Spotlight
ON COTTON R&D

AUTUMN 2025

New era for CottonInfo

Connecting cotton: building a data platform

Cracking the dryland code

CRDC

Allan Williams

In the Spotlight

Welcome to the Autumn edition of *Spotlight*, which marks the run into harvest and a busy time for our growers and the ginning, classing and merchant sectors.

This edition also marks a new era for CottonInfo. CottonInfo remains a joint partnership of CRDC, Cotton Australia and Cotton Seed Distributors (CSD) but the structure of the program has changed, with CRDC taking a leadership and managerial role, supported by Cotton Australia through the *my*BMP program, and CSD as a key program investor.

In this edition, we outline the changes to CottonInfo, and in the next edition of *Spotlight* we'll be introducing you to the new crop of Regional Extension Officers (REOs) who are joining the CRDC and CottonInfo team. In the meantime, we're focusing on the work Program Manager Janelle Montgomery and the CottonInfo team have underway through Area Wide Management (AWM) meetings across the valleys in partnership with Cotton Australia Regional Managers and CSD's Extension and Development Team. A CottonInfo pilot carbon and biodiversity field day in the Macquarie has been met with high recommendations from growers that all other growers and farm staff should attend.

CRDC is also pleased to be a step closer to delivering the cotton industry's data platform and we bring you an update on this in this edition. Throughout our stories, you will see how the platform will link to every aspect of what we do as an industry, from marketing to emission reporting.

As a core component of the Strategic Roadmap for the Australian Cotton Industry, the data platform will be integral to the industry's plan to meet current and future regulatory and supply chain requirements and expectations. The Roadmap is a partnership between Cotton Australia, the Australian Cotton Shippers Association and CRDC for the common good of the industry. It is now moving toward the implementation stage.

In this edition, we also continue our look at soil health and low emissions farming, with articles on the new Low Emissions Intensity Farming Systems project being undertaken in co-operation with the Grains Research and Development Corporation, along with long-term studies into soil health and carbon. Our industry is fortunate to have had the foresight of researchers and previous CRDC managers to support long-term trials on-farm and at the Australian Cotton Research Institute (ACRI). This work continues today.

Sustainability and greenhouse gas emission reporting has also been in the broader news lately as climate reporting becomes mandatory for large companies in Australia. We've included an article on how the industry's PLANET. PEOPLE. PADDOCK. Sustainability Framework, together with the data platform, is preparing the industry for a future of increased reporting formality. I would encourage crop managers to attend one of the events planned to discuss the framework and how growers, ginners and shippers can make the most of it.

We also check in with growers Jamie and Susie Grant, who have created a dryland farming system that raises eyebrows, soil moisture and carbon levels. The Grants must be congratulated for their resolve to create a system that works in harmony with their land and climate. Likewise, young grower Richie Quigley used his CRDC-supported Nuffield Australia Farming Scholarship to learn how to improve the outcome for dryland crops, soil health and fallow efficiency with a new way of harvesting and planting. Two great stories from our farmer innovators.

All these stories and much more in this Autumn edition of *Spotlight*.

Allan Williams
Executive Director

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

Autumn 2025

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 and development 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: Deacon Design

ON THE COVER:
Farm Manager Mick Sheather (at rear) at 'Douglas Station' in the NT and CottonInfo Technical Lead, QLD DPI's Dr Paul Grundy, who visited the NT and WA to deliver the CottonInfo Cotton Agronomy and Disease Management Workshop with CottonInfo Program Manager Janelle Montgomery.

Want to see more of Spotlight?

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

COTTON NEWS

FEATURES

Offsets for on-farm R&D

GROWERS undertaking on-farm experiments and trials may be eligible for the Research and Development (R&D) Tax Incentive.

The incentive offers a tax offset for Australian companies conducting eligible R&D activities. The rate that can be claimed varies depending on the size of the company but can be up to 48.5 per cent of the R&D spend.

Cotton growers are active in on-farm research. The 2024 CRDC Grower Survey found that 31 per cent of respondents had hosted at least one cotton industry research trial in the 2023-24 growing season. Just over half reported they were contributing data to industry R&D such as through participation in trials or monitoring activities on farm or providing on-farm data or information to researchers or industry projects, while 28 per cent reported they were involved in a cotton R&D program during the 2023-24 cotton growing season.

If involved in a grant program, overhead expenditure on top of grant income may be claimable. The incentive is non-competitive and self-assessed, so it can be claimed annually, with the relevant information about eligible costs.

Items that can be claimed include salaries and wages for time spent on R&D activities, contractor costs, decline in asset value and other business expenditure attributable to the R&D activities.

Growers can claim their expenditure up until April 30, 2025. Contact your trusted tax advisor for more on eligibility.

The Macquarie CGA recently held a red soils field day, which builds on previous field days on irrigation in red soil and moisture conservation, made possible through CRDC's Grassroots Grants program.

Local grants for growers!

ATTENTION cotton growers! Does your local Cotton Grower Association (CGA) need more weather data, want to run a trial or hold a workshop? Feel like you need a bit of training or help navigating the complex world of carbon? The CRDC Grassroots Grants program can help make it happen.

The program offers grants of up to $10,000 and has become popular with growers and consultants for activities planned through their local CGAs. Since 2011, CRDC has supported 95 projects across cotton growing regions, investing $827,000 to help fund local initiatives to increase the engagement of growers, solve specific regional issues and improve skills, knowledge and networks.

Projects have stretched across regions and topics. Recent initiatives include improving growers' digital skills, purchasing weather stations, visiting growers in other regions, creating networks and holding irrigation field days. CottonInfo Regional Extension Officers (REOs) often work with CGAs and Cotton Australia Regional Managers to develop a project and carry it out.

"Support is available for CGAs who are thinking about applying," CottonInfo Program Manager Janelle Montgomery said.

"One of the major benefits of these grants is that they can be tailored to the needs of growers and consultants in each valley. They're easy to apply for, don't involve a lot of paperwork, and funding is available now.

"We've been getting a lot of feedback through recent Area Wide Management meetings that growers are looking for more information or advice about holding training, workshops and events.

"Our CRDC Innovation Brokers and CottonInfo REOs are happy to talk through ideas and options with any interested grower, consultant or CGA representative."

Grant funding is capped annually, and is allocated on a first-in, first-served basis. Funding is currently available, and CGAs are encouraged to apply.

For more

CRDC Grassroots Grants

www.crdc.com.au/growers/community-grower-support

Commitment to CottonInfo continues

COTTONINFO has kicked off the new year with a change in structure that sees CRDC taking a more direct management role, Cotton Seed Distributors (CSD) as a key investor and Cotton Australia as a key partner.

Importantly, the CottonInfo partnership of CRDC, Cotton Australia and CSD is continuing, building on the strong success of CottonInfo's first 12 years.

Under the revised structure, CRDC is more actively leading the program, continuing to employ the Program Manager and Communications Lead, managing the Technical Leads through their CRDC-supported projects, and now also employing the Regional Extension Officers (REOs). Cotton Australia continues to support CottonInfo through *my*BMP, and CSD is now an investor.

"CottonInfo's three partners remain committed to the program and the delivery of world-leading CRDC research to growers," says Ruth Redfern, CRDC's General Manager for Communications and Extension.

"Bringing the CottonInfo REOs into CRDC brings the CottonInfo team closer to this research, which in turn brings growers closer too."

This change sees three REOs remain with CottonInfo: Annabel Twine on the Darling Downs; Andrew McKay in the Macintyre, St George and Dirranbandi region and Kieran O'Keeffe in Southern NSW. Two former CottonInfo REOs, Emma Chorley (Namoi) and Kim Stevens (Central Qld) have chosen to join CSD as Extension and Development Agronomists.

CRDC has been recruiting to fill those positions during December and January, as well as in the Macquarie and Gwydir valleys to replace Amanda Thomas and Dr Janelle Montgomery. After 12 years in the REO role, CottonInfo farewelled Amanda last year as she moved to take on family farming commitments, while Janelle stepped into the CottonInfo Program Manager role in late 2023.

"Amanda was a hands-on REO who was highly respected as a fellow grower, agronomist and extension professional. While she has left CottonInfo, we continue to work closely with her as a grower and in her role with her local Cotton Grower Association," says Janelle.

"With Kim and Emma transitioning to CSD, and me taking on the Program Manager role, we have four REO positions to fill to support growers in four valleys.

CSD is now a key investor in the CottonInfo program. Pictured are CSD's Ian Taylor with CRDC's Allan Williams as they signed the funding agreement for CottonInfo in Narrabri in late February. Cotton Australia is also a key partner in the program.

"Being an REO puts your boots firmly in the field, while offering an insight into R&D and growers' needs.

"REO roles offer a fantastic experience for people with a passion for both the practical, physical side of growing cotton and the extensive R&D that is behind it."

The REOs are supported by CottonInfo Technical Leads, who are a diverse group of researchers and industry professionals in their respective fields. The Technical Leads each specialise in a particular field, from water use efficiency to weed management, and climate to carbon farming. The team is also supported by a Communication Lead, Megan Woodward, and Cotton Australia's *my*BMP team of Rob Crothers and Nicole Scott.

Janelle said CRDC is excited to lead the CottonInfo team into this next phase and create a future-proof model for the extension of R&D to growers.

"CottonInfo has two key goals – to help grow our industry's profitability through extending research to meet grower's challenges, and to help grow our industry's sustainability and responsiveness to threats and risks.

"To achieve these goals, we will continue to create a two-way flow of information between our researchers, growers and agronomists.

"CottonInfo is uniquely placed to do this, thanks to the ongoing support of growers, consultants, researchers and our three partner organisations.

"We've recently been involved in Area Wide Management meetings and received positive feedback from growers and consultants about their value, and that they'd like to hold more.

"I'm looking forward to listening to this type of feedback from our growers to help guide the next decade of CottonInfo."

Cotton Australia's CEO Adam Kay said that growers have always appreciated the knowledge and advice of the CottonInfo team and the industry's need for ongoing research, innovation and extension.

"The work of the REOs is an important part of the program and having them closer to the research can only enhance the outcomes for growers," he said.

CSD CEO Dr Ian Taylor said CSD will continue to help Australian growers deliver the most desirable and sustainable cotton they can.

"We are proud of our ongoing support of the CottonInfo program and look forward to, with our partners and our own Extension and Development Team, tackling grower problems with high-quality on-ground research," he said.

For more
Dr Janelle Montgomery
janelle.montgomery@crdc.com.au

Walgett held its first area wide meeting earlier this year, with a raft of researchers making the trip to talk with growers and consultants.

Small networks covering big issues

GROWERS and consultants are welcoming the opportunity to get together at local catch-ups, creating connections within cotton communities.

These meetings, commonly referred to as Area Wide Management (AWM) meetings, bring together growers, consultants and local industry representatives to discuss issues of importance to the local area.

In the Upper and Lower Namoi, along with the Lachlan Valley, meetings in January this year were the first in a long time, while at Walgett (Wailwan country) growers met up for the first time, and have applauded the initiative. This keenness to share information and experience has seen the formation of four new networks, supported by CottonInfo.

The AWM meetings are working with, and in some cases through, Cotton Grower Associations (CGAs) and provide an opportunity to focus on specific areas within a valley, which often have a wide range of growing conditions, unique challenges, characteristics – and needs. This variation lends itself to the formation of informal groups, representing much smaller areas. There's an opportunity to feed more insightful and relevant information back to the CGAs, CottonInfo, CRDC, Cotton Australia and CSD, all of whom are involved in some way in the AWM meetings.

Informal catch-ups are key

According to those who've been attending, they're also good for an old-fashioned face-to-face catch up and yarn with other growers and consultants in the area.

The Upper Namoi AWM meeting was supported by the local CGA. CottonInfo Program Manager Janelle Montgomery said the meeting had "terrific" discussions on disease, particularly Verticillium wilt, cotton breeding and the impact of the current farming system. As a result, CottonInfo has already been able to tailor resources for this region.

"CottonInfo has since created a podcast with cotton industry pathologist Dr Karen Kirkby from NSW DPIRD and CSIRO plant breeder Dr Warwick Stiller to expand on the discussions we had there," Janelle said.

"Even though it was a small meeting, those who couldn't attend said receiving the meeting notes via CottonInfo really helpful."

Welcome visitors to Walgett

The first AWM meeting in Walgett was held in January, on the back of concerns about spray drift. Warwick and Karen attended this meeting along with CSIRO's soil scientist Dr Guna Nachimuthu, CSIRO's Dr Katie Broughton to talk about her mepiquat chloride trials, and Bayer territory manager Jack Sharp.

Wal Friend has been a long-time cotton grower in the Walgett area, and was pleased with the outcomes of the meeting and the opportunity to get together.

"It's good to know we aren't forgotten out here," Wal said.

"It is great opportunity to meet the younger farm managers and agronomists and to get together with the researchers to learn more about what's involved in growing cotton – it's not just about throwing siphons.

"We also got to talk about the effects of spray drift as a group, as we've had an issue with it again this year.

"Hopefully these meetings will create a better network so people are more aware of the impact they could be having, and the value of talking to our neighbours."

In her previous role as the Gwydir Valley CottonInfo Regional Extension

Officer (REO), Janelle ran AWM meetings for 12 years.

"These meetings found popularity back in the day when heliothis was an issue, helping us to take an area wide management approach, however in my time they've evolved to focus on broader conversations and discussion around issues or research that the growers are concerned about," Janelle said.

"It's about us all being open and transparent to the challenges, then we can address things and bring experts in if we know what growers and consultants need.

"We've had scientists talking about disease, mepiquat chloride trials, plant breeding, soil health and spray drift at some of the meetings so far this year.

"Topics for future meetings include micronutrients, so we will have soil scientist and CottonInfo Soil Health Technical Lead Blake Palmer travel to talk about his research."

Condo growers keen for more

Janelle and Cotton Australia Regional Manager Mel Swift convened the meeting held at Condobolin (Wiradjuri country) in the Lachlan Valley. Janelle made the trip from her base in Moree (Kamilaroi country) to be there.

"It was a fantastic get together of local growers and consultants in Condo and thanks to Mel for ringing around and organising the meeting," she said.

"I'd really like to extend a big thanks to everyone who came and for their great participation and willingness to share knowledge, experience and information, which is a reason for its success, along with just being a great bunch of people.

"Everyone is keen to hold another catch up, and to get a cotton community going, which is already happening thanks to Mel, who helped set up a Whats app group for the Condo growers which they're already putting to good use."

Like many valleys, the Lachlan is a large area that incorporates variable growing conditions and research, development and extension needs, extending from Forbes (Wiradjuri country) at one end of the valley to Condobolin at the other. AWM gives opportunity to drill down into area-specific issues and needs, as well as successes.

Jock Coupland has been growing cotton around Condo for 23 years, and says it was the best attended meeting they've had in the area. Jock was involved in setting up a mid-Lachlan grower group back in the mid-90s, which fell victim to the millennium drought. There's been nothing like it since.

"It was really positive and productive, we haven't had a meeting like that since the late 90s," Jock said.

"These AWM groups offer a casual, informal and ad-hoc way for growers, agronomists, CottonInfo and researchers to get together. We are able to set the agenda and CottonInfo and Cotton Australia helps with organisation and to provide the information or expertise we need.

"We definitely need CottonInfo involved, as they are our information source and have the resources to bring experts and scientists to our meetings, based on our needs at the time.

"Establishing these links and connections will allow us to get onto regional issuer quicker.

"The best thing to come out of the meeting was establishing the chat room.

"These meetings really help to link the industry up – it was great to see people there who may not be in touch with any industry people, or who hadn't met our CottonInfo REO Kieran (O'Keeffe) who is really proactive and a great grower advocate."

Jock was an agronomist before becoming a full-time farmer, and says it was great to see the sharing of knowledge and information at the meeting, which is beneficial to all involved.

"Word of mouth is gold," he said.

Some issues discussed at the meeting are common across regions, such as spray drift damage, others, such as difficulty in securing picker contractors were more area-specific.

Jock said sharing these issues may offer solutions among growers.

"Getting pickers is definitely as issue – and why I bought pickers to take control of the process," he said.

"While this may not be an option for everyone, there may be opportunities for several growers to look at buying one together.

"Hopefully by bringing us together with these AWM meetings we will see these types of conversations and solutions coming about."

With such a positive response from every meeting held so far, Janelle is encouraging growers, CGAs and consultants to contact her if they need help facilitating a meeting or linking up with researchers.

"The CottonInfo team are really looking forward to helping host more AWM meetings. They are a fantastic avenue for growers to engage directly with researchers, and they enable us to ensure we are providing the right support, resources and information to these growers," Janelle said.

"The direct feedback we receive from growers at these meetings also helps inform CRDC investment priorities and allows us to see first-hand the impact of our research in the field and where the gaps may be."

Pleased for the opportunity to get together: attendees at the Condobolin catch up in January.

For more

Dr Janelle Montgomery
janelle.montgomery@crdc.com.au

Creating a platform for the future of Australian cotton

Making data a powerful tool for the entire Australian cotton industry is one step closer, with work to create the cotton industry data platform soon to begin.

The Australian cotton industry data platform has been identified as essential for implementing key future-proofing initiatives such as the Strategic Roadmap for the Australian Cotton Industry, sustainability and emissions reporting.

Developing the cotton industry digital strategy and now the data platform has been one of the biggest and most important undertakings by CRDC and the steering committee in recent years, as it has the potential to add value to every aspect of cotton growing, ginning, warehousing and shipping.

"Bringing our industry data platform into being is very exciting, as it has been a coordinated effort over several years to address the growing demand for transparency and improved data management," says CRDC General Manager of Innovation, Dr Merry Conaty, who oversees the initiative.

"This new industry infrastructure will streamline data collection, sharing, integration, and management across the supply chain to deliver value back to growers, consultants, gins, merchants, and brands through data analysis and aggregation, as well as ensuring long term market access for Australian cotton into markets requiring detailed information about the cotton they import."

With consumers and retailers increasingly seeking detailed information about the origins, sustainability, and environmental impact of cotton production, CRDC's digital strategy aims to position the industry for future success by enhancing its data capabilities. Its goal is to make the industry more competitive and innovative in the global market by improving how data is collected, managed, and shared across the supply chain.

The data platform is the path to achieve this.

Since 2020, a steering committee led by CRDC has guided the strategy's progress. Key achievements include a data and capacity audit of the industry, business cases for data sharing across the industry, a comprehensive strategy document,

a governance framework, a draft data-sharing agreement and significant plans for the delivery of the strategy. This involved engagement with growers, ginners, shippers, merchants, classers, researchers, brands and retailers.

In 2022, the steering committee endorsed the proposal to build a central data platform and nominated CRDC to lead and drive the project. This was then integrated into CRDC's Strategic RD&E Plan for 2023-28, Clever Cotton, and the Strategic Roadmap for the Australian Cotton Industry, being developed by Cotton Australia, CRDC and the Australian Cotton Shippers Association, with data one of the five core pillars identified as crucial for cotton's future success.

Cotton Australia's Adam Kay says alignment between the data platform project and the Roadmap will ensure the platform will deliver a number of important outcomes.

"These include efficiency gains at the farm level, the ability to report sustainability data at the industry level, integration with *my*BMP, and to provide farm-level impact data if required in the future," Adam said.

How will it work?

The cotton industry data platform is being built to aggregate any on-farm or supply chain data that a grower or business in the Australian cotton industry wants to aggregate. Should, for example, a grower wish to combine their data or share it between the farm, the gin or their merchant they could give permission for it to be shared and combined automatically with their other data.

While the infrastructure to make this happen is complex, each user will only see their own data. Ownership of the data will remain with each user, and control will remain with them. The platform will simply facilitate the sharing of this data and the combining of data from many sources into one place.

What are the benefits to growers?

Once the platform is built, it will be up to growers whether they give permission or not to share their data. They'll also be informed of what the data would be used for. This permission can be given or taken away at the discretion of the grower.

What growers will get in return is drastic time saving through the automated aggregation and analysis of their data, a far simpler and more straightforward way to share data with a gin or to comply with data requests from merchants and retailers, and the knowledge that their cotton will be able to be sold into any market in the world instead of being shut out of markets that require information to accompany each bale of cotton before it can be sold.

"What growers will get in return is drastic time saving through the automated aggregation and analysis of their data..."

What's the difference between using an industry platform or my own?

Creating and maintaining a data platform like this is a costly exercise. Knowing what the future holds, growers will need to employ a data aggregator and a data analyst, or contract someone to perform these services for them. By doing this collectively as an industry we can reduce the cost through doing it at scale, and ensure that growers of every size can benefit from the opportunities data sharing will bring.

Will my data be safe?

The steering committee has already addressed key issues raised by the industry, including data governance and management. To ensure that data is handled responsibly, the platform will comply with the National Farmers' Federation (NFF) Farm Data Code developed in conjunction with the cotton industry and others.

To manage data at a grower level, work has focused on farm and field identification and understanding how to automate this through the supply chain. Discussions have included the potential impact on growers and the need for a consensus among industry stakeholders.

"An ID system will sit in the background of all the data collection points growers currently have, improving communications between points on the supply chain, and saving time on data quality control," Merry said.

"This is an essential step in connecting the industry and the platform."

CRDC aims to beta test the platform for the 2025-26 cotton season, with the platform build partner set to be announced in the coming months. Recruitment is currently underway for a project manager for the build and implementation phases and to lead engagement with growers and other stakeholders.

For more

Dr Merry Conaty
meredith.conaty@crdc.com.au

Building the roadmap to continued market access

An overarching plan has been developed to ensure the Australian cotton industry remains competitive and a supplier of choice in a changing global fashion and textiles market.

Cotton Australia, ACSA and CRDC are working to support growers and the industry to navigate the future, to make sure the industry has the credentials and checks and balances in place to access premium markets for the long term.

Cotton Australia, Australian Cotton Shippers Association (ACSA) and CRDC have been working with the wider industry and external stakeholders to develop the *Strategic Roadmap for the Australian Cotton Industry.*

Five key topic areas were identified during the Roadmap's development: traceability, industry data, sustainably-certified cotton/*my*BMP, human rights and Australian cotton promotion.

Cotton Australia's Brooke Summers said the action the industry takes around these topics will be conducted with broad consultation across industry, farmers and expert stakeholders.

"The Roadmap is a pathway to support growers and the industry to navigate the future, so our industry has the credentials and checks and balances in place to access premium markets for the long term. This requires new ways of doing business so we meet not only state and federal requirements, but new global requirements," Brooke said.

"We have a lot of clear ideas about where we need to be, the focus now is on the best way to get there, with further research and discovery required before value propositions for the industry can be identified and communicated, and investment decisions made."

Modernising *my*BMP

A comprehensive review of *my*BMP has been commissioned by CRDC to assess the program's effectiveness, relevance and future fitness, and to recommend how the industry can best meet new and emerging requirements for demonstrating sustainability credentials. It will ensure growers, researchers and the industry all contribute to its outcomes via a broad consultation process.

The review will take into consideration both the function of *my*BMP here in Australia, as well as what may need to change to meet the global requirements and legislation coming in to sell into premium markets.

"The brands and retailers we work with are very supportive of *my*BMP and what it has achieved since its introduction 25 years ago to manage industry risks. While it has created enormous change, we now need to investigate what additional value can be created from the program, particularly for our growers," Brooke said.

"We'd like to see our certified growers rewarded for all the hard work, investment and sustainability progress they've made over the last 20 years,

while ensuring they can continue to access premium markets well into the future."

Ensuring traceability

Cotton Australia last year secured a Queensland Government grant to identify traceability requirements and investigate and test solutions. The first phase of the 'Investigating Traceability Solutions for Australian Cotton' project identified system requirements, data needs and the current state of play. It identified that traceability of materials is a priority topic for the fashion and textiles industry, driven by increasing scrutiny from consumers and regulators in relation to green claims, the need to identify and mitigate modern slavery risks in the supply chain, and forthcoming regulation in the EU that will require enhanced social and environment due diligence and reporting for many large companies.

The second phase of the research was to identify and assess technical solutions available in the market, and the cost benefit analysis and assessment of the current chain of custody for the Australian Cotton Mark licencing program.

"This project is critical to identify the risks, value and solutions needed to maintain our market access in future. Without traceability, sustainability certifications and data are meaningless," Brooke said.

"Traceability is the starting point for the brands we work with who, from a due diligence perspective, are looking to identify and mitigate supply chain risks including environmental and social issues right back to raw material production.

"Phase 2 is now complete, and we're hoping to pilot at least one of the recommended technologies with the current cotton crop. Crucially, we would also like to test integration between traceability and the CRDC data platform as we believe the data generated at farm level will be key to creating value for our growers."

Data to support claims

Cotton's brand and retail customers, their shareholders and governments are demanding supply chain traceability, and certified sustainable raw materials backed up by data to support claims. There is growing demand for farm-level traceability and data from brands and retailers.

Alignment between CRDC's cotton industry data platform project and the Roadmap will ensure the data platform can deliver a number of important outcomes: efficiency gains at the farm level, the ability to report sustainability data at the industry level, integration with *my*BMP, and providing farm-level impact data if required in future.

CRDC Executive Director Allan Williams said the industry's supply chain was shifting its focus from physical cotton to information about where and how the cotton was produced.

"While the roles and responsibilities of industry and commercial organisations when it comes to producing and moving physical cotton through the supply chain are well established, the same can't be said about the information," Allan said.

"What information do we need to provide? Who is responsible for collecting, storing and providing it? How do we best share that information, safely and securely?

"The industry data platform and the Roadmap will help us answer these questions and help ensure that our cotton remains a product of choice because of its excellent fibre qualities and its sustainable production practices." (See story page 8)

Human rights in a global context

This topic is included in the review of *my*BMP to ensure the social compliance aspects of cotton production in Australia are properly covered.

"We are a global industry and human rights in textile supply chains today is a huge issue for cotton," Brooke said.

"While we know that we are low risk for human rights violations here on Australian cotton farms, we still need to be collecting the right evidence to verify those claims. All major global businesses including fashion brands and merchants are adopting due diligence approaches, and this will soon be mandated for every product sold in the EU.

"So while it might seem a little strange to be talking about child labour here in Australia, some of the topics such as the treatment of migrant workers, access to affordable childcare, climate risks like working outside in hot conditions and minimum working ages are all relevant.

"Our customers don't automatically know what our record is, and because there are issues in other parts of the world, we need to be across this.

"Feedback from brands and retailers is that Australian and state laws are not enough. For example, some state laws related to minimum working ages may be in contravention of the UN International Labour Organization conventions.

"We also need to prove we are a low-risk country with independently verified research. Cotton Australia and CRDC are working on a project to provide this evidence as an important starting point.

"This research will also start to look at the evidence required to verify and meet new global requirements that may be over and above Australian law."

The development of the *Strategic Roadmap for the Australian Cotton Industry* was funded by the Australian Government under the ATMAC program, and Cotton Australia and CRDC are making investments under the Roadmap's pillars.

For more

www.cottonaustralia.com.au/strategic-roadmap-for-australian-cotton

Equip yourself for the future

APPLICATIONS are now open for Nuffield Australia's 2026 farming scholarship, with cotton growers urged to apply. CRDC is a proud supporter of the Nuffield program, supporting one cotton grower annually to undertake the program in partnership with Cotton Australia.

Nuffield is one of the world's longest-running agricultural capacity building programs, offering its global program for 75 years. A Nuffield scholarship is a great way to build skills, grow networks and explore new innovations in the cotton sector. The comprehensive program includes a range of group and individual components, including travel around the world, to equip scholars with the tools, insights, knowledge and global networks they need to adapt to changing climatic and market conditions in agriculture.

Nuffield has created a diverse community of alumni who are united in a shared purpose: to lead and fuel innovation in agriculture. From paddocks to boardrooms, Nuffield scholars are leaders who push boundaries, drive change, and ensure Australian agriculture will thrive in a changing world.

In this edition of *Spotlight*, we feature Nuffield scholar Richie Quigley's deep dive into the strip and disc system, which has been successfully implemented on the Quigley family farms at Trangie in Central West NSW (Wiradjuri country).

For more
Nuffield Australia
www.nuffield.com.au

Nuffield scholar Richie Quigley.

CRDC Chris Lehmann Young Achiever of the Year 2024, Sharna Holman receiving her award from CRDC Executive Director Allan Williams.

Championing cotton's people

IT'S time to talk about champions of cotton again, as nominations open for the 2025 Australian Cotton Industry Awards.

The Awards will be celebrated at the Empire Theatre in Toowoomba (Barunggam country), Qld, on 7 August. They're being held in conjunction with the Cotton Collective and Australian Cotton Tradeshow that will run from 6-7 August at the Toowoomba Showground.

Nominations across all categories close on 28 March. These are the Bayer Cotton Grower of the Year, AgriRisk High Achiever of the Year, Cotton Seed Distributors Researcher of the Year, Incitec Pivot Fertiliser Service to Industry, and the CRDC Chris Lehmann Young Achiever of the Year award.

As part of their prize, the recipient of the CRDC Young Achiever Award will receive a bursary to attend the Australian Rural Leadership Foundation's TRAIL Emerging Leaders Program, valued at $12,000. It's a seven-day program held in Canberra in early March each year. This is a new aspect of the award, with 2024 awardee Sharna Holman, CottonInfo's Technical Lead for Biosecurity and Disease, the first recipient to complete TRAIL as part of her award.

CRDC General Manager, Communications and Extension, Ruth Redfern said with the amount of talent and contribution exhibited by younger people in the industry, there are plenty of young achievers worthy of nomination.

"Investing in our young achievers is a natural fit for us, and we look forward to meeting all the nominees this year," Ruth said.

"No doubt we will see faces that have come through one or more of the programs we invest in to build capacity in the Australian cotton industry.

"At CRDC we support the development of people in many ways: through Nuffield Australia's farming scholarships, the Australian Rural Leadership Foundation's programs, AgriFutures Australia's Horizon Scholarships, our own CRDC summer and honours scholarships, the Cotton Australia and CRDC Australian Future Cotton Leaders Program, and the CRDC-supported SHIFT on-farm workforce development program.

"A strong indication of the number of passionate young achievers out there is the fact that Cotton Australia and CRDC received 50 applications for our last Future Cotton Leaders intake. It shows the calibre, initiative and drive that exists in our next generation.

"We encourage young people working right across the industry to apply, and for others in the industry to nominate or shoulder tap someone you know who fits the description of a Young Achiever awardee.

"Help us recognise and celebrate young people doing great things for cotton."

To nominate:
www.cottonaustralia.com.au/awards-nominations

Pilot event clarifies benefits in creating carbon and biodiversity

Growers at a CottonInfo carbon and biodiversity pilot workshop in the Macquarie have recommended that “these are topics we can no longer ignore – all growers should attend”.

CottonInfo NRM Technical Lead Stacey Vogel with fellow CRDC Innovation Broker Dr Nicola Cottee and CottonInfo Program Manager Janelle Montgomery worked on requests from growers to create a program.

The pilot event at Nevertire (Wiradjuri country) in February featured presentations from CottonInfo Climate and Energy Technical Lead Jon Welsh on carbon, while Trangie farmer Alex Quigley from Louis Dreyfus Company spoke about sustainability and cotton markets. Farm aggregation and carbon markets were covered by Stacey and Andrew Ward from Regen Farmers Mutual, with Central West Local Land Services’ Dr Chioma Igwenagu talking about natural capital support.

“The workshop provided an opportunity for growers to better understand their on-farm natural capital and the market opportunities and risks,” Stacey said.

“We worked with the Macquarie Cotton Grower Association to design this event based on the questions they had. We’re really pleased with the outcome, because judging by the feedback there is definitely an appetite for more of what we covered in more context and more depth.”

Jon’s presentation ‘soil carbon and broadacre cropping systems’, covered carbon cycling, managing, measuring and monetising soil carbon and created much discussion.

“We had a really engaged group, who in their feedback said they’d like more in-depth information across the topics in my presentation,” Jon said.

“It really shows the appetite for information and is something that I’ve found is always strong in the cotton industry: it’s one of its strengths.

“Growers are pretty straight-forward, they want to know what the research findings are, what they need to know, and how they can act on it if they want to.

“In the carbon domain, independent R&D and advice is pretty hard to come by, which I think is part of the reason we had such a great response.

“With basically all Australian cotton being exported, we need to better understand the queries from our trading partners and market access requirements on carbon and biodiversity. A big takeaway was that all of us have to be conversant in sustainability and the farming system – not just one person or one employee.”

All roads led to Nevertire Hall in the Macquarie Valley recently, and if you weren’t there “you were missing out” according to those growers who attended.

Billy Browning farms at Narramine Station with his family and says the workshop gave him a better understanding of improving soil carbon and biodiversity, and the value it holds.

“It was an excellent insight into the carbon world, as Jon is a great presenter who is able to give us information from an independent standpoint,” Billy said.

“It was also an eye-opener as to the biodiversity avenue, learning that there’s a potential market that exists totally separate to the soil carbon space. We have value in our support land (native vegetation and riparian zones) we didn’t realise was there.

“It was such a valuable day, and we left so much better informed, that our organising committee felt disappointed for the local growers who couldn’t be there as well.”

Capturing environmental and economic value of on-farm natural capital

CRDC is partnering with Regen Farmers Mutual to run a pilot Landscape Impact program in the Macquarie Valley to help growers understand their environmental assets and leverage them into economic returns.
The pilot program will take a group of 10 growers in a particular landscape (e.g. Narromine) through a structured program to develop digital natural capital profiles of their farm and identify the management actions that individuals and the larger group can undertake to generate environmental benefits and ultimately yield economic returns.
Please direct expressions of interest to stacey.vogel@crdc.com.au

For more

Regen Farmers Mutual

www.regenfarmersmutual.com/our-projects

CRDC announces new low emission farming project

On-farm demonstration sites will give growers the opportunity to use and see low emission technology first-hand.

Without specifically focusing on reducing GHG emissions, by increasing their input efficiencies, some growers over many years would have been improving their emission levels. Installing irrigation systems with fewer pumping requirements, using enhanced efficiency fertilisers and variable rates, utilising robots, and improving crop residue/stubble management are helping growers reduce their emissions and improve their triple bottom line. Enhancing native vegetation and soil health may also increase the ability of a cotton farming system to sequester carbon.

Cotton industry researchers have illustrated that Australian conditions and farming practices do not lend themselves to easily achieving net zero (i.e. where carbon sequestered offsets the climate change impact of GHGs emitted) due to emissions sources that cannot be avoided. These include natural processes such as decomposing crop residues and microbial activity in the soil, and the lack of low emissions inputs such as green nitrogen (N) fertiliser (see full story in *Spotlight* Summer 2024-25).

As a result, CRDC's science-based ambition is to help growers to reduce emissions as much as technically possible through reducing reliance on fossil fuels on-farm, reducing on-farm emissions from N, and improving soil health.

CRDC Innovation Broker Dr Nicola Cottee says through these three major pathways, cotton growers have the opportunity and potential to create low emission intensity farming systems.

"Growers are keen to know more about what these pathways entail, and most importantly, how to capture value from reducing emissions," Nicola said.

To meet this challenge, CRDC has invested

The cotton Low Emission Intensity Farming Systems project is about facilitating the transition on-farm to be in line with what makes sense for the grower's business.

in an extensive project created by CRDC's sister organisation, the Grains Research and Development Corporation (GRDC) that is taking an innovative approach: working directly with growers so they can be supported to plan and implement emissions reduction strategies and calculate and report the emissions intensity of their crops. It's an important blend of research, development and extension (RD&E).

"The Cotton Low Emission Intensity Farming Systems project (CottonLEIFS) is about facilitating the transition on-farm in line with what makes sense for the grower's business," Nicola said.

"I've had a lot of feedback from growers around understanding the value proposition for thinking about carbon or investing in emission reductions. They want to know what their options are, what they need to do, why and when.

"Cotton growers will be integral to the project, and we are looking forward to working with scientists at the research sites and growers to create demonstration sites.

"The opportunities for growers who would like to be involved include trialling emission reductions technologies on-farm in a low-risk environment, which could be particularly important for N fertilisers, where risk is such a big driver for decisions (see story in *Spotlight* Summer 2024-25).

CottonLEIFS is working with the NSW DPIRD Farms of the Future project to demonstrate technologies that can monitor crops and inform decisions that will result in reduced GHGs from cotton production systems and the On-Farm Carbon Advice project that is educating farmers on GHG emissions in agricultural systems.

"Participating farmers will walk away from CottonLEIFS with a carbon plan, will have tested options for reducing emissions in a way that aligns with their farming system and business objectives, and will understand options for capturing value from their on-farm emissions reductions.

"In return, we ask that they open their gates to share their carbon experience with other growers and consultants."

CottonLEIFS will be primarily delivered through a NSW Action Research Network, managed by Dr Aaron Simmons, a senior research scientist of the NSW DPIRD Climate Branch.

"Our intention is to have on-farm demonstrations for GHG emission reduction strategies that we have confidence in, located throughout the cotton growing regions of NSW, and I'd really encourage farmers interested in hosting a site to submit an expression of interest when they are released," Aaron said.

In addition to on-farm demonstration sites, three research demonstration hubs for cotton will be established: at the Australian Cotton Research Institute (ACRI) near Narrabri (Kamilaroi country), Trangie Agricultural Research Centre (Wiradjuri country), and in southern NSW (location to be confirmed). These research hubs will be used to demonstrate emerging GHG emission reduction strategies. CRDC will be looking at ways to evaluate the NSW program to roll out a similar initiative in other states.

"CottonLEIFS will also trial and demonstrate technology to automate the calculation of the emission intensity of cotton at the paddock scale and the supply of the emission intensity to the supply chain," Aaron said.

"There will be a mix of facilitated activities such as demonstration site open days and more resources for growers through networks such as CottonInfo." Growers interested in hosting a demonstration site can submit an EOI to action.research.networks@dpi.nsw.gov.au

For more

Dr Aaron Simmons, NSW DPIRD
aaron.simmons@dpi.nsw.gov.au
Dr Nicola Cottee, CRDC
nicola.cottee@crdc.com.au

Improvements start with the soil

A healthy soil is productive, sustainable and resilient to the impacts of farm management practices and changing climatic conditions. It also stores and cycles carbon.

Soil organic carbon is strongly linked to soil quality and productivity. How much carbon your soil can store and for how long varies depending on factors such as soil moisture, soil texture (the clay and fine silt fraction), temperature and annual rainfall (amount and distribution over the year), and importantly, farm management practices.

Soil organic carbon is a key component of soil organic matter which includes all of the organic components of the soil such as plant and animal tissue in various states of decomposition.

Soil organic carbon is the lifeblood of soil, and research has been underway for many years to establish how to preserve and increase it.

Soil organic carbon provides a source of nutrients through mineralisation, helps to aggregate soil particles (structure) to provide resilience to physical degradation, increases microbial activity, increases water storage and availability to plants, and protects soil from erosion.

Ultimately, increasing soil organic carbon levels can lead to better plant establishment and growth. While increasing soil carbon is highly desirable, it is also easily lost, so maintaining what you have is important. Climate is a strong driver, affecting accumulations and decomposition of soil organic matter in soils.

One of the cotton industry's long-term senior soil scientists, Dr Guna Nachimuthu of NSW DPIRD, says healthy soil is a "superpower for your plants".

"Healthy soil with good structure is a result of soil storing good organic matter and soil organic carbon, then cycling them, which is good for crops," he says.

What determines the soil carbon content?

Many factors impact the soil organic carbon storage in broadacre cropping fields.

Guna says it's like a living puzzle with ever-evolving pieces, and soil scientists are constantly learning more about complex relationships in soil.

"Combine this with the impact of local climate and you get a situation where a practice that boosts soil carbon storage in one area might have little effect or even hurt it elsewhere," he said.

"To make things even trickier, some conservation techniques such as minimum till might increase carbon storage near the soil surface and decrease soil carbon deeper down, leading to an overall loss.

"This explains why crop managers might feel scientific studies on soil carbon seem contradictory, however, most scientists agree that practices like cover crops and no-till are winners for building carbon in the topsoil.

"Compared to conventional tillage and leaving bare fields, these methods keep more carbon near the surface.

"However, the jury's still out on how deeply they impact carbon storage. In fact, some practices might even accelerate carbon loss in lower soil layers and there is less consensus for deeper soils.

"The key take away from the science so far is when it comes to soil carbon storage, we need to consider the entire soil profile and tailor our approach to specific location taking into account soil type, management practices

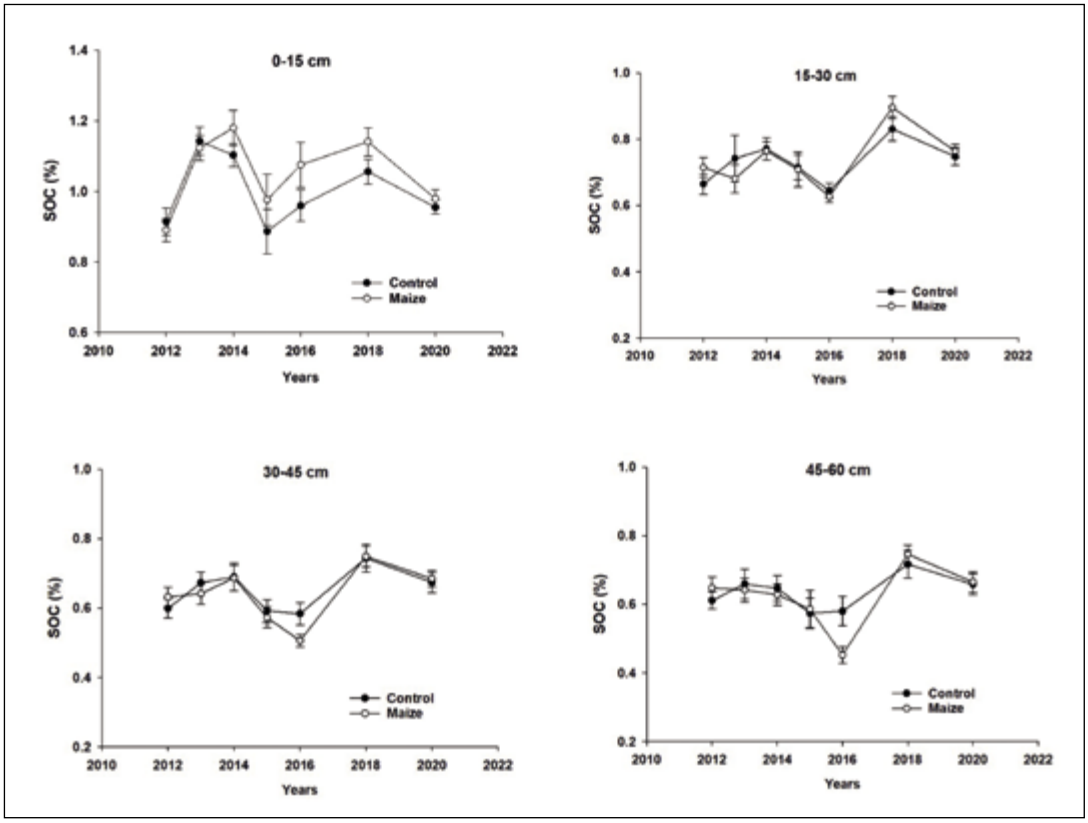


Figure 1. Soil organic carbon changes at difference depths in long term experiment as influenced by maize rotation.

and climatic conditions."

While there can be local variability depending on location, some general trends occur which include:

- Soils with the most potential for improvement in carbon storage tend to be the coarse texture or sandy soils with low productivity, low carbon content initially and that have historically received lower crop residues and manure.
- Adoption of soil health practices such as cover cropping, minimum or no-till practices enhance soil organic carbon in top soil (top 10cm).
- Irrigated systems hold more potential for carbon storage than dryland systems.
- Soil carbon fluctuates depending on soil moisture, but remains at fairly stable levels on a long-term basis.

Long-term cotton systems experiments

Guna says before diving into long-term Australian Cotton Research Institute (ACRI) experiments, it's important to understand how land-use changes impact soil organic carbon, as it depends on the balance between organic matter added to the soil (inputs) and what decomposes and releases carbon (outputs).

When land use changes, so does the carbon cycle in the soil. Converting forests or pastures to cropland often leads to a decrease in soil organic carbon as organic inputs decline. Over time, the soil organic carbon reaches a new, lower equilibrium level. Conversely, converting cropland back to pastures or forests increases organic inputs, leading to a rise in soil organic carbon and a new, higher equilibrium.

Two long-term experiments conducted by NSW DPIRD revealed a consistent decline in soil organic carbon regardless of the crop rotation or soil management techniques employed. However, the experiments also showed that implementing practices like minimum tillage and wheat rotation helped slow down the rate of decline.

While maize rotations showed some potential for increasing topsoil soil organic carbon with fluctuations both upwards and downwards over the years, these gains appeared short-lived. When rotations transitioned away from maize, the positive impact faded, and soil organic carbon levels began to decline again.

A separate 10-year study from 1998-2008 by the late Dr Ian Rochester of CSIRO found an increase in soil carbon storage. The differing soil organic carbon levels across ACRI fields, even though they're all within the same farm, raises the question of why these fields show variations in storage.

"The field with increasing soil organic carbon is near the river and floods more frequently, potentially depositing carbon-rich sediments," Guna says.

"Conversely, the declining soil organic carbon field has high subsoil sodicity, hindering biomass production. Additionally, differences in fallow-phase biomass turnover contribute to the variation in soil organic carbon trends.

"The declining soil organic carbon field, converted from pasture, might still be reaching its 'cropping equilibrium' – a stable soil organic carbon level for cotton production.

"Conversely, the high soil organic carbon field might be trending at the top end of the cropping equilibrium due to flood-deposited sediments and good fallow-phase biomass management."

The role of water

Generating biomass for soil carbon requires water, a scarce resource with variable annual rainfall and allocated quotas for irrigation water across cotton growing regions. This limited water availability can restrict the potential for biomass production and subsequent soil carbon storage in cotton cropping systems.

A preliminary study suggests lower soil organic carbon levels in commercial cotton fields compared to research farms like ACRI. This difference might be due to water availability. ACRI, with access to purchased water during droughts, can maintain crop rotations and minimise soil organic carbon decline. Conversely, grower's fields often rely on extended fallows, leading to carbon loss and there are limits on maintaining the soil organic carbon levels within the cropping systems.

Irrigated systems hold more potential for carbon storage than dryland systems. However, maintaining soil carbon through irrigation during droughts presents a water cost dilemma. Finding a solution to this water-carbon trade-off will be a long-term challenge for the industry.

Soil carbon, nutrient cycling, and cotton productivity

Guna says while building soil organic carbon is difficult in Australia's inland cotton regions due to extreme weather, efforts to improve soil organic carbon should persist.

"That's because higher soil organic carbon translates to a more fertile soil, boosting its ability to deliver nutrients and enhancing its resilience.

"Research across the globe shows that cotton plants can access a significant portion (60 to 70 per cent) of their nitrogen needs directly from the soil, highlighting the critical role of nutrient supply.

"Therefore, maintaining good soil organic carbon levels is crucial for long-term soil health and sustainable cotton production.

"This is backed up by a team of researchers from NSW DPRDI, the University of New England and CSIRO who investigated contrasting cotton fields (high vs low yield) and found a positive correlation between soil organic carbon and normalised lint yield.

"This finding underscores the significance of soil organic carbon for improving cotton production."

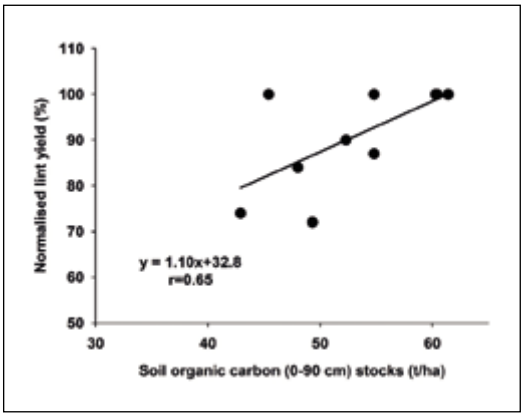


Figure 2. Relationship between soil organic carbon stocks (t/ha) and normalised lint yield across 10 fields. Normalised lint yield % = (The lint yield at the low yielding field /the yield at the higher yielding field) x 100.

For more
Dr Guna Nachimuthu
guna.nachimuthu@dpi.nsw.gov.au

What is the carbon cycle and why do cotton growers need to understand how it works?

Plants power the soil's carbon cycle. Through photosynthesis, plants capture carbon dioxide (CO_2) from the air and turn it into sugars for growth, releasing oxygen in the process. These sugars fuel the plants, but some are released as CO_2 again during respiration.

The cycle keeps turning thanks to soil microbes. Plant leftovers like dead leaves and root secretions become a feast for these tiny decomposers. As they break down the plant matter, they release some of the carbon back to the atmosphere as CO_2. The microbes themselves also contribute to the soil's carbon stores when they die.

Carbon created by these natural processes and stored in the soil is known as soil organic carbon and is a vital part of healthy soil. It helps plants access nutrients, improves soil structure and holds water.

Sustainability reporting: what you need to know

Through the cotton industry's Sustainability Working Group, CRDC and Cotton Australia are working to standardise sustainability reporting across the cotton industry. *Spotlight* asked cotton's sustainability adviser Chris Cosgrove to tell us what sustainability reporting is, what it means and how it can be managed.

What is sustainability reporting?

A sustainability report describes how a company or organisation identifies and manages its social, economic and environmental risks and opportunities. There are many different sustainability reporting standards an entity can choose to base its sustainability report on. This has created a lot of inconsistency and confusion.

Two years ago, the cotton industry aimed to eliminate confusion by choosing the International Sustainability Standards Board standards to align with its PLANET. PEOPLE. PADDOCK. Sustainability Framework. It is the standard Australia's new mandatory climate-related disclosure legislation is based on and most likely to be used by our customers and investors in the future.

A major aspect of PLANET. PEOPLE. PADDOCK. has been establishing sustainability indicators for Australian cotton production. We've also been working with the beef and grains sectors to ensure exactly the same sustainability language and indicators are being used across industries. That's the only way we can eliminate confusion for our growers who generally always grow winter crops and/or have livestock.

How does cotton's sustainability reporting work?

Our performance against the indicators in PLANET. PEOPLE. PADDOCK. creates an industry-level picture of sustainability. By having the data our customers and investors need, it makes it easier for them to buy or invest in Australian cotton. Data for these indicators comes from sources like the CRDC Grower Survey, however there is a need for a new method to provide broader yet 'quality' data that is more accurate, refined and relevant. The Australian cotton industry data platform – currently being developed by CRDC – is a major part our response to this issue (see story page 8). Not only will the platform give growers the ability to easily aggregate their own data to use and share how they see fit, with grower permission it could also allow industry-scale reporting and direct communication with the market.

Why are growers being asked for greenhouse gas emissions data?

It's likely growers will be asked soon by merchants, gins, banks and others in the value chain for greenhouse gas (GHG) emissions data so these companies can comply with the Federal Government's mandatory climate reporting. Growers are likely to be increasingly asked for other sustainability data as well. If they wish, growers can use the PLANET. PEOPLE. PADDOCK. sustainability indicators to start collecting the data these companies are likely to want.

In the near future, participation in the data platform will offer the best response to requests

for data, as it will enable automation of this process, saving time, effort and costs for growers. Sustainability data kept in this platform will make it easier to respond to information requests, and ensure that data is collected once for many purposes – a grower's sustainability data can also be used to inform better management decisions, benchmark performance and ensure access to all markets is on the table.

CRDC and Cotton Australia will be meeting with growers and others in the industry during 2025 to explain the sustainability framework and indicators, and how growers can use the data platform to communicate this data with merchants, gins or banks, as well as to hear from growers what they need to make the most of this in their farm business.

What is a mandatory greenhouse gas or climate report?

Sustainability reports are voluntary. Every sustainability report already includes a section on GHG. What has changed is many governments around the world, including Australia, are legislating mandating climate-related financial disclosures in annual financial reports. In Australia, mandatory reporting for large entities and large emitters started on 1 January 2025, while reporting for smaller entities and emitters will be phased in over coming years.

The content of a climate-related report is very similar to that of any good sustainability report. The only real difference is one part of a voluntary sustainability report (climate) must now be in the financial report of these entities and follow legislated guidelines for content.

Will broader sustainability reporting be made mandatory?

Climate-related reporting legislation is based on very clear guidance from the International Sustainability Standards Board, which in turn is based on the Taskforce for Climate-Related Financial Disclosures (TCFD).

The International Sustainability Standards Board also has general sustainability disclosure guidance. The environmental section of this guidance is based on the Taskforce for Nature-Related Financial Disclosures (TNFD). You don't have to be Nostradamus to see it is at least possible governments will mandate nature-related or broader sustainability-related disclosures, just as climate-related disclosures are now law.

What is CRDC doing?

CRDC's response is two-fold, focusing on what we need to report, and investing in the solutions to enable this reporting.

Firstly, we are investing in the infrastructure to enable the collection, analysis and reporting of sustainability data through the supply chain by every single grower, through the industry data platform. Secondly, we are working to align and standardise reporting guidelines. As mentioned, there are many different reporting standards and guidelines making it really confusing for companies or organisations to know what to report. The good news for growers is that CRDC and Cotton Australia have been working for several years to revamp the cotton industry's PLANET. PEOPLE. PADDOCK. Sustainability Framework and align it to the International Sustainability Standards Board. At the time, we thought this family of reporting standards would be the one customers and investors increasingly chose in future to report against.

As a result, sitting behind PLANET. PEOPLE. PADDOCK. is a framework that allows us to report for the whole Australian cotton industry the content our customers and investors are looking for about our industry, including:

- our governance structures for managing sustainability
- our process for identifying and monitoring climate and sustainability risks and opportunities
- our strategy for managing the most important risks and opportunities
- our indicators and metrics to show impacts and progress

The same indicators and metrics can be used by individual farms, as well as for the whole industry.

What does this mean for growers?

It's likely you will be asked soon by merchants, gins and other large companies you deal with for GHG data so they can comply with mandatory climate reporting. They may also increasingly ask for other sustainability data – either because it's important to their voluntary reporting now, or because legislation is introduced to mandate it in future. So, what should growers be thinking about?

Some growers may choose only to react to requests for information from entities in your value chain. This might be the easiest option right now but will be increasingly time-consuming and frustrating as requests for data increase.

For those who want to collect and aggregate data that merchants, banks and others in their value chain are likely to need, the indicators from

Workshops coming

A series of events in cotton growing regions this year is being planned to get input from growers and their trusted advisers to these indicators and how they can work with us to shape a sustainability reporting solution that makes sense and adds value for the industry. Keep an eye out for more information about these.

Soil

- Area of soil by type for land used for cotton
- Soil organic carbon
- Fertiliser applied per hectare
- Pesticides applied per hectare
- Use of two or more 'regenerative' practices (e.g. cover cropping, diverse rotations, groundcover preserved)

Biodiversity

- Area of farm set aside for conservation (i.e. not normally cropped or grazed)
- Change in natural forest area on farm as a result of:
  - land use change to grow cotton
  - drought, fire, flood
  - pests & invasive species
- Proportion of cotton produced on land determined to be deforestation free

Workplace

- Number of permanent fulltime employees
- Number & causes of fatalities & serious injuries
- Positive mental health initiatives
- Proportion of farms with a documented WHS systems
- Whether hazard analysis risk assessment & incident investigation systems are operational
- Employee participation & communication on WHS
- Programs for upgrading employee skills
- Training per person
- Percentage breakdown of workforce: age/gender/Indigenous
- Whether a human rights policy is in place
- Whether harassment & discrimination plans are in place; incidents of breaches
- Whether child or forced labour, & other exploitation policies are in place; incidence of breaches

Water

- Length of rivers & streams
- Length of rivers & streams with vegetation buffers
- Annual allocation
- Annual rainfall
- Volume withdrawn from ground or surface water
- Volume applied to cotton
- Number of water use non-compliances

GHG emissions

- Total scope 1, 2 & 3 emissions
- Removals of CO2 in vegetation & soil
- Net GHG emissions
- Net GHG intensity (kg GHG per kg cotton)
- Nitrogen use efficiency
- Description of strategy to reduce Scope 1 emissions (i.e. on-farm emissions from fertiliser & energy)

Economic contribution

- Gross value of production (not applicable for farm businesses)
- Economic value distributed:
  - procurement of goods & services
  - wages/salaries
  - rates & taxes
  - interest payments
  - community investment & support

Other

- Area of farm
- Area of farm used for cotton
- Total production & bales per hectare

the PLANET. PEOPLE. PADDOCK. Sustainability Framework have been designed for this purpose. Further participation in the industry data platform will give growers the ability to have all the information they need in one place, making it much easier to respond to information requests. Some growers are also producing their own voluntary sustainability reports.

What sustainability data should growers collect?

The cotton industry's aim is to have every agriculture sector and every business in the cotton value chain – farms, banks, agronomists, gins, merchants and others – all using the same sustainability language and indicators. That's the only way we can eliminate confusion.

Therefore, the revamped PLANET. PEOPLE. PADDOCK. indicators are being shared with other agriculture industries and the Australian Agriculture Sustainability Framework to work towards rapid harmonisation of sustainability indicators across Australian agriculture. With so many people needing to have a say in harmonised reporting this is taking a lot of time to get right, and there may be more tweaks. The table on this page outlines current recommendations for indicators every industry should report, and every farm business could report if it wants to.

CRDC also been working on a new global methodology that will allow the industry to work on building a foundation for reporting metrics and impact in a consistent way that meets the needs of the value chain (see story next page).

For more

Chris Cosgrove
chris@sustenancasia.com.au

Current recommendations for indicators every industry should report, and every farm business could report if they choose to.

Aligning approach to sustainability increases value of data

CRDC continues to work on behalf of Australian cotton growers on the global stage to ensure their place remains firmly as a producer of choice.

Data from Australian cotton production can now be included in the Higg Index, which is used by manufacturers, brands and retailers to leverage verified data in order to continuously measure, improve and share their sustainability efforts.

CRDC and Cotton Australia have been answering the call of growers domestically for standardised methodologies, models and indicators to measure their natural capital, carbon and greenhouse gas emissions. This is to create value for their product through transparency and acknowledgment of their sustainability credentials by governments and the apparel industry.

The CRDC data platform is the industry's proposed response to facilitate the collection and aggregation of this data to make it simpler for growers to communicate their data with the supply chain, and collect industry-scale information

Meanwhile, globally work has also been required to set consistent methodologies and models to create meaningful and useable data for cotton fibre production. This enables textile manufacturers, brands, retailers and ultimately consumers to make informed sourcing and sustainable choices.

Cascale, formerly Sustainable Apparel Coalition, has unveiled a new cotton Life Cycle Assessment (LCA) methodology for the Higg Materials Sustainability Index (Higg MSI), offering improved accuracy and consistency in assessing the environmental impacts of growing cotton.

The Higg MSI is a cradle-to-gate impact assessment tool that calculates environmental impacts from the extraction or production of raw materials, through manufacturing and finishing of consumer goods. This new methodology provides businesses with reliable data to make informed sourcing and sustainability decisions. It also enables more accurate and frequent measurement of cotton's sustainability and is crucial to track improvements and meet growing demand for data and transparency.

Transparent and usable environmental impact data helps drive further sourcing of preferred cotton through producer programs. In addition, the cotton LCA methodology is designed to accurately demonstrate the impacts of field practice improvements over time, providing Higg MSI users with more steering information and enabling more accurate impact monitoring.

CRDC has been working with Cascale as part of the Higg MSI methodology cotton expert team on the new cotton-specific methodology and model.

"This Cascale initiative shows the desire of our cotton industry peers around the world to ensure if an LCA is used – such as for hotspot analysis, risk assessment, and demonstrating impact – it uses best available data, and complements the Australian cotton industry's long record of collaboration and data transparency," CRDC Executive Director Allan Williams said.

"We expect this new methodology will give textile and apparel customers greater confidence in our cotton and potentially help them identify areas to work with our industry to further reduce their impacts."

Allan said this allows the Australian cotton industry to work on building a foundation for reporting metrics and impact in a consistent way that meets the needs of the value chain.

"If we look at the value chain, it starts with farmers making improvements/ changes/adopting practices which lead to improvements in key metrics," Allan said.

"The value chain is increasingly wanting access to these metrics: which can be reported at either the farm or industry scale, depending on the supply chain in question.

"For industry scale information it's important to firstly have data (metrics) that we have confidence in; we have the best data about Australian cotton production, but if we don't provide the data then the brands and retailers will try to obtain it elsewhere, and it is highly likely it will not be as accurate as our data, which may lead to misplaced concerns about the profile of Australian cotton growing

"Secondly, accept that while LCA is not an ideal tool for calculating agricultural impact, it is the one that the supply chain is using, so rather than fighting it conceptually, to work with organisations that determine the LCA approach to be used to try and improve how they treat agriculture and cotton farming.

"CRDC supported this work because the Higg Index gives us a consistent way of calculating and reporting environmental impacts that meets supply chain participants' needs and approaches, so that the brands and retailers can be confident that the same approach is being used for all the cotton in their supply chain."

For more
www.cascale.org

Cracking the dryland cotton code

Jamie and Susie Grant are first and foremost cotton growers. They've worked on the ethos that continually improving all aspects of their business is essential to create an economically and environmentally sustainable farming system. Sustainability comes in many forms, from ensuring professional development, training and safety for their staff, to being prepared to trial new technology, native vegetation restoration and working within the limits of their soil and climate.

Their version of sustainability and their journey that has resulted in the creation of an entirely new, sustainable cropping system, which creates the most attention of all their achievements while farming for over 51 years at "Kielli" at Jimbour on Queensland's Western Darling Downs (Barunggam country).

The most surprising thing about the Grant's system is that they don't grow any winter cash crops or summer rotations at all: they're purely dryland cotton growers. The second most surprising aspect is that you also won't see any fallow fields at Kielli. Jamie has essentially cracked the code of being able to grow a cotton crop and fallow country at the same time. The surprises don't stop there: he also doesn't use much nitrogen fertiliser.

The key to the farming system is the way Jamie has set up his white French millet sacrificial cover crop, planted between three-metre cotton rows. This is implemented across the entire farm.

It's been a journey driven by necessity, economics, innovation and enjoyment. The Grants' cropping system is set up to provide a healthy economic return, build resilience and reduce their vulnerability to a varying climate.

"I'm wired that I loved farming and solving the problems of farming," Jamie says.

"At the end of the day though I'm driven by economics, and the most valuable thing is moisture. It's the only thing we get for free, but people waste it by not capturing or preserving it in their soil."

For the Grants, sustainability has involved being early adopters of technology such as the first evolution of optical sprayers, controlled traffic, GM cotton, round bale pickers, zero till, cover crops and now robots.

This is all governed by being realistic about the capacity of their land and the climate. Or, as Jamie puts it: "I'm trying to ride the horse instead of the horse riding me".

"For farmers to do a good job of looking after their country they need to make money to do it.

"Because if things get tough, they will have to take short cuts, and the warm fuzzy stuff is the first thing to go. They'll end up flogging the country to survive.

"In dryland, you can't have a system that runs on good years. You will have failures, so your expectations have to be realistic: the climate hasn't changed as much as our expectation of what our country can produce with variable rainfall: that is what has changed," he says.

"We are happy with four bales per hectare every year. I'm trying to take the pressure off the country by making better use of my moisture and aiming to grow an average crop every year, as opposed to a 'big crop' occasionally.

"Under a 60-inch solid system, you need to grow eight bales per hectare consistently to match it, which is hard to do in a cotton every second-year rotation.

"We can all grow a good crop in a good season but there aren't enough of them.

"Everything in agriculture is a calculated risk and some of those calculations are bigger than others, but everyone calculates risk differently.

"I pretty much know what the end result is going to be before I do it. You won't grow four bales every year but you need to work out the capabilities of your soil stored moisture to stay on the middle-shelf, with an odd top-shelf crop."

Moving to zero till

"We started getting out of cultivation

The key to the farming system is the way Jamie has set up his white French millet sacrificial cover crop, planted between three-metre cotton rows. This is implemented across the entire farm.

and into minimum till 40 years ago, when nematodes and crown rot were affecting wheat crops, so we grew a lot of barley but it still got hammered.

"We also just weren't making good money out of grain, with too much disease and unreliable rainfall, and when there is a big grain season the price is ordinary.

"You can't keep doing the same thing and expecting a different result, so we sat down and looked at the capabilities of our system. We decided on cotton as it has the best gross margin, and asked ourselves 'how do we grow as much cotton as we can in the next 10 years?'.

Jamie says with 500ml rainfall in an average year he needed to develop a system to maximise the use of that water.

"With the system I have now, I could run on 12 inches of rain in four, three-inch falls regardless of when they come, because our fallow efficiency is better and if my cotton runs out it will forage into the millet area," he said.

"If you don't run your country so hard you can sustain a crop on the moisture you've got stored – and if we don't use it that moisture is in the bank for our next crop.

"We've been using French millet in our system for 15 years now and recently moved from a solid plant to 1.5 metre strip every three metres between the cotton rows across the farm, which has seen our fallow efficiency go from 60 to 90 per cent.

"Through our wet season there is either millet or cotton using the moisture so there is always room in the profile to take in more rainfall.

"I am essentially fallowing while cropping and giving my cotton the option of tapping into next season's moisture in the fallow strips to get it through a dry spell, then when it rains the whole paddock gets wet again.

"I just can't see the point in having a paddock sitting there fallowed losing moisture to evaporation or run off when you may have crops that could use it if it was available – as it is in my system.

"Basically, what we are doing is just maximising what we can produce on our moisture."

Controlled traffic opened doors

Early adoption of technology is a hallmark of the Grants' operation. Jamie credits controlled traffic farming (CTF) as the catalyst to his zero till operations and the system in place today.

The Grants are essentially fallowing and cropping at the same time, which also gives the cotton the option of tapping into next season's moisture in the fallow strips should it need it.

"We had a heap of good ideas back in the day but CTF opened the gate for zero till to flourish," he said.

"We had different width machines which gave us random tracks all over the paddock which were difficult to germinate seed in zero-till planting, so CTF solved that.

"Before coming up with our zero-till system, we relapsed for a while from no till to reduced till – but drought forced us back to zero till and we fought with that until we realised we had to get our wheel tracks in place and into permanent controlled traffic.

"Controlled traffic doesn't really get acknowledged for the impact it has had, because compaction is hidden below the soil surface and easy to ignore, but it is such a big effect of soil health."

By deciding to grow only cotton 25 years ago, it meant other summer rotations were out. Jamie cut back on other crops to the extent they didn't grow anything but cotton in a three-year fallow rotation – so were cropping on 30 percent of the farm.

Barley and sorghum were initially used as cover crops with cotton, but they took too long to mature and used too much moisture. Jamie says you need a plant that only uses a foot of moisture and reaches maturity quickly, and spray it out at its highest cellulose level, which is the start of seed set for the greatest benefit. White French millet was the answer.

"I haven't put any nitrogen on for ages," Jamie says.

"Because of the fallow strips there is natural mineralisation going on. We haven't been growing the big yields either – if we did, we'd need to put some nitrogen on. We run to what the plant wants, not to what we think it wants.

"There are so many advantages to this system, I should be starting to write them all down."

Not concerned about credit

Despite not taking formal steps to reduce emissions or sequester carbon, Jamie has installed a classic carbon-building cropping system.

The four pillars for managing soil carbon dynamics are:

- Reducing tillage to ensure physical shelter of carbon aggregates
- Enhancing biomass into the soil strata
- Improving the diversity and abundance of beneficial microbes, and
- Maintaining continuous vegetative cover on soil surfaces.

Professor Richard Eckard at the University of Melbourne is one of the country's leading scientists and says the agronomic benefits from increasing soil carbon through higher plant available water capacity and fertility will more than outweigh any monetary gains an Australian Carbon Credit Unit scheme (ACCU) project can offer.

The Grants have seen this firsthand. They aren't focused on emissions and haven't been actively measuring carbon or calculating any emission baselines for their farm – but they are focused on their soil health.

"I started trying to look after soil health more than 20 years ago, so if I did my baseline now, I wouldn't be in line for any credits anyway," Jamie said.

Jamie digs soil pits to keep an eye on his soil health and says what he finds is 'incredible'.

"It's not the reason we've done what we have done here.

"My measure is looking at my crops and with my agronomist who looks after the plant with leaf testing and we go from there.

"We do dig soil pits every now and then and what we find is incredible, so my advice is dig into your soil and see where the roots are, where the worms are and where the moisture is.

"We've put a few trials in recently to measure some of the benefits of the three-metre strip system versus the 60-inch, so it will be interesting to get some actual figures."

Restoring balance to riparian zones

Since 2019, the Grants have been restoring 150 hectares of mainly riparian grasslands and woodlands along Jimbour Creek at the property 'Wyalong'. They are seeing wildlife return to this important ecological community and crops benefit from the ecosystems services it provides through natural pest control. Their motto is restore, regenerate, and revegetate.

Initial work included feral pig management and weed control which has increased native groundcover, reduced erosion, and improved and expanded habitats for beneficial insects.

"Jimbour Creek provides an important corridor for fauna movement across the plains," Jamie said.

"It is an important habitat for local fauna including natural predators and beneficial insects which are an important aspect of our integrated pest management (IPM) system.

"The IPM benefits from the Jimbour Creek corridor are evident as refuge crops adjacent to the creek were still worth harvesting, but not in surrounding fields further away.

"Improvement through restoration of this corridor is a win-win for landholders, biodiversity and the landscape – and that was the aim of this project."

The Grants have worked with CottonInfo and CRDC on the project over the years. The *my*BMP framework was also used to guide them. Surveys provided insight into the seedbank and the flora that did and does still naturally exist in these communities, so the ecosystem can be restored to its natural state. Jamie says the surveys provide knowledge to allow refinement of their management practices to encourage natural regeneration of native grasses and trees.

"The surveys added to the information and knowledge they are accumulating about the landscape and its condition, and gave us a starting point we could use to improve on," he said.

"It was very dilapidated when we started, but now we've fixed water holes, improved water quality and the trees look beautiful. There is always wildlife there."

The cover crop system

Across the entire farm a 1.5 metre millet strip is sown between three-metre cotton rows. Millet is planted in October and sprayed out before it sets seed, when the plant is around a metre tall. Millet is a preferred crop due to its rapid growth and ability to provide a good quantity and quality of stubble. Jamie says when the millet stalks collapse it lays on the ground like a mat, giving 100 per cent cover. He says this system makes the stubble accessible to soil biota, essentially keeping his soil alive, as opposed to a bare fallow or a field with no stubble cover at all.

Cotton is planted up the middle of the previous season's millet strip. Over seasons, this system allows for the even spread of the residue from the millet crop across the whole field, offering protection for cotton seedlings from the direct heat of the sun, preventing erosion, and improving rain infiltration and moisture holding capabilities. Cover crops and crop residue also have weed suppression benefits.

Managing your climate risk using forecasting tools

Understanding how to use forecasting and weather analysis tools to assess climate risk can assist in better decision making in almost every area, from managing nitrogen, irrigation budgeting and scheduling to determining crop selection for an upcoming season.

Factoring this information into your cropping plan provides valuable guidance to help optimise the use of expensive crop inputs and can also help you prepare for extreme climatic events. However, there's just one issue – knowing how to read and interpret a lot of climate information is not simple and generally involves a deep understanding of how our climate functions.

To help growers and consultants understand the latest climate risk management information, CottonInfo Climate and Energy Technical Lead Jon Welsh brings together the insightful CottonInfo Moisture Manager newsletter, with regional summaries and events.

Jon prepares all the climatic models and forecasts, drivers and influences, saving readers time searching for the modelling results and presenting clear trends from a range of sources, allowing crop managers to run scenarios and manage farm inputs in advance.

What do you need to know?

Jon says forecasting tools rely on imperfect information which can cause variations in reliability, but the trends suggested by a range of tools can provide a valuable source of information to consider in risk management decisions.

"Relying on one particular model or information source is risky," he says.

"Computer guidance can be very reliable at certain times of the year, but there may also be strengths or weaknesses with climatic influences that are not always clear to the user.

"I survey information sources widely and look at a range of models to determine if there is a consistent pattern in the forecasts.

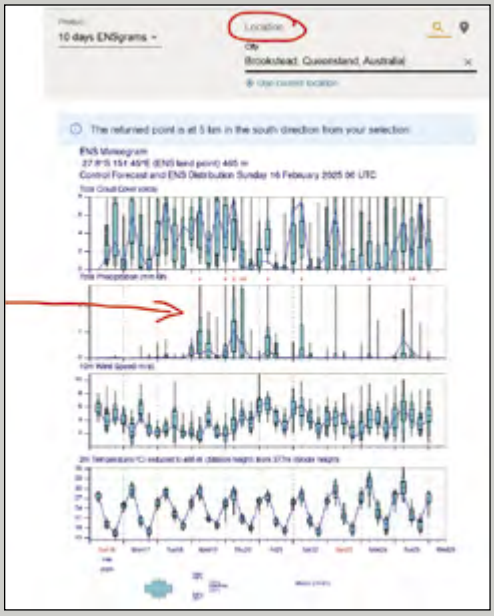
"I'll also share any tools and websites I think will be of benefit."

In a recent Moisture Manager newsletters, Jon outlined Meteologix, that summarises major global model research agencies in the one spot on an hourly basis and generates site-specific information.

"It's as simple as going to the website, typing in your location and starting the analysis for your farm, and there is a five-minute YouTube tutorial to take advantage of all the features."

Other top resources Jon recommends are the websites Climate Kelpie and Australian CliMATE.

It's free to sign up to the CottonInfo Moisture Manager to have a monthly summary of international forecasting models, climate indicators, expert opinion and local analysis delivered by to your inbox. Previous editions are available on the CottonInfo website. To subscribe, visit: www.cottoninfo.com.au/subscribe.



Create your own 10-day rain outlook

To find out how to generate a detailed 'Meteogram' for your location, head to the February 17 edition of the CottonInfo Moisture Manager newsletter, available by subscription or at the CottonInfo website. Features include six-hourly increments of cloud cover, total precipitation, wind speed and direction.

For more

Moisture Manager:

www.cottoninfo.com.au/cottoninfo-e-newsletters

Options and opportunities for broadacre cropping

By changing the way he harvests and manages stubble, an innovative young farmer from the NSW Central West is creating opportunities for farmers in lower rainfall regions that increase ground cover and crop residue while reducing evaporation, improving soil health, plant growth, drought resilience and ultimately, farm profits.

Coming up with a solution to some of farming's biggest challenges around improving soil water holding levels was the outcome of Richie Quigley's Nuffield Australia scholarship, supported by CRDC and Cotton Australia. Through the scholarship, Richie has taken a deep dive into how to create a more sustainable farming system by visiting farmers across the globe in marginal rainfall areas and trawling through research and data relevant to his region in the Macquarie Valley.

Richie farms at Trangie (Wiradjuri country) with his parents Tony and Sally, brothers Tom and George and their families. This is where he's put the 'strip and disc' method that he researched into practice. The Quigleys run a mixed farming enterprise growing irrigated cotton (overhead and furrow), dryland grain, chickpeas and canola, and opportunity crop dryland cotton.

The strip and disc system uses a 'stripper' header which strips mainly the grain/seed from the plant stalk, leaving most of the plant material behind as standing stubble. Unlike conventional header fronts, any crop residue that goes through the stripper is spread evenly on the paddock. The next crop is planted into the stubble using a single disc planter. The strip and disc system is compatible with dryland, sprinkler and drip irrigated cotton, but not conventional furrow irrigation due to the tillage requirements and stubble loads.

It was the drought from 2017–20 in the Macquarie that encouraged Richie to apply for a Nuffield scholarship to research and adopt the strip and disc farming system.

"I was accepted as a scholar in 2020 but couldn't travel overseas for two years due to COVID-19, but this did not stop me researching and implementing the strip and disc system at home," Richie says.

"After the drought I wanted to find a way to build resilience into dryland systems by conserving moisture, improving soil health and water holding capacity.

"Along with an average annual rainfall of 480mm and measured evaporation of over 2000mm, moisture is usually the limiting factor for our crops.

"We bought two stripper fronts for the 2020 harvest, and now our strip and disc farming system is fully adopted across the farm – and we have not looked back."

Significant increases in harvester efficiency and throughput result in reduced fuel use by up to 50 per cent. More even spreading of crop residue also creates more even soil-moisture and nutrient levels and suppresses weeds.

"The strip and disc system can improve the yield and quality of dryland cotton crops by providing more plant available water (PAW), therefore allowing our crops to finish better, with good grain fill and no or very little screenings," Richie says.

Richie's Nuffield scholarship took him to Singapore, Europe, Canada and the US, where he saw the strip and disc system in operation. He was particularly impressed with how farmers in Kansas and Colorado were using the system to store moisture, allowing them to grow new crops or crops in seasons that were traditionally too dry. Some used the system to catch snow, producing grain crops on less than 250mm of rain.

Richie says agronomic opportunities still exist in Australia to capture and store more water, reduce evaporation, and use PAW more effectively.

"Australian grain and cotton farmers are already efficient, so gains in productivity and cost savings going forward will be minimal, however it is the one per cent gains that cumulatively make a significant difference," he says.

"This will be the case until new disruptive technologies are developed and implemented."

A new front-ier

The stripping process significantly reduces the amount of plant matter that passes through the harvester, as most of it remains in the field. This reduces engine load and fuel use compared to traditional set ups. Only the grain, husk and leaf are stripped, so throughput efficiency can be increased by 30 to 50 per cent, and even 100 per cent in some cases, Richie says.

"Engine loads often don't exceed 65 to 70 per cent, so use 50 per cent less fuel in most growers' experience. Combined with increased speed, cost per hectare and per tonne harvested is reduced.

"These considerable savings could go towards repaying some of the initial capital cost of the stripper header. There's also less wear, repair and maintenance costs and the opportunity to reduce header size."

Efficiencies also extend to increased hours in the paddock. They can harvest earlier when stalks are still partly green, start earlier and run later into the night, adding up to 40 per cent more operating hours in the day.

The stripper also spreads crop residue more evenly.

"To have the greatest impact, an even spread of residue across the full swath width is crucial but is rarely achieved with factory spreaders," Richie said.

"Apart from implement blockages, it creates varying moisture levels across the swath and uneven distribution of nutrients."

Retaining the stubble avoided the removal of 2.5t/ha of crop residue, equating to 19 units (kg) of nitrogen, 1.5 units (kg) of phosphorus, and 28.5 units (kg) of potassium.

"If this happens consecutively over several years on GPS controlled-traffic tramlines, then it could lead to serious nutrition inequality across the swath and the field.

"Similarly, uneven distribution of plant residue by factory residue spreaders (from 50-200 per cent) also provides differences in soil moisture levels across the swath width, and density in places that create challenges at seeding and plant establishment."

LEFT:
Semi irrigated cotton being planted behind stripped wheat, highlighting the importance of RTK (real time kinematic) GPS for effective inter-row sowing, and the ability of disc planters to plant through high residue situations. RTK GPS is a type of GPS technology that uses a combination of GPS signals and a local base station to provide highly accurate positioning data.

OPPOSITE PAGE:
Canola in stripper straw flowering earlier around the unplanted CTF wheel tracks where soil has access to sunlight warming the soil profile and accelerating plant metabolism and growth.

Fallow efficiency

Richie says he's found out just how big the role residue management and ground cover play in fallow efficiency, with significantly more standing crop residue retained longer than if harvested conventionally, which has a cumulative effect.

"More crop residue will store more moisture and more moisture will grow more crop, and the cycle will continue," Richie says.

"At Trangie, winters are the driest, and simulations show summer fallow rainfall contributes up to 2t/ha of wheat yield in the Central West.

"This highlights the importance and effectiveness of stored fallow moisture, and is not surprising when looking at the average climate here.

"In our region, heavy stubble loads (5.4t/ha) can increase infiltration by 1.8 times when compared to light stubble loads, and more than doubles the amount of rainfall required to cause surface ponding or run off

"Zero tillage and stubble retention can increase infiltration rates of sandy clay loams and grey cracking clays in south-eastern Australia from two to eight times respectively, so our cereal harvesting methods can greatly influence the residue amount and orientation, and subsequently soil water evaporation during the fallow period."

Tall, standing stubble vastly reduces wind speed and air movement at the soil surface. Increased levels of crop residue provide both insulation and a protective layer against direct sunlight on the soil. In summer as soil temperatures have been noted to be 10°C or more cooler in stripper stubble vs draper stubble, and 20°C more so over tilled or bare soil.

"Research has showed that soil water evaporation could be reduced by 20 to 50 per cent just by increasing harvesting cutting height from 10cm to 50cm," Richie said.

"This could make a big difference to the next crop, as long-term research in wheat has shown that for every day after the optimum sowing window, a loss of 35kgs/ha/day can be expected, and in my opinion this is a conservative figure.

"By retaining moisture closer to the soil surface, it potentially allows for seeding to take place on time, many days or months after rain, or on more marginal planting rains, which can be the difference between getting a crop established or not.

"This has been experienced by many farmers I've met through Nuffield utilising the system, and is one of the major benefits of the system.

"Our average rainfall at Trangie in the fallow months December to April is around 250mm.

"Every extra millimetre stored and utilised in the growing season could equate to 20kg of additional grain per hectare.

"If growers can increase fallow efficiency by 10 per cent that equates to 25mm extra moisture available to the crop, so times that by 20kgs per extra millimetre stored and do the maths, we could improve yield by a significant number."

The role of cover crops

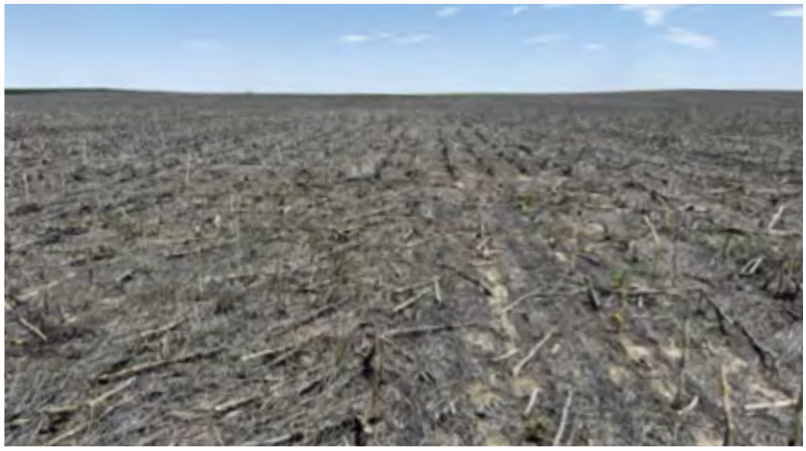
"Cover crops seem to be more effective than old crop residue as they are well anchored to the soil and have current root canals that help significantly with water infiltration by reducing the speed of water flow. The root systems also feed soil microbiology, stimulating and promoting soil health.

"With Bayer's XtendFlex cotton traits, legumes and brassicas can now be incorporated to create mixed species cover crops that can fix nitrogen and help with cotton disease management.

"Manageable crop residue is also a very important part of cotton production, particularly in sprinkler and drip irrigated cotton and dryland areas, to reduce the effects of sand blasting and early insect predation from thrips, increase infiltration and water use efficiency.

"Increasing crop residue on the soil surface provides most of the benefits of a cover crop while still being able to produce cash crops that are both economically and environmentally sustainable."

The strip and disc mulch effect on crop residue at Poss Farms in Colorado USA, where Richie visited in July 2023.



"Stripper headers are considered a tool of conservation agriculture that is applicable to broadacre farms across Australia in semi-arid grain growing regions, which will increase the sustainability and profitability of farm businesses."

The drawbacks

Richie says the strip and disc system is not without its challenges.

He said a very high level of attention to detail is required to implement the management techniques of the farming system.

"Without this attention to detail and the high levels of accuracy required undesirable results will occur," Richie said.

"Correct combine harvester setup for the use of a stripper front often requires significant modification but depends on the combine harvester type.

"Modification and setting recommendations are a good starting place but we still require more fine tuning and further research to get full efficiency and minimal losses.

"However, implementation of the strip and disc farming system into semi-arid grain growing regions of Australia will increase crop production and profitability without considerably increasing cost of production.

"The implementation of the system should provide planting opportunities for cotton and other crops in marginal or dry years that may not be there in conventional zero tillage systems or full tillage systems and reduce the severity of the effects of drought in your business."

CRDC and Cotton Australia support growers to undertake Nuffield Australia Farming Scholarships annually. Richie was cotton's 2020 Nuffield scholar. His full report *High Residue Zero-till Farming Systems in Central West NSW* is available on the Inside Cotton website, along with all CRDC-supported research.

For more

Nuffield Australia
www.nuffield.com.au
Richie Quigley
richiequig@bigpond.com

Building knowledge and skills in the Douglas Daly

A commercial cotton trial site at the Douglas Daly Research Farm in the Northern Territory produced its first rainfed crop in the 2023-24 season, one of the best in the district, providing the opportunity for learning, sharing and income to fund another trial this season.

The first CRDC/NT DAF cotton trials at the Douglas Daly Research Farm in the NT were picked in June last year, averaging a pleasing 3.2 bales per hectare.

CRDC in partnership with the NT Government's Department of Agriculture and Fisheries (NT DAF) is supporting the new research and demonstration site at Douglas Daly (Malak Malak country), 150km south of Darwin, where 50 hectares has been allocated to cotton growing. Any revenue from the crop is used to manage the trial site, grow future crops, support R&D capacity and build local knowledge. The concept has been expanded this season with a second site at Katherine (Jawoyn country).

The concept is based on a model CRDC has with the University of Sydney to grow dryland cotton on its "L'Lara" and "Nowley" farms near Narrabri in NSW (Kamilaroi country). CRDC initially provided funding toward growing 65 hectares of dryland cotton at each of the university's research farms in 2020. After each harvest, the initial investment and any surplus is returned to CRDC for reinvestment in further dryland cotton research. Most recently, it has allowed for the purchase of a new planter and other equipment needed for the trials.

In this new Northern Australia initiative, revenue will be co-invested with the NT Government to provide a funding stream to support cotton research. The trials sites themselves are integral in building expertise and agronomic knowledge in the north while also identifying risks and opportunities for cotton growing.

CRDC Senior Innovation Broker Susan Maas developed this partnership and continues to manage the project for CRDC.

"In its first season we have seen great value come out of the partnership," Susan said.

"The team at Douglas Daly have done a lot of learning on the go, with the help of a local, experienced cotton agronomist to produce this first crop.

"Growing cotton in monsoonal regions comes with many challenges, from heat at planting, to cloudy, wet weather as the season comes to a close. It's a challenge for experienced growers, let alone people who are new to growing the crop.

"The trial created a lot of interest and we are grateful for the input of the NT DAF farm staff in delivering high quality research, and for their efforts to share what they found with the broader agricultural community in the region."

The crop, which included planting rate trials, was planted with Bollgard 3 (714B3) and Roundup Ready Flex (812RRF) in December 2023 and harvested in June 2024. Prior to planting, urea with a urease inhibitor was deep banded at 200 kilograms per hectare (kg/ha) in November. The crop was side-dressed with 85kg/ha of urea in mid-January and 65kg/ha 10 days later. The 50-hectare block yielded 3.2 bales/ha with good

uniformity, strength and micronaire.

Along with growing an entirely new crop at the facility, the season was not without other challenges: the climate, a change in crop manager during the season, and working with ageing machinery.

After nearly 100 per cent germination and establishment in December, the seedlings did it tough with incredibly hot conditions in the first three weeks, and only two significant rain events in the first month. After the hot and dry start, good rainfall through mid-January followed by the monsoon saw the crop produce a lot of squares. The potential saviour of the crop was the good cover of mulch in the paddock, and the fact that fertiliser had been deep-drilled pre-plant, so the plants potentially had a good path to chase the moisture and establish roots.

From mid-January, cloudy and extremely wet conditions meant the crop struggled. Only one day of sunshine in January and very few through February and March resulted in the crop dropping most of its squares. Despite expectations that this would have a significant impact on yield, the crop still performed well overall.

An initial aim of the site was to demonstrate the differences in planting rates for the area's cropping system and conditions, with rates of six, eight and 15 seeds per metre sown. The best performer was the medium-density rate of eight seeds per metre.

Susan says the partnership with NT DAF to create these learning and demonstration sites shows both CRDC and the NT Government's commitment to northern cotton growing and growers.

"We are building research capacity, and while the NT had experience in small plot trials, this investment has enabled them to grow cotton at a commercial scale," she said.

"Growers wanted to see commercially relevant outputs from the research station and this partnership is enabling that. The team has also worked with local growers nearby to create extension opportunities.

"It is great to see both the Douglas Daly and Katherine Research Farms will also have *my*BMP accreditation this season."

Susan said there is a buzz around the new 10-hectare trial site at NT DAF's Katherine Research Station, 150km south of Douglas Daly, and the additional extension opportunities it offers researchers, growers and the public.

"It will mean that there is the ability to generate knowledge specific to growers in that area and the site is close to town so the community can come and see cotton growing in action," she says.

Experienced and more established growers have also been a great resource for the collaboration.

NT DAF farm managers spent time throughout the season with local growers, who provided feedback and insights from their own experiences.

The trial was shared with around 30 growers and industry people at the XtendFlex field walk in April 2024 hosted by NT DAF and CSD. The day also included visiting neighbouring properties 'Black Bull' and 'Douglas Station', with the cotton crops at full maturity. Grower insight has been essential to the rapid improvements in cropping knowledge, adding to the experience gained from the first year of the trial.

Growers say it is promising to see the research farm doing commercial size cotton trials and building staff capacity to inform local growers on cotton growing best practice. In future trials they'd like to see replicated trials instead of single blocks as that would give the results greater depth.

"Local growers have suggested they're very keen to see how rotations and cover crops can be incorporated into the farm plan and this will hopefully speed up the learning process for the region," Susan says.

"Growers and the wider industry are keen to contribute to future trial plans, with suggestions of skip row configurations and targeted fertiliser timing and types to demonstrate change on varying soil types and with seasonal variations.

"Along with NT DAF, we will incorporate this feedback to plan future trials and look forward to working with local growers, agronomists and research farm staff."

The trials looked at seeding rates, with the best performer being the mid-density planting of eight seeds per metre.

For more

Susan Maas
susan.maas@crdc.com.au

The needs of the industry in terms of managing herbicide resistance have moved on since the first HRMS was developed in 2014.

MELANIE JENSON

New HRMS set for release

Effective strategies for delaying herbicide resistance and managing resistant populations are essential for the long-term sustainability of cotton farming.

An integrated weed management system relies on a large number of complementary components, including chemical and non-chemical control tactics, planting crops for competition, rotations, farm hygiene and crop scouting.

For the past 11 years, the Herbicide Resistance Management Strategy (HRMS) has shown growers and consultants how to manage herbicides to avoid promoting resistance.

The cotton industry is now preparing to release its second HRMS, to stay in step with the new triple-stack varieties and herbicide resistance evolution among hard to manage weeds across farms.

The HRMS was first developed in 2014, coinciding with the release of Bollgard Roundup Ready Flex to manage the risk of herbicide resistance in irrigated and dryland farming systems and the escalating problem of herbicide resistance across multiple weed species to a number of herbicide modes of action (MOA). This included the original '2+2+0 survivors' strategy that saw the cotton industry adopt world's best, and most effective, glyphosate resistance management.

Although the existing HRMS and the 2+2+0 strategy has served the industry well, it focuses on slowing and managing resistance specifically for glyphosate. The commercial uptake in the past two seasons of XtendFlex with tolerance to two additional MOAs – dicamba and glufosinate – has required the industry to create a new strategy that will form the new HRMS.

The development of the new HRMS is being led by weed scientist Dr David Thornby, with Dr Graham Charles, Dr Jeff Werth and CottonInfo Weed Management Technical Lead Eric Koetz.

"It's likely glyphosate will remain the key tool for weed control for cotton in Australia for the foreseeable future, but we're continually moving in the direction of having more over-the-top chemistries for cotton and as such the range of modes of action that come under pressure for resistance gets wider," David said.

"The new HRMS will focus on overall herbicide diversity rather than 'glyphosate-plus-something'.

"The introduction of XtendFlex puts glufosinate and dicamba under more pressure than before, but they won't be the last products to become important in cotton.

"To give growers the best chance of slowing resistance and managing resistant populations that do occur, we need an HRMS that isn't focused on managing just one herbicide."

Cotton system industry weeds scientists are constantly alert to the fact that other herbicides are also at-risk for developing resistance.

"Many herbicides, including dicamba already have a history of use in cotton fields, indicating that some selection for

resistance for any registered herbicide could already have occurred," David says.

Key developments since the first HRMS

David says the development and introduction of XtendFlex in particular, and more non-glyphosate transgenic traits in the pipeline in general has been a major development for weed management.

"It means we need to manage (and take advantage of) multiple vulnerable modes of action at once, in-crop. And various residuals also fall into this category, since we've needed to use them more to manage glyphosate resistance risks," he says.

"Glyphosate-resistant weed populations have continued to appear and move around the landscape, but thanks to a robust HRMS and good on-ground use of solid strategies, this increase in resistance has been gradual and manageable, rather than an uncontrolled explosion.

"The industry is generally doing a good job at managing glyphosate resistant weeds, however it comes at a price, as diverse strategies to control glyphosate-resistant weeds naturally involves greater cost."

What's the impact of the triple stack technology?

"First, we should take the view that it gives us more opportunities to control weeds and especially survivors of other modes of action, conveniently in crop," David said.

"We can use more combinations, mixtures and sequences of herbicides in crop than before, and these are all good strategies for slowing down and managing resistance.

"Jeff Werth's work on using glufosinate as part of a double knock shows off the capacity of the industry to make clever use of over-the-top chemistries, rather than just programming sprays by date and hoping the worst doesn't happen.

"It is helpful to know your herbicide use history on weeds that have been on farm for many years."

"As an industry, the potential fit for the triple stack herbicides has been investigated and it's encouraging that the industry is being pretty realistic about the potential of each product.

"We need to make sure each one is used on the right weeds, at the right time."

One of the issues researchers and crop managers need to take into account is that none of the herbicides are new to cotton and broadacre grain production. Wherever there's a history of use of glufosinate or dicamba, growers have to expect resistance evolution to be partly underway because they won't be targeting unselected wild type populations of weeds.

Increased time to resistance

Research has indicated that typically glyphosate failure may appear in grass weeds after approximately 13 years (dryland) and 19 years (irrigated) in a glyphosate-only system. Resistance in broadleaf weeds can be slower to emerge and usually takes around 18 years in both irrigated and dryland systems when cotton is grown in rotation with a summer fallow.

Various other modes of action share similar or slightly longer timeframes (e.g. Group 4 herbicides, glufosinate), while others in Group 1 and 2 have substantially shorter timeframes.

It is important to remember that the most reliable herbicides in the system, including but not limited to glyphosate, have now been in frequent use for longer than these time frames in nearly all cropping situations in Australia. This means that time frames to resistance for populations on farm could appear to be much shorter, since we are unlikely to be starting with a truly wild type, unselected population.

It is therefore helpful here to know your herbicide use history on weeds that have been on farm for many years – and assume that resistance could appear much more quickly than these indicative timeframes, if the system begins to favour a particular herbicide.

"Glyphosate is definitely the dominant herbicide in the XtendFlex stack, being the most widely applicable and having the widest application window, so it's likely still the most at risk of resistance. But the others come with their own risks, including that dicamba resistant weeds might be cross-selected with 2,4-D and other related herbicides," David says.

Technology brings new benefits

The new HRMS also takes into account the impact of digital technologies for improving herbicide use patterns which have become more mainstream, in particular, optical spray technology. The capacity to create weed maps and plan herbicide applications around the data has also increased, offering more effective and efficient weed control, the capacity to manage weedy patches differently from surrounding areas, and reduced herbicide use over the whole paddock.

"It offers the potential to target pre-emergent residual herbicides to areas within fallow fields where problematic weeds were previously observed and therefore only apply these herbicides where the weeds are most likely to be, before any weeds emerge," Graham says.

"As the cotton industry is continually reviewing its sustainability credentials, the opportunity to reduce the volume of residual herbicides by targeting hard to control patches is important.

"A substantial change is underway as robotics become a core part of weed management.

"These machines create efficiencies and give growers options and opportunities to spray in correct conditions, at low speed and boom height, and manage weeds at different growth stages."

Careful management required

Finally, the industry will need to be careful how spray operations are managed between XtendFlex crops, other crops, vegetation and forestry, along with adjacent Roundup Ready Flex varieties that are only resistant to glyphosate.

"Herbicide drift issues continue to be important, and regulations have changed around that. The paraquat review is an important one for us as well," David said.

"How to best manage triple-resistant volunteer cotton is also under investigation.

"The industry's experience in managing the introduction of new traits and herbicides into the cropping system is really on show at the moment."

A sustainable system will require a high level of diversity and zero tolerance

for survivors of herbicide sprays. Herbicide resistance can be delayed by four to six years with good survivor control and product rotations and mixtures, and the same strategies are very effective for managing resistant populations that do occur. To drive down weed numbers and eradicate resistant biotypes, additional tactics such as intensive patch management are required.

The HRMS clearly outlines tactics that are 'risk reducers' and 'risk promoters' for herbicide resistance. For example spot-spraying glyphosate at high rates through optical sprayers strongly reduces risk, while relying on one or two herbicides highly increases risk of resistance forming.

In-crop integrated weed management strategies and their resistance risks are also outlined and ranked.

The success of moderate risk strategies is highly responsive to summer fallow actions in dryland cotton. Crops grown one year in three with a very low-risk, robust summer fallow program can sustain somewhat less diverse in-crop strategies. Back-to-back irrigated crops, where summer fallow control is not available, should stick with low-risk strategies in-crop.

The formula to delay or manage resistance

The most effective way to delay the evolution of herbicide resistance is to target weed control across the whole farming system with a diversity of tactics. A focus on reducing weed numbers in fallows or rotation crops will reduce the reliance on in-crop weed control. Aim to drive down weed numbers and ensure no weeds set seed after herbicide applications, and using a diverse program of modes of action.

The final recommendations for tactics are still undergoing approval from industry stakeholders including grower panels, CRDC and the TIMS committee. When approved, the new HRMS will be distributed via CottonInfo and available on the CottonInfo website.

For more
Susan Maas
susan.maas@crdc.com.au

Shedding light on managing crop growth

Plant growth regulants have been a hot topic across the area wide management (AWM) meetings.

Dr Katie Broughton is shedding light on using growth regulators for improved canopy management and resource use efficiency.

CSIRO's Dr Katie Broughton has attended several AWM meetings to talk about her new CRDC-supported project and discuss management strategies with growers and consultants keen to tailor crop growth to match their individual situation.

"It has been great to get to the meetings and hear how the growers and consultants in each region are finding the season, and share an update on our research," Katie said.

"We want to know what the most efficient plant architecture is across several varieties and how we can achieve this through crop management and with the help of mepiquat chloride."

Trials at the Australian Cotton Research Institute at Narrabri (Kamilaroi country) aim to generate different crop canopies: compact, normal and large. The research will explore and compare benefits such as nitrogen and water use efficiency, defoliation efficacy, maturity and yield. Measurements such as water use and light interception between the different crop architectures may 'shed some light' on system-level differences.

Katie's previous project undertook on-farm trials during the 2023-24 season, as part of a grower and consultant-led component supported by CRDC and the CSD Richard Williams Initiative.

"The research was based on key questions raised by cooperating growers and consultants around how early and 'hard' mepiquat chloride should be applied and if there is a difference in how it should be used based on variety," Katie said.

Four trials across growing regions demonstrated the effects of various alternative early season mepiquat chloride application strategies on growth and yield.

Although there were no statistically significant differences in yield between treatments across all sites there were tendencies for yield to be improved in the southern growing regions with mepiquat chloride applied early. The relative yield (the yield difference between the control and the treatment) was up to one bale per hectare more with applied mepiquat chloride compared to the control. Little difference was recorded in Wee Waa (Kamilaroi country) and Cecil Plains (Barunggam country). At the Griffith site (Wiradjuri country), there were more gains in relative yield with a low rate split compared with a high rate split of mepiquat chloride.

"Building on this, our new project is exploring its use in managing crop growth with the potential to enhance resource use efficiency and provide other benefits within a farming systems context."

For more
Dr Katie Broughton
katie.broughton@csiro.au
CottonInfo blog:
www.cottoninfo.com.au/blog/mepiquat-chloride-trial

CRDC
COTTON RESEARCH AND DEVELOPMENT CORPORATION

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

Subscribe to *Spotlight* today.

www.crdc.com.au