Spotlight
ON COTTON R&D

AUTUMN 2026

Lining up to lead: record number for industry program

Trials underway to reduce emissions intensity on-farm

Researchers return to the regions

CRDC

Allan Williams

In the Spotlight

As another cotton season draws to a close, this edition of *Spotlight* highlights practical research, development and extension underway across the industry. From on-farm trials and new research capacity in the regions, to leadership development and innovation, growers and researchers continue to focus on what works.

The Cotton Low Emissions Intensity Farming Systems (Cotton LEIFS) projects are underway in NSW and Qld, bringing researchers and growers together to tackle on-farm greenhouse gas emissions. These grower-led trials reflect the systems approach growers have called for, integrating emissions, soil health, irrigation and disease considerations and testing practical, regionally relevant strategies to reduce emissions while maintaining productivity.

In Qld, Cotton LEIFS falls under the major CRDC and Qld DPI project, *Future Cotton: Innovation and Impact for Sustainability, Biosecurity and Growth*. Through this project, we have been able to bring new research capacity to the regions of Goondiwindi, Emerald and Toowoomba – strengthening the connection between growers and researchers and responding directly to feedback about the value of having research expertise based locally.

I encourage growers to reach out to the project leads of Cotton LEIFS – Aaron Simmons and Paul Grundy – to learn more about the work and to get involved. All the details you need are within these pages of *Spotlight*!

Developing people and leadership across the industry remains a strong focus. This year, a record 17 participants have been selected for the Australian Future Cotton Leaders Program, reflecting the depth of talent across the industry and the growing demand for opportunities to build leadership capability. I am confident we will continue to see graduates stepping into influential roles on farms, in businesses and across industry organisations.

Supporting people on farm is also central to the CRDC-backed SHIFT program, which continues to help growers and team leaders build stronger, more sustainable workplaces. Recent on-farm workshops have reinforced the value of practical tools that support staff development, wellbeing and retention – all critical to the long-term success of our cotton businesses.

Planning is well underway for the Australian Cotton Conference to be held in August, where CRDC will once again return as a Foundation Sponsor. The 2026 theme, Future Fit, aligns closely with our Clever Cotton Strategic Plan and reflects the industry's commitment to addressing today's challenges using forward-looking research, innovation and collaboration. I look forward to catching up with many of you on the Gold Coast. In keeping with the themes of Clever Cotton and Future Fit, we have announced the 11 successful applicants in our 2025 Innovation Call. It's exciting to see the blue-sky thinking, technology and approaches being put forward to address cotton's challenges – from lightning-powered seed technology to biofertilisers made from farm waste and nature-based pest control!

Finally, some personal news from me. Following discussions with the CRDC Board, I have advised that I do not plan to seek an extension of my current contract beyond March 2027. While my term still has a year to run, we felt it was helpful to share this early to allow time for thoughtful planning and a smooth, well-managed transition, aligned with the timing of CRDC's next strategic planning cycle. I remain fully committed to leading the CRDC team through to the end of my contract and continuing delivery against Clever Cotton to ensure our organisation, and our industry, are well positioned for the future.

For now, as both crops and seasons start to close, I wish growers a safe and successful harvest.

Allan Williams
Executive Director

CRDC

CRDC acknowledges the Traditional Custodians of the lands of Australia's cotton communities, and recognises their enduring connection to the land and waterways that sustain us. We value the Aboriginal and Torres Strait Islander people who have cared for this country for thousands of years. We pay our respects to their Elders past, present and emerging, and extend that respect to all First Nations peoples today.

Autumn 2026

FEATURES

MELANIE JENSON

ON THE COVER:
AFF farm manager Paul Flewitt and researcher Aaron Simmons discuss CRDC-supported nitrogen trials underway to reduce greenhouse gas emissions.

Want to see more of Spotlight?

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

COTTON NEWS

Spotlight is brought to you by Australia's cotton growers and the Australian Government through the Cotton Research & Development Corporation (CRDC). CRDC is a research, development and extension partnership between the Australian cotton industry and the Australian Government.

CRDC
COTTON RESEARCH AND DEVELOPMENT CORPORATION

Cotton Research and Development Corporation
ABN: 71 054 238 316

Vision: A sophisticated, prosperous and sustainable Australian cotton industry, strongly connected to its value chain.

Mission: Delivering world-class outcomes for the cotton industry through thought leadership, innovation, adoption and collaboration.

Postal Address:
PO Box 282, Narrabri NSW 2390
Offices: 2 Lloyd Street, Narrabri NSW 2390
Tel: 02 6792 4088
Email: spotlight@crdc.com.au
Web: www.crdc.com.au
Editor/GM Communications: Ruth Redfern
Editorial Manager/Contributor: Melanie Jenson
Design: Neil Deacon Design

CRDC keeps Conference foundations strong

PLANNING is well underway for the industry's best loved and supported event – the Australian Cotton Conference, scheduled for August 2026 at the Gold Coast Convention & Exhibition Centre in Broadbeach, Qld (Bundjalung country).

CRDC will once again support the Conference as a Foundation Sponsor, along with fellow long-term sponsor, Cotton Seed Distributors (CSD).

CRDC sponsorship enables growers to attend at a discounted rate. Travel bursaries are available for researchers, and undergraduates can apply for support to attend through CRDC and Cotton Australia.

Exciting new CRDC-supported research undertaken under the Clever Cotton Strategic Plan forms a significant part of the presentations that will be on offer. In 2026, CRDC and CottonInfo will once again co-host a major stand in the Conference trade hall.

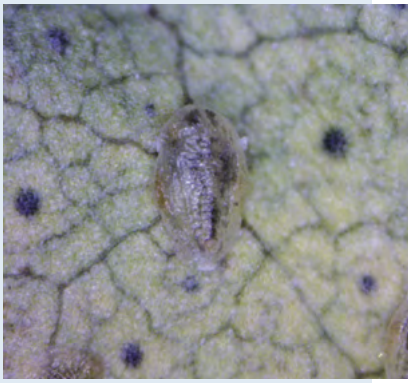
"The CRDC and CottonInfo teams look forward to the Conference as an opportunity to catch up with our cotton community in person, as well as showcase the industry's world-class researchers and their work in RD&E," CRDC's General Manager Communications and Extension, Ruth Redfern, said.

For more
Australian Cotton Conference
www.australiancottonconference.com.au

New App now in the field

TO assist with silverleaf whitefly sampling, the University of Southern Queensland (UniSQ), Qld DPI and CRDC have released the CottonInfo NymphCheck App. The App can determine nymph viability using a mobile phone image taken with the aid of a specific clip-on lens attachment. NymphCheck classifies nymphs as viable (healthy) or non-viable (parasitised, dead or empty cases).

From first open boll onwards, assessing nymph viability is a crucial component of ongoing silverleaf whitefly management decision making. During this period, assessment of nymph viability can determine the impact of parasitism (which can increase rapidly), and the efficacy of applied insecticides.



Parasitised whitefly nymphs are under the microscope with new NymphCheck App.

Determining nymph viability, particularly due to parasitism, can be difficult and requires magnification. The impacts of this mortality can markedly reduce what might initially appear to be high numbers of nymphs and negate the need to spray or make a follow-up application.

The App works entirely offline and does not need an internet connection. The software is based on research and development undertaken with support from CRDC by researchers from UniSQ's Centre for Agricultural Engineering in partnership with Qld DPI.

"When managing crops late in the season, please consider the silverleaf whitefly populations in your fields, and consult the silverleaf whitefly decision matrix, revised in 2024, to estimate your risk," CottonInfo IPM Technical Lead Paul Grundy from Qld DPI said.

"Take advantage of the revised NymphCheck App that can help determine parasitism levels in your crop. The simplified sampling procedure now focuses on the presence/absence of nymphs in the mid canopy."

Suitable for Apple and Android, the Beta release of NymphCheck is available in App stores now.

In this edition of *Spotlight,* we look back over time to track how the industry worked, and continues to work together in overcoming the threat of insecticide resistance in silverleaf whitefly. Turn to Page 29 to recount the experiences of those dealing with the pest during the first whitefly incursions in central Qld.

For more
CottonInfo NymphCheck App
www.cottoninfo.com.au/nymph-check-app

Ideas flow as CRDC attracts innovators from across Australia

FROM lightning-powered seed technology and AI-driven drones, to biofertilisers made from farm waste and nature-based pest control, almost $550,000 will be shared by CRDC across cutting-edge projects that aim to tackle some of cotton's biggest future challenges.

The successful projects under the CRDC Innovation Call will be delivered by some of the country's leading startups, ventures, entrepreneurs, agribusinesses and research organisations.

The 11 successful applicants were selected following a national open call for innovative solutions to three cotton challenges – preparing for a low-pesticide future, optimising nitrogen use, and improving weed management. It was a competitive process, with cotton growers involved through the CRDC and Cotton Australia research panels helping prioritise projects.

CRDC offered up to $50,000 to support each individual feasibility study across these three key priority areas.

"The Innovation Call provides CRDC with the opportunity to support research, development and extension (RD&E) in a different way to our usual investment channels and we have had a fantastic response," CRDC's Acting General Manager of Innovation, Susan Maas said.

"When Phase 1 is complete and the feasibility studies are in, we will offer up to $500,000 to a select few of these innovators to proceed to Phase 2 and deliver a proof-of-concept."

"This was a very competitive Call with some really different and exciting ideas proposed, both from people within the Australian cotton industry and people we've never worked with.

"We increased our intake from four to 11 participants due to the quality of the applications.

"This is particularly useful as we continue to seek new, better, more sustainable or most cost-effective solutions to our core priorities.

"We received a good spread of proposals across the three priority areas, plus another focused on fibre quality, which was outside our identified priorities, but was received positively by our grower panels.

"We were open to ideas that would align with CRDC's Strategic Plan and we really appreciated the advice of growers, because our biggest priority is ensuring our investments deliver impact."

The 11 successful innovators and their projects are listed here. Stay tuned for the Winter edition of *Spotlight* for more information on each of the projects.

"We really appreciated the advice of growers... our biggest priority is ensuring our investments deliver impact"

CRDC Innovation Call successful applicants & projects

Focus Area: Cost-effective riparian weed management

- Katherine Selhorst, Landcare Australia. Innovation: WildSeek Weeds: using drones and AI to detect weed species.
- Andrew Davidson, Southern Queensland Natural Resources Management. Innovation: Spatial planning for riparian investment in Southern Qld cotton regions.

Focus Area: Optimising nitrogen profitability while reducing environmental impact

- Lijing Wang, Royal Melbourne Institute of Technology. Innovation: Carbon dots from cotton farm wastes for enhancing nitrogen and pesticide efficiency.
- Floris van Ogtrop, University of Sydney. Innovation: N-Smart cotton.
- Darryl Lyons, Rainstick. Innovation: Variable Electric Field (VEF) technology for enhanced cotton germination, establishment and resource use efficiency.
- William Lane, Growth Ag Holdings. Innovation: Bio-waste to bio-fertiliser transformation project.
- James Brinkhoff, University of New England. Innovation: Real-time remote sensing-based monitoring for cotton nitrogen use efficiency optimisation.
- Paul Castor, MCA Agronomy. Innovation: Investigations into the costs and benefits of faba bean green manuring in rotation with irrigated cotton.

Focus Area: Limited-pesticides future

- Joshua Thia, University of Melbourne. Innovation: Bacterial symbionts as a tool for biocontrol of insect pests in cotton.
- Stephen Madden, The Crop Capsules Company. Innovation: Evaluating the efficacy of mass-releasing predatory mites to suppress two-spotted spider mites in cotton.

Focus Area: Fibre quality

- Vicky Alexandrou, Woven Optics. Innovation: Determine the value and feasibility of incorporating on-site micron testing to the cotton industry to better inform harvesting or processing decisions.

For more

Susan Maas
susan.maas@crdc.com.au

Conference committee fires up a program fit for the future

REGISTRATIONS are now open for the flagship 2026 Australian Cotton Conference at Broadbeach, Queensland (Bundjalung country), taking place from August 4-6, where delegates from the full length of the supply chain will explore how to adapt, innovate and thrive in a rapidly changing world.

Under the theme 'Future Fit Cotton' the conference will provide opportunities to step back, look ahead and shape what comes next for the industry, exploring on-farm realities and global market pressures, cutting-edge science and practical, take-home solutions.

Adding to the excitement of the 2026 Australian Cotton Conference launch is a fresh new logo and website, reflecting a modern, confident and forward-looking industry that values innovation, sustainability, collaboration and community.

Conference Chair, cotton grower Gus O'Brien of Warren (Wailwan country), said the three-day event will examine how the industry can stay ahead of emerging trends, strengthen its competitiveness and continue to lead as a fibre of choice.

"Attendees can expect a dynamic and varied program featuring leading research, real-world case studies, on-farm innovation and insights from experts both within and beyond the industry," Gus said.

"Topics will span areas such as the evolution of digital agriculture, on farm technology, data and traceability systems, soils, sustainability, water stewardship, workforce and community wellbeing, market access and competition, and the role of science and policy in shaping the industry's future.

"Delegates will be equipped with new knowledge and connections, practical advice, and plenty of ideas for how to move the industry forward, so that we remain future fit."

The Australian Cotton Conference is known for bringing together a diverse audience and 2026 will be no exception. Delegates will include merchants, ginners, spinners, manufacturers, brands and retailers, as well as cotton growers and their families, farm employees and managers, agronomists, researchers and scientists, students and educators, industry organisations and suppliers.

MELANIE JENSON

It's time to gather again for the industry's premiere event – the 2026 Australian Cotton Conference.

A major highlight is the Cotton Trade Hall, the central hub for business connection and exposure to the latest technology, machinery, crop inputs, services and innovation. Businesses are encouraged to book their exhibition space early, to secure a place at the heart of the industry's premier event and to maximise engagement with delegates.

Sponsorship opportunities are also available, offering partners a platform to promote and align their business with the world-leading Australian cotton industry.

The Australian Cotton Conference is proudly industry-led and organised by a volunteer committee. It raises funds for a nominated charity, offers a range of social networking events, and remains excellent value for money, thanks to generous sponsor support – including CRDC as a Foundation Sponsor.

"This diversity is one of the Conference's strengths, creating a forum where ideas are shared, challenges are debated and solutions are shaped across the entire value chain," Gus said.

"Whether it's growers looking for practical insights from fellow farmers, a researcher keen to connect science with industry impact, businesses seeking new opportunities, or a first-time attendee wanting to understand the cotton sector from the inside, the Conference offers something for everyone."

The new website is the central hub for Conference information, with details on registration, sponsorship, exhibition opportunities and program updates rolling out in the lead-up to the event.

2026 Awards nominations open

Nominations are open for the 2026 Australian Cotton Industry Awards, and growers, researchers and industry professionals are invited to recognise and celebrate the innovation, excellence and sustainability that defines the sector.

With nominations closing April 2, the Awards showcase leaders across five categories: Bayer Cotton Grower of the Year, AgriRisk High Achiever of the Year, CRDC Chris Lehmann Young Achiever of the Year, Cotton Seed Distributors Researcher of the Year and the Service to Industry Award.

Recipients will be announced on August 6 at a gala event on the last night of the Conference. Tickets can be purchased for the awards dinner when registering for the Conference.

For more

Australian Cotton Conference

www.australiancottonconference.com.au

Q&A with 2026 Australian Cotton Conference Chair Gus O'Brien

As preparations get into full swing for the 2026 Australian Cotton Conference, we caught up with Conference Chair Gus O'Brien, a cotton grower from the Macquarie Valley, to talk about his industry experience, his vision for the Conference and why he's excited about the year ahead.

Tell us a bit about your background in the cotton industry.

Cotton has been part of our family story for a long time. My parents started growing it in the Macquarie Valley in 1983, not long after cotton arrived in the region. At the time, it proved to be a far more profitable option than what they were doing previously, and we've been growing it ever since, aside from a few tough drought years. I came home to the farm in 1996 after college and worked my way up through the family business. Dad stepped back around 2005 or 2006, and I've been running my own operation since 2011. We're a mixed farming business: broadacre cropping, irrigated cotton when water allows, and a small grazing enterprise.

Why did you get involved in the Conference Committee?

I've seen the Conference from a few different angles over the years. Dad was involved in the early days through the Australian Cotton Growers Research Association (ACGRA), and I remember attending my first Conference in Brisbane in 2002, which really left an impression on me. More recently, as a director of Cotton Australia, I've had a closer look at how the Conference operates behind the scenes. I was on the Conference Committee in 2024 and saw just how well organised and professional it is. It's a well-oiled machine, and I felt I could contribute to it while also learning a lot along the way.

What does it mean to you personally to be Chair of the Committee?

It's a huge privilege. The Australian Cotton Conference is one of the best agricultural conferences in the country, and to be asked to chair it is an absolute honour. It's grown year on year and has become a real drawcard, not just for cotton growers but for the entire supply chain. We're heading into a more challenging economic landscape, so my hope is that we can continue to grow the Conference and make sure it delivers real value for delegates.

Gus O'Brien says being 'future fit' is about staying competitive, efficient and relevant.

What's your vision for the 2026 Conference?

What I'd really like to see is the Conference building on the strong foundations laid over the past 30 years. It's always been a collaborative event, and that's critical. With the theme, 'Future Fit Cotton', I want the Conference to help people navigate what I think are some very real challenges ahead, particularly around cost pressures and profitability. Agriculture is facing challenging times, and growers and businesses need practical insights to help them adapt. If people leave the Conference feeling better equipped to face those challenges, that's a win.

What does the theme 'Future Fit Cotton' mean to you?

I think it's a very fitting theme. We're dealing with issues like sustainability pressures, cost squeeze, competition for fibre share and global market challenges. For cotton to remain a leading fibre, we need collaboration right across the industry. From a grower's perspective, yield and profitability is key. Cotton has been one of the most profitable crops for decades, but with recent price movements, we need to ensure we don't lose hectares to other crops, or market share to other fibres. Being future fit is about staying competitive, efficient and relevant.

Why should growers and industry make the effort to attend?

There's no better industry event where you get everyone in one place. It's at a good time of year, when people can step away from the farm, and it brings together growers, researchers, resellers, merchants and end users. From a grower's point of view, you learn a lot in the sessions, but just as much comes from the informal conversations – between sessions, over dinner, or even late at night! We're planning strong grower-led content again, because learning from what other growers are doing is incredibly valuable.

Why did you choose Beyond Blue as the Conference's nominated charity?

Mental health is something I feel strongly about. Suicide is a leading cause of death for men in rural Australia, and the statistics are very confronting. Beyond Blue has a strong national presence with a regional focus, and I believe they can make a genuine difference in rural and farming communities. Tough times come and go in agriculture, and anything we can do to support people through those periods is money well spent. I'd love to see us raise $40,000 this year. It's ambitious, but it's worth aiming high.

Any final thoughts?

There's no better event for anyone involved in cotton. It's the perfect opportunity to learn, connect and be part of shaping where the industry is heading. I'm really excited about what lies ahead and looking forward to seeing everyone on the Gold Coast in August!

Success of cotton leaders program sees record number of applicants

The popularity of the Australian Future Cotton Leaders Program (AFCLP) continues to grow, with a record number of highly skilled applicants for 2026.

The success of the program has prompted the selection panel to increase the 2026 intake to 17 participants, up from 16 in 2024 and 15 in 2022, with all cotton growing regions represented.

The AFCLP is delivered every two years by Jo Eady of RuralScope, and hosted by Cotton Australia with funding support from CRDC. Since its establishment in 2006, the program has produced 132 graduates.

Jo Eady said the AFCLP has now achieved a level of success where past participants are encouraging their employees and colleagues to apply.

"Dalby growers Matt and Allyse McVeigh are both AFCLP alumni and this year, their employee Alexander Stephens is a program participant. And there's also Goondiwindi grower and alumni Charlie Clarke and his staff member Liam Blackwell participating," Jo said.

"Megan Baker at CRDC will follow in the footsteps of Acting General Manager of Innovation, Susan Maas, who was part of the very first AFCLP cohort, while Nat Aquilina from Cotton Seed Distributors (CSD) is a 2026 participant, and follows on from other CSD alumni Sam Lee, Kym Stevens, and Angus Marshall.

"Australian Food & Fibre has also been a big supporter of candidates over the years, with Georgina Rowlands the newest entrant."

Taking on leadership roles

Previous AFCLP graduates have progressed to senior leadership positions on farms and as industry representatives on boards and committees. While not all participants move into public roles, they say personal growth and the ability to give 100 per cent to anything they want to achieve are common outcomes from the program.

Alumni say they've gained the confidence to follow new career paths, develop business ideas and take up representative positions in industry and business, as well as develop short and long-term goals and better manage workplaces.

Many go on to participate in other industry-supported leadership programs, such as the Australian Rural Leadership Program, TRAIL and Nuffield Australia Farming Scholarships.

"We are seeing a type of succession playing

out in the AFCLP now, and the record demand for positions on the program speaks to the success of program alumni as industry ambassadors," CRDC Executive Director Allan Williams said.

"The AFCLP is an example of how leadership and innovation underpin the industry's productivity and sustainability. By expanding the intake to 17, we're investing in leaders who will convert their ambition into tangible productivity and sustainability outcomes.

"Because the program is hands on and facilitates learning through practical, real world projects, it builds a strong peer network. In partnership with Cotton Australia, CRDC is proud to back a cohort that will lead change on farms, in businesses, and across the industry."

CGAs in support

Cotton Grower Associations (CGAs) are also creating an environment that encourages participation.

Paul Sloman of Cotton Australia, who oversees AFCLP on behalf of the industry, said CGAs have seen a lot of past participants move into positions of responsibility on their committees.

The Central Highlands Cotton Grower and Irrigators Association (CHCG&IA) has been encouraging applicants and this year selected their new secretary, Bridget Bender, to take part.

"We also have two current CGA chairs in Sam Ryan from Southern Valleys and Lochie Holz from Walgett CGA in the 2026 program," Paul said.

"Grace Griffiths, the MacIntyre Valley CGA events coordinator, was a 2022 participant and is a great advocate for the program."

Cotton Australia CEO Adam Kay believes increasing the intake is the right decision to ensure the industry continues to build strong leadership capability across the board.

The 2026 Australian Future Cotton Leaders Program participants are:

- Emily O'Shannessy, CGS, Kununurra WA
- Alexander Stephens, McVeigh Partnership, Macalister Qld
- Angus Dalgliesh, Nutrien Ag Solutions, Cloncurry Qld
- Bridget Bender, AGnVET, Emerald Qld
- Henry Perry, Perry Farming, Goondiwindi Qld
- Jason Salvetti, Salvetti Farming Co, Arriga Qld
- Lauren Roellgen, Tyunga Farms, Brookstead Qld
- Liam Blackwell, Clark Farming Group, Billa Billa Qld
- Ashley Hollis, Cotton Australia, Sydney NSW
- Georgia Carrigan, Australian Food & Fibre, Warren NSW
- Georgina Rowlands, Australian Food & Fibre, Ashley NSW
- Hugh Lennon, Hancock Agriculture, Merah North NSW
- Lachie Holz, B&W Rural, Walgett NSW
- Jessie Schwager, Priag Marketing, Narrabri NSW
- Megan Baker, CRDC, Narrabri NSW
- Natalie Aquilina, CSD, Narrabri NSW
- Sam Ryan, Wingbadge Pty Ltd, Murrami NSW

"It's encouraging to see applicants from all parts of the industry putting themselves forward. This year's group brings a wide range of experience, perspectives and ambition, which is exactly what the program aims to develop," said Adam.

In 2026, AFCLP participants will take part in face-to-face forums, interactive online sessions, one-on-one coaching, and industry activities. They will also complete an individual project aligned with their interests, gaining experience in applying leadership skills in a real-world context.

The program will conclude with graduation in August 2026 at the Australian Cotton Conference.

For more
Paul Sloman
pauls@cotton.org.au

Growers and broader industry urged to consider ARLP

Two cotton scholarships are being offered to join the Australian Rural Leadership Program (ARLP) Course 33, kicking off in mid-June 2026. Supported by CRDC and Cotton Australia, the scholarships are open to growers or those working in broader supply chain or research. Facilitated by the Australian Rural Leadership Foundation (ARLF), the ARLP is widely considered to be the most in-depth, cross-sectoral, national leadership program for rural, regional and remote Australians – a reputation it has garnered over 30 years of operation.

The program offers a combination of face-to-face residential workshops, online sessions and project work both individually and with fellow participants.

To find out more or register interest, contact Megan Baker at CRDC.

Course 33 key dates:

Session 1: June 2026 Sydney to Kangaroo Valley
Session 2: September 2026 Alice Springs
Session 3: April 2027 Indonesia
Session 4: August 2027 Canberra

For more:
Australian Rural Leadership Program
programs@rural-leaders.org.au
www.rural-leaders.org.au/application-arlp/
Megan Baker
megan.baker@crdc.com.au

Sign up to take your digital and data knowledge to a new level

The Digital and Data Solutions for Cotton Systems course offers the opportunity to see first-hand some of the technology used to generate data relating to soil, crops, water and management practices, such as variable rate technology.

NO matter how far along people are in their data and digital journey, a new short course at Narrabri (Kamilaroi country) in July will offer something for everyone.

Registrations open in early April for microcredential two under the CRDC Cotton Course: the *Digital and Data Solutions for Cotton Systems* course. It will be held at the University of Sydney's Narrabri campus as a three-day intensive from July 7-9, 2026.

This microcredential follows the first course held in March. The course, Microcredential one: *Australian Cotton Farming Systems* was designed for those new to cotton and the industry. The CRDC Cotton Course is being delivered by CRDC and the University of Sydney (USYD) in partnership with CottonInfo and Cotton Seed Distributors.

The second in the series of newly-developed courses is aimed at more experienced growers, agronomists and consultants and will provide participants with an understanding of the range of technologies and data streams available to them, and the fundamentals of obtaining and storing data. This includes moving from a paper-based to digital systems, and ways to overcome the common barriers to the uptake of new technology.

Topics include where and how to access data relevant to cotton-growing from devices and online sources, and how to ensure that growers get value for money and economic benefit through uptake and understanding.

The course offers the opportunity to see first-hand some of the technology used to generate data relating to soil, crops, water and management practices, such as variable rate technology. A session will also explore data derived off farm, from sources such as satellites, regional data and remote sensing, and how to use digital platforms to make maps and decisions relevant to cotton production. Topics include the current and future application of AI in cotton production.

The CRDC Cotton Course microcredentials each involve a three-day intensive study session in Narrabri, plus some pre-reading and previewing of resources beforehand. There are no prior educational requirements, exams or assignments and enrolments are open to all in the Australian cotton industry.

The CRDC Cotton Course is coordinated by USYD's Ian Simpson, who is based at the IA Watson Grains Research Centre on the Narrabri campus.

Ian said Microcredential 2: *Digital and Data Solutions for Cotton Systems* is specifically aimed at growers and agronomists, to assist them to find solutions and better harness technology and data on farm.

"Participants will have the opportunity to access and view different data sources through computer-based practical sessions, as well as learning through case studies how different streams of data can be collected and 'wrangled'," Ian said.

"They will be taken through a precision agriculture in cotton exercise to understand the causes of yield variability, learn to create management zones for a cotton field, and analyse an on-farm experimentation dataset using a commercial data platform.

"We believe it will give greater confidence to crop managers and ensure they harness the limitless opportunities offered by technology and data."

CRDC Cotton Course Microcredential 2: Digital and Data Solutions for Cotton Systems

- Enrolments open: early April 2026
- Course Date: July 7-9 at Narrabri, NSW
- Cost: $950 with a 10 per cent discount for enrolments prior to 31 May 2026. This includes tuition and catering. The price has been kept to a minimum thanks to CRDC support. For those travelling long distances to attend, CRDC travel support may be available.
- For more information or to apply: https://short-courses.sydney.edu.au/course/CCDDS

For more

www.crdc.com.au/crdc-cotton-course

CRDC Cotton Course Coordinator

Ian Simpson

cotton.course@sydney.edu.au

CHANTAL CORISH

Dr Nicole McDonald, Colorada Cotton's Matt Anning, Sam Heagney, South Bunarba Agriculture, Jo Eady and Clarke Farming's Charlie Clarke from Goondiwindi at the Corish family property "Mundine".

On-farm coaching brings positive shift toward workplace success

PLACES filled quickly for the inaugural SHIFT on-farm coaching program held at Goondiwindi (Bigambul country) in February, and the participants were not disappointed.

Supervisors and team leaders from six cotton farms met at Chantal and Simon Corish's property, "Mundine", to learn new skills in coaching and staff development in a one-day workshop, to be followed by a 10-week remote coaching program.

The on-farm initiative is a result of the three-year, CRDC-funded project *SHIFT: Delivering best practice to manage future skills*, which was developed specifically for the cotton industry to address growers' needs in attracting, developing and retaining staff.

Grower evaluation of the SHIFT project suggested that there was a need for further information on how to develop employees' non-technical skills.

"Consequently, CRDC has supported this 12-month project developing this 'coach-the-coach' program, which also involves looking at options for an ongoing SHIFT program, and how the program can support the framework used to demonstrate workplace sustainability across the industry," said Dr Nicole McDonald, a cotton industry workforce researcher with Central Queensland University (CQU) and the SHIFT project lead.

Bringing the program to the growers

The on-farm coaching program is being delivered by Jo Eady of RuralScope (who delivers the Australian Future Cotton Leaders Program), with Nicole and Goondiwindi cotton grower, psychologist and CRDC-supported PhD candidate Chantal Corish, who hosted the event. Dr Amy Cosby of CQU is also part of the SHIFT team. Chantal has been exploring psychological safety as part of her PhD study. Her findings have been incorporated into SHIFT and the coach-the-coach workshop.

Psychological safety in the workplace determines whether employees feel safe to speak up about errors, challenge the status quo, and contribute their unique set of skills, knowledge and experience to the job. It is strongly linked to better performing teams through increased learning behaviours, greater employee effectiveness, increased innovation, improved wellbeing and higher retention rates.

Jo Eady said the on-farm coaching program aims to boost awareness of psychological safety and other non-technical skills that are essential to helping people adapt to the challenges everyday farming presents.

"We know they are proficient at the technical side of growing cotton, but

through the SHIFT experience we want to ensure growers provide psychologically safe teams and workplaces that will result in efficient recruiting of staff, and most importantly, retaining them," Jo said.

"This new program helped them to understand how a one-on-one meeting with a team leader can multiply outcomes for a whole team, and how to perfect the art of giving one-on-one feedback that motivates change.

"We also touched on topics about how to connect and care for staff, so they perform at their best, and how to 'shake the shame' when things don't go to plan."

Ten weeks of remote coaching now follow the initial one-day program. Having developed the SHIFT resources over the initial three-year project, Dr Nicole McDonald is excited to see the growing interest in the suite of resources available.

"SHIFT is a direct outcome of listening to industry and grower concerns around attracting and retaining the workforce, and it's the culmination of previous CRDC-funded research projects that focused on adaptable and engaging workplaces," Nicole said.

"Showing growers how to take control of the things that can improve the attraction and retention of workers, and how to recharge and manage the risk of burnout for themselves while providing a safe and supportive workplace, is central to SHIFT."

CHANTAL CORISH

South Bunarba Agriculture's Jack Scilley, Sarah Vivers and Sam Heagney. Sarah and Sam have contributed to cotton industry non-technical skills guides for new entrants and growers.

SHIFT resources cover a wide range of skills for people management, including the *Australian Cotton Industry Non-Technical Skills Guide for New Entrants* and another specifically for team leaders. The full suite of SHIFT resources are available to growers via the CottonInfo website.

For more
SHIFT resources
www.cottoninfo.com.au/blog/shift-resources

Boll counting using machine vision

CONSULTANTS are being invited to test the latest advanced field sensing technology using artificial intelligence (AI) and machine learning to assess boll and square counts.

The Bollscan App has an accuracy of more than 90 per cent compared with manual boll counts. It was developed through a CRDC project led by the University of Southern Queensland (UniSQ) in collaboration with Qld DPI investigating the potential for new technologies to reduce labour inputs and improve precision across a range of routine crop assessments for pest, disease and agronomic management.

With Beta testing in the 2025-26 season underway, the research team is looking for interested consultants who would like to use the BollScan App to undertake boll counts in crops that have cutout. Researchers will use the feedback to further refine the technology, while CRDC will continue working with research partners, Qld DPI and UniSQ, to determine the best way to ensure the technology is made available to industry. BollScan is one of four developments using machine learning and AI, with infield sensing for canopy management, spatial wilt disease monitoring and silverleaf whitefly viability monitoring also under development.

Consultants are being asked to be a part of testing new machine learning technology to undertake boll counts.

For more
Derek Long
derek.long@unisq.edu.au

Weeds surveys show need to maintain diversified management approaches

MELANIE JENSON

Cotton systems are being surveyed as part of the GRDC's *Herbicide resistance status of grain and cotton cropping regions* project, in collaboration with CRDC.

One of agriculture's leading weeds researchers, Dr John Broster has encouraged growers to use non-herbicidal weed management tactics to prolong the life of available effective herbicides.

John is a Senior Lecturer in Agronomy and Weed Science at Charles Sturt University and is leading the latest national weeds survey being undertaken by the Grains Research and Development Corporation (GRDC), with support from CRDC to build a picture of herbicide resistance in key weed species. It builds on previous GRDC national weeds surveys and is an extension of collaborations with CRDC and the Analytics for the Australian Grains Industry to collect and collate data on weed species, building on the current knowledge of weed distribution and herbicide resistance.

The 2024-25 weeds survey started in November 2024 with a summer weeds survey in March-April 2025. Over the next two and a half years, the team will screen the sampled weed populations for herbicide resistance and compare the results with the previous survey, as many of the same sites were visited.

Weeds which have evolved resistance to herbicides have placed significant pressure on existing herbicides. Currently, 47 weed species have confirmed herbicide resistance status in Australia. These are resistant to 10 different modes of action and 30 of these species are known to be weeds in crop production systems.

Herbicide resistance can develop through the selection of naturally occurring resistant weeds; the movement of resistant genes through pollen; or the importation of already-resistant weed seeds through flood, animals, or practices such as the purchase of contaminated grain or feed and use of contaminated machinery. Species shift to naturally tolerant species also occurs.

"More diverse strategies embracing non-herbicide control tools must be developed and adopted to help preserve herbicide efficacy in Australian cropping systems," John said.

"We need to think about how we can maximise the use of our herbicides before we lose them.

"These surveys provide knowledge of what weed species are present, the level of infestation and their resistance status which enables both the research conducted and management advice for growers and agronomists to be better targeted for each region."

Testing to form complete picture

Now around 18 months into the project, the team has done most of the sample collection and

started the resistance screening. The survey tracked herbicide resistance in annual ryegrass, wild oats, brome grass, barley grass, sow thistle, Indian hedge mustard, feathertop Rhodes grass, flaxleaf fleabane, awnless barnyard grass and sweet summer grass.

John said the project is a continuation of the previous GRDC survey project between 2020 and 2024 which was the first nationally coordinated weeds survey.

"This latest national herbicide resistance benchmarking survey will give us a broad and complete picture of herbicide resistance and to identify emerging issues early," John said.

"The data will provide invaluable information to industry about the incidence of herbicide resistance, which can guide investment to develop management strategies for priority weed species identified through the survey.

"Ultimately, our findings can be used to help growers develop strategies to manage weeds effectively and delay resistance development."

Annual ryegrass under the microscope

The information will include annual population and resistance status of key weeds by region and an estimation of the frequency of major winter and summer grain cropping weeds across the Australian grain and cotton growing regions.

Annual ryegrass *(Lolium rigidum)* was identified as the number one problem weed in the 2020 GRDC national survey. Prior to that survey three per cent of annual ryegrass randomly surveyed was resistant to glyphosate, and in the 2020 survey that had jumped to 13 per cent.

"Not only does it readily develop resistance, but annual ryegrass is also one of the costliest weeds to manage," John says.

"The survey showed high levels of annual ryegrass resistance to post-emergent herbicides, while pre-emergents on the most part is still effective."

Nationally, 71 per cent, 23 per cent, 91 per cent and 79 per cent of annual ryegrass samples were resistant to pinoxaden (Axial), clethodim (Select), iodosulfuron-methyl (Hussar), and imazamox + imazapyr (Intervix), respectively.

Summer time is weeds' time

The previous survey showed that 100 per cent of flaxleaf fleabane, 99.3 per cent of feathertop Rhodes grass and 50 per cent of awnless barnyard grass populations were resistant to glyphosate.

Increased glyphosate resistance in summer weeds was expected because of the heavy reliance on the herbicide for fallow weed control. In this survey the were no feathertop Rhodes grass or awnless barnyard grass populations with resistance to Group 1 herbicides and resistance to Group 22 herbicides was only recorded in feathertop Rhodes grass populations, both herbicides commonly used in double knock strategies.

However, John says growers and the research community must remain vigilant given that resistance to Group 22 pesticides has occurred in other grass weed species. There was no resistance to 2,4-D amine or paraquat+diquat in flaxleaf fleabane. This means these herbicides remain effective for control of these weeds.

In summer weed management, the size of the weed is a significant factor in control. This is a key tactic promoted in the cotton industry's Herbicide Resistance Management Strategy (HRMS, see story

Cotton growers are 'seedbank aware'

A recently released report from GRDC on the impact of weeds in both grain and cotton systems found that, overall, the annual cost of weeds to Australian growers was estimated at $4.4 billion ($206/ha) with weed control expenditure dominating these costs. This includes the loss of 1.2 million tonnes in crop production.

Weeds cost cotton growers $145 million ($445/ha) in revenue losses and expenditure costs again with weed control expenditure the major cost at $387/ha. In dryland cotton systems, this represents around 25 per cent of their total variable costs on weed control, and around 14 per cent in irrigated systems. The use of integrated weed management practices, often used to delay or manage resistance, cost Australian grain growers $1.07billion ($51/ha) and cotton growers $9 million ($28/ha) annually.

The study by CSIRO and led by GRDC with support from CRDC found that cotton growers are 'seedbank aware' as they implement long-term, economically optimal strategies to minimise in-crop weed density.

Lead researcher and CSIRO data analyst, Jackie Ouzman, said the expenditure on herbicide and non-herbicide weed control tactics is keeping weed pressure low in cotton farming systems.

"When both the current season yield benefits and the long-term advantages of reducing the weed seed bank are considered, the investment in keeping weed density low usually pays off," Jackie said.

"Cotton yield losses due to weeds are very low at around 0.4 per cent of production, or $58/ha, attributable mainly to the industry's near 100 per cent adoption of herbicide-tolerance seed technologies, which are worth a conservative $24 million per year or $75/ha in weed control benefit."

For more

Impact of weeds on Australian Grain and Cotton Production
www.weedsmart.org.au/pdf/impact-of-weeds-on-australian-grain-and-cotton-production/

JOHN BROSTER

Dr John Broster is leading the herbicide resistance project and says a major takeaway is that resistance levels we see today are the result of previous management decisions.

page 16) and through the WeedSmart initiative.

John says that is there is still an assumption it is more economical to apply herbicides to larger weeds once, but "spraying smaller weeds in cooler conditions without dust generally leads to better control results".

"An effective integrated weed management plan relies on knowing which herbicides work and what doesn't and when they work best," he said.

"Not all weed survivors are due to herbicide resistance. They may be caused by poor application, a lack of sprayer calibration or stressed weeds.

"That's why to rule out herbicide resistance and know which herbicides to use, these survivors should be sent for testing."

Residual use a resistance tactic

Managing increasing glyphosate resistance, especially in cotton and grain cropping regions in NSW and Qld has forced growers into alternate management approaches. These include the use of residuals in fallow periods with a residual herbicide program applied immediately post-harvest, generally in conjunction with a double knock to clean up anything that was present in the crop at harvest.

"While residual herbicides can be more costly and can have associated rotational crop restrictions than knock-downs, the loss of reliable knock-down herbicides has caused a rethink," John said.

"Nobody likes the idea of cultivating fallow paddocks, but this is being forced onto some growers as a result of farming decisions taken over the previous 20-plus years which have now resulted in paddocks with populations that can no longer be practically controlled with the remaining herbicide options.

"A major takeaway is that resistance levels we see today are the result of previous management decisions.

"Most of the decisions we take around herbicide use are mainly for operational efficiency – not to maximise efficacy or to prevent/delay resistance, and this is the mindset we need to change."

The GRDC projects align with CRDC's Strategic Plan goal to invest in research that creates a five per cent improvement in management strategies for resistant weeds by 2028 through increased knowledge of the herbicide resistance status of key weeds of grain and cotton cropping systems in Australia.

"The plan's aim is that a pest-suppressive farming system is established that is better able to cope with challenges like exotics, resistance, and species shift while meeting community expectations about less reliance on pesticides," CRDC Innovation Broker Shakira Johnson said.

"By collaborating with GRDC we are able to tap into nationally consistent resistance data that directly informs management improvements, helping the industry track progress toward measurable gains in resistant weed control by 2028."

For more

John Broster
jbroster@csu.edu.au
Shakira Johnson
shakira.johnson@crdc.com.au

David Thornby says the new Herbicide Resistance Management Strategy (HRMS) for cotton expands the diversity of weed management to apply six or more tactics over two years, with a strong emphasis on the need to control survivor weeds.

New HRMS to protect triple-stack technology

As cotton growers contend with glyphosate-resistant weeds and shifting weed spectrums, a new Herbicide Resistance Management Strategy (HRMS) was released in 2025, recommending the application of six or more management tactics over two years.

This is a change from the previous HRMS recommendation focused on managing glyphosate resistance, however the emphasis on the need to control survivor weeds remains strong.

In 2013, CRDC supported the development and introduction of the cotton industry HRMS. It was based on the '2 + 2 and zero survivors' strategy, to extend the effective life of over-the-top glyphosate in Roundup Ready cotton systems. The strategy stipulated using two non-glyphosate tactics targeting both grasses and broadleaf weeds during the cotton crop, plus two non-glyphosate tactics in summer fallow targeting both grasses and broadleaf weeds and controlling survivors of glyphosate applications so they did not set seed.

In 2025, CRDC commissioned an updated HRMS, working with NSW DPIRD and cotton industry weeds researcher and data modeller, David Thornby, who says there was broad adoption of the first HRMS recommendations by growers, but there is now a need for new strategies to combat herbicide resistance.

"The industry now has access to XtendFlex varieties with triple-stacked herbicide tolerance technology, but cotton growers are now contending with glyphosate-resistant weeds and shifting weed spectrums which call for a broader range of chemistries to manage the weed seed bank," he said.

"The new HRMS expands the diversity of weed management to apply six or more weed management tactics over two years and maintains a strong emphasis on the need to control survivor weeds.

"It requires three herbicide modes of action in crop, and three different modes of action in fallows.

"Growers who plant rotational grain crops can implement a wider range of non-herbicide tactics to control weeds and manage herbicide resistance risk, including different planting times, crop competition, break crops, green and brown manure crops, harvest weed seed control, crop-topping and stubble burning."

Cotton smart is WeedSmart

The cotton Herbicide Resistance Management Strategy (HRMS) is an industry-specific application of the WeedSmart initiative's 'Big 6'.

CRDC and GRDC support WeedSmart to deliver science-backed weed control solutions to growers and advisors to ensure long-term profitability for Australian agriculture.

The Big 6 is a practical planning framework and farming systems approach, encouraging growers across all crops to add more diversity to their farming system and weed control program. The six pillars are diverse farming systems, competitive crops, mixing and rotating herbicides, effective spray application, stopping weed seed set and harvest weed seed control.

The cotton industry HRMS has actioned the WeedSmart Big 6 approach and incorporated the key principles of integrated weed management to incorporate rotation crops, increase crop competition, mix and rotate herbicides, optimise spray efficiency, stop weed set and manage weeds, including rogue cotton, during and after harvest.

WeedSmart promotes diversity in cropping systems and weed control to keep herbicides working for longer, protect seed technologies, build soil health, maximise crop yield and improve long-term profitability and sustainability. WeedSmart's extensive resources are available on the program website and are supported by district extension agronomists across cotton and grain growing regions.

WEEDSMART

Technology is giving growers options and reducing chemical usage. Optical spot spraying technology can reduce herbicide use by up to 90 per cent and reduce resistance risk by allowing for the use of more expensive, effective chemicals on specific, hard-to-kill weeds.

WeedSmart Northern Extension Agronomist Paul McIntosh is the team member who is most familiar to the cotton industry. Paul has mentored many cotton industry agronomists over 30-plus years in the industry, and is well-respected for his ability and willingness to share information with growers and advisors.

Weed management in cotton farming systems will feature in the 2026 WeedSmart Week forum and field days planned for Griffith on August 18-19, 2026. There are also a host of online resources, including interviews and case studies, as well as alerts and information about events including weeds workshops, trial tours, webinars, and spray workshops.

"WeedSmart offers an additional resource to CottonInfo, with a pure focus on helping growers manage weeds and herbicide resistance," CRDC Innovation Broker Shakira Johnson said.

"CRDC supports WeedSmart as it covers research outside our investments which is relevant to not only cotton but other crops that our growers grow.

"The WeedSmart message is also shared through CottonInfo networks with clear, practical weed management information.

"I'd urge anyone not already signed up to CottonInfo or WeedSmart to get on board and make the most of the many resources for integrated weed management."

For more

Cottoninfo
www.cottoninfo.com.au

WeedSmart
www.weedsmart.org.au

Triple stack offers flexibility

Cotton growers rely on herbicide control and associated seed technologies such as XtendFlex, which enables over-the-top applications of glyphosate, dicamba and glufosinate, to prevent evolving herbicide resistance in weeds.

Irrigated systems with back-to-back cotton and only occasional breaks are at greatest risk. To protect the long-term efficacy of the triple stack technology, crop managers need to devise a program that includes an array of herbicide modes of action to minimise resistance.

The revised HRMS suggests growers apply at least six different weed control tactics over a two-year period to target grass and broadleaf weeds. More tactics may be required if the program includes grass or broadleaf selective. The program should include both herbicide and non-herbicide tactics where possible.

"As most growers look to harvest and fallow paddocks, consider strategic cultivation, double-knock, optical spot spraying, patch management and cover crops," David Thornby said.

"Mix and rotate herbicide mode of action groups within the fallow herbicide options (Groups 9, 5, 14, 27, 22, 22+34, 10 and 4), and scout for and eliminate survivor weeds before they set seed using chipping, cultivation, manual spot-spraying or optical spot-spraying."

For more

Herbicide Resistance Management Strategy
www.cottoninfo.com.au/publications/herbicide-resistance-management-strategy

Goondiwindi just grew by two

New opportunities being offered in rural Qld are attracting people to cotton who have the perfect blend of agricultural science knowledge and a desire to be a part of strong regional communities.

Agricultural scientists Chaiyya Cooper and Georgia Ditchfield have recently taken up the new roles with Qld DPI in Goondiwindi (Bigambul country) made possible under the CRDC Future Cotton initiative, in partnership with Qld DPI.

The *Future Cotton: Innovation and Impact for Sustainability, Biosecurity and Growth* project was launched in 2025, with an aim to grow on-farm cotton productivity through targeted research, development and extension (RD&E) to address the cotton industry's most pressing challenges – from pest and disease management to emissions reduction, ag tech adoption and climate resilience.

Importantly, the project increases research and extension capacity across key cotton regions of Goondiwindi, Emerald (Gayiri country) and Toowoomba (Barunggam country). While the research is largely grower-led and focused on regional issues and solutions, the outcomes will benefit the industry across all regions.

"Increasing RD&E capacity in the regions is a key driver of Future Cotton, to create a direct link between researchers and growers in those regions," CRDC Acting General Manger of Innovation Susan Maas said.

"To bring new research scientists and technical specialists like Georgia and Chaiyya into Goondiwindi, Emerald and Toowoomba were clear aims of this project, based on feedback from growers and the need for support and research capacity in the regions.

"They'll be involved in experiments and trial sites in collaboration with other major CRDC investments such as the Australian Cotton Disease Collaboration (ACDC), the Cotton Low Emissions Intensity Farming Systems (Cotton LEIFS) initiative and the CRDC-supported University of Southern Queensland's (UniSQ's) Centre for Agricultural Engineering projects developing novel technology for crop, disease and pest management."

Heading in from the west

Chaiyya comes to cotton from the Department of Primary Industries and Regional Development (DPIRD) in Perth, Western Australia (Wajuk country), where she worked as a grains industry research scientist.

Chaiyya said the sustainability aspect of the Cotton LEIFS project attracted her to the role.

"One of the key factors that drew me to agriculture, despite not coming from a farming background, is the challenge to produce more from our primary industries in an increasingly challenging environment, and through LEIFS I can try to address that," Chaiyya said.

"I wanted to move regionally at some point in my career to be closer to the communities and people that an agricultural scientist aims to help through research, so when this opportunity

Project lead Paul Grundy, at left, Chaiyya and Georgia have already been travelling to other regions, talking with growers and fellow researchers, supporting and learning about projects such as the Cotton Low Emissions Intensity Farming Systems initiative.

MELANIE JENSON

Chaiyya Cooper and Georgia Ditchfield have moved to Goondiwindi in the McIntryre Valley to take up positions with Qld DPI as part of the Future Cotton project collaboration led by CRDC.

arose, I decided to go for it!"

Chaiyya's previous research focused on improving frost tolerance in cereal crops, where she investigated control methods for the ice nucleating bacteria that occur naturally in crops and increase the severity of frost damage.

Chaiyya is busy learning about the cotton production system and plant science, through going to field days, networking with industry members and asking lots of questions.

"I saw my first cotton crop when I moved to Queensland in January and I'm already fascinated by this crop and excited to learn more over time. I'm also keen to explore the local area and get involved with the Goondiwindi community."

Returning to town

Georgia Ditchfield completed a Bachelor of Rural Science (Honours) at the University of New England in Armidale specialising in soil science, before starting work as a graduate research scientist with Qld DPI.

Georgia is no stranger to cotton or Goondiwindi, so when she saw the new roles with Qld DPI and Future Cotton advertised, she was quick to apply.

"I previously worked as a bug checker for consultant Dave Kelly in Goondiwindi, which was a great way to learn about the industry, and I also spent time in a small lab primarily testing cotton petioles," she said.

"This is now my third cotton season in Goondiwindi, and it's a great place to live.

"In my new role I've spent a lot of time meeting more growers and industry researchers, and it's been great to visit the Future Cotton team in Emerald to learn about cotton production in a different part of the country.

"I've recently joined the Macintyre Valley Cotton Field Day Committee as treasurer, and I'm really looking forward to being more involved with them.

"I'm also hoping to get to some more research sites around Goondiwindi and the Darling Downs as the current season draws to a close."

Future Cotton is led by Qld DPI Principal Research Scientist Paul Grundy, who said having new capacity in Goondiwindi will really help deliver meaningful and locally relevant outcomes for the cotton industry. Paul is also the CottonInfo Technical Lead for Integrated Pest Management and Northern Australia.

"It's fantastic to have research scientists based in Goondiwindi again given it centrality to much of industry," he said.

"It's often a challenge to place people in smaller towns, but both Chaiyya and Georgia have their sights set on research, living in the regions and working with growers, so it's a win-win situation all round."

"Increasing RD&E capacity in the regions is a key driver of Future Cotton, to create a direct link between researchers and growers"

For more

Chaiyya Cooper
chaiyya.cooper@dpi.qld.gov.au
Georgia Ditchfield
georgia.ditchfield@dpi.qld.gov.au

Equipping growers to navigate a low emissions future

Demand for low greenhouse gas (GHG) emissions intensity commodities, including cotton and grains, from the post-farm gate supply chain is expected to increase in the near future.

A key driver of this is the need for supply chain organisations (banks, merchants, brands and retailers) to meet voluntary GHG emissions reduction targets that have been committed to in response to shareholder and customer demands. Another driver is a legislated requirement for some organisations to disclose their climate risks including GHG emissions to shareholders as part of their annual reporting requirements.

The GHG emissions associated with the production of the goods purchased by an organisation, for example cotton lint purchased by a textile manufacturer, are included in an organisation's GHG accounts as Scope 3 emissions, including from the farm. Therefore, a probable strategy for an organisation to reduce its GHG emissions and meet its emissions reduction target is to buy commodities produced with relatively low GHG emissions.

In response, the Low Emissions Intensity Farming Systems (LEIFS) initiative was developed for the grains industry by the Grains Research and Development Corporation (GRDC) and is being delivered by CSIRO in partnership with state governments in South Australia, Western Australia and NSW. GRDC Sustainable Cropping Systems Manager Mark Callow said the initiative was developed to help grain growers respond to increasing pressure to monitor, manage and report GHG emissions intensity, and meet trade, finance and consumer expectations, allowing them to identify and capture productivity and profitability opportunities.

LEIFS was initially designed by GRDC to investigate and demonstrate the tangible benefits of monitoring, managing, and reporting GHG emissions at the farm scale. It aims to reduce emissions intensity, improve production efficiency, and unlock new market opportunities. The initiative also supports growers in navigating trade, finance, and consumer pressures by equipping them with practical tools and insights to manage emissions

LEFT: Trials are underway to assess the impact of optimising nitrogen fertiliser management, and the effect enhanced efficiency fertilisers have on reducing inputs and emissions intensity on cotton farms.

risks and align with sustainability credentialing schemes.

The priority was to support growers to make informed, emissions-conscious decisions that align with their enterprise goals.

Importantly, LEIFS projects are regionally-based, taking a participatory approach and peer-learning, with ambitious goals to improve grower, service provider and government access to consistent data and knowledge to drive progress through clarity, credibility and collaboration.

Cotton LEIFS developed

Seeing the value of a cotton-specific version of LEIFS, CRDC Innovation Broker Dr Nicola Cottee, developed Cotton LEIFS with research partners in consultation with GRDC. The project in currently running in NSW and Qld. It is based on grower participation to generate robust scientific evidence at farm and regional levels of on-farm emissions and mitigation strategies and their benefits. It includes demonstrating technology to monitor crops, inform decisions and reduce GHG emissions intensity.

In NSW, Cotton LEIFS is a collaboration with NSW DPIRD, led by Senior Research Scientist in Low Emissions Agriculture Dr Aaron Simmons. Aaron has trials examining the use of enhanced efficiency fertilisers (EEFs) underway in NSW in the Riverina, Murrumbidgee and Namoi valleys.

In Qld, Cotton LEIFS forms a part of CRDC's major farming systems project *Future Cotton: Innovation and Impact for Sustainability, Biosecurity and Growth*, in a strategic partnership with Qld DPI. Future Cotton aims to grow on-farm cotton productivity via a whole of system approach to research, development and extension (RD&E) by considering flow on-impacts of management decisions on other issues such as how irrigation or crop choice affects disease and pest incidence – and emissions reduction strategies. In keeping with this approach, Cotton LEIFS projects in both Qld and NSW will involve practical on-farm research through on-farm trial sites, where multiple experiments covering different aspects such as disease, irrigation and carbon can be overlaid.

Future Cotton is headed by Qld DPI Principal Research Scientist Paul Grundy, who is also running the Cotton LEIFS component which currently includes trials using the novel cover crop sunn hemp to reduce GHG emissions along with EEF trials.

Cotton LEIFS is just one initiative under CRDC's ongoing sustainability investments, which currently includes constantly updating the PLANET. PEOPLE. PADDOCK. Sustainability Framework, research to update emissions benchmarking for the Australian cotton industry, improve knowledge and capacity in calculating, monitoring and managing emissions, improving nitrogen-use and other fertiliser efficiency and investigating how to create a circular economy for Australian cotton products.

What's involved for growers?

Growers can receive assistance with benchmarking and estimating GHG emissions reductions when implementing:

- enhanced efficiency fertilisers (EEFs)
- variable-rate application of nutrients and chemicals
- nitrogen use efficiency strategies
- nitrogen-fixing rotations (using legumes to reduce the need for fertiliser)
- low carbon liquid biofuels

Growers who participate can:

- trial emissions-reduction strategies
- reduce input costs or improve input efficiency
- access support to cover costs of testing and comparing new practices
- improve farm carbon and nutrient performance
- position their business for supply-chain requirements.
- help develop real-world evidence relevant to cotton farming in Qld and NSW.

Trial strategies on your farm

Cotton LEIFS was intentionally designed to be grower-led and regionally specific. To ensure this aim is met, growers in NSW and Qld are being offered the opportunity to work with LEIFS scientists to implement strategies to reduce GHG emissions from cotton production systems. These findings can then be shared with other local growers learn more about how to calculate the emissions associated with their cotton and grain production. The following articles in this edition of *Spotlight* outline some of the work already underway.

For more

Paul Grundy
0427 929 172
paul.grundy@dpi.qld.gov.au

Aaron Simmons
0418 259 550
www.dpi.nsw.gov.au/dpi/climate/low-emissions-agriculture/leifs

Senior Research Scientist in Low Emissions Agriculture Dr Aaron Simmons is overseeing Cotton LEIFS trials in NSW. He travelled to the AFF Narrabri trial site in February to speak with a group of growers and consultants wanting to know more about LEIFS trials.

MELANIE JENSON

Could enhanced efficiency fertilisers offer a lasting solution to on-farm emissions?

The production and on-farm use of nitrogen fertilisers are the leading sources of greenhouse gas (GHG) emissions in irrigated cotton, accounting for up to 60 per cent of emissions.

This means that optimising nitrogen use efficiency offers a pathway to lower GHG emissions intensity in cotton and grain production.

There are two main pathways to reduce on-farm GHG emissions intensity: increase yields using the same amount of nitrogen fertiliser; or maintain yields with a reduced rate.

Strategies to achieve this include matching nitrogen supply to predicted nitrogen demand, while monitoring in-crop nitrogen uptake to avoid overapplication, or using variable rate nitrogen applications in cotton fields that have highly variable soils. A third potential pathway is enhanced efficiency fertilisers (EEFs), or slow release fertilisers, and evidence is emerging that these products may be a cost effective way to improve nitrogen use efficiency. Research underway through the Cotton Low Emission Intensity Farming Systems (Cotton LEIFS) project aims to quantify the economic benefits of using EEFs through grower-led field trials. Growers are also invited to trial other methods to optimise nitrogen use and reduce GHG emissions without compromising yield.

EEFs offer potential benefits and flexibility to growers when managing crop nutrition. Cotton LEIFS research aims to examine their effects on GHG emissions, lint quality, yield and the bottom line.

Senior Research Scientist in Low Emissions Agriculture Dr Aaron Simmons is overseeing Cotton LEIFS trials in NSW.

"We are targeting tactics to optimise nitrogen fertiliser use as part of the LEIFS initiatives," Aaron said.

"The research will generate robust evidence to give growers confidence that any potential risks associated with matching nitrogen fertiliser rates to crop demand to improve nitrogen use efficiency are manageable. These strategies will reduce nitrogen application rates and GHG emissions.

"For EEFs, we are essentially looking at whether the increased cost can be offset by using less nitrogen and quantifying the GHG emissions reductions that can be reported when they are used.

"The Cotton LEIFS initiative is giving growers the opportunity to trial strategies and measure the impact from an emissions and economic perspective."

The economic and GHG reduction potential of EEFs will be assessed from a systems perspective, taking in the impact on successive, alternate crops.

"For example, applying less nitrogen to a cotton crop could reduce the emissions from the cotton but the lack of residual

nitrogen in the soil means more fertiliser might need to be applied to the following grain crop," Aaron said.

"In the end, for irrigated cotton, it is about managing the risk of lowering water productivity by not applying enough nitrogen, with market risks associated with demands for low GHG emissions cotton and grains."

Commercial trials underway

Aaron has established replicated field trials in the Murrumbidgee, Macquarie and Namoi valleys to collect data on the effect of using EEF in the form of nitrification inhibitor-coated urea on cotton and grain production. The trials are investigating whether the use of nitrification inhibitors at the full rate increase yield through an improvement in nitrogen use efficiency, or whether nitrogen application rates can be reduced when using nitrification inhibitors without incurring a yield penalty.

Replicated strip trials are underway at Australian Food & Fibre's (AFF) Narrabri and Warren farms along with a trial at Griffith. The strips will include:

- urea at the grower's usual full rate
- full rate with nitrification inhibitor
- reduced rate with nitrification inhibitor
- some treatments will be applied upfront or in-crop, and both up front and in-crop.

Aaron said the research could give growers the power to use EEF to reduce nitrogen losses that occur at the start of the season, by better matching nitrogen supply to crop demand through the season by delayed or controlled release. This would allow growers to reduce up-front nitrogen application rates and thus GHG emission intensity.

"Implementing a new strategy or technology in a production system is inherently risky so by working with growers on these trials they can assess the impact of adopting nitrification inhibitors in a low-risk way," Aaron said.

"We can quantify the economics and also the GHG emissions reductions, along with the effect on lint recovery and quality."

Results of the 2025-26 cotton trials are planned to continue to study the 2026 rotation crop and the following cotton crop.

"Because cotton and grain production often occurs in the same farming system the risk to the system in terms of impact on subsequent crops also needs to be assessed," Aaron said.

MELANIE JENSON

Cotton LEIFS ramps up capacity in NSW

Cotton LEIFS coordinators and scientists are now on the ground, with people stationed in regions such as Narrabri in north west NSW, Trangie in central NSW and Leeton in the Riverina. They'll be on board to help growers with on-farm trials and support efforts to understand and reduce greenhouse gas emissions.

In the Namoi Valley, NSW DPIRD Technical Officer Andy Hunt brings knowledge working with well-known cotton and grains scientist Jon Baird, who undertook research for CRDC into nitrogen and management and enhanced efficiency fertiliser trials. He is joined by Bill Manning, a former NSW Local Land Services cropping officer, with extensive experience across cropping systems.

Extra firepower will come from NSW DPIRD's Dr Karen Kirkby at the Australian Cotton Research Institute. Karen (pictured centre) has worked for decades as a cotton industry pathologist, conducting extensive research into verticillium inoculum and rotation crops. Karen will work directly with growers, assessing the impact of disease on emissions and nitrogen efficiency, and vice versa.

Recruitment is underway in southern and western NSW regions, where another two coordinators will be stationed.

Measurements in the field

At the AFF Narrabri site, Aaron is working with University of Queensland's Professor Peter Grace. Peter is measuring the impact of EEFs on GHG emissions as part of his *Climate Smart Cotton* project, with support from CRDC through the Australian Government's Climate-Smart Agriculture Program. It's impactful work that will give growers and the industry evidence backed by science to be able to report emissions reductions associated with the use of EEF.

While in the early stages, Peter's team have installed instruments to detect when the inhibitors wear off and nitrogen becomes plant available by detecting pulses of nitrous oxide. These pulses are delayed compared to the treatments with untreated urea.

"Prior to these experiments, we haven't had any data on any of the EEF products for emissions reductions in irrigated cotton," Aaron said.

"If farmers can make the claim and back it up, it's really beneficial for them in terms of emissions accounting, carbon footprint and transparency for customers of their fibre."

To share the research findings, Aaron and the team will be working with CottonInfo to hold small groups meetings to allow one-on-one discussions about the trials and answer any general queries about emissions. The results will also be shared via CottonInfo and NSW DPIRD.

LEIFS harnesses farming systems approach through Future Cotton

Trials are underway in Qld under the Cotton Low Emissions Intensity Farming Systems project (Cotton LEIFS), providing growers with specialist support to test the potential for on-farm strategies to reduce greenhouse gas emissions (GHG) while maintaining productivity.

Sunn hemp growing alongside mung beans in Qld Cotton LEIFS trials at Cowal Ag, Emerald.

Through Cotton LEIFS, growers in Qld and NSW can test a range of known GHG reduction practices and with the help of experts, comparing the GHG emissions intensity of the cotton produced before and after the practice is implemented.

Many of the strategies suggested for uptake are centred around improving nitrogen use efficiency to mitigate emissions from its use, in particular the potent nitrous oxide (N_2O), a potent GHG with roughly 273 times the global warming potential of carbon dioxide.

Nitrogen fertiliser is the largest contributor to GHG emissions in cotton production, accounting for approximately 50 to 70 per cent of on-farm and production-related emissions.

These emissions result from energy-intensive manufacturing (about 20 to 30 per cent) and direct soil emissions of nitrous oxide after application (about 20 to 30 per cent in irrigated cotton and seven per cent in dryland systems).

"The core objective of Cotton LEIFS is to help growers improve efficiency without compromising productivity or quality. Our role is to help participants benchmark potential system changes against their existing practices," said Paul Grundy from Qld DPI, who is leading the Qld component of Cotton LEIFS with support from CRDC under the four-year Future Cotton project with Qld DPI.

"The aim of the Cotton LEIFS program is simply to test what works to reduce emissions and demonstrate it on farms, to build confidence and clear value propositions for growers and supply chains.

"Efficient nitrogen practices are not only more profitable but are also likely to reduce the emissions intensity of the cotton produced, and may also have benefits for better management of diseases like verticillium wilt.

"We are particularly interested in working with growers who may be having difficulties with disease and are willing to undertake additional measures to test whether more efficient practices for nitrogen usage also have positives for disease control.

"Less disease can lead to increased yield and potentially reduce cotton's GHG emissions intensity."

Growers backed by technical support

Growers are provided with technical support to set up comparison practices at the paddock scale, including soil and plant sampling, data collection, and some assistance with the marginal costs associated with alternative inputs that might be utilised on demonstration/trial sites.

Initial Cotton LEIFS farm sites in Qld have been established at St George (Kooma country), Dalby (Barunggam country) and Emerald (Gayiri country) since the program started in mid-2025. They are examining tactics such as nitrogen-fixing cover crops to reduce the need for nitrogen fertiliser on the following cotton crop, and the use of enhanced efficiency fertiliser (EEF).

In late January, a large crowd attended a field day on the Darling Downs to see the legume sunn hemp and hear how it could be incorporated into a cotton system. Meanwhile research in central Qld over the last two seasons has found that sunn hemp can generate up to 146kg N/ha in its above ground biomass, and that it is also very effective in suppressing reniform nematodes (see story page 28).

"Sunn hemp may have a useful role to play in cotton systems as a fast-growing cover crop, and there's also work being done as part of the Australian Cotton Disease Collaboration (ACDC) initiative to understand its interaction with wilt diseases," Paul said.

Increasing interest in EEFs

Another key area of interest has been the use of EEFs together with tactical nitrogen timing to improve nitrogen use efficiency.

"At each of these sites we have helped growers to set up valid system comparisons and collect field data to understand the productivity and efficiency aspects of EEFs," Paul said.

"As this season's crops approach maturity and with planning for the 2026-27 season underway, now is the perfect time for growers in southern and central Qld to reach out if they are interested in setting up a comparison site to explore farming systems practices that might improve nitrogen use and emissions efficiency.

"Even if you have started making changes in the last couple of seasons but would like assistance with assessing the impact, we are here to help."

For more
Paul Grundy
0427 929 172
paul.grundy@dpi.qld.gov.au

Qld DPI Research Scientist Gail Spargo is based in Emerald, where she's a part of the Future Cotton team working on Cotton LEIFS projects in the region.

Trials compare EEFs with regular urea application

Enhanced efficiency fertilisers (EEFs) are fertilisers that have a mechanism for delaying nutrient release into the soil environment.

Work is underway at St George in southern Qld and Emerald in central Qld to compare the crop nitrogen use efficiency of EEFs with regular urea application approaches.

Qld DPI's Paul Grundy is leading the trial work on the farms of Scott Brimblecombe at St George (Kooma country) and Cowal Ag at Emerald (Gayiri country), with support from CRDC and in collaboration with Incitec Pivot. It's one of the projects underway as part of the Cotton Low Emissions Intensity Farming Systems project in Qld, supported by CRDC under the Future Cotton initiative, a partnership with Qld DPI.

Paul explains that EEFs are mostly nitrogen based, relying on either polymer-coated granules that degrade over time, or chemical additives that prevent the conversion of urea to ammonium, or ammonium to nitrite (by suppressing *Nitrosomonus* bacteria within the soil), ultimately delaying post-application conversion of fertiliser to nitrate.

"If nitrate release from pre-plant fertiliser application can be better aligned with peak crop uptake, the opportunity for loss due to leaching or denitrification is significantly reduced," Paul said.

"There is little opportunity for crop uptake until late squaring onwards, when cotton can then take up between three and four kg of nitrogen per hectare per day until just prior to cutout, which highlights how important aligning availability and uptake is."

Using grower practice as benchmark

A central aim of the trial work is to take what is already known from research and demonstrate it at scale on farm, utilising the grower's regular practice as a benchmark. The experiments compare nitrogen use efficiency from three treatments to see whether the EEF or more timely application strategies can be used to reduce nitrogen use without compromising productivity.

The treatments are:

- Grower reference (regular practice): Base application of regular urea (400 kg/ha) pre-plant with in-crop application of regular urea (200 kg/ha) prior to flowering. Total urea 600 kg/ha.
- Base only: Base application of EEF (Incitec's eNpower) (400 kg/ha), with no additional in-crop urea. Total urea 400 kg/ha = 30 per cent less.
- In-crop only: No base application. Regular urea (400 kg/ha) applied in-crop between first and second irrigation and prior to first flower. Total urea 400 kg/ha = 30 per cent less.

Measurement of crop nitrogen uptake and yield along with soil sampling before and after harvest will assess changes to available soil nitrogen. The emissions profile for each practice will be calculated and equated against lint yield to provide a relative measure of both emissions intensity and production efficiency.

Paul said while the trials are still in the early stages, measurements to date indicate that different strategies will produce similar yields, albeit with altered crop emissions intensity.

"It may be that the 30 per cent reduction in urea application may exceed the anticipated uptake efficiency impacts of the EFF or more timely regular urea application, but our collaborators were keen to explore what was possible with a view to recalibrating if needed going forward," Paul said.

"A saving of 100 kg of applied nitrogen in-field could reduce nitrous oxide emissions by 0.5-1.5 kg/ha.

"Because nitrous oxide is such a potent GHG, improved efficiencies in nitrogen management can significantly reduce the emissions intensity of the cotton produced.

"When considering nitrogen associated emissions (manufacturing and in-field), a 200 kg/ha reduction of urea can reduce emissions by 1000–1500 kg CO_2 equivalent."

Stay tuned to *Spotlight* and CottonInfo for regular Cotton LEIFS project updates and Paul's trial findings.

Tackling emissions head on

At Emerald in central Qld, Cowal Ag is building on its own work to reduce greenhouse gas emissions by hosting trials for the Cotton Low Emissions Intensity Farming Systems (Cotton LEIFS) initiative, as it seeks to achieve carbon neutrality by 2040.

Cowal Ag consists of eight farms comprising 5000 hectares and growing a variety of summer and winter crops, including irrigated cotton, mungbean, sorghum, chickpeas and wheat.

Cowal Ag's Emerald production manager Greg Kauter has been working with Cotton LEIFS project leader Paul Grundy to quantify the impact of nitrogen fertiliser use on the intensity of GHG emission intensity.

"The company has an overall strategy to reduce emissions intensity ourselves, and while energy is a big contributor, we are a bit limited in terms of options just yet, unless we can source green energy," Greg said.

"One of the biggest gains we can make is in optimising the use of nitrogen fertiliser. If we can reduce the amount of applied nitrogen but maintain yield, we could make efficiency gains with less emissions and less cost.

"A big contributor to this is improving the efficiency of the nitrogen we apply, so that we don't get caught with a crop running out early which creates problems throughout the season."

The team at Cowal Ag have been incorporating legume cover crops and enhanced efficiency fertilisers (EEFs) for about three years, including using EEF urease inhibitors as coated urea.

Tactics include putting the EEF down closer to

"One of the biggest gains we can make is in optimising the use of nitrogen fertiliser."

Cowal Ag Emerald Production Manager Greg Kauter says rapid canopy closure and warm early season soil temperature are major factors affecting options for improving nitrogen fertiliser management and greenhouse gas emissions intensity on-farm.

planting, and ensuring in-crop urea is incorporated for side-dress application.

Cover crops with nitrogen-fixing abilities such as sunn hemp are also being trialled in the farming system.

"We aim to reduce our applied nitrogen by optimising what we put down, and that means making it available to the plant when it needs it," Greg said.

"We're involved in the Cotton LEIFS trials so we can quantify the impact of EEFs and sunn hemp. In this season's trial we've reduced our urea application rate by 30 per cent, so we are really pushing the system to see where it starts to become yield-limiting.

"If we can reduce the applied amount, it offsets the cost of the EEF treatment. Our pre-plant nitrogen is exposed to considerable losses, so improved efficiency is an offset or insurance against early season losses."

Tailored results for local conditions

The Cotton LEIFS on-farm trials are designed to directly address the questions of the host growers, so that data and recommendations can be region-specific and better tailored to the climate and plant responses of each farm.

In central Qld, it's the rapid canopy closure of the crop that presents challenges for optimising nitrogen use. Getting nutrients to the plant when it needs it usually entails in-crop applications, but Greg said that's not always straightforward at Emerald.

"We have canopy closure within 50 days and then around 65 days we are putting the rotobucks in for the last time, so this limits our options in terms of in-crop application timed to peak demand," Greg said.

"Added to this, our soils warm up quicker and are prone to being a bit wetter, so we get losses earlier than other areas. It makes up-front or early season application before the crop closes over less of an option."

To further reduce high rates of applied nitrogen, the EEF trials are linked to the farm's cover cropping program, currently utilising sunn hemp, mung beans and pigeon pea.

Sunn hemp is shaping up as having the potential to decrease urea use while returning a lot of organic matter and sweeteners to the soil.

"Sunn hemp fixes a lot of nitrogen, has a lot of biomass and isn't weedy. It's easy to establish on rain moisture and within 10 to 12 weeks of planting, we mulch it.

"It's easy to mulch and the fibre is pretty soft, so it breaks down well before we work the country with offsets and get ready to plant cotton in September. Our target is to generate 150kg of nitrogen per hectare, which previous research shows is possible," he said.

"We need to have it established in January to get that big nitrogen input because the later you go, the less growth you'll get, and a bit more stubble management is required before planting."

This season Cowal Ag is trialling sunn hemp with no in-crop side-dressing nitrogen, and with a pre-plant rate of only 92kg of nitrogen per hectare.

They've also established a trial this summer comparing sunn hemp with pigeon pea and bare fallow, and once that's completed, will have results from two seasons.

There are anecdotal reports that sunn hemp may also be beneficial to water infiltration.

"We think infiltration rates could be improving, because irrigator feedback was that those sunn hemp fields were easier to water up, but as we go on it will become more apparent," Greg said.

"We are really impressed with the multiple benefits of sunn hemp and have slowly increased the area we've grown here over the last three seasons.

"Ultimately, we are looking at reducing the total applied amount of nitrogen fertiliser and creating flexibility in the system so we can apply fertiliser when we want to – which is when the plant needs it."

Sunn hemp shows promise as cover crop

Trials are underway to assess the potential for a fast growing, drought hardy, nitrogen-fixing legume to become a beneficial rotation crop with pest management benefits for cotton growers.

Sunn hemp *(Crotalaria juncea)* is an erect shrub of one to two metres and one of the fastest growing legumes known, with the capacity to produce more than 150 kg of nitrogen per hectare.

Sunn hemp trials in central Qld produced up to 146 kg of nitrogen per hectare in above-ground biomass, and were also shown to suppress the microscopic parasite, reniform nematode.

The on-farm trials are part of the Cotton Low Emissions Intensity Farming Systems (Cotton LEIFS) project in Qld, supported by CRDC under the Future Cotton initiative, a partnership with Qld DPI. They are being led by Qld DPI researchers Paul Grundy, Harry Gaston and Gail Spargo.

In the Dawson Valley, sunn hemp's suppression of reniform nematode resulted in significant yield increases in the cotton crop that followed, while on the Darling Downs, sunn hemp trials are being monitored for their contribution to moisture infiltration.

The central Qld trials grown on one metre spacings under a range of conditions produced 80-146 kg of nitrogen per hectare in the above-ground biomass, which indicates a significant impact on the amount of nitrogen fertiliser needed to be applied to subsequent cotton crops.

Sunn hemp germinates quickly and emerges within two to three days when sown into moisture during summer, with maximum growth occurring on days between 30 and 40°C. Nitrogen production is maximised at flowering which is typically six to eight weeks after sowing.

PAUL GRUNDY

An erect, branching, annual summer legume, sunn hemp is a vigorous grower with a strong taproot and branching root system. It reaches a height of over 1.2 m in 60 days when grown under favourable hot and wet conditions. It is drought hardy, nitrogen fixing, and suited to a wide range of soil types (pH 5.0-8.5). The plant can be used as livestock feed or processed into hemp fibre.

"One of the factors that makes sunn hemp attractive for central Qld growers is the ability to grow a cover crop in 50 to 60 days," Harry said.

"These crops are grown either to make use of summer rainfall on fallow ground, or specifically sown following cotton picking in March and then incorporated in May as part of ground preparation for back-to-back cotton crops."

Trials begin on Darling Downs

At Jimbour (Barunggam country) on the Darling Downs, cover crops have traditionally been planted to improve soil cover following a winter chickpea crop, and to aid soil water infiltration from any subsequent rainfall over late summer to winter in preparation for the 2026-27 rainfed cotton crop.

It's hoped that the newly-available sunn hemp may provide a similar service to the traditional sorghum cover crop, with the added benefit of nitrogen fixation.

For the trial, sunn hemp and silo sorghum were sown into moisture in early December 2025 following November storms and a winter chickpea crop. The seed was treated with Group I inoculum and sown at approximately six to seven kg/ha, and emerged within three days.

Both crops were sprayed out in mid-February as they were nearing peak biomass. This is at the boot stage for sorghum and mid-flowering for sunn hemp when both crops have developed sufficient lignin to persist as standing stubble.

Above-ground crop samples were taken from both the sunn hemp and sorghum plots just prior to being sprayed out to determine the nitrogen content of the biomass.

"These results could determine if a fertiliser program may be adjusted depending on the nutritional status of the soil and the amount of nitrogen measured in the biomass," Harry said.

"Differences in soil moisture prior to sowing cotton will be assessed for each cover crop scenario, and subsequent cotton yield will be monitored and an assessment made of any impact on production efficiencies due to cover crop differences."

For more

Harry Gaston
harry.gaston@dpi.qld.gov.au

Perfect storm turns to sea of calm in battle against silverleaf whitefly

When silverleaf whitefly (*Bemisia tabaci* MEAM1) was first detected in Australia in 1994, no one suspected it would lead to one of the Australian cotton industry's most severe pest outbreaks.

Silverleaf whitefly arrived with broad-spectrum resistance to organophosphates, carbamates and synthetic pyrethroids which would initially challenge attempts to manage it. The pest went on to highlight the role of integrated pest management (IPM) research and the importance of the industry's Insecticide Resistance Management Strategy (IRMS).

The outbreak

The pest first tested the industry around Emerald (Gayiri country) in the Central Highlands of Qld in the 2001-02 season in what grower Neek Morowitz described as "a perfect storm" as the sky became foggy with the insect. At this time there was no insecticide resistance monitoring program, so resistance levels were unknown.

Long-term Emerald agronomist Dave Parlato remembers the industry scrambling to find a solution.

"It seemed to escalate quickly, but in hindsight, they were already out of control," Dave said.

"When the outbreak hit, there'd be a white haze at sunrise, almost like a fog across our paddocks, and people were walking around town with handkerchiefs or masks around their faces. The whole town was like that for a good month or so."

Renee and Brad Anderson also went through the outbreak at 'Kerry Downs'. Renee said it was impossible to walk around the farm comfortably.

"I'd try to go for a run in the morning, and they would get in my mouth, and they were in my eyes and ears. We'd never seen anything like it."

ABOVE:
In 2017, through a CRDC Grassroots Grant and with support from CottonInfo, a group of agronomists and growers from the Central Highlands in Qld travelled to Moree to share their silverleaf whitefly experiences and the integrated pest management message. Pictured are Moree consultant Jake Cutliffe with visiting agronomist Dave Parlato, grower Brad Anderson and consultant Iain Macpherson who was then based at Goondiwindi.

In response to the outbreak, conventional broad-spectrum insecticides were used. These attempts largely failed to control the pest due to resistance and just further flared populations by decimating natural predators (beneficial insects).

"It was probably a perfect storm. Seventy per cent of the crop was non-Bt varieties so we still had a heavy reliance on conventional chemistry," Neek recalled.

"We were looking down the barrel of a bad situation, and quickly realised this wasn't just our problem or one person's problem, we were all affected."

The learning curve that followed was steep. Local growers, consultants and researchers started searching for more information and control options, which included a trip to the United States to learn what had worked there, with support from CRDC and Cotton Seed Distributors.

The delegation visited the state of Arizona where whitefly had been a cotton pest for some time. Information gained from key researchers in Arizona gave local researchers and growers a place to start in managing this pest.

First steps

Qld DPI Principal Research Scientist and CottonInfo IPM Technical Lead Paul Grundy was a part of the group. He said key information from Arizona included utilising a specific sampling and threshold approach, the deployment of insect growth regulators such as pyriproxyfen which specifically targets silverleaf whitefly but largely leaves other species untouched and the conservation of natural enemies.

Ongoing resistance testing has been proven to being pivotal in managing insecticide resistance.

"All of this was backed in by growers agreeing on common objectives with a tightened sowing window and avoidance of the use of broad-spectrum older style insecticides," Paul said.

"We quickly realised that this pest needed to be managed well across the region and not just in isolation.

"With these initial changes, the result the following season were reduced populations of whitefly that were managed which provided the

Industry standing together to overcome threats: After explosions in silverleaf whitefly populations and resistance moved south from central Qld, growers and advisors from the north lent their shared experiences and management knowledge with growers in the Gwydir Valley, NSW. It was by working together with area-wide management that helped central Qld overcome the issue, along with softer chemistry and a 30-day window for the use of the cornerstone product pyriproxyfen added to the IRMS.

central Qld industry with breathing space.

"At the same time, with CRDC support, Dr Richard Sequeira had commenced research to better tailor the Arizona information to central Qld conditions," Paul said.

"With all of us working together with this initial information, it made a huge difference," Renee Anderson said.

"In the following season we came together as an area wide group across the Central Highlands, with growers and agronomists meeting fortnightly to share information about population changes and the progress of control measures."

"We are a relatively small irrigation area on a channel system, so what we do definitely affects our neighbour all the time. It made us all work together," Dave Parlato added.

"Not everyone agrees and some do things differently, but we had one main aim, that being to avoid a second outbreak."

Spreading its wings

In 2005-06 whitefly began appearing in numbers in the St George (Kooma country) and Western Downs region. It was becoming clear that this pest was no-longer just a central Qld problem.

"It was also becoming clear that the industry needed a wholistic integrated management strategy for this pest that would entail economic thresholds for Australian production systems, a better understanding of the pest's ecology and natural enemies and monitoring of resistance so that the limited number of effective insecticides could be sustainably used," Paul said.

With Bollgard II in place and the reduced emphasis on Helicoverpa management, some of the industry's leading researchers – Drs Richard Sequeira, Lewis Wilson, Simone Heimoana and Jamie Hopkinson – turned their attention to working on components that would form the IPM tool box for silverleaf whitefly management.

Resistance monitoring begins, resistance grows

In 2007, a formal resistance surveillance program for silverleaf whitefly was implemented by Qld DPI scientists through support from CRDC. Monitoring initially showed very low levels of resistance to pyriproxyfen which had rapidly become the cornerstone product for whitefly management.

For the next decade, the only resistance was detected in horticultural regions of Qld in the mid-2000s, which demonstrated the pest's potential to adapt but levels remained very low across central cotton districts.

However, whitefly continued to spread south and become an annual pest of cotton, resulting in increased pyriproxyfen use. By 2017, testing identified a trend for increasing resistance to pyriproxyfen in cotton crops on the Darling Downs, at St George, Dirranbandi, Mungindi, and the Gwydir, McIntyre and Macquarie valleys.

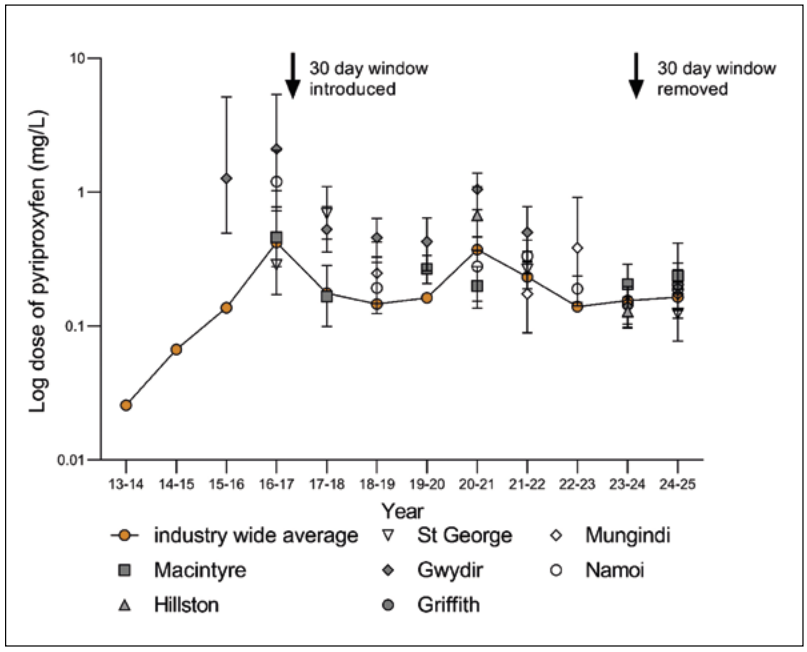


Figure 1. Timeline showing the impact of the 30-day window on resistance in silverleaf whitefly.

Qld DPI Entomologist Dr Jamie Hopkinson who leads the silverleaf whitefly resistance testing research, said that this was potentially a very serious issue for the industry because pyriproxyfen was the only cornerstone product for whitefly management at the time.

"Back then, few effective alternatives existed, so if pyriproxyfen failed due to resistance, growers would have been left with limited control options which would dramatically increase the risk of sticky cotton," he said.

In response to this change, the area wide management tactic of a 30-day regional spray window for pyriproxyfen was added to the IRMS.

"This was important because whitefly are highly mobile between farms and therefore having people act simultaneously reduces the risk of repeated population selection with pyriproxifen which would have exacerbated resistance levels," Jamie explained.

This was coupled with an IPM campaign via CottonInfo emphasising the importance of area wide management, conservation of natural enemies and appropriate use of thresholds. It would also soon be complimented with a revised threshold for whitefly management based on nymph checking arising from research led by Richard and Simone, which would enable people to better target insecticides when and where they were needed.

Along with these efforts to stem any further rise in pyriproxifen resistance levels, several alternative modes of action for whitefly control in the form of

spirotetramat, acetamiprid and buprofezin became available soon after these detected resistance levels, which also gave crop managers a wider range of control options and reduced reliance on pyriproxyfen.

Resistance plateaus

By 2019, pyriproxyfen resistance had plateaued. By 2023-24, consecutive seasonal levels had receded enough to allow the TIMS Committee to remove the 30-day regional spray window requirement, however the one application per season limit remains.

"The new broader window in the IRMS gives growers greater flexibility in timing their use of pyriproxyfen, but it is still critical to only apply a single application per field," Jamie said.

"Resistance is currently low in regions like northern NSW and the Border Rivers, and remains largely undetected in many other regions, where silverleaf whitefly typically require less frequent management."

The latest testing results from 2024-25 showed that a third of tested populations still carry resistance genes to pyriproxyfen, although the levels are very low and unlikely to impact field efficacy.

"However, one population from the lower Namoi Valley did have slightly higher resistance than has been seen in recent years, reminding us that potential exists for the re-emergence of resistance if products aren't used judiciously," Jamie said.

CRDC's Acting General Manager of Innovation, Susan Maas, said the management of silverleaf whitefly is a good news story for the cotton industry.

"How the industry used its research capacity to rapidly address this evolving pest, not only as part of the initial response to a crisis but also to emerging resistance more recently, is something we can be proud of.

The 'known susceptible' population used for SLW resistance testing has been kept in a laboratory without contact with insecticides since the mid-1990s.

"Following significant attention and investment by CRDC and our partner organisations and the commitment of many researchers, we now have a relatively robust IPM program for silverleaf whitefly with local thresholds, greater reliance on natural enemies and effective management of resistance.

"This has put the industry in a strong position to continue to manage any threats posed by this pest to our reputation as producers of high-quality cotton.

"It's a credit to the growers, agronomists and researchers who proactively sought information and travelled to other countries and shared their knowledge and experience.

"A positive to come out of it was area wide management and broad uptake of IPM by the whole industry to confront the pest."

A robust IRMS protects industry

The adoption of the IRMS is critical to the sustainability of Australian cotton growing, by ensuring that the efficacy of registered insecticides for cotton pests can be maintained.

The industry developed its first IRMS in response to widespread resistance of cotton bollworm *(Helicoverpa armigera)* to pyrethroid insecticides, which first caused significant crop failures in central Queensland in January 1983.

To remain fit for purpose, the IRMS is developed and updated each season by the TIMS Committee, with advice from the Cotton Australia's Insecticide Technical Grower Panel. It is updated annually to reflect the current resistance levels and is published in the CottonInfo/CRDC Cotton Pest Management Guide.

Since starting in 2007, the results from CRDC-supported insecticide and miticide resistance monitoring programs each season are used to inform the Committee of any field-scale changes in resistance levels. Extensive communication and discussion with cotton growers and consultants is undertaken in all growing regions before the TIMS Committee finalises its recommendations.

The IRMS manages the risk of resistance in all major pests of cotton, including aphids, mites, silverleaf whitefly and Helicoverpa, for cotton. Additional resistance management requirements are also in place for managing the risk of Helicoverpa developing resistance to Bt cotton.

The IRMS was used to manage pyriproxyfen resistance in silverleaf whitefly. After six seasons, the latest resistance statistics and the removal of a 30-day regional spray window restriction in 2024-25 is testament to the commitment of the industry.

Drought and flooding rains:
what stories do birds tell in the long term?

An extensive biodiversity and carbon survey taken 10 years apart at the same sites is delivering unique information about the value of native vegetation on cotton farms.

From 2023 to 2025, a team led by Dr Rhiannon Smith, Senior Lecturer in Environmental Management at the University of New England, resurveyed 195 sites on cotton farms from central Qld to the Riverina region of NSW. They assessed whole-of-ecosystem carbon levels, vegetation condition and biodiversity, including plant and bird types and populations. This was to better understand the potential co-benefit of carbon sequestration and biodiversity conservation on cotton farms, and whether that can be managed for a financial return.

"While we are still analysing the carbon data, through the bird and vegetation surveys we are already getting a better understanding of the potential value of biodiversity conservation on farms in Queensland and NSW," Rhiannon said.

"Given we have had both a record drought and floods across many cotton growing areas over the 10 years since the last survey, we really needed to track changes in biodiversity conservation and carbon storage values in the latest survey."

What the birds tell us

Bird surveys provide insights into how biodiversity on cotton farms has changed over the past 10 years and clues as to the management impacts and climate drivers. Results from a 2023 survey were presented at the 2025 International Rangelands Conference.

"In this survey we looked at habitat condition specifically for birds, as we are using them as an indicator for all biodiversity, along with the diversity of plant species and vegetation that make up those habitats, " Rhiannon said.

The survey found that land birds were almost twice as abundant in 2023 as in 2014, indicating an improvement in biodiversity condition over the decade. Most (104) of the 126 species recorded in both years were more frequent in 2023 than in 2014.

These results were largely attributed to the three years of above average rainfall from 2020-22 and consequently the increased vegetation biomass, particularly of herbaceous plants which allowed successful breeding and population increases in most bird species. By contrast, the 2014 surveys were followed by 18 months of average or below-average rainfall.

MELANIE JENSON

Dr Rhiannon Smith in the Namoi Valley where she's undertaken several CRDC-supported studies into biodiversity, revegetation and carbon sequestration.

Threatened species declining

The 2023 increase in birdlife and diversity of local species was generally among listed and declining woodland bird species, indicating that the excellent seasons in 2020-22 drove a population increase, counteracting the processes responsible for their decline.

However, the increase in populations of woodland species is likely to be short-term when drier conditions return. Long-term data collected nationally between 1985 and 2018 shows an average decrease of 60 per cent in the relative abundance of threatened bird species.

The 2023 survey found an overall increase in native birds listed under the Environmental Protection & Biodiversity Conservation Act (EPBC Act), including the endangered hooded robin and vulnerable species such as the painted honeyeater, superb parrot, brown treecreeper and the southern whiteface.

Four sedentary (those that do not move into other habitats in search of food and shelter) and

declining woodland species in south-eastern Australia were either not recorded in 2023 or were less widespread or abundant than in 2014.

"While populations of some of these species may have moved further inland in more arid habitats in 2023 due to good seasons (harrier, parrot, cuckoo), the reduced abundance or frequency of the more sedentary species (warbler, sittella, shrike-tit, bellbird) is a concern," Rhiannon said.

"For example, the painted honeyeater is dependent on mistletoe fruit for food, and part of its population may have relocated to more arid habitats in 2023, if excellent seasonal conditions promoted an unusually large amount of fruit further inland.

"The worsening of figures in some threatened and declining sedentary species could mean the factors contributing to their decline are having a greater influence than the positive effect of prolonged high rainfall."

Key threats to bird populations include land clearing, overgrazing, 'cleaning up' paddocks (removing dead trees, logs and mistletoes), and an overabundance of noisy miners. Growers could consider revegetation projects (see next story) to restore connectivity through the landscape, adopt sustainable grazing practices, leave remnant vegetation areas 'messy', and encourage regeneration of shrubs or revegetation to increase the understory and discourage noisy miners.

Good seasons also good for invaders

The Invasive Species Specialist Group, a member of the Species Survival Commission of the World Conservation Union, declared common myna to be one of the world's most invasive birds, listing it with only two others in its report, 100 of the World's Worst Invasive Species.

An area of interest for researchers is whether wet periods are as advantageous to introduced bird species as natives, since invasive species are the principal threat to flora and fauna species listed as threatened under the EPBC Act. Researchers were shocked by the increase in numbers of common myna, one of the introduced species that were more prevalent in 2023 than 2014.

The survey showed rapid expansion of the common myna and its negative impact on other birds, including small insectivorous species that contribute to ecosystem services like natural pest control.

"The increase in common mynas was startling," Rhiannon said.

"Only two were recorded in one site in our 2014 surveys, whereas 102 were recorded across 26 sites in 2023, showing they are spreading rapidly in eastern Australia."

Carbon data coming soon

Rhiannon will share the carbon sequestration results from the survey as soon as the data is ready, however previous CRDC research provides valuable insights.

"We expect to see a high degree of correlation between site-based value for carbon sequestration and biodiversity conservation," Rhiannon said.

"However, this relationship may be complicated by the fact that old growth trees that are extremely important for biodiversity conservation have lower growth rates, particularly if they are affected by dieback, and may therefore sequester less carbon than younger, healthier forest and woodland stands.

"On the other hand, a 2017 CRDC-supported project I undertook that found river red gums with access to more permanent water, such as those found in riparian zones, sequester and store carbon at much higher rates than other types of remnant woody vegetation that was present on the survey sites."

For more:
Dr Rhiannon Smith
rsmith66@une.edu.au

Specialist resources for growers

CRDC and CottonInfo continue to support the development of resources to help growers navigate products in the interlinked realms of biodiversity, natural capital and environmental markets. A series of CottonInfo information sheets offer neutral advice to help growers consider their natural capital and how to assess it.

The CottonInfo Regional Biodiversity Tool also offers information on how to understand and measure biodiversity. "What's On My Farm?" is an extensive resource covering all Local Government Areas in cotton growing regions.

Looking ahead, automated biodiversity monitoring technology is being refined under a CRDC project to make monitoring less arduous and expensive.

Rhiannon recently led a collaboration with a team of researchers at UNE with support from AgriFutures Australia to develop 'Environer', a portal that outlines financial and market access opportunities in natural capital, carbon, biodiversity and sustainability for growers across all Australian agricultural industries.

For more
www.cottoninfo.com.au/natural-resource-management
environer.une.edu.au/home

Updated guide offers insights into successful revegetation projects

If you're thinking about an on-farm revegetation project, for the best chance of success, consult the industry's step-by-step guide, backed by science and grower experiences.

Revegetation offers opportunities to improve habitat connectivity, biodiversity and pest suppression, soil health and carbon and mitigate spray drift. Revegetation in the soils and climate of cotton-growing regions is not straight forward, so cost-effective and practical steps are needed to ensure it's successful.

The CottonInfo *Native Revegetation Guide for Australian Cotton Growers*, includes key information and has been updated to include the stories on of the Watson family at Boggabri, John and Juanita Hamparsum at Breeza, and the Kahl family at Wee Waa (all Kamilaroi country). Their revegetation projects were undertaken through the Biodiversity Project, a partnership between Country Road and Landcare Australia, supported by CRDC and Cotton Australia.

What are the benefits?

Revegetation can provide many benefits to landholders.
These include:

- habitat for natural pest control agents, soil stabilisation and carbon sequestration
- shade and shelter for stock, windbreaks and amenity
- better ecosystem functions that support healthy environments, such as nutrient cycling and creating microclimates
- potential economic benefits, such as agroforestry, natural capital and carbon accounting
- helping growers meet sustainability goals and demonstrate good environmental stewardship.

The revised revegetation guide include clickable links through to case studies with cotton growers, following their journeys and learnings as they take on planting projects on their farms.

The families trialled the Guide's six-step 'pathway to success' designed to help growers plan, plant, manage and monitor revegetation sites, with a focus on what works best in the heavy clay soils common to cotton catchments.

"The environments and soil types found in cotton growing regions throw up a lot of challenges when it comes to getting vegetation established, as growers know full well," Dr Rhiannon Smith said.

"The *Native Revegetation Guide for Australian Cotton Growers* is useful for everyone, regardless of their experience in revegetation."

A Senior Lecturer in Environmental Management at the University of New England in Armidale, Rhiannon provided significant information for the guide about cotton riparian landscapes and revegetation, biodiversity conservation and carbon sequestration.

"At a basic level, the guide helps find the species most suited to a grower's region with the greatest likelihood of survival, which is a crucial initial step," she said.

"It helps growers tailor their revegetation effort to their goals, which can include conserving biodiversity, minimising spray drift, increasing natural pest control and restoring riparian ecosystems."

The digital publication has clickable links to more information on key questions around these goals, along with specifics such as the main types of vegetation on cotton farms by region, how to prioritise areas for revegetation, and the inspiring stories of the three case study farms.

The publication is an outcome of the Cotton Landcare Tech Innovations 2021 project, funded by CRDC with support from the Australian Government.

For more
Native Revegetation Guide for Australian Cotton Growers
www.cottoninfo.com.au/publications/native-revegetation-guide

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