

# Spotlight

ON COTTON R&D

**AUTUMN 2024**

**Coly: a story of irrigation,  
community & biodiversity**

**WAND now 24 hours**

**Does regen ag have  
a home in cotton?**





Allan Williams

# In the Spotlight

Welcome to the Autumn edition of *Spotlight*.

Firstly, on the back of an interesting summer of weather, it's always great to hear about and see some very impressive cotton crops around. It's a credit to you, our growers and consultants, who successfully manage these crops in so many varied climates, under such varying conditions.

In this edition we take a look at Coleambally, where growers have tackled the issue of soil variability with outcomes that are delivering a win-win solution: helping improve productivity and returning dollars to the community.

Coleambally town and the irrigation district surrounding it has a unique history which also includes protecting biodiversity and remnant vegetation. It's a region built on diversity and community, which has seen a resurgence in cotton growing over the past decade. In this edition of *Spotlight*, we include a series of fantastic feature stories on this region: we hope you enjoy them.

Looking further afield, late last year I travelled to India for the International Cotton Advisory Council (ICAC) meeting to talk about sustainability and the role of regenerative agriculture in cotton. In this edition we look at the risks and benefits of regenerative agriculture practices, with a focus on cover cropping. You can read about the plans for a regional cover cropping guide for growers and the on-farm experiments trialling new crops on page 14.

As you know, sustainability is already a core focus of CRDC's under Clever Cotton, our Strategic RD&E Plan for 2023-28, and cotton's PLANET. PEOPLE. Paddock Sustainability Framework. One of our nine themes is carbon, and we take a look at it in this edition. We've been part of a collaboration to deliver a carbon accounting tool – the Environmental Accounting Platform – with our fellow RDCs and it's now live for testing by cotton growers. We'd love to hear your thoughts.

As all growers know, ensuring the RDCs work together is essential for leveraging your levy dollars. With GRDC, we are continuing to forge a path in delivering technology to cotton and grains growers, giving you advantages your compatriots around the world can only dream of. One such example is WAND, which has just released new technology to give a 24-hour forecast for hazardous inversions. This is a game changer for time management and efficiency, along with reducing spray drift hazards.

Finally, I look forward to seeing you at this year's Australian Cotton Conference. CRDC is a foundation sponsor, having supported the event since the beginning. Through our support, growers receive a discounted rate to attend: just one small way that CRDC is delivering value back to you for entrusting us with your valuable research dollars. We look forward to bringing you the latest RD&E at the event – and of course, in the pages of *Spotlight*.

Allan Williams  
Acting Executive Director



CRDC acknowledges Australia's Indigenous people as the traditional custodians of our country, and recognises their continuing connection to lands, waters and culture. We pay our respect to Elders past, present and emerging, and extend that respect to all Indigenous people.



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**CRDC**  
COTTON RESEARCH AND DEVELOPMENT CORPORATION

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**Our mission:** To invest in RD&E for the world-leading Australian cotton industry.

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**ON THE COVER:**  
Biodiversity blocks are managed by the Coleambally Irrigation Co-operative in the Murrumbidgee.

### Want to see more of Spotlight?

This edition can be viewed online at: [www.crdc.com.au](http://www.crdc.com.au)

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The 2023 CRDC Chris Lehmann Young Cotton Achiever of the Year Emma Bond with CRDC's Acting Executive Director Allan Williams.

## Excellence has a name

**AUSTRALIAN** cotton growers are being urged to nominate themselves or someone they know for the 2024 Australian Cotton Industry Awards – celebrating excellence in the way Australian farmers grow cotton.

Demand for our sustainable product is increasing in Australia and globally. Along with large national crops in 2022 and 2023, and predictions of another significant crop in 2024, the Australian cotton industry is going from strength to strength due to research, innovation and improved farming practices and the commitment of growers to continuously improve their sustainability and environmental outcomes.

Nominations are open in the following categories for 2024:

- ◆ Bayer Grower of the Year
  - ◆ AgriRisk High Achiever of the Year
  - ◆ CRDC Chris Lehmann Young Cotton Achiever of the Year
  - ◆ Cotton Seed Distributors Researcher of the Year
  - ◆ IPF Service to Industry Award
- Nominations close March 29.

Individuals and teams can nominate others, or themselves, for the 2024 Australian Cotton Industry Awards through the online nomination form.

### For more

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



MELANIE JENSON

## Guiding optimised defoliation

**AS** we get toward the pointy end of the cotton season in major growing regions and harvest looms, decisions around defoliation are front of mind for growers. Not including harvest, it's one of the last operations of the season, and while knocking leaves off the plant may seem a simple business, poor defoliation practice can affect the outcome of the crop in terms of quality and quantity.

"Defoliant is an amazing example of how we've learned to exploit a natural process in cotton plants," says Paul Grundy of CottonInfo and Qld DAF, who has been involved in multiple research projects looking at defoliation.

"However, crop managers can run into difficulties with harvest preparation when the biological components of boll opening and defoliation are overlooked.

"For example, successful defoliation relies on the plant's vegetative growth having already stalled due to boll load and the depletion of nitrogen and moisture.

"If a crop's boll load is not at capacity, and nitrogen and soil moisture are readily available, the plant's internal hormone system will be signalling for re-growth.

"This will conflict with applied harvest aids (that encourage senescence), reducing their efficacy."

Another often overlooked factor is that the pace of defoliation is a biological process driven in part by day degree accumulation. As the weather turns cooler, senescence will slow and more harvest aid inputs will be required for successful leaf drop.

"Crop managers need to allow for defoliation (which often takes at least three weeks in autumn) in season length assessments when making management decisions around crop cutout and last effective flower," Paul says.

"The CottonInfo Defoliation Guide for crop managers explains why defoliation has become more challenging in the last decade and aims to provide readers with fundamental knowledge that they can use to overcome these difficulties and better optimise end of season crop management."

The guide, created by Paul and CottonInfo in conjunction with the *Australian Cotton Grower* magazine, takes a fresh look at defoliation and boll opening from the cotton plant's perspective. It examines crop, environment, chemical and application factors and how these interact during defoliation and boll opening.

Topics covered include how defoliation and boll opening works, important steps for harvest preparation before you defoliate, the impact of environment and crop factors on harvest aid performance, the mode of action for defoliant, boll openers and desiccants, crop maturity for timely harvest aid application and how to improve defoliant application efficacy.

### For more

#### CottonInfo Defoliation Guide

[www.cottoninfo.com.au/publications/defoliation-optimising-your-end-season-management](http://www.cottoninfo.com.au/publications/defoliation-optimising-your-end-season-management)

# Know if it's going to be hazardous – 24 hours ahead

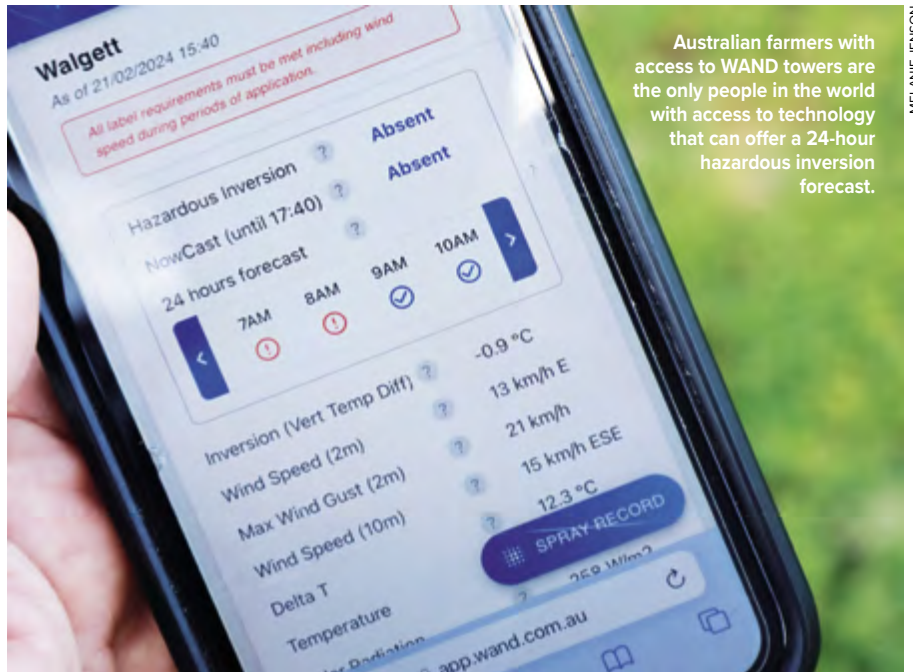
**THE** Weather and Networked Data platform, WAND, has released a game-changing forecasting feature, which extends the hazardous inversion forecast out to 24 hours. Broken into one hour segments, the new feature supports more strategic decision making when it comes to spray operations.

The 24-hour forecasting provides significant benefits in terms of operational planning for staff, machinery and chemical needs, says Goanna Ag CEO Jay Jalota, who partnered with CRDC and the Grains Research and Development Corporation (GRDC) to deliver WAND to growers.

“It’s technology not offered to any other farmers anywhere in the world,” Jay said.

“Technology like this not only works to mitigate the risks of spray drift, it creates many efficiencies across a farm, because resources can be directed to where they need to be, and more importantly, away from where they don’t need to be.

“As part of another new feature, WAND is able to store two years of historical weather data in graph form, which is a



Australian farmers with access to WAND towers are the only people in the world with access to technology that can offer a 24-hour hazardous inversion forecast.

MELANIE JENSON

## The WAND system

- The WAND system is a world-first, Australian-developed technology that has proven to be a game changer for growers and spray operators.
- It provides real-time weather data, updated every 10 minutes, able to distinguish between hazardous and non-hazardous surface temperature inversions.
- The NowCast feature, also updated every 10 minutes, has now been expanded to a 24 hour forecast broken into hourly segments showing the presence or absence of a hazardous surface temperature inversion.

WAND isn’t designed to close the spray window, but rather has opened the spray window by taking the guesswork out of when it is suitable or not to spray based on the presence or absence of a hazardous temperature inversion.

huge leap up from the current 48-hour history.

“These new features are important steps forward for WAND and come off the back of feedback from our users.”

While use of WAND will remain free for the core features of real-time weather data, detection of the presence or absence of hazardous inversions, and the two-hour NowCast, an annual subscription will be required to access these enhanced features from mid-2024.

“We’ve made the new features freely available since January so farmers and spray operators can determine for themselves the value of the operational benefits that this technology offers,” Jay said.

CRDC’s Senior Innovation Broker Susan Maas has led the WAND project for CRDC and encourages people to log on and see what benefits the new technology offers.

“This is a vitally important step forward for WAND as it transitions from being research and development supported by GRDC and CRDC, to a commercial product delivered by Goanna Ag for the continued benefit of the cotton and grain industries,” she said.

“With 102 towers now live, this is a huge undertaking. Ensuring WAND is self-sustaining means vital research and

development levy funds can be reinvested by GRDC and CRDC into important new projects for growers.”

CRDC and GRDC are eager for more growers and spray contractors to access the service. Just over 3500 of an estimated 5000 cotton and grain growers within the WAND footprint have signed up since the network went live in December 2022.

“The more users of WAND we have, the more spray drift we can minimise, and the greater the spray efficiencies that can be realised by growers,” Gordon Cumming, Manager of Chemical Regulation at GRDC, said.

“This type of innovation is exactly why GRDC and CRDC invest in research: to deliver tangible solutions that make a real difference for our growers and their communities.

“WAND is world-leading, available now, and accessible simply by using your smartphone.

“We urge growers to take advantage of this huge opportunity, and work with us to reduce the impact of spray drift on Australia’s cotton and grains industries.”

**For more  
WAND**

[www.wand.com.au](http://www.wand.com.au)

# Improving preparedness with scientific exchange

**THE** Beltwide conference in the United States (US) has again provided some food for thought for CRDC Innovation Brokers and cotton industry pathologists about the future of disease research and what new disease discovery means for biosecurity.

Qld DAF pathologist Dr Linda Smith attended Beltwide with support from CRDC in January to present her research on reoccurring wilt. Caused by several novel *Eutypella* species, the disease is only found in Australia and is the most recently confirmed of the wilts affecting cotton here, joining Fusarium and Verticillium.

While sharing information and expertise at Beltwide was an honour, Linda said that the most rewarding and valuable aspect was picking up new discoveries that can help Australia prepare for similar issues or events.

“Interestingly for Australian R&D, *Xylaria necrophora*, an emerging root-associated pathogen responsible for taproot decline of soybean in the southern US is being detected in cotton and is extremely pathogenic,” Linda said.

“This pathogen is also a wood inhabiting and degrading fungus belonging in the same order of fungi as *Eutypella*.”

“The fact that this order of fungi can manifest as it has in US cotton puts us on alert here.”

CRDC Senior Innovation Broker Susan Maas says CRDC supports science exchanges as they create opportunities for collaborations and accelerate responses and understanding to emerging issues.

“It was actually a presentation from visiting US scientist Kaitlyn Bissonnette from Cotton Incorporated at the Australian Association of Cotton Scientists Conference last year that prompted us to organise and support Linda’s trip,” Susan said.

“Kaitlyn highlighted US experiences with guava root knot nematode (*Meloidogyne enterolobii*) and grey mildew which are emerging issues for us.



MELANIE JENSON

**Dr Linda Smith sharing her knowledge of Eutypella with fellow scientists at the Australian Association of Cotton Scientists Conference last year.**

“We discussed the value of a fact-finding mission and decided that it would be very worthwhile for Linda to go to the US to find out more.”

Guava root knot nematode (GRKN) was detected in Australia (NT and Qld) for the first time in 2023 in vegetables. Cotton is a host and Linda said although not of great concern in US cotton crops, GRKN has a very wide host range and can be extremely damaging.

“Of much greater concern for some states in the US is reniform nematode which is reported to cause greater than 50 per cent yield loss,” Linda said.

“Reniform is so far the most damaging of nematodes to cotton in Australia, which has only been found in Central Queensland.”

Grey mildew, also known as areolate mildew, frosty blight, Ramulariopsis and Ramularia leaf spot, is a foliar disease that thrives during extended humid and hot summer weather. If conditions are favourable this fungal pathogen can cause significant premature defoliation, leading to yield loss.

“Recent detections of grey mildew on cotton in northern Australia causing disease, and in some cases defoliation, is concerning,” Linda said.

“In the US fungicides are used to manage the disease, however the effect on yield is variable.

“With limited fungicide options available in Australia compared to the US it is important to manage the disease in a way that minimises the risk of developing fungicide resistance.”

The threat of new pathogens arriving

in Australia is constant. Every year more than 18,000 vessels, 1.8 million sea cargo consignments, 41 million air cargo consignments, 152 million international mail items and 21 million passengers arrive in Australia – and numbers are increasing.

Cotton Australia holds the official role for biosecurity stewardship in the Australian cotton industry and works with the Australian Government through its membership of Plant Health Australia (PHA).

With funding support from CRDC, PHA conducts formal five-year reviews of the Cotton Industry Biosecurity Plan including updating the list of potential threats.

“The industry biosecurity group which includes many industry researchers, adds to and revises the threat tables annually to help ensure support industry’s preparedness,” Susan said.

“Supporting our researchers to expand their international networks is important to keep our finger on the pulse of potential exotic threats.

“While there is information about diseases in publications, there is huge value in creating opportunities to understand the local context and experiences.”

If crop managers see anything out of the ordinary, contact Biosecurity Queensland on 13 25 23 or the Exotic Plant Pest Hotline on 1800 084 881.

## For more

**Dr Linda Smith**

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Fluctuations in public sentiment towards the cotton industry appear to be tied to environmental factors like drought, however fair use of water remains a top three priority area for the public.

## Tracking community trust in cotton

**GAINING** a deep understanding of the community’s level of trust and acceptance of primary industries, including cotton, is the purpose of the cross-sectorial Community Trust in Rural Industries research.

Now in its fourth year, the community trust program is a multi-industry multi-year collaboration to understand, track and build community trust. Measuring community sentiment enables rural industries to better understand issues of concern to the community, and where necessary act to ensure industry practices align with community expectations. The work is led by AgriFutures Australia in partnership with six of the RDCs, including CRDC, and the research is undertaken by the team at

Voconiq, a community engagement and data science company that emerged out of CSIRO.

### What do people think of the cotton industry?

Through the cross-sectorial project, and a piece of research focusing specifically on cotton, CRDC and Cotton Australia have been tracking community trust in the cotton industry.

A nationally representative sample of 1000 Australians from across the country were engaged via an online survey.

The results found that the three key drivers of trust in cotton are: environmental responsibility; the industry’s responsiveness to community concerns; and the belief that water use

in agriculture is fair.

Overall, 77 per cent of community members trust the cotton industry to act responsibly.

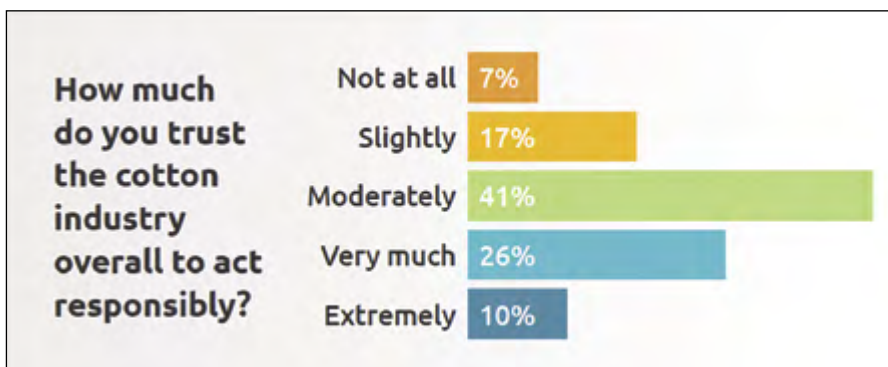
73 per cent of respondents agreed that cotton growers play an important part in society, with 77 per cent agreeing the cotton industry plays an important role in regional communities.

Almost half of those surveyed (44 per cent) believe the Australian cotton industry listens to and respects community opinions. 44 per cent also believe the industry is prepared to change practices in response to community concerns.

At the same time, 42 per cent believe the cotton industry hasn’t taken enough action to respond to concerns around water use.

The research showed that when the cotton industry is silent about an issue the community cares about – like water use – community members assume the industry has something to hide. Being proactive on issues of importance to the community and holding industry participants accountable attracted much more positive community sentiment.

When the community can see the cotton industry actively responding to issues of concern, particularly around water and the environment, their level of



trust in and acceptance of the industry is higher.

Comments such as ‘when groups representing rural industries like cotton speak out against individual rule-breakers, I feel like I can trust them’ and ‘when rural industries like cotton acknowledge their mistakes after public outcry, I can forgive the mistake’ show that when the cotton industry is seen to acknowledge an issue and hold individuals accountable when they misuse water resources, community members feel they can trust the industry.

### Trust in cotton tied to environmental factors

The research has also found that fluctuations in public sentiment about cotton appear to be tied to environmental factors like drought.

“More than most industries, background environmental conditions appear to influence community sentiment toward the cotton industry,” said Voconiq CEO and co-founder Dr Kieren Moffat.

“When asked about drought in Australia, the percentage of the Australian community who agreed or strongly agreed that they were worried about drought as an issue for Australia has decreased.

“Yet community concern about the use of water in the cotton industry remains

## Industry responsiveness



Almost half of those surveyed (**44%**) believe the Australian cotton industry listens to and respects community opinions.



**44%** believe the Australian cotton industry are prepared to change its practices in response to community concerns.



**42%** believe the cotton industry hasn't taken enough action to respond to concerns around water use, while 39% gave a neutral response. This shows a potential lack of understanding of how water is managed and presents an opportunity for the cotton industry to engage with and educate the community, showing their responsiveness to community concerns.

high. The question ‘the cotton industry in Australia uses water responsibly’ has the most positive correlation with trust and acceptance. When agreement with this statement increases, trust and acceptance increase.”

“Conversely, the question ‘the industry uses more water than it is entitled to’ has the most negative correlation with trust and acceptance. When agreement with this statement increases, trust and acceptance decrease.

“Community members remain consistent in their view that being open and transparent is a positive pathway to

a more productive, mature relationship between the Australian people and the cotton industry. The results underscore a community that values accountability for actions.

“They also provide continued, strong evidence that proactively addressing concerns raised by the community is a productive pathway to deeper trust,” Kieren said.

#### For more

**Dr Kieren Moffat**

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## Knowing key drivers improves performance

CRDC has partnered with CSD and Ag Econ to gain a better understanding of the key drivers of profitability in Australian cotton.

The collaboration will look at the challenges faced by cotton growers when it comes to rising production costs, fluctuating yields and regulatory constraints. It's hoped the initiative will have a positive impact by providing growers with information to enhance their profitability.

The project aims to integrate various economic data sources that have been collected across the industry over many years. It acknowledges the economic factors that affect everyday decision making processes related to crop management and investment in crop inputs. The information may also assist agronomists in understanding the impact of their advice on crop profitability.

The metrics and benchmarks are focused around the key areas of price,

yield, efficiencies, and costs.

“Through leveraging agronomic data collected by both CSD and CRDC and pairing it with the knowledge of Ag Econ, we aim to develop a clear understanding of the practices that are profitable and sustainable, and establish benchmarks for growers to assess their economic performance and efficiency at a field level,” said CSD's James Quinn.

“The initial phase – which focused on assessing the overall value of the datasets collected by CSD and CRDC – is complete,” said CRDC's Acting General Manager, Innovation Dr Merry Conaty.

“This involved an evaluation to ensure that we could extract the most value out of the data.

“Part of this activity involved developing some economic assumptions about the cost of certain crop management practices as not all practices had the costs associated with them.”

Now well into the second phase,

Ag Econ is engaging with growers and agronomists, while also gathering perspectives and insights.

“The analysis will include comparative profitability assessments across systems with different yield targets, productivity indicators (both positive and negative drivers), estimation of system efficiencies, and a range of costings associated with different management practices,” Ag Econ economist Janine Powell said.

“The project will not only highlight the economic drivers of cotton production but also provide assessments of the grower feedback which will validate the information collected. The outcome will be a better understanding of how we can best utilise the economic data, particularly around grower benchmarking.”

#### For more

**Janine Powell**

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## Supporting cotton growers in a carbon economy

**CARBON** accounting is usually confusing and cumbersome. The current default methods for measuring carbon are spreadsheets which take time and often require a level of expertise to complete. They are also commodity-specific, meaning mixed-enterprises cannot easily measure their total carbon footprint.

Eight Australia's RDCs, including CRDC, are working to overcome this challenge via a cross-sectoral project to develop a carbon footprint solution with Agricultural Innovation Australia. Originally called the 'Know and Show your Carbon Footprint' calculator, the Environmental Accounting Platform (EAP) is an easy-to-access tool to help growers better understanding their on-farm baseline carbon emissions and residual footprint and make better-informed decisions.

AIA launched the new online carbon calculator at evokeAG in Perth recently. The first of its kind, the EAP enables a carbon footprint to be calculated at a commodity, enterprise and whole of business level and provides Australia with an accessible and standardised approach to carbon accounting across different commodities.

"Primary producers and their industries need simple, time-saving tools that allow them to understand their carbon footprint and support decision-making around reducing emissions and capturing new business opportunities," AIA CEO

Sam Brown said.

"It's crucial that our sector has the data and evidence to help drive positive environmental and economic outcomes, demonstrating that Australia is ahead of the curve."

Professor Richard Eckard, Chair of the EAP Technical Advisory Panel and Director of the Primary Industries Climate Challenges Centre within the University of Melbourne, said the platform allows producers to enter data once to achieve a whole of enterprise carbon footprint.

"AIA has taken the current Greenhouse Accounting Frameworks for Australian Primary Industries and digitised and aggregated them into a common platform," Professor Eckard said.

"The aim is to provide a new way for producers to baseline their operation, calculate their carbon footprint and make more informed decisions."

The beta version of the EAP is currently live for cotton, grains, beef, sheep, goats, feedlot and sugar, with pork, dairy, eggs, poultry, rice, fisheries, aquaculture, wine and other commodities to follow. Growers are invited to register their interest in trying out the live beta version via the link below.

**Understanding and navigating carbon and emissions can be confusing for landholders. A new platform has been released by AIA to provide a standardised approach to carbon accounting across different commodities.**

### For more

[www.aginnovationaustralia.com.au/aiaeap/](http://www.aginnovationaustralia.com.au/aiaeap/)

# Zero Net Emissions CRC

**FURTHER** good news for growers is the formation of the CRC for Zero Net Emissions from Agriculture (ZNE-Ag CRC) which has received \$87 million from the Australian Government to further develop and scale up technologies to reduce methane emissions from cattle and sheep and improve crop quality and production.

The ZNE-Ag CRC is an initiative brokered by the University of Queensland and Qld DAF and involves 73 partners across industry, education and government, including CRDC as a Tier 2 partner. The CRC will officially kick off in July and will run for 10 years.

“This national collaboration has secured \$300 million in funding over 10 years, with the Federal Government’s contribution of \$87 million making it the largest CRC in the program’s history,” said ZNE-Ag CRC Chair Dr Debra Cousins.

“The ZNE-Ag CRC will develop technologies and solutions to reduce emissions in agriculture, mitigating risks to future investment and trade and securing the economic future of our industry.”

This will happen with the leadership of highly regarded agricultural identity Richard Heath, who took up the role as CEO in March. Richard is the former executive director of the Australian Farm Institute and sits on the board of CRDC’s fellow RDC, Grains Research and Development Corporation.

“The ZNE-Ag CRC is very important to the future of agriculture in Australia,” he said.

“Our agricultural and production systems and capacity are under threat from climate change, and we must act now to protect the future of one of the country’s most important sectors.

“We will coordinate an industry-led approach to help safeguard the profitability and marketing access of Australian agri-businesses as we make the transition to net zero.”

Richard said ZNE-Ag will support the industry to achieve emissions targets in Australian agriculture by 2030 and 2050.

“Our trading partners also look to us as a source of science and technology, so it will strengthen our capacity to engage with our neighbours to help with their efforts in the same direction,” he said.

“The CRC will deliver standardised, trusted guidelines, metrics and benchmarking tools to monitor on-farm emissions and accelerate Australian agriculture’s transition to net zero and beyond.”

## For more

[www.zneagcrc.com.au](http://www.zneagcrc.com.au)



Landcare Australia CEO Dr Shane Norrish has overseen several collaborations with the cotton industry and has had a hands-on role in tree planting projects along the Namoi River.

# Opportunities for carbon projects

**TO** give cotton growers the confidence and knowledge to make informed decisions, Landcare Australia is collaborating with the Country Road Climate Fund, CRDC and CRDC’s fellow RDC Australian Wool Innovation (AWI) to deliver a practical initiative to assist growers navigate the evolving carbon market.

The Landcare Australia team has expertise in establishing and managing carbon sequestration projects and this collaboration will deliver a toolbox providing independent information to assist growers make informed decisions about their farms and potential participation in the market.

In late 2023, Landcare Australia held a meeting with cotton and wool growers in Moree NSW (Kamilaroi country) to further understand grower concerns, barriers to participation, questions about the workings of the market, existing opportunities and examples of successes in carbon storage. All of this information is being used to better tailor the toolbox. Attendees also discussed options and rules for participation in carbon sequestration projects, and comparison of gross margin impacts when converting portions of a property to carbon farming.

“The event provided Landcare Australia with a unique opportunity to engage directly with growers, gaining insights into carbon storage,” Landcare Australia CEO Dr Shane Norrish said.

“This exchange, with its diverse perspectives and cutting-edge knowledge, will guide us in refining the development of the toolbox and help us find innovative solutions.

“Growers who participated will be invited to access future funding opportunities for establishing carbon projects if they decide this is a viable option, which includes Landcare Australia experts assisting in the process.

“We will be showcasing on-ground works across several trial properties to validate the toolbox and provide practical, registered examples of carbon credit projects delivering biodiversity co-benefits.

“Growers who couldn’t attend the meeting are invited to contact us to find out about further opportunities.”

To learn more or be involved in future meetings or projects, contact Landcare Australia.

## For more

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# Does regenerative agriculture have a home in cotton?

Outside of his role with CRDC as Acting Executive Director, Allan Williams chairs a highly regarded cotton industry panel on the global stage.

The International Cotton Advisory Committee's (ICAC) Expert Panel on the Social, Environmental and Economic Performance of cotton production (SEEP) isn't a group you often find talked about in media or domestic cotton circles. However the panel is responsible for providing the ICAC with objective, science-based information on the negative and positive social, environmental and economic aspects of global cotton production.

As the SEEP chair, Allan reported to the ICAC 81st Plenary Meeting held in Mumbai last December. The presentation *Can Cotton Producers Adopt Regenerative Agriculture Practices?* focused on a report recently commissioned by SEEP on regenerative agriculture, and Allan wasn't the only one talking about it. Sustainability and traceability as well as regenerative agriculture made noticeable appearances in the presentations and other ICAC reports.

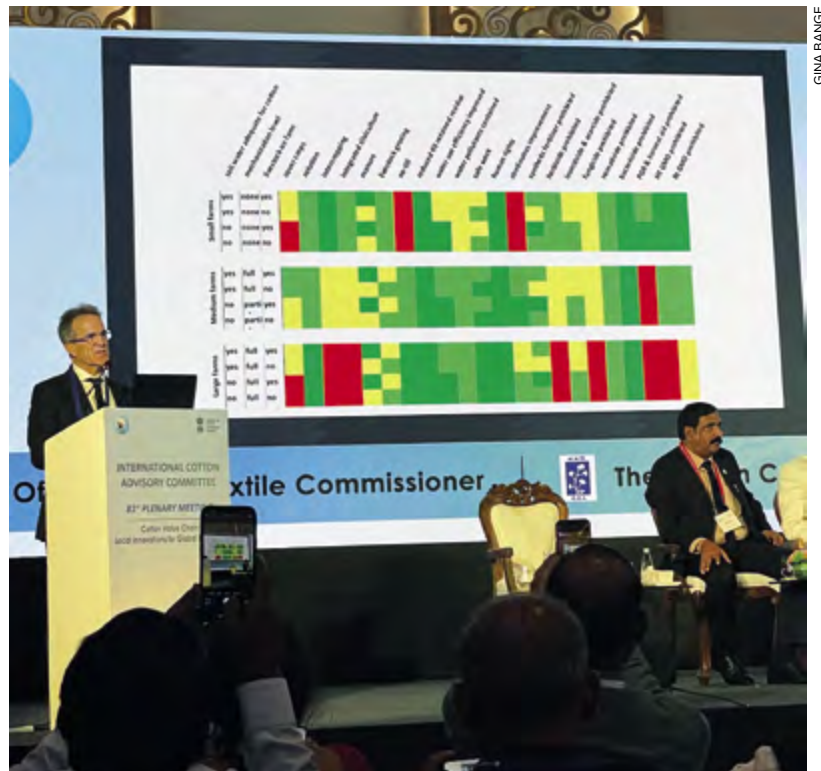
"The Global Economics of Cotton Production report said that while cotton was often criticised for its negative impacts on the environment, it also highlighted that agriculture in general and cotton in particular have a key role to play as part of the solution for a sustainable future, particularly as the industry continues its long-term shift to regenerative agriculture techniques and processes," Allan said.

"It was acknowledged that regulatory pressures and market demand for transparency and sustainability are growing, yet one of the biggest challenges to achieving this is there's no agreed definition of 'sustainability'."

## Regen ag is the new black

As part of his presentation to the international delegates, Allan described regenerative agriculture as 'the new black' when it comes to the definition of sustainability and noted it is especially popular among retailers and brands looking to demonstrate their sustainable sourcing credentials.

"The challenge is that there are multiple definitions, and while some include specific practices, many of the definitions focus on high



GINA BANGE

level principles and outcomes," Allan said.

"For example, the United Nation's Food and Agriculture Organisation definition is: 'regenerative agriculture describes holistic farming systems that, among other benefits, improve water and air quality, enhance ecosystem biodiversity, produce nutrient-dense food, and store carbon to help mitigate the effects of climate change.'

"While no-one is going to question the importance of achieving those outcomes, farmers ultimately need to adopt farming practices, not principles."

## What are regenerative practices?

For this reason, SEEP with the support of ICAC, commissioned Dr Kater Hake to review the types of practices being promoted as regenerative, with a view to assessing the feasibility of implementing them across a range of different farming systems.

As a result of the review, 22 practices were identified that are generally accepted as regenerative. These were then assessed for their feasibility to be implemented across 12 different global farm types, grouped by factors such as size, access to water and degree of mechanisation.

**As the ICAC SEEP chair, CRDC's Allan Williams presented to the ICAC meeting held in Mumbai last December, discussing a report recently commissioned by SEEP on regenerative agriculture.**

### What does regenerative mean in the field?

What does 'regenerative' actually mean for a farmer at the practical level of 'this is what is required to be done on your farm'?

The SEEP review found that cover crops and tillage (reduced, minimum, no-till or zero-till) are the most frequent practices referenced in regenerative frameworks/standards. The next most referenced practices are crop rotation, livestock grazing and reduction in synthetic pesticides and fertilisers.

"Given the potential for the supply chain to request or require that farmers grow their cotton according to regen ag principles, and indeed perhaps even the potential for regulation in different parts of the world, the report currently has a number of aims, as well as stimulating discussion," Allan said.

"The review doesn't seek to define regen ag,

rather it provides a high-level overview of the types of practices currently considered regenerative, that should be understandable for all readers, along with analysis of how feasible those practices might be to implement.

"For example fully mechanised farms like ours are more dependent on off-farm purchased inputs such as fertiliser and pesticides and would find adoption of intercropping very challenging," Allan said.

"Another dimension is the adequacy of soil water, as inadequate water limits the adoption of cover crops but enhances water use and tolerance to insects and diseases (see breakout box).

"The review identifies the R&D needs to mitigate risks that might be associated with adoption of regen ag practices.

## Cover crops in focus

Allan says it is critical that the practical implications and risks for farmers of implementing regenerative agriculture farming practices as required by the supply chain are well understood.

This evaluation of the benefits and risks of the various practices being promoted such as cover crops was a key focus of the SEEP report, along with the assessment of the feasibility of implementing the practice based on parameters such as farm size, level of mechanisation and water availability.

### Benefits and Risks

Cover crops provide multiple on and off farm benefits to farmers and their communities. These include earthworm populations, erosion control, livestock forage, nitrogen sources, improved nutrient availability, organic matter additives, pollinator habitats, soil structure improvements and weed suppression.

However, risks and unintended negative consequences can include the cover crop being a weed or host for overwintering insect pests and diseases. They may be difficult to terminate without foliar herbicides or heavy machinery. Where irrigation and rainfall are less than annual needs of a cotton crop, cover crops may utilise the limited moisture without generating a harvestable crop.

These factors bring an element of risk to growers which will discourage adoption unless the benefits of a non-harvested cover crop are greater than the risk from reduced water availability for a subsequent crop (e.g. cotton). The greatest risk of cover crops where moisture is limited occurs at planting – if a cover crop has sufficiently depleted soil moisture then a healthy cotton stand cannot be achieved.

### What's required to mitigate risk?

To fully utilise cover crops requires local research to evaluate optimum species and cultivars, combinations, planting methods/timing, agronomy, termination methods/timing and a local seed supply of cover crop seed uncontaminated with



SUSAN MAAS

Cover crop trials near Emerald in Central Queensland (Gayiri country) are using Sunn hemp, which was highlighted in the SEEP report.

weed seeds. Regardless of the farm size, cover crop adoption is more challenging where soil moisture (rain, storage, or irrigation) is insufficient for full cotton production.

Improved long range weather forecasts along with tools to precisely monitor soil moisture and abruptly terminate the cover crop would mitigate some of the cover crop risk in low moisture environments by allowing growers to preserve necessary soil moisture in response to unanticipated winter drought.

“A key issue is: who bears the risk of adopting different farming practices?”

### Who bears the risk?

This issue of risk and cost was addressed in ICAC’s Private Sector Advisory Council (PSAC) report, which examined traceability regulations and potential solutions to challenges connected to sustainability requirements. The Council then produced a series of recommendations.

One of those was that governments and international organisations should provide funding and resources to launch traceability and sustainability initiatives, and the supply chain must take the lead to implement, sustain and further develop these initiatives, thereby ensuring that the costs are not borne only by producers. These interventions should also aim to reduce ‘audit and reporting fatigue.’

### Not one size fits all

The global cotton community and industry provides employment for 23.9 million farmers and 125 million people throughout the value chain. These farms vary in size, access to water and degree of mechanisation. So how can sustainability expectations or regulations be applied to all farmers equally?

PSAC said that the cotton and textile value chain recognises traceability, sustainability and responsibility for the potential to create a positive impact for people and planet, where traceability and sustainability should go hand-in-hand.

Improving traceability has become a priority for retailers in the move towards a more sustainable and ethical apparel industry, as incoming regulations and increased consumer demand make it a business-critical issue. However, PSAC highlighted that achieving this in complex cotton supply chains is challenging.

Traceability for example, is a key aspect of sustainability, yet current traceability technologies are both expensive and technologically challenging for smallholder farmers and smaller industrial units to implement and can eat into their already-tight margins.

**“The SEEP review identifies the R&D needs to mitigate risks that might be associated with adoption of regen ag practices: a key issue is, who bears the risk of adopting different farming practices?”**



GINA BANGE

A final concern noted by the PSAC is the lack of a level playing field for cotton with man-made fibres. They say at a minimum, governments should consider subjecting man-made fibres to the same levels of traceability and sustainability standards as natural fibres.

“No single traceability standard is sufficient to provide complete credibility, and as a result, governments should encourage standardising the processes for rules systems, utilising validation tools to make the process as simple as possible,” the report said.

“The goal is to make things easier for companies and customers to reduce costs and promote wide-scale adoption.”

Allan notes that the strong focus by the supply chain on procuring cotton grown in accordance with regen ag standards, the range of definitions of what it is and the importance of local interpretation of what regen ag means for a farmer under the particular conditions, means it is imperative that growers and the supply chain have a good understanding of the risks, opportunities and research needs associated with adopting of regen farming practices.

“We anticipate this will be the focus of our SEEP work in 2024,” Allan said.

“We have the opportunity to build consensus on the objectives of regen ag and importantly how best to measure whether they are being achieved.”

**Allan (centre) with fellow Australian delegates (from left) Omnicotton Australia Pty Ltd General Manager Cliff White, Australian Government Trade and Investment Commissioner John Southwell, researcher and CottonInfo Fibre Quality Technical Specialist Rene van der Sluijs and ICAC Researcher of the Year, Dr Mike Bange.**

**For more**  
[www.icac.org](http://www.icac.org)

# Why do you grow cover crops?

Cover crops are grown for various reasons, with varying outcomes and across a variety of climates.

They are grown to help weed and disease suppression, alleviate long-fallow syndrome, protect young cotton plants from sand blasting or adverse weather and to keep the moisture in and soil temperature down. However, we also know that cover crops need to be carefully considered as they can also promote disease, harbour pests, deplete soil moisture and tie-up nutrients.

A global panel recently acknowledged cover crops are a major spoke in a list of sustainability and 'regenerative agriculture' practices (see previous story), yet there are very few guidelines around cover cropping in Australia or globally.

To ensure Australian cotton growers have the ability to grow the right cover crops at the right time, CRDC is supporting University of Sydney (USYD) Postdoctoral Research Fellow Tom O'Donoghue to create regional guidelines for cover cropping that cover both benefits and risks.

Firstly, Tom wants to know how and why growers are using cover crops.

"We want to know what services cover crops could or are offering crop managers in different valleys," Tom said.

"From the answers, we will identify regional interests and experience and

## Calling all growers and agronomists

1. Are you interested in cover crops? Why?
2. Have you incorporated cover cropping into your system?
3. Have you had or do you know of any cover cropping successes?

Growers and agronomists can contact Tom or their local CottonInfo Regional Extension Officer to pass on their answers or to express interest in working with researchers on the cover crop trials.



**Tom O'Donoghue in a Sunn hemp trial at a cover crop field day near Emerald (Gayiri country) in February. Tom is seeking more growers to join in the trials, to ascertain the most suitable cover crops for their region.**

invite interested growers to participate in on-farm trials and guide the selection of 'next step' management practices for trials at USYD research farms near Narrabri and Spring Ridge (Kamilaroi country).

"A research program will then be built around quantifying performance in terms of emergence, yield, quality, disease, weeds, soil carbon, biodiversity, and water balance.

"We've already got some on-farm cover crop trials going at Emerald (Gayiri country) and through this farmer-led best practice we would like to establish regional guidelines for cover crops."

Tom has been asking crop managers to answer basic questions and in return, all data collected will be passed back to growers raw, and following analysis he will provide performance evaluations of current cover cropping systems.

"It's a great opportunity to have us look at your system and give feedback, while at the same time adding to our knowledge to produce reliable and relevant information about the benefits of cover cropping," Tom said.

There's already a lot of interest from growers at Emerald where he's working with Qld DAF and CottonInfo's Dr Paul Grundy on cover crop trials at Cowal Ag's 'Jabiwarra' where Siberian millet, mungbean and Sunn hemp were planted and the effects compared to bare-earth

plots. A field walk there in late February attracted a crowd keen to learn more about new cover crop options for the Central Highlands.

CRDC Acting Executive Director Allan Williams says Tom's research goes further still to help bring Australia in line with global recommendations around cover cropping, which is to create regional knowledge.

Allan chairs the International Cotton Advisory Committee's (ICAC) Expert Panel on the Social, Environmental and Economic Performance of cotton production (SEEP). In its report, *Can Cotton Producers Adopt Regenerative Agriculture Practices?*, SEEP says that to fully utilise cover crops "requires local research to evaluate optimum species and cultivars, species mixtures, planting methods/timing, agronomy, termination methods/timing and a local seed availability."

"It's about quantifying the risks and benefits of a particular cover crop in a particular region to ensure they are having a positive impact on-farm and also at an industry level," Allan said.

### For more

**Tom O'Donoghue**

[t.odonoghue@sydney.edu.au](mailto:t.odonoghue@sydney.edu.au)

# International recognition for Australian researcher

Dr Michael Bange is one of the most well-known faces in the Australian cotton industry and is now recognised as one of the best cotton researchers in the world.

Mike, who has spent his career as a research systems scientist specialising in agronomy and physiology, is the 2023 International Cotton Advisory Committee's (ICAC) Researcher of the Year.

It is globally accepted as the highest international recognition for cotton scientists and Mike travelled to ICAC's 81<sup>st</sup> Plenary Meeting in Mumbai in December to receive his award.

"It is with great admiration and respect that we honour Dr Mike Bange, a cotton systems agronomist of exceptional international reputation, with over three decades of innovative work, and a significant contributor to sustainable management practices," ICAC Chief Scientist Dr Keshav Kranthi said.

"Mike's innovative approach has consistently enabled him to meld

comprehensive understanding of farm-scale requirements with an in-depth analysis of key biological processes.

"His profound insights into productivity under varied and shifting climates have distinguished his career.

"He is known for addressing challenges throughout the entire value chain, from seed to shirts, with an innate ability to engage farmers, advisors, and stakeholders in his research."

Mike has worn many hats since joining the cotton industry, with a broad R&D resume in water use efficiency, agronomy, harvest and postharvest management, climate change impacts and adaptation.

His recognition includes four prestigious international accolades and a substantial 17 national awards from institutions such as CSIRO, the CRC Association of Australia, the Australian Museum, Cotton Australia and the Australian Cotton CRC, among others.

Mike was awarded the Beltwide US cotton award in 2017 for contributions to physiology and agronomy. In 2016, he graced the World Cotton Research Conference as a keynote speaker, discussing cotton physiology as the cornerstone of cotton science.

While also a leader for many years in the Australian industry, as an agronomist and crop systems scientist first and foremost, the award means a lot to him.

"It was a really pleasing acknowledgement that highlights Australia

IMAGE: RUTH REDFERN

Mike Bange is one of the best known faces in the Australian cotton industry and now as a researcher on the global stage as the ICAC Researcher of the Year.



is at the leading edge of cotton research and in my field as well,” he said.

“In my career I certainly didn’t set out for awards, or to be a leader, but I have always simply had passion for ensuring research has led to impact.

“I have been very blessed to have great people lead me and around me with the same vision.

“Notwithstanding this, I have worked in such an engaging industry with incredible people and one that has supported myself and my teams so well.

“There is clearly a movement toward not only acknowledging exceptional science, but towards acknowledging impact, which may have been a factor in receiving this award.”

Mike began his cotton science journey at CSIRO based at the Australian Cotton Research Institute near Narrabri (Kamilaroi country) in 1995. Within two years he was working in a leadership role and when he left in 2019 he was a Chief Research Scientist.

“My passion to turn the science into action has probably lent itself to me taking on early leadership roles in the industry.

“I wasn’t expecting to be in these roles at an early age, but it did allow me some influence in getting things done.

“After university at Gatton College I probably thought I’d be a field research agronomist for quite some time, but taking on leadership roles at a relatively young

age has given me the opportunity to shape the industry.

“A few years into CSIRO, I was a senior leader, leading decision support systems R&D for growers and getting them packaged up and out into their hands, and this was also the case through subsequent Cotton CRCs.”

Leading highly functional and successful teams based at a regional research station and delivering impact over 25 years are the highlights of Mike’s career so far.

“One of the things I am most proud of is my team developing decision support tools such as CottonLogic, and the development of CottAssist which others around the world have mimicked.

“We also undertook research to improve understanding of cotton physiology – the impacts of temperature and waterlogging for example to help enhance and improve management.”

Mike said people can sometimes equate leadership roles to age and maturity, but his advice to younger people is to not let age define you, to seek opportunities outside your home range, and to find mentors. He attributes his travel to the US as a Fulbright Scholar as one key opportunity that enabled his development as a leader. He cites the development of canopy temperature sensor technology in the Australian cotton system as one example that resulted from

this visit.

Reflecting on his career and leadership roles, he said mentors have played a big role.

“Diversity and exposure, the chance to meet and collaborate is so important,” he said.

“Collaboration is key: I have never lived by or had the ethos you hear in science realms of ‘publish or perish’ – I live by ‘partner or perish’.

“I also accept that there is always somebody who is smarter or who has a better idea than you and am always keen to seek out these people.”

Along these lines, the term ‘business as usual’ has also never been a part of Mike’s vernacular.

“It’s something that should not be considered in R&D.

“Being flexible and adaptable and always prepared to try or invest in something different or get other people in to get things done is how I’ve always operated.”

In Mike’s latest role, leading the Richard Williams Commercial Research Initiative at CSD he is excited to continue to support and lead research that is delivering impact for industry. Importantly, it has allowed him to continue his career journey in regional Australia.

“I definitely think one part that has defined my career is being a scientist living in a rural community which does define the way you see the world.

“Bringing a regional perspective to the science is a unique and vital perspective for the cotton industry and agricultural science.

“Those that know me will know that I am passionate about how regional communities are viewed and I have certainly not been afraid to speak up.

“Furthermore, the emergence of so many young professionals engaged in regional communities means that the future is bright for Australian agriculture.”

Mike is the second Australian to receive the ICAC Researcher of the Year Award, following Dr Greg Constable (one of Mike’s mentors) who received the honour in 2015.

**For more**  
**International Cotton Advisory Committee**  
[www.icac.org](http://www.icac.org)



Dr Mike Bange (second from left) joins an elite list of scientists and is only the second Australian to be presented with the ICAC Researcher of the Year award.



# Conference in good hands with industry leaders on board

Plans are well underway for the next Australian Cotton Conference at the Gold Coast Convention Centre in Broadbeach (Bundjalung country) from August 6 to 8, 2024.

With three, jam-packed days of more than 100 presenters, a trade hall brimming with over 100 exhibitors and nearly 20 social events to choose from, the event is the most popular on the cotton industry calendar. The Conference is organised by a committee of volunteer growers, researchers, crop consultants, and representatives from Cotton Australia, the Australian Cotton Shippers Association (ACSA) and foundation sponsors CRDC.

For Riverina (Wiradjuri country) cotton grower and Cotton Australia Deputy Chair Liz Stott, it's par for the course to be taking on the role as chair of one of the largest agricultural industry events in the country.

In addition to being a cotton grower, Liz is a communications professional with qualifications in science and leadership, having worked in policy and communications across agriculture and water-related industries. This capable and passionate advocate for rural issues is bringing her grower and industry insight to the role as Conference Chair. Liz is a graduate of the Australian Rural Leadership Program (ARLP), and she credits cotton's commitment to that course as part of the reason she stepped up for the Cotton Australia board, the Deputy Chair position, and now Conference Chair.

"Cotton Australia and CRDC were my sponsors for the ARLP, so any opportunity I have to provide some 'return on

***"The thing I love most about the conference is the collaborative nature of our industry pulling together..."***



**Leeton cotton grower Liz Stott has stepped in to Chair the Australian Cotton Conference in 2024.**

investment' to the industry is definitely worthwhile for me," Liz said.

"I'm looking forward to working with a relatively new committee to pull together an interesting and dynamic conference program for 2024.

"I'm grateful for the experience of conference stalwarts Tracey Byrne-Morrison (who leads the conference secretariat), Adam Kay (Cotton Australia) and Tony Geitz (ACSA) along with the returning committee members to help me guide this process over the next few months.

"The thing I love most about the cotton conference is the collaborative nature of our industry in pulling together such a wonderful event including to chair renowned key note speakers, researchers, growers and of course, the Awards Dinner.

"By the time readers receive this issue of *Spotlight*, the Conference will be just four months away and we can't wait to welcome everyone back to the Gold Coast."

Cotton Australia's Brooke Summers is a conference veteran of over 20 years and oversees the event

communications, along with various jobs as a volunteer committee member.

"It isn't long after one conference finishes that work begins on the next," Brooke said.

"With many years of surveys now, it's really clear that delegates are looking for a diverse range of interesting topics and speakers and opportunities to network with friends and peers.

"It's got to be family-friendly and accessible – that's really important to our attendees and increasingly we need to ensure we cater for a very diverse range of delegates that have interests ranging from bugs and weeds and on-farm innovations to market drivers and the technologies driving fashion forward."

For CRDC, the opportunity to present so much research and innovation in one place is not to be missed. CRDC returns as a founding sponsor for the 2024 event.

"CRDC has supported the conference since the very beginning," said Ruth Redfern, CRDC's General Manager Communications & Extension, and CRDC's representative on the committee for the past 10 years.

"Part of CRDC's commitment to the Conference is ensuring as many growers as possible can attend: to connect with each other and our cotton research community, and to hear the latest advances in our cotton research, development and extension. Through our support of the conference, growers receive a discounted rate to attend.

"We also support cotton researchers to attend, with applications for travel bursaries now open via our website," Ruth said.

Registrations for Conference are now open, with early bird discounts available.

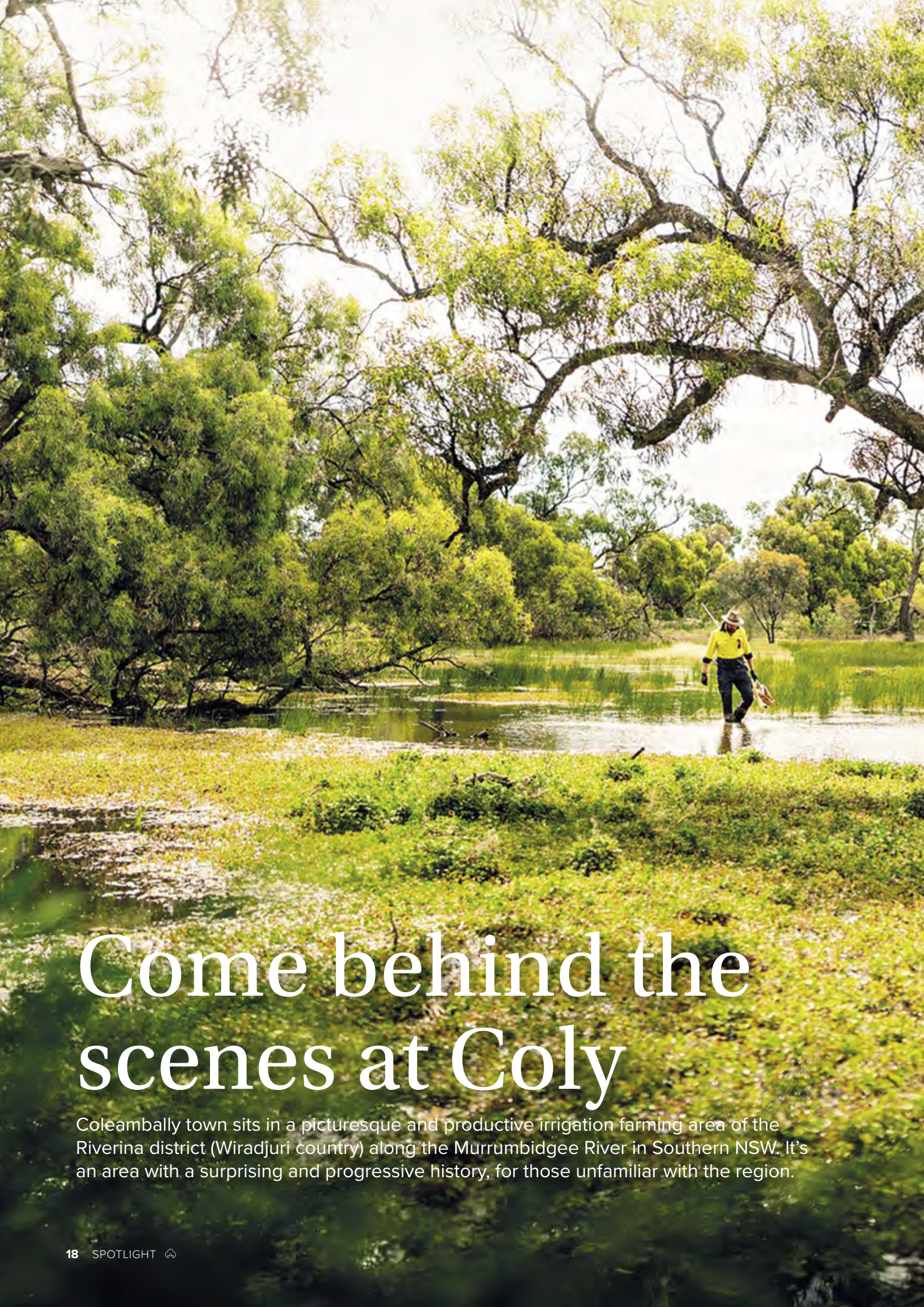
## **For more**

### **To register to attend:**

[www.australiancottonconference.com.au](http://www.australiancottonconference.com.au)

### **To apply for a CRDC-travel bursary for cotton researchers:**

[www.crdc.com.au/researchers/scholarships-travel](http://www.crdc.com.au/researchers/scholarships-travel)



# Come behind the scenes at Coly

Coleambally town sits in a picturesque and productive irrigation farming area of the Riverina district (Wiradjuri country) along the Murrumbidgee River in Southern NSW. It's an area with a surprising and progressive history, for those unfamiliar with the region.

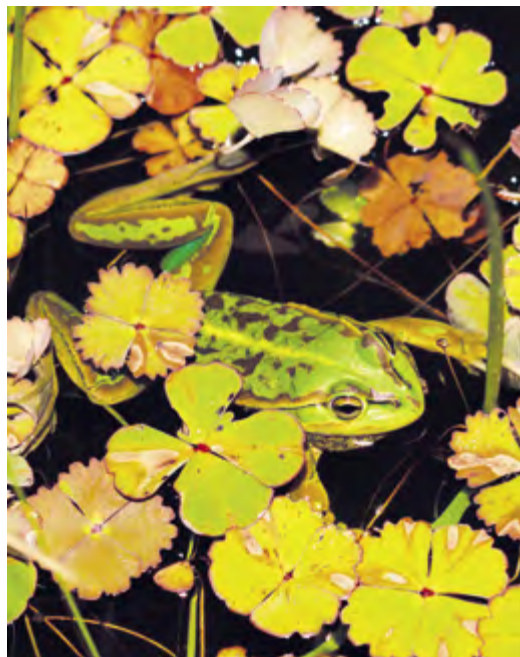


'Coly' as it's known is one of the state's newest towns, purposely built and 'opened' in 1968 to service the newly constructed Coleambally Irrigation Area. This area was created by the NSW Government reclaiming country from the surrounding sheep stations – nearly 90,000 hectares in all, which the government developed for agriculture in the 1950s.

It was all on the back of an ambitious new project thousands of kilometres away: the Snowy Mountains Hydro Electric Scheme. The irrigation area and town were explicitly built to take advantage of the additional water made available by the Scheme. It diverts the headwaters of the Snowy, Eucumbene and Murrumbidgee Rivers westward through the Great Dividing Range, through a series of tunnels and dams releasing water into the Murray and Murrumbidgee Rivers.

Farms of 220 hectares in the irrigation area were allocated to people through a ballot system. Interesting stipulations included not already owning any land in the area and having enough cash to get started farming. The first farms received irrigation from the Murrumbidgee River in the 1960–1961 summer season, marking the start of what would become the nation's fourth largest irrigation district. There were 12 ballots, with the farm allocations between 1960 and 1970 taken up by people from many places and walks of life.

The irrigation area remained under the direction of the then Department of Land and Water Conservation right up until 1997 when Coleambally Irrigation Corporation was formed and vested with the irrigation undertaking known as Coleambally Irrigation Area. The ownership transferred to the co-operative's irrigators in 2000 when Coleambally Irrigation



The endangered southern bell frog has been the focus of conservation initiatives by the Coly Irrigation Co-operative.

Co-operative Limited (CICL) was formed.

Today, with an area of operations covering 457,000 hectares (ha) and an irrigable area of approximately 100,000 ha, CICL has 295 members/growers and provides irrigation and drainage services to nearly 500 farms. The average size of an irrigated farm is 220 hectares and water is delivered via a state-of-the-art gravity-fed irrigation system powered by Rubicon's Total Channel Control technology, allowing members to access water on a two hour stop/start notice.

### The new rice bowl, with a touch of cotton

While irrigation in Coleambally was initially envisaged to support mixed farming of wheat and sheep, rice was permitted by the Department to be grown for the first six seasons as a means of providing the new farmers with cash flow. The first crops were in the early 1960s.

Concurrently, on the back of a cotton gin being built by Ricegrowers Co-op Mills in nearby Darlington Point, just down the road, the first cotton crops were grown in 1963, buoyed by the cotton Bounty Act which provided a bounty on a raw cotton quality basis for sales to Australian spinners. It was also a way to counter the impermanence of rice growing. While there were some promising crops, the district average yield was only three quarters of a bale per acre, so it wasn't profitable and quickly abandoned in favour of rice, once 'permanent rice' was granted.

Permanent rice came about after farmers, not satisfied with this short-term arrangement of growing rice for only the first six seasons, began to campaign to the Ricegrowers Association and NSW State Government. Approval for permanent rice growing was given in the late 1960s and rice was established as the dominant crop.

The last major cotton crop was grown in 1973 (the same year the cotton gin in Darlington Point shut down), and while odd crops were grown here and there over the years, it would be 40 years until it would make a comeback to Coly.

The adoption of GM cotton varieties, and later the introduction of John Deere round bale harvesters, were some of the key drivers of the reintroduction of cotton to Coleambally, with the first major crop of 885 ha grown in 2010-11. Only eight seasons later, cotton has replaced rice as the main summer crop grown by members, with the 2022-23 crop covering 10,600 hectares.

### A balance with biodiversity

Coleambally is fortunate to be home to a wide range of important native species and CICL works closely with the community to improve the security of its biodiversity including initiatives to protect species that have become threatened or endangered.



As part of its commitment to conserving the local remnant vegetation, in 2007 CICL became the land manager of 1600 ha of Crown land surrounding Coleambally, establishing the Coleambally Irrigation Biodiversity Reserves. Composed of eight separate blocks, the Reserves are predominantly comprised of two endangered ecological communities – Weeping Myall Woodland and Sandhill Pine Woodland. Interspersed within the woodlands are shallow depressions and broken creek lines dominated by black box, lignum and nitre goose foot, forming a rich mosaic landscape.

Keith Thompson is employed as an Environmental Compliance officer at CICL, responsible for coordinating conservation programs both on-farm and within the biodiversity reserves.

“CICL and its members have worked closely with government departments and conservation groups in many conservation projects targeting threatened, endangered or elusive animals in the last 30 years,” Keith said.

“Perhaps the largest program to date has been the work to conserve the Australasian Bittern, an endangered bird that nests in rice fields.

“Through the bitterns in rice and boosting the bunyip bird programs, CICL and its members have grown bittern-friendly rice, recorded bird sightings on farm, surveyed nest sites, trapped and tracked bitterns and participated in education programs.”

Species that have disappeared elsewhere have maintained strong populations around Coly including well-known species such as the superb parrot and southern bell frog. CICL is working in partnership with the NSW Department of Planning, Industry and Environment in their multi-year program Saving Our Species program for the southern bell frog.

“We have coordinated the delivery of environmental water to creeks and wetlands on members’ farms and within the biodiversity reserves, as well as participating in frog surveys and the development of local management plans,” Keith says.

“In the last eight years we have also participated in Greening Australia’s superb parrot habitat restoration program, with almost 500km of direct seeding undertaken on the Biodiversity Reserves to provide foraging habitat for the threatened species.”

CICL has also funded and participated in smaller research and conservation programs for the painted snipe, plains wanderer and rakali. These initiatives are indicative of the proactive nature of the co-op and its members, going back decades.

#### **Taking action to restore the water table**

By the 1990s the impacts of 30 years of irrigation on the local landscape were becoming evident. Prior to the commencement of irrigation,

**Coleambally town was built in the 1960s to service the new irrigation district developed by the NSW Government.**

the water table was on average 20 metres below the natural surface, but by 1991 approximately 40,000 hectares of the Coleambally Irrigation Area had a water table of less than two metres.

Keith says many gravel pits and natural depressions were full of saline water year-round with widespread evidence of waterlogging. At the time it was feared that if no action was taken at least a quarter of the irrigation area would be salt affected by 2023.

“As part of privatisation CICL undertook a land and water management plan to ensure that Coleambally remained a sustainable irrigation area into the future,” Keith said.

“Members elected to pursue an ambitious program of on-farm irrigation efficiency and land management schemes, including biodiversity conservation programs. The results of these schemes have paid dividends for the community, in terms of biodiversity and the range of unique and endangered flora, fauna and birdlife in the area.”

### Targeting biodiversity

CRDC Innovation Broker Stacey Vogel and Cotton Australia’s Jenny Brown visited some of the reserves with Keith while undertaking grower consultation on the Australian cotton industry’s PLANET. PEOPLE. Paddock Sustainability Framework’s draft native vegetation and sustainability targets and priorities.

“The biodiversity block we visited has remnant cypress pine, yellow box, black box and wetland vegetation,” said Stacey, who is also CottonInfo’s Natural Resources and Catchments Technical Lead.

“It’s very special to see, as this remnant vegetation is home to a diverse range of plants and animals.

“I was really impressed with the condition of the vegetation and the initiatives Coleambally Irrigation have implemented at the site such as the wetland watering program and the direct seeding of native vegetation.

“The wetland is watered by Coly Irrigation as part of their biodiversity initiatives and is in amazing condition as a result.

“CICL is committed to helping protect its local environment and love to share their story through wildlife and wetland tours of the reserves.”

The tours are open to the public: to arrange a visit, phone 02 6954 4003.

#### For more

**Coleambally Irrigation Co-operative Limited**

[www.colyirr.com.au/biodiversity-initiatives](http://www.colyirr.com.au/biodiversity-initiatives)

**Stacey Vogel**

[stacey.vogel@crdc.com.au](mailto:stacey.vogel@crdc.com.au)

## CGA consultation in March-April

**Land clearing and land use conversion are about to come under as much scrutiny from our supply chain as greenhouse gases currently do, due to recent changes to the global sustainability standards used by corporations to manage sustainability.**

Very soon customers and financial institutions will expect the cotton industry to report changes to native vegetation on cotton farms.

“Instead of ignoring this coming reality and having reporting requirements imposed on us, CRDC and Cotton Australia have been working since 2021 to create a voluntary, industry-scale approach that makes sense for Australian cotton farms and still meets customer expectations,” CRDC Innovation Broker Stacey Vogel said.

This approach has three parts:

1. Clear, regionally appropriate cotton farm native vegetation extent and condition targets and priorities for action, aligned to existing regulatory requirements and regional Natural Resource Management (NRM) plans.
2. Cost-effective but robust data collection to measure impact across the industry, using consistent indicators aligned to common customer sustainability frameworks.
3. Bringing all the advice, financial and other support into regional hubs to make it easier for individual farmers wanting to preserve or increase native vegetation to take action, to avoid confusion, and to coordinate action at a regional scale.

The process to date has involved:

- ◆ Collaborating with NRM Regions Australia and the seven NRM regions where cotton is traditionally grown to develop this approach.
- ◆ Consulting with 96 growers in 11 Cotton Grower Associations (CGAs) to understand and incorporate their views, where possible, in refining the approach.
- ◆ Presenting the refined approach to the November 2023 Cotton Australia General Meeting.

“The feedback we heard was support for the need for proactive action, the condition target, and the regional hub concept to coordinate action, and that the draft extent target needed more refining to align with government legislation,” Stacey said.

“We also heard a strong view that while native vegetation provides some ecosystem services to individual farmers, it generally provides much more public good to broader society, so there is an urgent need for farmers, governments and customers to create innovative whole-of-society funding models to equitably fund the public good component of keeping or increasing native vegetation.

“We have taken this feedback on board and will consult with growers again via the CGAs on the refined extent target in March-April. We encourage all interested growers to participate in this process via their local CGA.”

From there, CRDC and Cotton Australia will seek endorsement from growers on the final draft targets at Cotton Australia’s June general meeting.

“It’s very important to note we can’t tell growers what to do with their land,” Stacey said.

“We do, however, need to clearly show the risks and opportunities that our industry and our individual growers face if they choose to clear or convert land, so they can make an informed decision to support a model designed to fit in with Australian farming systems. In turn, this will maintain access to premium cotton markets and build trust in the Australian cotton industry.”

## From Sydney to a rough dirt road: the growth of a farming industry

**Peter Sheppard is a second-generation irrigation farmer who has been running a family mixed-farming irrigation farm at Coleambally since 1963. He is also the chair of Coleambally Irrigation Co-operative Limited (CICL).**

As with many second or third generation farmers at Coly, Peter Sheppard's parents did not come from farming backgrounds, or even the region. His dad worked for the Postmaster-General and the family lived in Mona Vale on Sydney's Northern Beaches (Eora country). His agricultural experience was running a small dairy with his brother on the South Coast.

Due to the conditions around eligibility for the land ballot system, the irrigation blocks were taken up by people with little farming experience but a broad range of professions and vocations. Therefore the Coly region and community was uniquely built on an incredibly diverse range of skills, education and experience. And build it they did.

When families moved there in the 1960s they were greeted with bare, undeveloped 220 hectare parcels of land, marked only by boundary pegs, with not a fence or single piece of infrastructure in sight, bar the irrigation delivery system built by the NSW Government.

For six-year-old Peter, it was a stark change he remembers well.

"They were undeveloped blocks and to get there was on roughly formed up clay dirt roads, in sedans, as there were no four-wheel-drives," he says. "There were no houses".

"On the blocks there were pegs marking the boundary and that's it, unless you happened to get one of the blocks that had an old cottage or something on it from the sheep station days, but they were few and far between.

"There were no phones or electricity and no running water – the only water was in the channels at irrigation time."

Peter says most people built small machinery sheds first up and closed in a bay to live in, while some had caravans, and others tents.

"All these future farmers came here on equal footing – with nothing," Peter says.

"There were school teachers, bank workers, clerks, soldiers, you name it.

"We had to get in and build everything from scratch."

The Coleambally township didn't open until the late 1960s and Peter still remembers a travelling salesman coming around to service the newcomers. Today, the 'long-term' locals around Coly are



understandably proud of what they have achieved and where they are going.

Like all the new farmers to the Coly Irrigation District, rice was the Sheppard family's choice of crop until 2012, when Peter grew cotton to add diversity to his program. He said due to the climate, farmers there had few summer crop options before cotton and corn offered attractive options.

"Rice was the only real summer crop option for us, along with our wheat rotations and sheep," Peter said.

"With cotton, the season comes in on us quickly going into winter and then at planting we can often struggle waiting for it to warm up and we have incredible diversity in our soils, but we are growing some really good crops down here."

Cotton may also be responsible for bringing young people home.

"Keeping in mind the Coly Irrigation Area was created purely for irrigation, during the millennium drought a lot of people encouraged kids to go away and get trades," Peter said.

"After the drought and when cotton came and we had more water, cotton became attractive to farmers and especially the younger generation, which has brought some of them back to the farms.

"They are excited by the change, the big machinery, the research and the support that comes with the cotton industry.

"We are lucky to have two great industries here in rice and cotton, who albeit quite different in their methods, are both very good in their delivery of R&D, and we're quite spoilt with that

"We are a pretty unique community, built on water and a lot of blood, sweat and tears from the first generation of farmers who came here to start a new life on the land.

"We see a good future with the diversity crops like cotton bring."

**Peter Sheppard says Coleambally was one of the last large-scale infrastructure projects of its kind undertaken by the NSW Government, which opened up irrigated land to people beyond the borders of the surrounding sheep stations.**



ALI KUCHEL

# Saving soils while supporting the community

A CRDC Grassroots Grants project on a community-run farm at Coleambally (Wiradjuri country) is helping to overcome the challenges of soil variability and underlying soil constraints – two of the biggest challenges in irrigated cotton in southern NSW.

The positive outcomes of this ongoing project highlight the benefits of small communities working together for the common good, and the role that cotton industry support can play in their sustainable future.

The 400 hectare Murrumbidgee Shire Community Demonstration Farm at Coleambally is run almost entirely by local volunteers and farmers, many with the local APEX club and other community groups.

Each year the Demonstration Farm committee selects six local groups or organisations to grow a crop of their choice and for the past five years, clubs have chosen to grow cotton during summer. The committee retains overhead costs, which are kept low thanks to farmers volunteering their time, and local businesses' generosity.

While Coleambally was a purpose-built town to service the Coleambally Irrigation District, when it opened in 1968 (see previous story) it lacked many basic community facilities. The community has banded together to build the town, and the



**LEFT: Coleambally cotton grower Chris Gardiner, Cypress View Lodge aged-care facility manager Karen Hodgson and Coleambally Demonstration Farm Vice President Danny Graham. Cypress View Lodge was one of the beneficiary groups from the farm, supported by the local APEX club to grow the cotton.**

Demonstration Farm has made a large contribution to the community's ability to build and upgrade sporting facilities, schools, local health services and community clubs.

The first community crop was grown in 1996 when the local Lions Club grew a small rice crop. Since then, it's progressed into a large-scale, volunteer farming operation that grows several crops and has contributed more than \$3 million back into the Coleambally community. Just last season, local clubs and organisations benefited from about \$300,000, mainly from cotton crops.

The CRDC-supported Grassroots Grant project was initially created under the banner of the Southern Valleys Cotton Growers Association (SVCGA) to improve the soil health of the farm to maintain its value to the community, while also offering valuable extension opportunities.

The project has been developed and managed by local consultant James Kanaley, who saw an opportunity for the funding to assist with identifying local constraints and conveying the knowledge and outcomes to local growers. It's already having an impact on soil health in the region. The Grassroots Grant helped the participants to start undertaking soil testing and planning for soil amelioration.

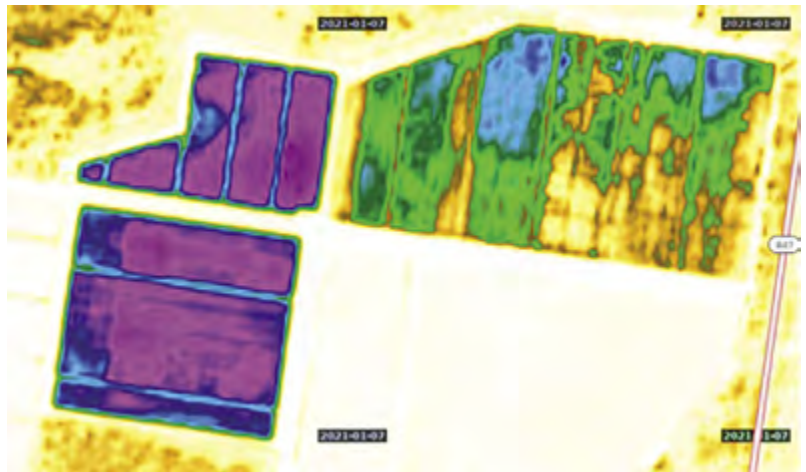
"We believe these improvements will make a huge difference to the Demonstration Farm's soil health and ensure the community farm can continue to operate in the Coleambally community in the future," SVCGA President Joe Briggs said.

"This project at the Demonstration Farm is having impacts directly on the soil in those fields, but is not confined to them, with benefits being seen through adoption of practices by other growers. So it has been and continues to be a very worthwhile project all round."

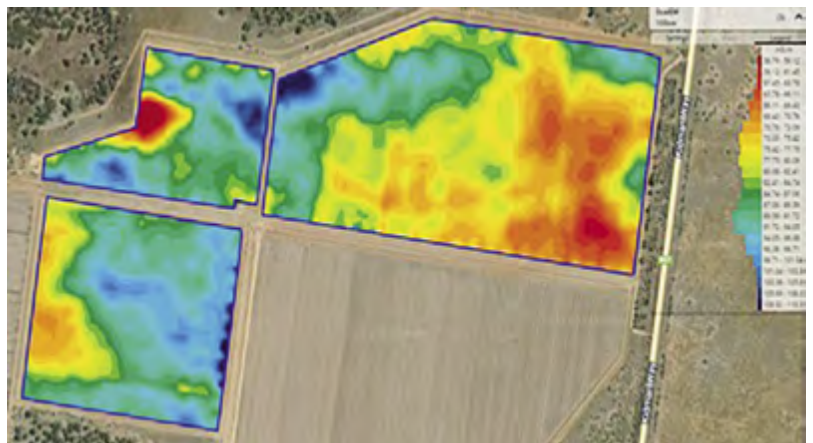
Soil variability is a major issue for farmers around Coleambally. Farmers say within fields there is a mix of natural variability coupled with the effects of intensive rice growing over the years, along with creating larger fields from smaller fields with varied use histories.

"With our variable soils in the region, standard practices in soil sampling and amelioration have been somewhat effective in the past to combat these issues, but we are still seeing soil constraints impact production," James says.

"With increasing costs of production and water input costs and availability becoming more variable, increasing the profitability of the soils we are



**Figure 1. NDVI image showing cotton biomass differences in field and between the three fields during the 2020-21 summer (source Satamap).**



**Figure 2. Dual EM survey characterising soil variability (source PCT).**

dealing with is crucial to the long-term sustainability of crop production in southern NSW."

James has been the driving force behind this project. He's given his time and expertise to oversee the project on behalf of the CGA, after witnessing serious soil issues heavily impact productivity for clients on their own farms, and at the Demonstration Farm.

"Due to its history of use and crop rotation, the Demonstration Farm is a challenging one for crop production: soil variability within one field can be quite stark and change aggressively over short distances," James says.

"This farm basically highlights some of the underlying issues we are seeing commercially across the district.

"We have variability that you won't find in a lot of other growing regions, and traditional soil sampling methods may not pick up on these constraints."

The 2022-23 season saw cotton planted into 50 per cent of the study area and irrigated bread wheat in the remaining area. There are eight fields at the Demonstration Farm, with the three main fields followed for the 2022-23 summer crop season. All three fields were coming out of a cereal rotation

which was planted directly behind cotton from the 2020-21 summer season.

“The fields showed significant variability during the cotton rotation and in one field in particular it was very difficult to establish cotton, with suspect acidity killing off cotton seedlings,” James said.

“To get some more accurate data and assess the soil variability, intensive grid soil sampling was undertaken.

“While there are many soil properties we can measure, we consider sodicity, acidity and phosphorus availability to be the key properties and low hanging fruit we can manipulate.”

EM surveys were also conducted over the three



Consultant James Kanaley started his career in the Wagga Wagga area before entering the cotton industry in Moree. He now runs his own independent agronomic consulting business based in the Murrumbidgee and Murray valleys and also works in his family's farming business.

JAMES KANALEY



A healthy crop of Sicot 606B3F planted in the 2022-23 season at the Coleambally Demonstration Farm, which is raising money for local groups and helping growers ameliorate tricky soils.

fields to help refine analysing soil variability. They also help to differentiate soil texture changes (sand/silt/clays), locate and install moisture probe sites, define soil testing strategies and analyse yield data.

“While the end goal was sustainability and financial profitability for the farm to be donated to local charities and groups, the learning experience along the way has been of great value to the local farming community,” James said.

“Relaying what we have found to growers that there are potential cost savings with inputs and advancing adoption are key objectives for us.

“Through facilitating the project, local volunteers, farmers and other community stakeholders have increased their understanding and knowledge of soil mapping and nutrition.

“The extension uptake has been very rapid and there has been a dramatic increase in intensive and strategic soil sampling in the area.”

For local grower and APEX member Chris Gardiner, what's he learned through the project has seen him take another look at soil sampling.

“The product saved from application in the right areas of the fields through variable rate technology convinced me that the grid sampling was worthwhile,” Chris said.

“Prior to this I certainly wasn't sold on the grid soil sampling that's for sure, but now I'm excited to see our results and bring our fields more into line.

“It was unfortunate due to wet weather we didn't get a cotton crop into the main field (field 5) as it had the biggest issues from the soil tests.”

James says the primary environmental benefit is improving efficiency in the use of the farm's most valuable resource, water.

“More crop per drop and maximising the water holding capacity of the soils also have flow on benefits such as improved nitrogen use efficiency,” he said.

“The project has improved the local environment through incorporating sustainable farming measures and placing a strong emphasis on improving our local environment to achieve the best result for the community, the environment and beyond.

“The soils we are dealing with in the Murrumbidgee and Murray valleys are known to be extremely variable, yet quantifying that variability and communicating it with growers can be very difficult.

“But as farmers are very visual, grid sampling and variable rate maps can produce stark and abrupt changes that can be made easily to the system.

“This isn't new science – this is old soil science but conveyed in new ways.”

Joe Briggs further supports the Demonstration Farm as an APEX member and local grower. He says James's trials at the Demonstration Farm are having impact with landholders, including him.



Joe Briggs says changes are happening on his farm and around the Coleambally district, as a new generation of growers embrace technology and put it to work to improve soil health.

He's now incorporated regular soil testing into his farming system.

"One of the biggest issues in Coleambally is redeveloping multiple paddocks with different histories into one bigger block," he said.

"Rice history has been causing a lot of issues for new cotton growers and new blocks.

"If we can demonstrate this practice for growers to see the cost saving in fertiliser and correct

placement it will potentially make the transition into cotton more profitable in their first season."

In his first year of soil testing, Joe says while they didn't save money on inputs, the improvements in the consistency of his crop were 'unbelievable'.

"Based on the soil testing and mapping, our variable rates were between zero and 400kg/ha, averaging 250kg/ha," Joe said.

"For me this reaffirmed what I already knew, and it has demonstrated the value of this technology to other growers."

Joe now has soil tests undertaken every two years, prior to planting cotton.

"That's potentially more than what's generally done and something I've decided to do," Joe said.

"Our local supplier here has been fantastic to help us get on board and capitalise on this technology."

Joe says having good support is vital to uptake.

"When variable rate came out everyone said 'let's do this' but we didn't know how use it.

"It's great to see it being incorporated into so many farming decisions here now, because if you're not staying up with technology, you are behind.

"This project has also increased the sustainability of the Demonstration Farm, which is of high importance to our community."

"The Demonstration Farm is such an important pillar in the community, and through conducting this project, we have been able to make improvements and ensure its longevity," James said.

"More can always be done, but through putting back into the farm, we can ensure the community groups, local charities and communities can continue to benefit into the future."

## Community is the word at Coleambally

It all began back in 1990 when a group of determined and dedicated locals pursued the acquisition of land and the allocation of water for a community farm. The Coleambally Lions Club had been growing a community rice crop for almost 20 years but the land used was no longer available and an alternative site was needed. Their vision was for an expanded community project incorporating experiments, demonstrations and a place to give all community groups within the Council area the opportunity to grow crops for their fundraising purposes.

By 1992 they had the land and it took a further three years to achieve a full water allocation of 576 megalitres. The organisation was incorporated in 1993 and in 1995 the water was sold on a temporary transfer to raise capital to develop the land. The first crop of rice was planted by the Lions Club of Coleambally in 1996-97, incorporating a trial of cattle and fowl manure. Cotton has now been the fundraising crop of choice over the past five years for the six local recipient organisations chosen each year who then choose which crop is grown on their designated 'block'.

### For more

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# New growing areas call for solutions to crop destruction

As cotton production moves into new regions, it throws new challenges at growers and researchers. This is particularly relevant in northern Australia as it's a vastly different system.

One area of challenge for growers of rain-grown cotton in the north, particularly around Katherine in the Northern Territory (NT), is crop destruction.

Dr Graham Charles from NSW DPI is looking for avenues to improve crop destruction in these climates and zero-till systems by defoliating and killing the crop at the same time.

Graham and his fellow NSW DPI weeds researcher, CottonInfo Integrated Weeds Management Technical Lead Eric Koetz, travelled to northern Australian cotton growing areas to better understand local weeds issues and management, which includes cotton crop destruction.

“Observations made during trips to the Ord Irrigation Area (Miriwoong country), Katherine (Jawoyn country) and Mareeba areas (Djabugandji country) have indicated the weed issues of these areas are very different, such that the areas need to be considered separately,” Graham said.

“Cotton production in the Ord follows our traditional irrigated cotton systems, mostly on heavy clay soils.

“Glyphosate resistance is already an issue, so the challenge for the Ord is to diversify their weed control and herbicide options and maybe introduce some residual herbicides to support the system.”

Rain-fed cotton production around Katherine is radically different from traditional systems and rapidly evolving.

“These wet-season crops, often growing on light, hard-setting soils, are very rain dependant, but have shown tremendous potential to deliver high yields, with six or seven bales/ha achievable in a good season.



GRAHAM CHARLES

**Wet-season crops, often growing on light, hard-setting soils, are very rain dependant, but have shown tremendous potential to deliver high yields. The soil and climate also create crop-destruction challenges for growers.**

“Glyphosate is currently working well for them, but they have big problems managing cotton after picking in what can be a zero-tillage environment – not dissimilar to the issue in southern zero-tillage systems, where heavy cultivation to kill cotton plants post-harvest in really dry soils doesn't fit well in the system.

“The problem stems from the combination of high-intensity summer rain and that a lot of the cotton is on very hard-setting, fragile soil, often on slopes, so a heavy tillage pass after harvest on very dry soil is not a good option.

“Cotton production is new to the Atherton Tablelands/Mareeba, but going into traditional farming areas where it is just a new crop in an old area, where again, residual herbicides and glyphosate resistance are issues. Crop destruction can be a problem there as well, but the problem can be wet soils, not the dry soils of the NT.”

One year into the trials at the Australian Cotton Research Institute at

Narrabri (Kamilaroi country), Graham looked at several methods of defoliating and causing plant death at the same time. While the trials were hampered by wet weather, the results from the first experiment to cause plant death were very variable but encouraging.

“The best treatments appeared to kill better than 90 per cent of cotton plants without causing leaf freeze.

“The experiment will be repeated on younger cotton this season to confirm the result, and then new treatments will be applied later in the season based on these findings.

“We will also repeat our weed surveys in all three northern Australia areas during the 2024 and 2025 seasons to get a better understanding of weed pressures in these areas.”

## For more

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# Looking for answers to speed up defoliation

MELANIE JENSON

For growers in southern NSW, where seasons are shorter than most other regions, the question most asked of CottonInfo Fibre Quality Technical Lead René van der Sluijs is: ‘how can defoliation be sped up so we can harvest earlier without sacrificing quality and yield?’

He hopes a project he is working on looking at ‘priming’ defoliation could offer a valuable option to speed up the defoliation process. It’s a process of applying low rates (50ml/ha) of thidazuron liquid at six to eight nodes above cracked boll (NACB), targeting seven NACB, followed by normal defoliation processes.

“Delayed harvests in short seasons often attracts lint quality and yield penalties,” René said.

“And as the days start to cool off, senescence slows down which also means more harvest aid products are needed for successful defoliation.”

Currently there are few proven options to help these southern growers get pickers into the crop without having

to wait weeks after applying defoliants which puts them in a riskier position of sustaining weather damage to open bolls.

René’s project is following up on earlier priming experiments for late season insect control that showed good results.

“This application of thidazuron, a hormone-based defoliant, will induce leaf drop by changing the hormone status in the plant,” René said.

René says the theory of leaf drop was first floated by industry entomologists in 2010 as an integrated pest management tactic.

“It was proposed by (former CSIRO cotton entomologist) Dr Lewis Wilson and CSIRO’s Dr Simone Heimoana to control late season outbreaks of pests such as thrips, jassids, cluster caterpillar, loopers and spur-throated locusts,” René said.

“Preliminary trials in southern NSW in the 2018-19 and 2019-20 seasons showed favourable results which warranted further investigation.”

With the assistance of Kieran O’Keeffe, CottonInfo’s Regional Extension Officer in the south, a number of commercial scale trials have run over the past three seasons with encouraging results. These trials have resulted in a two to four percent increase in lint turn out in primed fields and no statistically significant differences in yield or fibre quality.

Due to the cool, mild, and wet conditions over these years, which was indicative of conditions growers often face, it wasn’t possible to determine any potential advantages in terms of harvesting earlier and earlier winter crop planting.

However, further research is underway with small-scale trials being run with assistance from CottonInfo’s Integrated Weed Management Technical Lead Eric Koetz at NSW DPI’s Leeton Research Station (Wiradjuri country). This trial will test the process across five varieties: Sicot 746 B3F, Sicot 748 B3F, Sicot 714 B3F, Sicot 606 B3F and 3141 B3XF. Seed samples also will be collected to test for any impact on germination, as this is unknown.

Commercial trials are again planned, with several growers already on board. René and Kieran are keen to hear from additional growers who are interested in participating.

## For more

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# Genetic testing uncovers how top three weeds spread

Australia has the most extensive evolution of weed populations with resistance to multiple herbicides across cropping regions, and is second only to the US with respect to the number of resistant weeds in the country with 49 herbicide-resistant weed species.

As part of the Area Wide Management (AWM) for Cropping System Weeds project, researchers consulted with weed management stakeholders including growers, agronomists, contractors, extension officers, biosecurity officers and public land managers from cropping regions across Australia.

The three-year project which finished in 2023 was led by the Grains Research and Development Corporation (GRDC) with support from CRDC as part of the Department of Agriculture, Fisheries and Forestry's Rural R&D for Profit program. It involved a broad collaboration with industry research organisations and universities who brought their particular expertise to the project. Also involved were regional councils and managers of other public land.

The project surveyed 84 stakeholders to determine the weeds of greatest concern. The top three were: flaxleaf fleabane (*Conyza bonariensis*), annual ryegrass (*Lolium rigidum*) and feathertop Rhodes grass (*Chloris virgata*).

A review on the costs of weeds to the grain industry by CSIRO's Rick Llewellyn, who led the AWM project, found that flaxleaf fleabane is a high impact summer fallow weed responsible for crop yield losses of \$43.2 million per year. This is in

addition to the high cost of maintaining control of summer weeds.

These top three weeds have highly mobile seed or pollen with the potential to become resistant to our most important herbicides. They're known as 'mobile weeds' as they spread readily, spreading herbicide resistance as they carry resistance genes across the landscape.

## How far do mobile weeds spread?

We know the movement of seed and pollen of mobile weeds spreads herbicide resistance, but the small size of seed and pollen make identifying the extent of weed movement challenging.

Using a 'population genetics' approach, the research team assessed the movement of the three key weeds across each focus region studied in the project: the Riverina in NSW, Darling Downs in QLD and the Sunraysia region of Victoria. The weed species were selected based on high potential mobility and the concerns of growers in each region.

Ten populations of each weed species were collected in each region (flaxleaf fleabane from across the Riverina and Sunraysia, annual ryegrass the Riverina, and feathertop Rhodes grass across the Darling Downs), across varying land uses, and explored the genetics of each population looking for evidence of weed mobility.

## Genetic variation across the regions

Dr James Hereward of the University of Queensland led this study into genetic variation across the regions and found populations of ryegrass, feathertop Rhodes and fleabane were similar genetically across both farm and roadside populations indicating movement between these land uses at the regional scale.

"For feathertop Rhodes there is one genetic population across the whole of the Darling Downs region and for annual ryegrass the same is true across the Riverina, with little genetic differentiation between samples. This suggests high levels of weed dispersal has occurred across the region," James said.

"For these two species we found that resistance genes can be spread by pollen as well as seed – likely by wind.

"For fleabane we did find evidence of more localised populations within the Riverina region, and fleabane spreads more by seed than by pollen."

Fleabane populations within the Riverina and between the Sunraysia and Riverina regions revealed surprising evidence of genetic variation.

A healthy fleabane crop in the lab ready to undergo genetic testing, which has led to a better understanding of how weeds and resistance spreads throughout the landscape.





“This suggests fleabane may be less mobile than its small, wind-dispersed seeds would suggest, although there was evidence of long-distance dispersal between the regions,” James says.

### High rates of outcrossing

One finding that surprised the researchers was that feathertop Rhodes grass has high rates of outcrossing (even higher than annual ryegrass). This means that resistance genes can move via pollen as well as seeds in both these species, likely suggesting that herbicide resistance in annual ryegrass and feathertop Rhodes grass is moving widely across the landscape.

“It also means that it is easier for these two species to stack resistance to different herbicide modes of action and therefore more rapidly acquire multiple herbicide resistance in a population,” James warns.

“The high rates of geneflow detected combined with the even spread of herbicide resistance found across the regions by fellow researcher Dr Chris Preston of the University of Adelaide.

“His resistance testing showed how weed movement and geneflow spread resistance across a region.

“In thinking about AWM, the most mobile species are good candidates for an area wide approach because they more rapidly become shared problems.

“We found that all three species are highly mobile and that weed movement spreads resistance across the region: this means that all three species are good candidates for area wide approaches.

“This will have a larger impact than individuals working independently.”

### Glyphosate resistance across the landscape

The AWM project also examined the distribution of glyphosate-resistant weeds at a local scale across the three regions for the three weeds.

High frequencies of glyphosate resistance were identified across all weeds and districts ranging from 42 per cent of flaxleaf fleabane samples in the Sunraysia to 65 per cent of annual ryegrass samples in the Riverina. Not only did resistance occur across the areas sampled, but it was present across multiple land uses — including farmland and non-farmland, such as roadsides and irrigation channels. These findings highlight the risk of herbicide resistance spreading across multiple land uses and underscore the need for a landscape scale approach to weed management.

The project team investigated how integrated weed management (IWM) might play a role in AWM, helping reduce costs and increasing resilience to new weed problems. The results indicate growers who invest in a diverse weed management strategy are likely to profitably manage existing weeds and reduce costs and risks from new weed and herbicide resistance introductions. Practices likely to reduce the seed set of a new and potentially mobile weed can also improve landscape-scale control.

**Dr James Hereward with researchers Leela Maya Rizal and Angela Ezeh at the University of Queensland. The research team were surprised that feathertop Rhodes grass has high rates of outcrossing which means resistance genes can move via pollen as well as seeds.**

#### For more

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# Record applicants for future leaders program

Young people from across the cotton industry are embracing the opportunity to learn about leadership, with a record number applying for the 2024 Australian Future Cotton Leaders Program (AFCLP).

CRDC Innovation Broker Rachel Holloway was part of the selection panel and said with 46 applicants, it was also extremely difficult to choose just 15.

"We would love to accommodate them all, but ultimately we added one more participant for this life-changing opportunity," Rachel said.

"This very diverse mix of participants will go on to take leadership roles, advance their careers, find more career satisfaction and develop connections with fellow participants that last a lifetime."

The 2024 participants are Angus Marshall, CSD E&D agronomist, Katherine NT; Georgie Flick, Pablo Vega agronomist, Goondiwindi Qld; Greg Pearce, Bayer territory business manager, Goondiwindi Qld; Grace Griffiths, agronomist/business owner 101 Ag Pathways, Goondiwindi Qld; Rhys Herbert, farm manager, Warra Qld; Dr Alison McCarthy, UniSQ senior research fellow, Toowoomba Qld; Brendan Murray, Queensland Cotton grower services manager, St George Qld; Jacob Booby, Namoi Cotton account manager Namoi, Narrabri NSW; Kate Lumber, Poole Ag agronomist, Moree NSW; Sam Carberry, cotton grower, Narrabri NSW; George McCalman, cotton grower, Gunnedah NSW; Sarah Vivers, cotton grower, Weemelah, NSW; Hayden Petty, Summit Ag agronomist, Leeton NSW; Angus Whittaker, Customised Farm Management area manager/cotton grower, Darlington Point NSW; Prue Byrnes, cotton grower,

Rowena NSW; and Jack O'Neill, cotton grower, Narrabri NSW.

Held every two years the AFCLP is run and coordinated by Cotton Australia with support from CRDC and facilitation by Jo Eady of Ruralscope. The program has produced 116 graduates since 2006.

"Each year we have been challenged in our selection process because the standard of applicants is incredibly high, and this year was no exception," Cotton Australia CEO Adam Kay said.

Grace Griffiths has a love of agriculture and cotton she is passionate about sharing.

Along with working as an agronomist and office manager in the family business at Goondiwindi (Bigambul country) in South-East Qld where she grew up with irrigated farming, Grace is already demonstrating her leadership potential by promoting cotton and agriculture and highlighting roles and opportunities in the industry.

Her business, 101 Ag Pathways, isn't just about advertising jobs. Grace's passion for sharing the positive and rewarding aspects of living and working in rural Australia stands out. Her social media channels include video interviews, stories and interesting information about people living and working in agriculture. She's really chuffed to see a few Goondiwindi faces in this year's cohort and what it says about the town.

"I think the strong showing from Goondi is testament to the supportive nature of people in the industry here," Grace says.

"What I've learned through my business is that early-career or younger professionals really need the mentorship and support of their peers.

"For me personally, I'm 24, and am increasingly in situations where I'm overseeing others or I need to manage them, and I want to be good at that, to be a good leader who people want to go to work with.

"There is a difference between being a 'boss' and a leader, which no doubt I'm



**Grace Griffiths is a well-known advocate for agriculture and inspiring early-career professionals to come to the bush.**

about to learn about and experience in the best way and I'm really looking forward to it.

"I've heard amazing things about the course and can't wait to learn and then put that to work in my daily work and life."

In 2024, the program will feature face-to-face forums, interactive online discussions, one-on-one coaching and integration with industry activities. Participants also lead a project related to their area of interest. The program concludes with a graduation ceremony at the 2024 Australian Cotton Conference on the Gold Coast (Bundjalung country) in August.

## For more

### Australian Future Cotton Leaders Program

[www.cottonaustralia.com.au/leadership-programs](http://www.cottonaustralia.com.au/leadership-programs)



# How do you make more unicorns?



Scientist Blake Palmer has been keeping himself busy at the Australian Cotton Research Institute (ACRI) running soil health trials that started before he was born. Blake, 31, is one of the cotton industry's new generation of scientists and has been described by his fellow researchers as a unicorn.

It's not his magical aura or flowing mane – it's because he's a Narrabri (Kamilaroi country) local who went to work, then university and came back to his home town to continue his career. He now works with NSW DPI Soil and Water as a research/development officer on a CRDC-supported carbon benchmarking project, is studying for his PhD and has a role as a Regional Soil Coordinator with the Southern NSW Innovation Hub supporting the delivery of Australia's National Soil Strategy. If Blake was a cotton plant, you'd ask Warwick Stiller to get onto an increase to go commercial, stat.

CRDC has supported Blake's journey through his tertiary education, which has enabled him to study and work at the same time. Mentors such as fellow NSW DPI soil scientist Guna Nachimuthu have ensured that he finds a permanent, enjoyable and rewarding home in cotton.

As the cotton industry and agriculture in general focuses on methods of bringing young scientists into the fold, Blake's story may offer some insight. He went to work before university, came home to Narrabri and didn't always envision a career in science. He very nearly became a tradesman instead, which illustrates how fate can play a role in young people's futures and the importance of giving them opportunities to thrive.

"I was interested in science thanks to Narrabri High School biology teacher Allan Tame, but I never wanted to go to uni when I left school," Blake says.

"I grew up on farms and in agriculture, so after a stint working for Boral near Brisbane, I thought coming back to the country and working in ag was for me.

"I came back and worked in quarries around here for a while and then with an ag contractor, which is where I first came in contact with cotton. My first exposure to cotton was mulching it, and my first exposure to cotton science was working at Cotton Seed Distributors in the seed shed."

It wasn't long before Blake felt he should get a trade or go to university. He applied for both and was accepted into uni first. Blake began a Bachelor of Agriculture at the University of New England in 2015, while still contracting. It was here he met cotton-industry supported soil scientists Dr Chris Guppy and Dr Oliver Knox. This set him on his future course.

"Chris and Oliver turned me toward soil science, as I was looking more at agronomy," Blake said.

For a person not initially inclined to follow a scientific career, the more you talk to Blake it becomes clear that small interactions with science

over time accumulated to help make his career choice.

“The experience with science at school, then working briefly in the lab at Boral, then the job at CSD. To then have the opportunity to study with support from CRDC cemented my path.”

Blake makes the daily commute from Narrabri to ACRI, about 20 kilometres out of town, with his wife Natasha who is part of Dr Warwick Stiller’s CSIRO plant breeding team.

“All my school mates have gone pretty much and it’s sad to see so many young people go away and becoming skilled, educated or experienced, then take those skills with them somewhere else,” Blake said.

“So I am pretty passionate about keeping skills in the bush or attracting people from bigger centres, including keeping those scientists who come through for a short stay.

“Natasha is a good example of someone who has come for work and stayed, although I can’t marry everyone so that might not be the most appropriate way to maintain a young workforce in the area!

“We need to make the opportunities that are available here well-known and make it really overt that it’s affordable and doable. A good work/industry culture that fosters, supports and includes them will help them see that they have a future in the bush.

“After all, that’s where the action is – where our primary industries are!”

Blake sees cotton growers themselves as a reason to join the industry as a scientist.

“The advantage the cotton industry has from a science perspective is that the growers are really, really hyper engaged.

“I don’t know if you get that same level of reward in the other industries, cotton growers are really switched on and into the science. They get it: that’s the best bit.

“The motivation for me as a scientist is that you are making a difference, so it helps so much more when the growers are engaged and they want the same things we do – outcomes.”

The relatively small number of growers is also a bonus.

“It makes it feel more like a community. The conversations I hear between growers at workshops and events show familiarity, and even if they don’t know each other, they are open and willing to share.”

In 2021 Blake completed his degree in soil science and agronomy while working as a technical officer with NSW DPI, with support from CRDC. He’s now started a PhD into ameliorating soil compaction using rotation crops with further support from CRDC.

“I was lucky – I got to do my do my honours on

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## ***“Blake sees cotton growers themselves as a reason to join the industry as a scientist.”***

micronutrients in cotton with support from CRDC,” he said.

“It was cool to be working inside a project and studying at the same time. It allowed me to produce some outcomes from the project and gave me a really well-rounded experience. It’s a great feeling to know it’s my work that brought this knowledge out.

“I have had heaps of support as a result. Having the support of Guna has been invaluable, he has put a concerted effort into my development.

“My motivation being involved in science is getting the answers. Now in my PhD, I want to find that elusive sweet spot between production and sustainability when it comes to compaction.”

Blake’s PhD work is in response to increased mechanisation in cotton and in particular the 36 tonnes associated with round bale pickers.

“That’s a pinch point in our cotton operation at the moment in terms of compaction,” he says.

“I get the practicality of these awesome machines but we need a solution. The way climate is changing and intensifying the risk of rainfall events when you don’t want them carries greater compaction risks at harvest. So while we can try to avoid compaction, it will still happen.”

Blake said the project is just kicking off with an investigation into the influence of strategic tillage and having identified suitable rotation crops for the trial.

Along with this research, Blake is part of the soil carbon benchmarking project supported by CRDC.

“I feel really lucky and grateful for the support through CRDC and the NSW DPI soils unit,” he said.

“It has made all the difference to how my career in science has progressed, and how much I enjoy it, which gives me every reason to stay and work in the bush.

“I’d love to see more people like me, either coming home or moving to the bush to work in cotton science, because I’ve felt valued and supported and as a result have brought knowledge into the world that didn’t exist before.

“And that’s pretty cool.”

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### **For more**

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# Opening doors and opportunities

Becoming a recipient of a CRDC scholarship offers a lot more than financial support, with a range of events, networks and opportunities to support current and future scientists in the cotton industry.

CRDC supports students, scientists and researchers with support to complete honours and summer scholarships, and masters, PhD and postdoctoral research projects. CRDC supported six summer scholars, 15 PhD students and eight post-doctoral researchers in 2022–23.

These scholarships provide a smooth pathway to experience the cotton industry, with activities and tours planned specifically for students and early-career researchers. At last year's Australian Association of Cotton Scientists Conference, for example, students toured a cotton farm, attended a welcome dinner and had a special lunch time speed-networking event with industry peers. They were supported by CRDC Innovation Broker Rachel Holloway, who oversees the scholarship recipients and organised the events, which included opportunities to be introduced to experienced scientists and industry players.

CRDC supported NSW DPI's Blake Palmer through his honours.

"It was an amazing opportunity to be able to work inside a project and study at the same time. It gave me a really well-rounded experience, and I have had heaps of support as a result," Blake said.

NSW DPI soil scientist Guna Nachimuthu has been a mentor for students and other early-career scientists. He says CRDC honours and postgraduate scholarships are building blocks of workforce development within the cotton industry, particularly in research and development.

"These scholarships offer students invaluable opportunities and exposure to the cutting-edge innovations in cotton science," Guna said.



Researchers new to the industry, post-graduate students and early-career scientists enjoyed a special luncheon at the AACCS Conference, which was aimed at allowing them to meet seasoned industry professionals and make important connections.

"They also enable scientists like me to attract top talent to research endeavours in the cotton industry.

"It's crucial to offer such chances to nurture the finest talents in the upcoming generation, as they are often driven when they recognise the value of their contributions."

Guna says for him, being a mentor means offering guidance in a supportive manner, without being overbearing and encouraging staff and students to find solutions on their own, while being available to provide advice when needed.

"I consistently work to inspire and support both my students and staff (including Blake) in their professional growth by advocating for new training opportunities, qualifications, and advanced studies," he said.

"Drawing from personal experience, when a staff member learns new skills or obtains additional qualifications, it not only enhances their own productivity and career but also contributes to the overall productivity and advancement of the team and the organisation."

Guna says he works in the cotton industry because it demonstrates remarkable proactivity, with cotton growers and consultants often among the first to embrace research findings.

"Following the completion of my PhD at the University of New England, I have remained deeply engaged in applied

research focused on soil and system management.

"This ongoing involvement in applied field research within the cotton sector has been immensely rewarding.

"Over several years, it has become evident that identifying cropping systems resilient to extreme climatic events and the associated soil characteristics requires long-term research efforts that encompass seasonal variability.

"To see this research passed into good hands with early career scientists such as Blake is very rewarding, as he is now working on trials that began before he was even born, continuing a long legacy of cutting-edge soils research in cotton."

Students and researchers interested in applying for a CRDC-supported scholarship should first consult the 2023-2028 Strategic Plan Clever Cotton. Proposals will be assessed on their alignment with CRDC's research priorities and the capacity for outcomes to be achieved within the specified time frame.

#### For more

[www.crdc.com.au/researchers/scholarships-travel](http://www.crdc.com.au/researchers/scholarships-travel)

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*Spotlight* is brought to you by CRDC: the Australian cotton industry's research, development and extension investment body, jointly funded by Australian cotton growers and the Australian Government.

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