by some of the newer camera technologies – like finding insects in crop!

"Drone spraying is another 'cool' aspect of drone use; Pyka, a company in the US, is developing larger fixed wing drones to replace manned spray planes, it's amazing stuff."

CRDC R&D Manager of NRM Stacey Vogel said the workshops were supported by CRDC and CottonInfo, as part of the broader Cotton Landcare Tech Innovations 2021 Project, co-funded under the National Landcare Program Smart Farming Partnership Initiative.

"These workshops came about as a result of requests from landholders and others across the industry for training in drone operation and use," she said.

"With new innovative technologies

"People are amazed at how much detail can be captured"



Moree Plains Shire Council Senior Biosecurity Officer/Weeds, Ian Schwartz and Stanley Garrett learning to harness the technology on offer from drones.

emerging such as using drones to undertake large scale revegetation projects it seemed a timely time to run the workshops.

"We have been very pleased with the response, we had 46 attendees, and with strong interest to run more."

Meteora Agronomic Consulting P/L agronomist Liz Lobsey said she was really impressed with the content on the day.

"Meg really knows what she is talking about and delivered some very complicated information in a way that is easy to understand," Liz said.

"All my questions were answered without even having to ask the question."

For more

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Improving weed research and thresholds

The value of using mimic weeds in competition experiments in irrigated cotton has been quantified.

These mimic weeds have the advantages of availability of seed, uniform germination and growth, and the potential to confer better experimental controllability and repeatability.

"We all know that not all weeds are born equal and some are far more competitive than others, the difference between a small dwarf amaranth plant and a very large noogoora burr or sesbania is self-evident," says NSW DPI researcher Dr Graham Charles, who undertook the study.

"However more than 50 weed species can be commonly found in a single cotton field.

"Even undertaking competition experiments in the field with many of these weeds is difficult or nearly impossible, due to the need to gather large quantities of

weed seed, and then get them to establish at the right time and the right densities (without any other weeds being present).

"Currently it is just a matter of coming across a field with a really high density of just one problematic weed, and then talking the grower into letting an area be 'mismanaged' for research."

An alternative is using other crop species as 'mimic weeds' which give the advantages of easy seed availability, uniform germination and growth and the potential to confer better experimental controllability and repeatability.

Graham compared a range of morphological traits (plant height, node and leaf number, leaf area, leaf size, and dry weight) in mimic and real weeds. This included substituting Japanese millet for barnyard grass; mungbean for bladder ketmia; and common sunflower for fierce thornapple.

Graham said there were similarities and differences between the mimic and real weeds, but impact on cotton lint yield was most closely associated with weed

height and dry weight at mid-season.

"Mimic weeds can be substituted for real weeds in competition experiments where seasonal and environmental conditions are not limiting, such as with fully irrigated cotton, provided the plants have similar dry weight and height at mid-season," Graham said.

"In addition, if we know the typical height and dry weight of a weed species at mid-season, we can extrapolate the competition results from mimic weeds and we can easily work out how competitive the weed is, and hence, what the threshold for controlling the weed will be, without having to study each individual weed species."

"This should enable us to come up with a more accurate, multi-species weed control threshold for cotton in the near future."

For more

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Highlighting cotton's most valuable resource: people

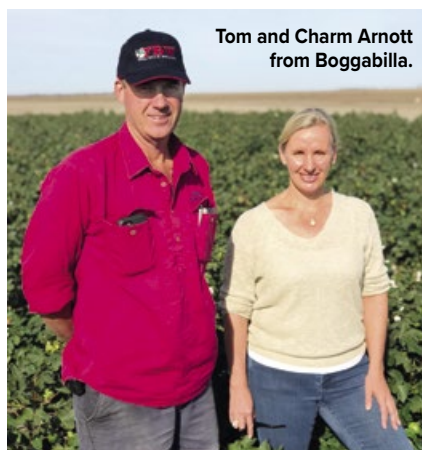
Get your nominations in for the 2020 Australian Cotton Industry Awards, to help industry recognise excellence and high achievement throughout the cotton supply chain.

Nominations are open to individuals and teams. Anyone in the industry can nominate themselves or others through the form on the Cotton Australia website. Recipients will be announced at a gala dinner on August 6, 2020, in conjunction with the 2020 Australian Cotton Conference, (August 4 – August 6).

Cash prizes are on offer across five categories:

- ♦ Bayer Grower of the Year
- ♦ AgriRisk High Achiever of the Year
- ♦ ADAMA Chris Lehmann Trust Young Cotton Achiever of the Year
- ♦ Cotton Seed Distributors Researcher of the Year
- ♦ Incitec Pivot Fertilisers Service to Industry Award

"The Awards are a highlight of the year as they recognise the hard work of all who make Australian cotton such a special part



**Tom and Charm Arnott
from Boggabilla.**

of our country's agricultural story," Cotton Australia CEO Adam Kay said.

"Whether you're a grower, a ginner, a product supplier, consultant, agronomist, or researcher, I strongly encourage you to nominate for the Awards and recognise those who have made enormous efforts to better our industry and country."

The 2019 Bayer Growers of the Year were Tom and Charm Arnott from Boggabilla, on the NSW-Queensland border.

"To be the recipient of this award was a great honour especially given all the finalists had incredible businesses," Charm said.

"The judging process has been an excellent opportunity to showcase our whole operation, and it gives others the chance to see how we are fine-tuning our farming business.

"In turn, we have also learnt from the other finalists, the judging panel and the broader cotton community.

"It has been tough in most cotton production regions this year, including for us in the Macintyre Valley.

"Farm productivity is much lower than usual but we would highly recommend everyone gets involved with this year's Awards program."

Nominations close at 5pm on Friday March 27 2020.

For more

[www.cottonaustralia.com.au/
awards-nominations](http://www.cottonaustralia.com.au/awards-nominations)



Bore pumps: is it time to repair or replace?

Many old bore pumps are inefficient or outdated and new technologies are offering increased productivity and efficiency. The question is, should you repair or replace your old pump?

Irrigators with groundwater allocations are mindful of the importance of pump and water use efficiency, however research proves that for many, current bore pumps are inefficient, oversized or outdated.

A new study by AgEcon's Janine Powell and Jon Welsh commissioned by CRDC has compared the standard line-shaft bore pump widely used by irrigators across Australia, to newer submersible

units available. The study found that, generally, by replacing or adapting their older systems of operation, growers are able to increase their water, energy and labour productivity.

The current standard pump used by irrigators is a vertical turbine pump (VTP), configured with the above-ground motor connected to the below-ground pump with a long, thin line-shaft. Line-shaft VTPs are

for the most part effective in the simplicity of their nature and have been working for irrigators since the first development of irrigated cotton farms in the 1960s and 80s. When working well, these VTPs systems also use slightly less energy per metre head than competing submersible systems. The researchers have found that many of the line-shaft pumps installed during the seventies and eighties are now

outdated and in need of regular repair work or replacement.

“While the repair process is a relatively simple one, it requires heavy industrial machinery to be outsourced off-farm, meaning issues surrounding access, timeliness and the high cost of sourcing cranes arise,” Jon says.

“In comparison, developments in technology have allowed submersible pumps to become more cost competitive with commonly used line-shaft VTPs.”

The submersible VTP operates with a motor located below ground, in the bore alongside and directly connected to the pump assembly.

“As submersibles operate without the long line-shaft system of connection, extra power is saved that is usually lost in the friction along the shaft, which can range from two to five kilowatts per 100 metres in depth.

“The general wear and tear issues resulting from the line-shaft, its bearings and motor pedestal components are also eliminated when using submersible VTPs.”

One of the key beneficial features associated with submersible VTPs, is its installation process, made efficient by its collapsible design, also making bore maintenance simple (without the need for cranes).

Janine Powell says the other salient feature of submersibles is the ability to easily check pump running amps and know the pump is running on its duty point, delivering the right amount of water per unit of energy.

“As we have seen with line shaft

Example comparison

- ◆ Complete repair overhaul of a diesel line-shaft VTP: < four-year payback
- ◆ Alternatively, replace with a submersible VTP: < eight-year payback

These scenarios do not value risk. A key benefit of a submersible is the timeliness of repairs and maintenance. Extended break downs in critical crop growth stages can cost tens of thousands of dollars, consideration of these risks may change the submersible as a value proposition.



A new study has found that by replacing or adapting their older systems of operation, growers are able to increase their water, energy and labour productivity.

pumps, diesel goes in the motor and if water is coming out then it's easy to feel at ease that the pump is working away fine, when in fact it may not be unless the time is taken to measure flow rates, head measurements and energy used,” she said.

“There are pros and cons, but submersibles are usually less costly to install and the installation process itself can be done using equipment that can be found on-farm, such as a front-end loader, crane truck or a simple rolling wheel with a forklift.

“Submersible VTPs also provide the option to reduce costs and improve the sustainability practices of broad-acre irrigators if operators choose to supplement traditional energy with renewable energy sources, most commonly solar.

“As technology continues to dictate Australian farming practices, it is also prescient to note the ability to easily integrate telemetry within the submersible set-up, allowing for the off-site monitoring of both pump performance and aquifers.

“This technology is significant in reducing the necessity for paid operating labour on-farm, as well as peace of mind of pump performance.”

While the study listed the apparent benefits of the newer submersible VTPs on offer, it also acknowledged that submersible pump lifespan is reduced with each start, therefore regular replacement intervals are necessary.

“Another finding was the importance for irrigators to be assessing their borehole hygiene with regular screen cleaning in order to save costs and gain the highest possible flow,” Janine said.

“There is no doubt that this screening process is made significantly more cost effective when using submersible pumps rather than the rigmarole required to clean screens for line-shaft pumps.

“Regular calculations of kWh or diesel required to lift one megalitre should be recorded to benchmark energy costs and ensure pump/motor energy efficiency.

“Maintenance and monitoring of either pump configuration is essential and will save both energy and money in the long run.”

For more

www.cottoninfo.com.au/energy-use-efficiency

Bridging the gap—weekly and fortnightly climate outlooks available

The Bureau of Meteorology is producing more climate outlooks, more often, providing better information for farmers and agribusiness.

For the first time, outlooks for the weeks ahead are now available, closing the forecast gap between the seven-day weather forecast and the existing monthly to seasonal climate outlooks. The new outlook information for the weeks ahead will also feature how much above or below average temperatures are likely to be in regions across the country, and the likelihood of different rainfall totals.

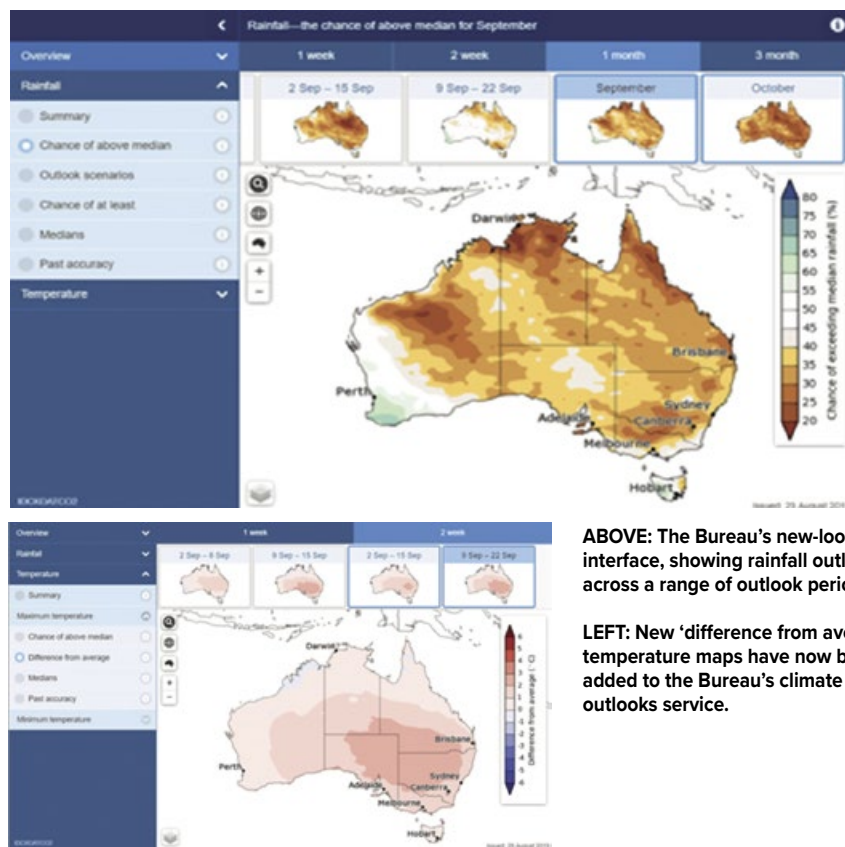
In addition, thanks to scientific improvements and the computational power of the Bureau's new supercomputer, an extra three-month outlook period is included. This is one month further than was previously available. For example, BOM's first summer outlook will appear in October rather than November, allowing planning decisions for summer to be made earlier.

More outlooks, more often

The outlooks will also be issued more frequently, providing farmers with the most up to date rainfall and temperature outlook information. Monthly and seasonal outlooks will now be issued weekly on Thursdays (twice as often as previously) and the outlooks for the weeks ahead will be released twice weekly, on Mondays and Thursdays.

The new suite of outlooks adds to the Bureau's range of tools that can assist farmers plan for future conditions such as a particularly wet or dry period. By providing outlooks across a range of time periods, this ensures the information can be applied to a broad variety of important risk-management decisions.

Which outlook to use really depends on the kinds of decisions the user is looking to make. For example, a farmer may want to know what the rainfall will be like over the next few weeks, to plan when to ease back irrigation or when would be



ABOVE: The Bureau's new-look interface, showing rainfall outlooks across a range of outlook periods.

LEFT: New 'difference from average' temperature maps have now been added to the Bureau's climate outlooks service.

a good time to harvest. Knowing a heat wave is likely in the next fortnight can allow better irrigation planning.

By subscribing, BOM climate outlooks can be sent direct via email.

CottonInfo's Climate Technical Lead Jon Welsh said publishing the multi-week forecast certainly helps join up the weather and seasonal outlooks, but caution remains on accuracy during this time period.

"This is an emerging area of science and inherently the most difficult to predict out of the three forecasting timescales (ie weather, multi-week and seasonal) so these models are also the least accurate," he said.

"There are only a handful of freely available multi-week models and when viewed collectively in a table, the ensemble can certainly aid in some early warning of broadscale changing occurring which can assist on-farm decision making.

"From a technical perspective the multi-week models are only run say, twice

weekly in contrast to the weather models which may be run every eight to 12 hrs, so it's important to identify how fresh the forecast is and what the other global models are saying."

Jon said the Madden-Julian Oscillation and the Southern Annular Mode will be key inputs into the multi-week models and predictability of these two drivers outside 21 days is limited.

"When outputs line up and rain is forecast, these can help logistical decisions such as arranging contractors, fertiliser and irrigation scheduling on decent lead times," he said.

The BOM multi-week model is one of five others summarised in the CottonInfo fortnightly e-news – the Moisture Manager. Subscribe at www.cottoninfo.com.au/subscribe

For more

www.bom.gov.au/climate/outlooks

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