Spotlight
ON COTTON R&D

SPRING 2024

$13m disease investment underway

Conference unites cotton industry

Creating a digital future

CRDC

Allan Williams

In the Spotlight

Welcome to the Spring edition of *Spotlight*.

We hope every one of the 2900 people who attended the 2024 Australian Cotton Conference made it home safely, all the more knowledgeable and well connected for it.

It has been described by visitors from overseas as the best of its kind, and we are proud to remain a foundation sponsor, helping researchers and students attend and supporting so much of the cotton RD&E that was on offer. We would love to cover everything that happens at conference in these pages, but we would need more than one edition of *Spotlight* for that! Remember, all the presentations can be viewed at home via the conference website.

Our congratulations to all the nominees, finalists and awardees from the Australian Cotton Industry Awards. You'll find their profiles within these pages, including that of CRDC Chris Lehmann Young Cotton Achiever Sharna Holman and her CRDC-supported PhD study in northern Australia. Sharna is also the CottonInfo Biosecurity Technical Lead, driving the uptake of on-farm biosecurity plans, which also feature in this edition of *Spotlight*.

It was actually the Cotton Conference that first sowed the seeds of a career in cotton with Sharna. It has certainly become a must-attend event for anyone keen to be involved in the cotton industry, and we saw this in the incredible contingent of talent among the scholars we supported to the event. We have featured our young achievers, future leaders and scientists in this edition of *Spotlight*.

The announcement of the Australian Cotton Disease Collaboration (ACDC) partners, which also took place at the conference, is an important one for the industry. We are delighted to have the University of Southern Queensland (UniSQ) and the Queensland Department of Agriculture and Fisheries (DAF) on board with this important initiative. In this edition we take a look at what the partnership means for growers, and in future editions, we will be bringing you the latest outcomes from the ACDC research.

Another focus at the conference was CRDC's commitment to creating cotton's digital future: harnessing and capitalising on the incredible amount of data we are creating every day right across the industry. The first step has been working with a cross-sectoral group consisting of industry groups, growers, ginners, merchants, classers and researchers to develop a digital strategy for the Australian cotton industry.

It's all part of our work to develop a cotton industry data platform to aggregate, store, analyse and communicate data to the industry and beyond. The data platform is a key element of our Strategic Plan, Clever Cotton, based on clear evidence about the changing nature of cotton production and the data needed by our global supply chains, and you can read all about it in this edition.

Finally, I'd like our readers to closely consider our article with cotton's sustainability advisor Chris Cosgrove on defining 'regenerative agriculture'. As is our proactive nature as an industry, we are advocating for a common definition to be used across agriculture industries to avoid confusion and to retain as much value as possible for farmers in demonstrating regenerative practices. We welcome your feedback on the definition, outlined in our story.

Good luck to all those gearing up for season 2024-25. We'll be bringing you the RD&E you need via *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.

Spring 2024

Spotlight is brought to you by Australia's cotton growers and the Australian Government through the publisher 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

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

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MELANIE JENSON

ON THE COVER:
Crop geneticist and pathologist Associate Professor Sambasivam (Sam) Periyannan of UniSQ has been appointed as ACDC director, pictured here with CottonInfo Program Lead Janelle Montgomery.

Want to see more of Spotlight?

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

COTTON NEWS

FEATURES

Protect your next crop

THE latest edition of CRDC and CottonInfo's *Cotton Pest Management Guide* is enclosed with your copy of the spring *Spotlight* magazine for subscribers.

This year's guide has a fresh new look and includes information on XtendFlex, along with two new disease sections. There is also a new introduction to pests and crop protection and the Insecticide Resistance Management Strategy (IRMS) has been simplified to match crop stage, with an increased emphasis on mites.

It's a one-stop-shop for pest management, with the updated 2024 silverleaf whitefly matrix recommendations included, along with new tables on crop symptoms and weed hosts of cotton diseases.

CRDC Senior Innovation Broker Susan Maas oversees the review of the guide and said annual updates allow the inclusion of new and emerging issues, ensuring it remains a current and relevant resource for all crop managers.

The 2024-25 Cotton Pest Management Guide can also be downloaded from the CottonInfo site, or if you would like additional printed copies contact your local CottonInfo Regional Extension Officer.

To download the guide:
www.cottoninfo.com.au/publications/cotton-pest-management-guide

First year CRDC-supported PhD scholar Xinyue Tang at the Australian Cotton Conference.

MELANIE JENSON

Scholarships open industry doors

ATTRACTING and supporting new industry scientists, researchers, technicians and extension specialists is crucial to maintaining the Australian cotton industry's world-class research, development and extension, which benefits the industry from growers to shippers.

Undergraduate and postgraduate students are coming into the industry via CRDC scholarships. There are currently 12 scholars undertaking study and research projects under these scholarships.

CRDC's undergraduate scholarships – the CRDC Summer and Honours Scholarship – offers up to $10,000 to enable university students to conduct short research, extension or industry projects under the direct supervision of a researcher or extension officer. The scholarships are open to all university students of a high standard who are completing their senior years of an undergraduate degree or enrolled in an honours program, and the application must be completed by the researcher or extension officer or their organisation.

CRDC's postgraduate scholarships – the CRDC PhD top-up scholarship – offers up to $35,000 per year and can be applied for by PhD students who are interested in joining the Australian cotton industry, whose study is relevant to cotton, and who are already receiving a Research Training Program (RTP, or equivalent) scholarship. To be eligible, candidates must be undertaking postgraduate study at a recognised institution and projects should align with CRDC's Strategic Plan, Clever Cotton.

As outlined in this edition of *Spotlight* (page 8), students who receive CRDC-supported scholarships join a strong network of peers, have opportunities to attend major industry research events, regional tours and activities, and are supported by CRDC Innovation Broker Rachel Holloway to capitalise on opportunities within the cotton industry.

Students who are considering applying but are a little unsure on their project idea are encouraged to contact Rachel. Applications close November 30.

For more
Rachel Holloway
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CRDC scholarships
www.crdc.com.au/researchers/scholarships-travel

New Governor General shares passion for circularity

AUSTRALIA'S new Governor General, Her Excellency Sam Mostyn made a visit to CSIRO cotton research facilities as part of National Science Week, telling the CSIRO team that both she and King Charles share a strong commitment and passion for the circular economy of textiles.

Her excellency was invited by new CSIRO CEO Doug Hilton AO to visit the CSIRO Canberra (Ngunawal country) cotton lab where the scientists shared how CSIRO is integrated with the broader cotton ecosystem. They outlined the industry's long-term use of science and collaboration, sharing some of the research involving the CSIRO cotton breeders on improving yield, disease resistance and fibre quality. This included a preview of a world first for Australia - GM pink cotton fibres.

All cotton produced in Australia is from CSIRO-bred varieties. CRDC was a major investor in the CSIRO Plant Breeding Program for 17 years, investing $46 million on behalf of growers into cotton breeding RD&E from 1990 to 2007.

At that point, CRDC stepped out of cotton breeding in order to invest vital RD&E levy funds into other key areas for growers, and CSIRO and CSD formed the Cotton Breeding Australia partnership to continue this research.

Governor General, Her Excellency Sam Mostyn (at left) was recently hosted by CSIRO for an inside look at its cotton lab in Canberra (Ngunawal country) where she spoke with cotton researchers.

Her excellency also visited the new CSIRO Diversity Building at Black Mountain, home to Australia's leading biodiversity research collection.

Take a closer look at irrigators' experience

COTTONINFO'S Technical Lead for Energy & Climate Jon Welsh has developed two case studies analysing the economics associated with irrigation conversion projects at two cotton farming operations in NSW.

At the Cotton Conference, Jon presented on the case studies to a packed irrigation session and was joined on a panel by the case study growers – Ben Kirkby from 'Norwood' at Moree and Darren Eather from 'Bellevue', Narrabri (Kamilaroi country).

At 'Norwood', the motivation for converting from siphon to bay and rollover bankless irrigation was major flood damage in 2022, and the decision to shift to a more efficient irrigation system rather than repair their fields. Water saving, less reliance on casual staff, and all-round productivity benefits were the main drivers of change.

Meanwhile at 'Bellevue', the team converted from siphon to small-pipe-through-the-bank to implement a more productive irrigation system and reduce labour and management requirements while meeting crop agronomic needs.

Both case studies offer an overview of the system in place prior and after changes, the key considerations made and the key benefits, as well as an analysis of costings and the project economics, with three more case studies set to be developed over the coming season.

MELANIE JENSON

A panel session with cotton growers Darren Eather and Ben Kirkby (pictured left) with CottonInfo Technical Lead for Energy & Climate Jon Welsh was a packed-out affair. If you missed it, you can learn more about what they are up to with new CottonInfo podcasts.

CottonInfo caught up with Jon, Ben and Darren at Conference directly after their live sessions to record an overview of the process of change and their reflections post conversions. The resulting podcast under CottonInfo's Crop to Top series is available on the CottonInfo website or via your preferred listening platform.

For more

Read the case studies:
www.cottoninfo.com.au/publication-type/case-studies

Listen to the CottonInfo podcast:
www.cottoninfo.com.au/podcasts/cottoninfo-podcasts

Watch the Australian Cotton Conference session:
www.australiancottonconference.com.au

Moree cotton grower Mick Humphries with CRDC Innovation Broker Elsie Hudson, who oversees the new ACDC.

MELANIE JENSON

Partnership underway in $13M disease investment

THE partners in a $13 million landmark partnership to tackle diseases of cotton were announced at the Australian Cotton Conference in early August.

The Australian Cotton Disease Collaboration (ACDC) sees the University of Southern Queensland (UniSQ) and Qld Department of Agriculture and Fisheries (DAF) partner with CRDC to help safeguard Australian cotton growers against the rising economic impact of disease.

With disease already having a significant impact on Australian cotton growers, and climate change threatening to increase the spread and severity of plant diseases, CRDC is making its largest single investment in a first-of-its-kind collaborative approach to cotton disease research through ACDC.

The initiative is part of CRDC's commitment to disease research under its five-year strategic RD&E Plan, Clever Cotton.

The goal is to reduce the impact of both current and emerging diseases to less than five per cent of the cost of production by 2028, through RD&E to support practice change. Currently the impact of disease is 14 per cent of the cost of production.

"Disease is a critical challenge for Australia's cotton industry – contributing to significant yield losses which undermine long-term confidence in growing cotton. In extreme cases, disease pressure is forcing some growers to opt out of cotton production altogether," said CRDC Innovation Broker Elsie Hudson who oversees the initiative.

"Recent research commissioned by CRDC has found that across the cotton industry, disease is causing an eight per cent reduction in yield.

"For growers directly affected by disease, they are seeing an average reduction in yield of 12 per cent. In some extreme cases, it can be as high as 100 per cent: their entire crop is at risk.

"While we've invested in cotton disease research over several decades, a new approach is needed to overcome this persistent, leading limitation in the cotton production system."

Targeting impact

ACDC changes the game for growers, delivering a comprehensive coordinated national disease program that will help understand the impact of disease, enhance foundational pathology resources and capability, and deliver tactical management and innovative technical solutions.

Recent Crop Consultants Australia/CRDC surveys show an increase in the impact of Verticillium wilt, particularly in cooler, wet seasons. In 2021-22, 11 per cent of respondents said disease had impacted them to the tune of more than $300/ha in costs and yield loss. Twenty-one percent said it cost them between $50 and $100/ha. Black root rot, boll rots and Verticillium were the most damaging in terms of costs and yield in both the 2021-22 and 2022-23 reports.

New approach to partnerships

ACDC is an example of CRDC's bold, ambitious new approach to solving industry-defining challenges: a shift away from smaller projects to larger single investments with bigger outcomes and bigger impact.

The announcement of strategic partners UniSQ and DAF brings the delivery of ACDC a step closer.

DAF's Agri-Science Queensland Executive Director Dr Wayne Hall said DAF continues to invest in cotton disease research to protect the future of the cotton

industry and this collaborative approach will amplify this effort.

"This initiative demonstrates DAF's commitment to collaboration and to providing cotton growers with tactical management strategies to enhance disease resilience and sustainability," he said.

UniSQ Deputy Vice-Chancellor (Research and Innovation) Professor John Bell said UniSQ was proud to lead the strategic alliance to combat cotton diseases from its Toowoomba (Barunggam country) campus.

"Through cutting-edge research and collaborative efforts, we are paving the way for effective cotton disease management strategies that will enhance industry resilience and sustainability," John said.

"The initiative exemplifies our dedication to translating research into actionable solutions that will empower cotton growers and strengthen the future of Australian agriculture."

Director announced

ACDC and UniSQ have also announced the appointment of crop geneticist and pathologist Associate Professor Sambasivam (Sam) Periyannan of UniSQ as the ACDC Director. Sam has a passion for crop protection and in his previous work with CSIRO characterised new pathotypes of *Puccinia sp*. which causes rust disease in wheat.

Sam co-developed a rapid resistance gene cloning technique and characterised several resistance genes for rust disease. He also was a co-inventor in three patent applications while at CSIRO.

Sam said UniSQ was uniquely positioned to lead ACDC.

"UniSQ is a renowned agricultural, research-intensive university, strategically located on the Darling Downs," he said.

"This collaboration will enhance UniSQ's research capabilities and bring significant benefits, training next-generation researchers and consultants for the cotton industry.

"As a nationwide collaborative project, ACDC brings multiple experts from various agencies together to tackle disease in cotton.

"Importantly, this project will look to extend beyond national borders and collaborate with researchers from USA, India, China, Brazil and Pakistan.

"Through knowledge and material sharing, this global network will ensure the Australian cotton industry's preparedness and contribute to the global cotton industry's resilience against outbreaks of new strains of cotton pathogens."

MELANIE JENSON

Moree grower Mick Humphries with CRDC Board Directors (from left) Niall Blair, Michelle Tierney, CRDC's General Manager Business and Finance Graeme Tolson and Director Julie Bird during a visit to Mick's farm where he explained the impact disease has on his cotton crops.

Impact on the ground

Moree (Kamilaroi country) cotton grower Mick Humphries is hopeful the change in approach can unlock new solutions.

"Disease is a challenging area to get meaningful R&D breakthroughs," Mick said.

"We make headway on a promising solution and then, bang! It's back to the drawing board.

"Couple that with the piecemeal 'one project here, one project there' approach the industry has relied on for the last 30 years, and it means solutions aren't coming fast enough."

That disease affects different growing regions in particular ways has also added to this effect in terms of focus and capacity. Meanwhile growers are changing their practices to try to manage disease. The latest CCA survey showed that 32 per cent of respondents had changed irrigation practices as a result of disease pressure, while 24 per cent plant later to combat disease issues, and the same percentage now manage the crop for reduced yield expectation. Other management changes include nitrogen application and rotations. A small percentage no longer grow cotton in certain fields.

Mick estimates disease costs his business 20 per cent of his gross annual income.

"I want to claw that 20 per cent back, so I'm hopeful that bringing experts together in a strategic, coordinated way that eases the burden for cotton growers into the future."

Mick is also playing a part in research, hosting disease trials on his farm as part of the disease action participatory research initiative, supported by both CRDC and CSD through their Richard Williams Commercial Research Program. He says other ways growers can have impact is by engaging with the R&D sector and CRDC via Cotton Grower Associations (CGAs), who via grower panels, help set research priorities.

"It is worthwhile making connections with CRDC Innovation Brokers and joining your CGA," Mick says.

"The opportunity to attend the research priority forums with CRDC and Cotton Australia to discuss face-to-face our issues and put our cases forward is very valuable.

"The more interaction growers have with CRDC, who are a very approachable group, the better."

For more

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Associate Professor Sam Periyannan
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Horizon scholar Ayla Christophers with CRDC Innovation Brokers Rachel Holloway and Stacey Vogel.

MELANIE JENSON

Conference another golden event

COTTON Conference attendees didn't have to go to Paris to set a new record, with 2900 people making the trip to the Gold Coast (Bundjalung country) to be a part of the industry showcase.

With a record number of attendees registered prior to conference, hundreds more turned out to register on day one, pushing the figure way past expectations. Delegates and speakers came from across Australia and overseas to speak, network, learn and unite around the 2024 theme 'Cultivating Excellence'.

This year, 160 speakers and panellists with 26 chairs over 29 individual sessions meant the program was as full as the venue. In addition, the largest cotton industry trade display in Australia featured more than 120 exhibitors.

As conference coincided with the Summer Olympics in Paris, there was an Olympic Lounge so that delegates could stay updated on the Olympic action. But it wasn't all on tv, with Olympic gold and silver medallist Brooke Hanson enthralling a packed room for just over an hour with her high intensity presentation. Meanwhile, one of Australia's favourite sons and arguably cricket's most loved modern player Steve Waugh kept the crowd engaged for the last session.

Artificial intelligence (AI) featured in the first session of the conference, with mathematician and broadcaster Adam Spencer astounding and amusing the crowd with his take on AI and what it's going to mean for industries like agriculture and cotton. The theme continued as AI featured again in other sessions, with agtech and irrigation also hot topics for attendees. Many sessions included panels of growers, researchers and experts from agribusiness, covering weeds, Northern Australia, traceability and diseases.

The diverse range of speakers covered renewables, cover cropping, carbon farming, climate forecasting, water surveillance, new cotton varieties and mental health. The sustainability credentials of Australian cotton were examined along with soil health from one of the world's leading authorities on the topic, along with global cotton identities who delivered a worldwide supply and demand overview and how that impacts on Australian cotton and on the global fibre trade.

For CRDC and CottonInfo, the event is an opportunity to showcase RD&E to growers and the cotton community. Across the three days around 50 CRDC-supported researchers, CRDC directors and team members took to the stage to talk cotton research.

CRDC and Cotton Australia co-chaired a two-part session on the future of Australian cotton, including an update from CRDC Executive Director Allan Williams on the Cotton Australia and CRDC review of cotton's myBMP program, and an outline from CRDC General Manager of Innovation Dr Merry Conaty about CRDC's ambitious project to create an industry-wide data platform (see story page 14).

It was also an opportunity to announce details of the Australian Cotton Disease Collaboration (ACDC) partners, the

University of Southern Queensland (UniSQ) and the Queensland Department of Agriculture and Fisheries (Qld DAF). CRDC Innovation Broker Elsie Hudson, newly appointed ACDC Director, UniSQ's Sam Periyannan, and Qld DAF pathologist Dr Linda Smith spoke about the new initiative (see story page 6).

The conference also offered the perfect opportunity for new and potential researchers to meet and make contacts. Researchers attended the conference on CRDC travel scholarships, including three new cotton industry researchers from the Northern Territory. CRDC also supported Horizon, PhD and post-doctoral scholars to attend. While there, CRDC Innovation Broker Rachel Holloway organised activities and meetings to bolster the value of their attendance (see story page 30).

Future Cotton Leaders Program participants also attended the conference with support from CRDC and Cotton Australia, with a sold-out graduation event for them held on the eve of the official conference start. One of the graduates of the program this year was Moree agronomist Kate Lumber, who was a finalist last year in the CRDC Chris Lehmann Young Cotton Achiever Award, and has just been announced as cotton's 2025 Nuffield Scholar (see story page 29).

CottonInfo also hosted a number of sessions over the conference via the Rabobank stage. The CottonInfo focus for the Conference was biosecurity: working to 'Set the Gold Standard' in biosecurity knowledge. The 'Pest Pursuit' app – an interactive quiz – was trialled on the CRDC and CottonInfo stand, testing users' knowledge of endemic and exotic pests. The game will be available on the CottonInfo website soon.

To top this off, CottonInfo's Biosecurity Technical Lead Sharna Holman was named the CRDC Chris Lehmann Young Cotton Achiever of the Year at the Australian Cotton Industry Awards on the final evening of the conference.

Conference presentations are available to watch via the conference website, with a link to the photostream where images can be downloaded.

For more
www.australiancottonconference.com.au

MELANIE JENSON

Enthusiasm aplenty: Horizon students are able to immerse themselves in the industry and its people during Conference, setting many on career paths in cotton.

An event to forge career pathways

THE Cotton Conference has become an important vehicle to strengthen and sustain the industry by opening up a whole new world of opportunities for young people.

Next generation scientists, agronomists and leaders were supported to attend the conference through initiatives of CRDC and Cotton Australia, and left with a new sense of the opportunities available in the cotton industry.

These opportunities are realised by connecting these newcomers to cotton's people, assisted by CRDC Innovation Broker Rachel Holloway.

"Many of our students have an interest in agriculture or cotton, but very little direct connection to our industry or our people. There is enormous value in helping them make these connections, and that is where I can help," Rachel said.

"The Cotton Conference is the perfect opportunity to enable these connections: everyone is in the room, and the students see the innovation, the opportunity, the support and the familiarity that people have with each other – and want to be a part of that.

"Our 2024 CRDC Chris Lehmann Young Cotton Achiever of the Year awardee Sharna Holman is a brilliant example of this: she came to her first conference on a Cotton Australia scholarship and says by the third day she knew the cotton industry was where she wanted to be.

"Fast forward to today and now she's a well-known and highly regarded cotton extension officer in the CottonInfo team and is also undertaking a CRDC-supported PhD."

Rachel said the industry recognises that people are its most important resource.

"The students commented on the industry willingness and desire to help the next generation and to support and understand their career aspirations," she said.

CRDC supported 12 attendees from nine different universities to attend the Conference, including two CRDC-supported AgriFutures Horizon scholars, an honours student and six PhD students. CRDC also supported Cotton Australia with career events for their 15 undergraduate student scholarships, 15 AgCAREERSTART students and 40 high school students.

And the awardees are: Scott and Shonel Balsillie, Bridget and Steve McVeigh, Ross Munro, Dr Lisa Bird and Sharna Holman.

Night of nights reveals industry stars

The 2024 Australian Cotton Conference's Awards Dinner on the Gold Coast (Bundjalung country) again recognised outstanding individuals for their contributions to the cotton industry.

Sharna Holman was named the CRDC Chris Lehmann Young Cotton Achiever of the Year, Dr Lisa Bird honoured as the Cotton Seed Distributors (CSD) Researcher of the Year, and Ross Munro recognised with the Incitec Pivot Fertilisers Service to the Cotton Industry Award.

Queensland growers were in the spotlight with the 2024 Bayer Cotton Grower of the Year going to Scott Balsillie, the farm manager for Eastern Australia Agriculture in Dirranbandi (Kooma country) and the AgriRisk High Achiever Award going to Steve and Bridget McVeigh from Dalby (Barunggam country) on the Darling Downs.

Qld DAF's Sharna Holman was celebrated for her impactful work as CottonInfo's Biosecurity Technical Lead and CRDC-supported PhD researcher. Sharna's journey into the cotton industry began as a student scholar at the Australian Cotton Conference in 2014. Sharna's PhD research focuses on the cluster caterpillar in northern Australia, which could pose serious production challenges (see next story).

NSW DPI's Dr Lisa Bird was named researcher of the year for her long-term and crucial role in managing the industry's insecticide resistance program. Her work, supported by CRDC, involves extensive research and monitoring of insecticide resistance across five major cotton pests: Helicoverpa, mirids, thrips, mites and aphids.

Lisa said it was a team effort, spanning 40 years.

"I am thrilled to be named researcher of the year for 2024 – thank you Cotton Australia, and I'm grateful to CSD for sponsoring this award along with CRDC for funding this important piece of research over many years," she said.

"It's great to see so many women nominated this year and I especially want to acknowledge my fellow nominees Nicole McDonald and Alice Payne for the amazing work they do to support human capacity building and sustainable textiles in the cotton industry.

"It's lovely to be recognised for the work we do in insecticide resistance research at NSW DPI, which we have been a leader in for over 40 years, but it really is a team effort.

"I am grateful to everyone who has been involved in the resistance program because I rely so much on the passion that others have for the industry – from the crop managers to the technical leaders and the CottonInfo team.

"It's so rewarding to be part of a process that delivers practical advice to help manage the challenges of resistance, and it wouldn't be possible without the dedication of the technical team at Narrabri and Tamworth (Kamilaroi country) who always go the extra mile to deliver the best science quality we can back to the industry."

Lisa said she's also been lucky to have had two incredible science mentors Neil Forrester, formerly of NSW DPI, and Ray Akhurst at CSIRO.

"The solid foundation in industry-based research learned from Neil and Ray is something I never take for granted.

"I'm just grateful to have had the opportunity to develop my career in cotton and to work with so many amazing people, and hope to continue to play a role in delivering research outcomes that will keep the industry strong and sustainable."

CRDC Senior Innovation Broker Susan Maas said the resistance surveillance research is important for both endemic and exotic pest management.

"This important area of research informs our Insecticide Resistance Management Strategy (IRMS) for endemic pests, and importantly also monitors for exotic incursions.

"If there is a sudden change in

resistance or unusual survival of pests, the resistance program would encourage people to submit samples and raise concerns and directly detect new threats," Susan said.

"A lot of the pests we worry about are worse versions or very similar looking versions of our existing pests, so Lisa's work in this field is incredibly valuable."

Long involvement for top grower

Cotton grower of the year Scott Balsillie's family has been involved in cotton since his grandfather and uncles started growing cotton in the Miles/Chinchilla area in the 1980's. Scott first started working fulltime in cotton 25 years ago and today runs farms 'Clyde' and 'Kia Ora', growing up to 6500 hectares combined.

Scott has been focused on improving water efficiency through the bankless conversion from siphons, achieving huge benefits in labour and water savings, machine efficiencies and yield benefits. He has moved from 800 metre row lengths to 1800, while employing deep tillage strategies to get through the compaction layer to around 60cm, allowing the roots to be exposed to moisture and nutrients at depth. He has also invested in the latest technology allowing him to plant at 16km/h achieving 250 hectares per day out of a 12-metre planter.

"I love growing cotton, it's an amazing crop to grow," Scott said.

"It's all the 'one percenters' that you get right that give you the amazing crop at the end. There's nothing better than seeing those rows of white gold."

AgriRisk High Achievers Steve and Bridget McVeigh grow more than a thousand hectares of irrigated and dryland cotton. Steve's family has been involved in growing cotton for 44 years over three generations.

"I'm a big believer in development, diversification and technology," he said.

"We are always looking at water and labour-saving technologies and looking to adopt the latest tech.

"We monitor everything on the farm, and we stop and start the irrigation system on the phone. We are big on safety, and we have QR codes on all entrances and sheds and machinery for our team to scan to get all policies and procedures.

"Anyone coming onto farm has to scan and sign in, so we know who is on farm at any time."

Hundreds of people come together at the end of the Conference to celebrate the industry and its people.

Cotton Australia CEO Adam Kay congratulated all award recipients and all nominees.

"This year, innovation, technology and sustainability outcomes feature prominently in the awards process," he said.

"The grower award recipients have been recognised for their intelligent and forward focused approach to growing cotton, and that's something all the nominees, and the industry as a whole, share.

"Importantly, alongside the growers recognised as part of the awards program we have other industry representatives including researchers and the up-and-coming participants who will make a difference for years to come.

"It's pleasing that our CRDC Chris Lehmann Young Cotton Achiever Sharna Holman began her interest in cotton by attending the Australian Cotton Conference as a student scholar – that highlights the importance of our education program which is introducing students to a career in cotton.

"This year had a record number of students at the conference, and there may be another future award recipient among them."

Helping carry an industry

Ross Munro of BMC Partnerships in Moree (Kamilaroi country) was lost for words after being presented his service to industry award.

Ross started his relationship with cotton in the 1970s working alongside his father. They were establishing a business growing cotton and having conversations about starting a cotton transportation business. Later he would become responsible for operating infield loaders, loading flat top trucks and transporting cotton modules on chainbeds.

Ross began pulling apart, redesigning and remodifying these machines in the name of efficiency. He travelled to the United States to develop a greater understanding of how they were transporting cotton and conducting internal gin movements. On returning to Australia, Ross met Danny and John Bourke who were providing a similar offering in the market. They teamed up and formed what is known today as BMC Partnership.

"Ross has a well-deserved reputation for offering advice and a helping hand to anyone in the industry," Adam said.

"Whether it's about machinery setups, designing bale grabs or generally helping people to be more efficient at harvesting and moving cotton, Ross always makes himself available."

For more

Photos from Conference and the Awards celebration:
www.flickr.com/photos/australiancottonconference

Young achiever was hooked from the start

An enthusiasm for science and people is at the core of who Sharna Holman is and what she does, naturally bringing people together and volunteering beyond her core roles in the cotton industry.

Sharna was named the CRDC Chris Lehmann Young Cotton Achiever of the Year at the Australian Cotton Industry Awards in August. The award is in honour of the late cotton consultant Chris Lehmann and provides recognition of the rising stars in our industry such as this year's finalists: Sharna, CRDC Innovation Broker Elsie Hudson and Moree-based (Kamilaroi country) agronomist Alexandra Trinder.

Sharna is a development extension officer with Qld DAF, as well as the CottonInfo Biosecurity Technical Lead. While initially based in Emerald (Gayiri country), Central Queensland (CQ), this intrepid researcher now works between Toowoomba (Barunggam country) and Kununurra (Miriwoong country) in WA. This allows Sharna to focus on her CRDC-supported PhD research into the cluster caterpillar *(Spodoptera litura)*, a challenging pest in northern Australia.

Sharna is a graduate of the Australian Future Cotton Leaders Program and has become a positive and inspirational ambassador for the industry, advocating the rewards and fulfillment that can come from a professional career in agriculture.

Sharna's dedication to her work and the cotton industry has seen her live in Kununurra to conduct research during the last three cotton seasons. Despite the challenges of the climate and at times isolation, it has enabled her to fast track her research.

CRDC Executive Director Allan Williams presenting Sharna with her award.

Impact through extension

Sharna's PhD supervisor, Qld DAF's Dr Paul Grundy, says the work she is undertaking on cluster caterpillar aims to underpin the long-term sustainable management of this key pest, particularly now as northern cotton production transitions from trials to to a commercial industry.

"Recognising the historical significance of this pest, particularly its role in the collapse of the Ord cotton industry in 1974, Sharna's research promises to underpin sustainable stewardship of Bt cotton for years to come," Paul said.

"Further to her research contribution, Sharna has also played a lead role in extension. She's already made a significant impact in raising biosecurity awareness and action across the industry.

"Over the last seven years, with Sharna in the CottonInfo Biosecurity Technical Lead role, the industry has transitioned from largely unprepared to having biosecurity front of mind.

"The percentage of cotton enterprises with on-farm biosecurity plans has increased from less than 10 percent to 52 percent over five years.

"Resources and networks are now in place and annual processes where biosecurity matters are considered and reviewed are undertaken and accepted as best practice.

"Biosecurity is an area renowned for its complexities and inherent challenges, but despite these obstacles, Sharna has successfully led industry-wide initiatives, biosecurity protocols and workshops on enhancing preparedness, as well as creating a wealth of printed and visual resources via CottonInfo."

CRDC Senior Innovation Broker Susan Maas says Sharna's dedication to her roles has been evident from the outset.

"Sharna enthusiastically embraced the challenges of her biosecurity responsibilities, and established herself as a respected figure in the CQ

cotton community and within the CottonInfo team.

"Sharna has the ability to engage with growers and agronomists around a range of endemic and exotic pest issues, providing leadership to advance the industries biosecurity preparedness," Susan said.

With the fall armyworm incursion in Australia in 2019, Sharna was integral in the development of the Plant Biosecurity Research Initiative's Biosecurity Extension Community (BEC). The BEC now connects extension experts from across plant industry bodies and government agencies on topics relevant to plant biosecurity and extension best practice.

"By cultivating relationships with key stakeholders such as Plant Health Australia and state biosecurity agencies, Sharna has established critical networks for potential incursion events."

Hooked on cotton

A native of Sydney, Sharna became aware of the cotton industry in 2014 when she attended the Cotton Conference with support from a Cotton Australia undergraduate scholarship.

"By day three of my first cotton conference I knew I wanted to be a part of the industry," Sharna said.

"The culture of the cotton industry was exuberant, inclusive and collaborative – and this was, and still is, very evident at events such as the conference.

"There was also a real passion and desire from growers, consultants, and the wider industry for research and information to help improve practices, which I found really appealing and wanted to be part of."

That summer Sharna made her way to Narrabri (Kamilaroi country) and the Australian Cotton Research Institute via a Primary Industries Centre for Science Education (PICSE) scholarship to work with Dr Mary Whitehouse on the genetics of *Helicoverpa* Bt resistance.

Sharna says the industry was dynamic and welcoming and she further set her sights on a career in cotton, applying for and being awarded a CRDC-supported Honours scholarship, undertaking a research project under Mary's supervision.
"Doing a Bachelor of Science in Agriculture meant there were a lot of different potential agricultural career options: research, extension, policy, communications, agronomy, business, so while I was an undergraduate I was still deciding what career pathway I was interested in pursuing.

"I did a broad range of work experiences, mainly with the other natural fibres of sheep and alpacas - then found my fibre of choice!"

"Towards the end of my degree, I knew I was wanting a role in agricultural extension and in the cotton industry and serendipity would have it that a cotton development extension officer role opened in Emerald as I started looking at next steps, and the rest is history.

PAUL GRUNDY

While based in Toowoomba, working on her cluster caterpillar PhD project means Sharna spends part of the year away in Kununurra.

"The cotton industry has so many passionate young people, like my fellow award nominees Elsie and Alex, doing great work in their roles and communities so it's a real honour to be announced as the award recipient.

"It's fulfilling knowing that the work I'm doing on cluster caterpillar and biosecurity extension is appreciated by industry."

CRDC had informally supported the young achiever award for many years as part of the judging panel, and in 2023 came on board as the award sponsor.

"This award is something we're really proud to support, along with a host of other leadership and development programs," CRDC General Manager, Communications and Extension, Ruth Redfern said.

"Sharna will be offered the opportunity to attend the Australian Rural Leadership Foundation's TRAIL program, to further support her development as one of our industry's future leaders.

"We'd like to acknowledge Cotton Australia for hosting the Australian Cotton Industry Awards, the Chris Lehmann family for their ongoing support of the young achiever award, this year's finalists, and the judging panel: cotton grower Aaron Kiely, 2023 recipient Emma Bond, cotton consultant Steve Madden and Chris's daughter Jess Lehmann."

For more
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Every field, every farm: developing cotton's digital strategy

Over the past four years, a cross-sectoral group of cotton industry bodies, growers, gins, merchants, classers and researchers have been meeting to develop a digital strategy for the Australian cotton industry.

Its purpose is to prepare Australian cotton for a digital future and enable the industry to share, coordinate and use the mountains of data it creates in more meaningful ways.

Over the past year, this strategic project has made important steps forward, says Dr Merry Conaty, CRDC's General Manager of Innovation, who leads the project for CRDC.

"The first is the decision to endorse the National Farmers' Federation (NFF) Farm Data Code as the basis for good data governance in the cotton industry," Merry said.

"The second is the development of a data governance framework, incorporating the principles of the Farm Data Code and spelling out how we as an industry want to manage and coordinate data sharing into the future.

"These two guiding documents/frameworks provide the necessary guardrails for us to confidently share data to create value through the supply chain, use data to innovate and change, and develop new systems underpinned by confidence in data privacy and security."

From here, the next set of important decisions by the digital strategy group are focused on preparing the industry to capitalise on significant changes into the future. Work is underway on data standardisation across the industry, and the development of a cotton industry data platform to aggregate, store, analyse and communicate data back to the industry and beyond.

The development of this data platform is a key element of CRDC's Strategic RD&E Plan, Clever Cotton, and its data-driven decisions theme.

"The need for this is based on clear evidence about the changing nature of cotton production domestically, and our global supply chains," Merry said.

"As technology develops, and its use on farms increases, growers, consultants, gins and classers are collecting more and more data about how plants are growing and developing, the environment around them, and mapping in increasingly fine detail nuances in the production environment or yield across a field – however we aren't necessarily turning this data into meaningful information because we lack the ability to combine different data sets.

"Across our supply chain, from merchants, spinner and brands, the demand for information about commodities like cotton is also growing exponentially.

"This demand is being driven by several global changes – regulatory changes in many of our key markets like Europe and the US mean that increasingly granular and verifiable information about the way our cotton was produced will be required for every bale, to ensure our ongoing access to these key markets.

"The brands and retailers themselves have internal frameworks for impact assessments of their supply chains, which rely on gathering reliable and detailed information about everything that went into the production of the products they sell.

"There is a huge demand for information, creating an enormous opportunity for Australian cotton.

"By focusing on data standards and privacy and ensuring good governance, the industry can confidently adopt new industry infrastructure like the data platform – which will underpin many future innovations and ensure that we are ready for a future where data and information are essential to any successful agricultural enterprise."

CRDC General Manager of Innovation Dr Merry Conaty talks about the cotton industry's digital strategy at the 2024 Australian Cotton Conference in August.

MELANIE JENSON

For more

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COMMENT: WITH CROP CONSULTANTS AUSTRALIA

Ensuring you have the best data at the end of the day

There is no doubt that the collection and storage of farm data is big business in agriculture. Farm data has long been used for benchmarking seasonal performance on many levels, particularly production and economics, and it's evident that this data is becoming even more crucial as growers and the industry are called upon to demonstrate accountability and improvement in sustainability.

For more than 30 years, Crop Consultants Australia (CCA) has been collating data from Australian cotton farms on behalf of CRDC to track the progress of our evolving industry. It's this data that has proven vital in conveying the industry's improvements from water efficiency to pesticide and herbicide usage. Without this hard data, the Australian cotton industry would find it difficult to prove its commitment to continual improvement and demonstrate its social licence to farm.

This 'big' cotton dataset is however made up of many smaller sets that in themselves tell a story. Most Australian cotton farms will have already accumulated their own extensive sets of data. The challenge for growers and managers is to ensure that data set is as accurate (or 'clean') as it could be, and just as importantly, that they make the most of that data and the story that data tells.

Through the ongoing CRDC-supported Cotton Market Audit project and subsequent report, CCA has collated thousands of such individual data sets which have been recorded on many different platforms. Over the years, this data has gone from being 100 per cent paper based, to now, almost entirely digitised in proprietary software in the cloud. But all who have worked on the project agree that it is not the platform that dictates the quality of the dataset.

CCA asked past and current project managers for tips for ensuring growers and crop managers have their best data on hand when it is required. These are their top 10 tips for success:

1. Regardless of the data storage system that you use, take some time to do some training and upskilling. This will minimise mistakes and maximise the benefits that the software will bring to your enterprise. One hour of online training may save you hours over the season and produce end figures that you didn't think possible.
2. Make sure that you record every important item – every operation, every application and every detail even if it seems minor at the time.
3. Have a consistent system for data entry especially when there are two or more people entering data for one enterprise. Communication is key here to avoiding double entries or missing entries entirely.
4. Double check the units that you are entering every time. This is particularly applicable to product rates where it is easy to make typo mistakes in data entry.
5. Choose the correct brand and name of the product applied (not just recommended). Active loadings differ between products and accuracy is key.
6. Make use of activity description fields in your operations. This may be an optional field, but additional information may give clarity to someone trying to explain an anomaly in data or understand the intention behind a management decision. This detail for example will enable the user to understand that they are looking at a replant situation, rather than a double-up.
7. Always input the data assuming that you are not the end user. That way you will input the information required for the data to 'stand-alone' without your input or explanation.
8. Run a quick comparison of your data with that from prior years to see if there are any obvious differences. If it looks 'wrong', chances are that it could be.
9. Back up your data. Check the backup protocols of any online storage platform, but also make sure that data stored locally is backed up adequately. Your data is valuable.

Finally, point 10 comes from CCA Director and digital ag consultant Sally Poole who is currently completing her PhD in digital agriculture through the University of Sydney.

"It is so important never to delete a data set just because it doesn't look 'right' or it represents an abnormal production year," Sally said.

"Just because a data set looks out of place doesn't mean that it doesn't belong and isn't useful in looking at the bigger picture of what is happening in the field. Those years that aren't 'normal' are part of farming, and we need to make sure that they are included."

Sally highlighted that while these data sets might not seem useful at the time, they help build a bigger picture how environmental influence (i.e. floods or disease) and management decisions can influence production now and into the future.

"Don't be tempted to delete something that doesn't fit with the story you want to tell. It is still very useful and important data," she says.

"I would also make notes about the context in which this data was produced to accompany the data for future references."

In this era of data-driven agriculture, all growers should be using their data, not just to understand where they have been, but to plan for the future. Your consultant will have the knowledge not only to assist you to make improvements with your data collection and collation, but also with its interpretation and application.

Knowledge is power, and in some cases, it can be surprising how much valuable knowledge we already have at our fingertips.

For more

www.cropconsultants.com.au

Are people willing to pay more for sustainability credentials?

Consumers are increasingly looking for transparency of responsible practices in the clothing products they buy, but are they willing to pay more for it?

A new study titled *Willingness to pay for naturally and sustainably produced clothing: A case study of Australian consumers*, found cotton is the fibre of choice when buyers are looking for credibility beyond basic fair-trade certification.

In an effort to understand consumer behaviour, CRDC-supported researcher, Dr Sorada Tapsuwan, and colleagues at Swinburne University and CSIRO Agriculture and Food undertook to find out if consumers will pay more for more sustainably and naturally produced garments.

Australians are the world's biggest consumer of textiles per capita, buying an average of 56 new clothing items a year, compared to 53 items per year in the US, 33 in the UK and 30 in China. We are also very large producers of textile waste, with more than 200,000 tonnes of clothing ending up in landfill each year.

MELANIE JENSON

Dr Sorada Tapsuwan came to the Australian Cotton Conference to present the findings of her research, which will be used to inform cotton's Sustainability Framework and Strategic Roadmap.

"Consumer waste and ethical considerations are gaining prominence in the textile industry, as are market regulations around how cotton and other textiles are produced," Sorada says.

"However, a consumer's motivation to purchase textiles is multifaceted, with price, quality, and verification of product attributes playing significant roles in their decision-making process."

The study surveyed over 500 Australian consumers on their willingness to pay for naturally and sustainably produced clothing. It examined different market segments and estimated how much extra consumers were prepared to pay for different features of a 'smart' casual t-shirt.

People prefer cotton

Cotton was the most preferred fibre, followed by viscose and hemp. Just over half (57 percent) were prepared to pay extra for a t-shirt that was made from natural fibre or its derivatives (including cotton, hemp, or viscose) compared to polyester, and had an organic, non-GMO or pesticide-free certification as compared to a basic fair-trade certification. The respondents who were prepared to pay more for features were more concerned about sustainability and 'doing the right thing' for the environment, and were more fashion-forward than the remaining 43 percent who were not prepared to pay any extra.

"In terms of communicating with these buyers, or the target market segment, the 57 percent of the population that are more likely going to buy natural fibre care about what other people think they should do, feel a strong moral obligation to behave sustainably, and were less modest about how 'fashion-forward' they are," Sorada said.

"People were also prepared to pay more if the t-shirt had a sustainability certification beyond a basic fair-trade certification.

"Furthermore, while switching to natural fibres is important to consumers, buying clothes from recycled fibre is not as important.

"Lastly, their willingness to pay for sustainability features was relatively greater than their willingness to pay for better fabric features, including well-placed seams, moisture wicking, and wrinkle-free properties."

This research can be used to inform the cotton industry's Sustainability Framework PLANET. PEOPLE. PADDOCK. and the Cotton Industry Strategic Roadmap by helping identify environmental, social and economic topics that are important to consumers. Cotton Australia, the

Australian Cotton Shippers Association (ACSA) and CRDC are collaborating to develop the Roadmap, which will help the industry remain competitive in a changing fashion and textiles market.

Mapping cotton's future

The Roadmap covers five key topic areas – traceability, industry data, sustainably-certified cotton/myBMP, human rights, and Australian cotton marketing – which are being addressed following broad consultation with growers and the industry. Following feedback from the industry about where Australian cotton would like to be on these topics, Cotton Australia, ACSA and CRDC are now working out how we'll get there, who's responsible and how any new initiatives may be funded.

Sorada's research is also useful for the Australian Fashion Council Roadmap to Circularity.

"We can help inform some of the citizen behaviour change and help encourage responsible practices around clothing so we can aim messages that are about enhancing people's sense of responsibility, communicating norms around what they ought to do, and start communicating with people who are more fashion conscious first," Sorada said.

"We can use these surveys in future research to track preferences or behaviour change, to look at how market share will change eventually in terms of natural fibre.

"We can use it to look at incentives to reduce disposal or retain clothing for longer and understand our market segments better.

Understanding consumer considerations when buying clothing has found that an industry 'doing the right thing' by the environment is a factor.

"Lastly, we can also help track how Australians are doing in terms of the different areas of circularity and use this information to improve life cycle analysis, material flow analysis, and validate previous statistics as to whether Australians really do buy 56 items per year."

For more
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What does this mean for the Australian cotton industry?

Industry sustainability advisor Chris Cosgrove says the research can be used to encourage a higher proportion of sustainably produced natural fibres to be used in the textile and apparel industry.

"The finding that Australian consumers buy over 50 items of clothing per year is truly surprising, and it shows why a lot of organisations around the world are looking at how to encourage less frequent purchases of more sustainably produced clothing," Chris said.

"The other finding that is important is over half the consumers surveyed prioritised sustainability.

"If the cotton industry and individual growers can give brands and the Australian Fashion Council Roadmap to Circularity more evidence that cotton is far more sustainable than polyester, it allows those fashion-forward consumers to be targeted more effectively to purchase less clothing made from more natural fibres.

"This makes the Strategic Roadmap for the Australian Cotton Industry – which includes traceability, data and sustainability certification – incredibly important to give textile buyers the evidence they need.

"It also makes the collective work of Australia's cotton growers equally important to show consumer expectations around greenhouse gases, biodiversity, water quality, human rights, and other sustainability topics are being met."

Chris also cautioned cotton growers against assuming 'willingness to pay' in a survey translates into consumers paying more at the cash register.

"It's very common for survey respondents to overstate their willingness for 'virtuous' things, like paying more for sustainable products or reducing drinks per week or increasing exercise," he said.

"So growers shouldn't think most consumers will actually pay more for sustainably-branded cotton.

"What it does clearly show though is that sustainability traits are important to the majority of consumers, and if individual growers or the industry as a whole can give evidence of meeting them, a sale is more likely to be made – especially at the premium end of the market."

New Namoi family joins Biodiversity Project

To celebrate Biodiversity Month this September, Country Road and Landcare Australia have announced a fifth project site in The Biodiversity Project in the Namoi Valley (Kamilaroi country) on the Schwager family farm, 'Wentworth', where 4000 native seedlings on 43 hectares have been planted along 2.8km of riparian and floodplain habitat on the Namoi River.

Kevin Schwager, pictured here with his daughter and grandchildren, says "we want to show that farming and the environment and young families can and do coexist".

The Biodiversity Project is a collaboration between Landcare Australia and Country Road, supported by the Australian cotton industry via Cotton Australia, CRDC and CottonInfo. The project was established to work with cotton farmers to restore and enhance biodiversity on properties in the Namoi Valley.

Landcare Australia CEO Dr Shane Norrish said the partnership with Country Road is enabling funding for five Australian farming families to be involved in The Biodiversity Project, and the impact to date includes 18,300 seedlings planted along 14.4 km of riverbank in the Namoi Valley, rehabilitating a total of 102.6 hectares of native vegetation.

"Together with Country Road, and with the support of the cotton industry, our work on The Biodiversity Project is achieving our shared vision to improve biodiversity and habitat connectivity, support threatened, vulnerable and iconic fauna species while also providing farming co-benefits," he said.

Kevin and Mary-Ellen Schwager's 550-hectare dryland farming property along the Namoi River will be the fifth site restored through the program and will involve planting shrubs, understory, and canopy species to protect natural habitats and threatened species.

Kevin says being a part of The Biodiversity Project enables his family to play a part in making a meaningful, responsible impact on both the environment and community.

"Through The Biodiversity Project, we wish to demonstrate that we are responsible custodians of our land. We want to show that farming and the environment and young families can and do coexist," Kevin said.

"Consumers are becoming more interested and discerning about where their food and clothes are coming from. As farmers, we wish to be outward looking and thinking, we need to respond to a changing marketplace. Being involved with The Biodiversity Project allows us to play a part in societal change."

The site was identified as an area of interest for biodiversity enhancement for a range of threatened species in research findings from the report, *Management of Biodiversity in the Cotton Landscape: Iconic and Threatened Species,* developed by CRDC with support from the Australian Government's National Landcare Smart Farming Partnerships Initiative.

In the Namoi project area, the research identified iconic species that are threatened, including the koala, brush-tailed rock wallaby, eastern grass owl, superb parrot, painted snipe and black-striped wallaby, along with plant species including Belson's panic, ooline and Coolabah Bertya.

In total, the report found that Australia's cotton farmlands are home to 138 threatened plant and animal species. It identifies and maps areas for further biodiversity enhancements required throughout cotton growing regions, in line with the Australian cotton industry's sustainability framework PLANET. PEOPLE. PADDOCK.

CRDC Innovation Broker and CottonInfo Natural Resources Technical Lead Stacey Vogel confirmed the benefits

that The Biodiversity Project brings to growers and the environment.

"These projects are restoring regionally important threatened species habitats and improving native vegetation connectivity within the Namoi catchment," Stacey said.

"We know from our research that well-managed areas of native vegetation on farm bring benefits not only for iconic and threatened species but also to the farm by providing natural pest control, improving soil health and storing and sequestering carbon."

Cotton Australia CEO Adam Kay says the key benefits of the project are the ongoing funding provided by Country Road, and the sharing of knowledge with other cotton growers.

"Biodiversity enhancement can be expensive and time consuming for farmers. The Biodiversity Project is a great model for how we can bring a range of expertise together to get positive outcomes for our farmers and the natural environment," he said.

"It's exciting to see brands like Country Road, that are sourcing Australian cotton fibres in their products, invest in issues that we all care about.

"An important part of the project for the cotton industry will be to capture the lessons learned by the farmers participating and use these to further enhance our biodiversity work across the industry."

The Namoi Valley families involved in The Biodiversity Project to date are the Kahls of Wee Waa, Watsons of Boggabri, Hamparsums of Gunnedah, Pursehouses of Breeza, and Schwagers of Narrabri.

Snapshot of Australian cotton industry biodiversity assets

- The total extent of cotton properties mapped was 45,070 km^2 and total cotton landscapes 136,117 km^2.
- 490 vegetation types were mapped across cotton landscapes, 348 of which occur on cotton properties. The most extensive vegetation types include coolibah open woodland, black box open woodlands, popular box woodlands, and various grassland communities. River red gum occurs along all the major rivers in the cotton landscape.
- Approximately 26 per cent of the cotton landscape and 21 per cent of the combined extent of all cotton properties retains a cover of remnant native vegetation.
- 50 per cent of cotton landscapes and 40 per cent of cotton properties exhibited native vegetation which is in 'high' or 'moderate' condition.
- 7300km of major rivers and creeks and 10,480km of minor creeks flow through cotton properties. Of this, 627 km^2 of major rivers and creeks have riparian buffer which were at least 50m wide (with 75 per cent retained vegetation) and 195 km^2 of minor creeks have a 20m wide riparian buffer (with 43 per cent retained vegetation).

For more

Country Road

www.countryroad.com.au/our-impact-partnerships-landcare-australia

Information is available and growing with monitoring project

While The Biodiversity Project specifically focuses on the Namoi Valley in NSW, the Management of Biodiversity in the Cotton Landscape: Iconic and Threatened Species report covers all cotton growing valleys, and CottonInfo has made this information easily accessible to all via an online tool: Managing Biodiversity in Cotton Landscapes.

This tool, available on the CottonInfo website, provides biodiversity information for every Local Government Area (LGA) in Australian cotton growing regions. Biodiversity assets and priority management actions for threatened and iconic species are available for each LGA.

This information has been collated to help growers understand and prioritise the conservation value of areas of native vegetation within cotton landscapes, which covers cotton farms plus a five kilometre buffer. It also identifies priority areas and management actions to help restore these areas for the benefit of threatened and iconic species.

Growers interested in finding out if their farm has areas identified as priority zones for restoration should contact CRDC and CottonInfo's Stacey Vogel.

In addition to this tool, CRDC is also supporting a project focused on monitoring biodiversity and assessing the ecosystem services of native fauna. Led by bat biologist and ecologist Professor Stuart Parsons from the University of the Sunshine Coast (UniSC), the project uses novel automated acoustic monitoring devices, equipped with artificial intelligence-based software developed in a previous project under the National Landcare Program in collaboration with CRDC. It is undergoing further field testing as part of this new project.

Stuart and Maggie Campbell-Jones, along with Professor Susan Fuller of QUT, were at Stephen Seery's property 'Fairford' at Moree (Kamilaroi country) in north-west NSW recently, looking at sites to install acoustic monitoring devices. The Lower Gwydir Valley offers varying types of cotton landscape connectivity where the acoustic devices can monitor the array of species and abundance of birds and bats. The researchers will be back later this year to deploy the recorders and start information gathering.

If you'd like to be involved in hosting acoustic monitoring devices on farm, contact Stacey.

For more

Managing biodiversity in cotton landscapes

www.cottoninfo.com.au/managing-biodiversity-cotton-landscapes

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Tracking trends on sustainability

Australian cotton's annual sustainability update was released in August. It is a summary of the industry's sustainability progress for 2023 across its most important topics in the industry's Sustainability Framework PLANET. PEOPLE. PADDOCK.

The update shows Australian cotton growers have dramatically improved productivity over time: the five-year average area planted to cotton has increased by just 19 per cent since 1994, but total production has increased by 94 per cent.

It also shows that water use efficiency has decreased against the five-year trend as a result of seasonal conditions. The hazard of pesticides on bees has declined, while the effect of herbicides on algae has increased against the five-year trend due to wet seasons which have contributed to more herbicide use in recent years. The long-term trend, however, shows the hazard to bees (from insecticides) and algae (from herbicides) has reduced by 91 per cent and 60 per cent respectively since 2004.

In the update, workforce and wellbeing have been combined under the Workplace theme to reflect how wellbeing is linked to overall health. Over the past year, fatalities declined slightly but serious injuries increased. For the first time, research showed misinformation about the cotton industry may be impacting grower wellbeing.

For more

Australian Cotton Sustainability Update 2023

www.crdc.com.au/publications/australian-cotton-sustainability-update-2023

		Targeted Outcomes	Five-year trend	2023	KEY 2023 TAKEOUT	SDG Alignment
PLANET	**Water**	Increase water use efficiency, within sustainable river & ground system limits	−	✕	About 50% less water is used to grow a bale of cotton compared to 1997 in most seasons. In very wet (like 2022) or dry seasons, that figure is closer to 40%.	6 CLEAN WATER AND SANITATION
	Greenhouse gas emissions	Contribute to the Paris Agreements' aim of a climate neutral world	No trend data		Previous year comparisons can't be made due to new input data used to more accurately estimate emissions. Defining a low emission path is a current priority.	13 CLIMATE ACTION
	Native vegetation	Native vegetation management on cotton farms contributes to regional priorities	−	−	An ambitious and collaborative project to better manage and measure native vegetation on cotton farms continued to progress.	15 LIFE ON LAND
	Pesticides	Support optimal crop production while having no negative impact on human & environmental health	+	Bees +	The hazard to bees (from insecticides) and algae (from herbicides) has reduced by 91% and 60% respectively since 2004. Wet seasons have contributed to more herbicide use in recent years.	12 RESPONSIBLE CONSUMPTION AND PRODUCTION
			✕	Algae ✕		
	Soil Health	Sustained cotton productivity growth by improving soil health	No trend data		Regenerative practices continue to be commonly used by growers. The cotton industry is collaborating with other sectors on a consistent way to measure soil health.	2 ZERO HUNGER
PEOPLE	**Workplace**	Keep farmers & core employees	No trend data		A new approach is being introduced to identify and measure the impact drivers of keeping and attracting people.	3 GOOD HEALTH AND WELL-BEING
		Attract casuals & contractors	No trend data			
		Keep everyone safe & skilled	Fatalities +	NA	Fatalities declined slightly but serious injuries increased. For the first time, research showed misinformation may be impacting grower wellbeing.	8 DECENT WORK AND ECONOMIC GROWTH
			Injuries ✕	NA		
			Skills +	NA		
PADDOCK	**Productivity**	Increase yield within sustainable environmental boundaries	−	Irrigated +	The yield gap between irrigated & dryland cotton continued to grow. This shows the key role of sustainably withdrawn water to deliver sustainable intensification.	2 ZERO HUNGER
			+	Dryland ✕		
	Economic contribution	Resilient farms able to invest in their business & community	+	✕	Irrigated cotton is very important to whole farm profitability and resilience, which in turn gives more stability to regional communities.	8 DECENT WORK AND ECONOMIC GROWTH

This table shows the 2022-23 annual change and the five year trend for each topic. The full sustainability update, and an associated data pack containing data sources, explanations of methodologies, pathways for improvement and more for each topic, are available at the CRDC website.

HAYDEN PETTY

What is regenerative agriculture?

While the term ‘regenerative agriculture’ seems to crop up everywhere these days, there is no real consensus on what the term means or looks like in practice.

It’s a term often more associated with grazing than broadacre farming, yet there are implications around what is termed ‘regenerative agriculture’ for the Australian cotton industry.

University of Sydney researcher Dr Tom O’Donoghue (see breakout box) reviewed the exploding number of regenerative agriculture programs and whether they actually can improve how farms function almost a decade ago. He clearly showed these programs are based on a 300-year-old premise put forward by the ‘father of modern agriculture’, Jethro Tull. Born in 1674, Jethro was known as a thought leader of his time – inventing the seed drill, and writing the classic *Horse-Hoeing Husbandry* in 1731.

“It turns out Jethro Tull isn’t just a rock band known only by people of a certain age,” sustainability advisor Chris Cosgrove says.

“In Horse-Hoeing Husbandry, Tull encourages people to consider the expense, goodness and certainty of a crop, and the condition in which land is left after a crop and I believe that Tull’s thinking is still on the money today.

“With the benefit of 300 years of hindsight, if we add in the importance of how we leave ‘society’ then you have regenerative agriculture in a nutshell.”

Chris says not only is there no agreement of what it is or how it is measured, there’s also no agreement as to whether it can be measured at all.

“In light of all this, the Australian cotton industry is exploring a definition of regenerative agriculture which is applicable for all Australian agriculture sectors.

“It’s important to the cotton industry as the vagueness of ‘regenerative agriculture’ is creating a proliferation of marketing programs that are confusing both farmers and consumers.

“In addition, farmers are increasingly being asked to provide evidence of different regenerative practices to different companies in their value chain – normally for no financial reward.

“We are advocating for a common definition to be used across agriculture industries to avoid confusion and to retain as much value as possible for farmers in demonstrating ‘regenerative’ practices, instead of having third parties capture premiums or certification fees for themselves to

Increased use of cover crops could be beneficial for the industry to show evidence of regenerative agriculture, as well as potentially benefitting growers by reducing input costs.

demonstrate this good work."

Working with Tom and across the industry, Chris says we've arrived at a draft definition: 'Regenerative agriculture is any farming system that increases product quality and yield reliability, and the natural and human resources agriculture depends on, relevant to the natural complexity and variability of each farm'.

"Regenerative agriculture is often thought of as improving soil health. In reality, it is much more than that," he said.

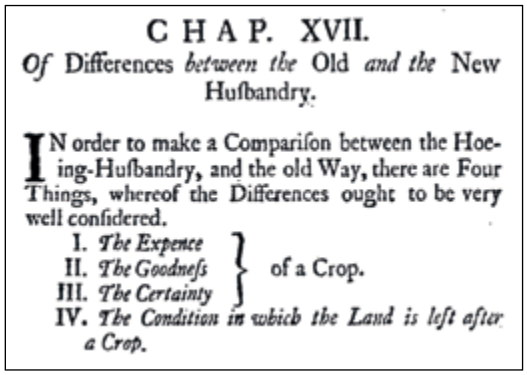
"Our definition or description is broader than, but consistent with, most of the multiple regenerative agriculture definitions in existence, but by having a direct link to the 1731 thinking of Jethro Tull, it reinforces regenerative agriculture is not new.

"It is also directly aligned to the cotton industry's work to revamp its sustainability data framework to measure, value and track stocks of natural and human capital, impacts and dependencies.

"The indicators we have for each of these – which are sustainability indicators customers of food and fibre are increasingly seeking – lets us measure the expense, goodness and certainty of a crop, and the condition in which land and society is left after a crop."

The definition has not yet been adopted by the industry and discussions are ongoing with multiple stakeholders in other industries and along the cotton value chain.

"We're very happy for others to disagree with us and provide an alternative definition we can support," Chris said.



CHAP. XVII.

Of Differences *between the* Old *and the* New Husbandry.

IN order to make a Compariſon between the Hoeing-Huſbandry, and the old Way, there are Four Things, whereof the Differences ought to be very well conſidered.

I. *The Expence*
II. *The Goodneſs* } of a Crop.
III. *The Certainty*
IV. *The Condition in which the Land is left after a Crop.*

"In our view, effort shouldn't be spent arguing about definitions or philosophies or reinventing 300-year old wheels.

"We think there are only two things that matter.

"First, we need a single definition agreed by all agriculture to maximise value for farmers and reduce confusion and inconsistency along the value chain.

"And second, the definition needs to allow farmers to choose practices that measurably impact product quality and yield reliability, and natural and human resources, relevant to the natural complexity and variability of each farm."

For more
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The link between regen ag, cover crops and sustainability

The Australian cotton industry isn't alone in its interest in regenerative agriculture. It was the focus of a keynote address by CRDC Executive Director Allan Williams at last year's International Cotton Advisory Committee conference in India.

As the chair of SEEP (ICAC's Expert Panel on the Social, Environmental and Economic Performance of cotton production), Allan presented the findings of an international review, commissioned by SEEP to review the types of practices being promoted as regenerative, with a view to assessing the feasibility of implementing them across a range of different farming systems.

Allan described regenerative agriculture as 'the new black' when it comes to defining sustainability, especially among retailers and brands looking to demonstrate sustainable sourcing credentials.

"The challenge is that there are multiple definitions, and while some include specific practices, many of the definitions focus on high level principles and outcomes," Allan said.

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

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

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

Dr Tom O'Donoghue, who undertook the review of regenerative agriculture definitions in 2015, is currently conducting CRDC-supported research into cover cropping in cotton systems. This important work will quantify the impacts growers are seeing with cover crops. Increased use of cover crops could be beneficial for the industry to show evidence of regenerative agriculture, as well as potentially benefitting growers by reducing input costs.

For more
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New plan, new resources: creating a buzz around biosecurity

With the release of the latest *Biosecurity Plan for the Australian Cotton Industry*, there are also a wealth of biosecurity resources available to growers for on-farm use.

The Plan is a resource in itself, identifying high priority pests (HPP) and other significant biosecurity threats to Australian cotton. The review and development were coordinated by Plant Health Australia (PHA) in collaboration with CRDC and developed through a partnership approach with Cotton Australia, government and industry. This includes the Cotton Technical Expert Group and Cotton Biosecurity Implementation Group.

To complement the Plan, CottonInfo has been developing a range of resources. The Crop to Top podcast has a special Biosecurity Excellence series to help industry learn more about the people, projects and programs protecting Australia's cotton crop.

"From growers and consultants on the ground, to inspection officers at the borders, we're speaking to people whose work, projects and actions are helping to protect us from some of cotton's most unwanted pests, weeds, and diseases," CottonInfo Communications Lead Megan Woodward said.

"These short, sharp podcast episodes will give an insight into the biosecurity system and how the actions we take as a collective are working towards the same goal of keeping Australia safe."

CottonInfo has also developed an updated exotic priority pest poster based on the new Biosecurity Plan, that can be easily downloaded and printed out to put up on the office or shed walls.

"Being aware of industry high priority exotic pests enables you to keep an eye out for these pests or symptoms in the

field – and know what actions to take if seen," CottonInfo Biosecurity Technical Lead Sharna Holman said.

"CottonInfo has a suite of resources available, including the Farm Biosecurity Management Plan template which has been really successful in helping growers to develop a plan (see story next page).

"This easy-to-use online template was designed with growers in mind, and we've included having a biosecurity plan as a practice in *my*BMP.

"I'm always available to answer any biosecurity questions or queries, as are the CottonInfo Regional Extension Officers."

In addition to the development of the Biosecurity Plan, PHA recently signed a memorandum of understanding with Cotton Australia to enhance the Cotton Industry Biosecurity Program, aiming to boost biosecurity capacity across the sector. PHA also supported the Cotton Australia cotton guardians biosecurity workshop in Brisbane, equipping industry participants with essential skills and knowledge to protect against biosecurity risks.

In response to demand for biosecurity training, PHA and Animal Health Australia have also developed a platform with a library of biosecurity training resources that have been developed for growers, consultants, the public, and government employees called the National Biosecurity Training Hub. PHA also called on social scientists through a behavioural economics 'Nudgeathon' challenge to encourage landholders to create on-farm biosecurity plans, where CRDC Senior Innovation Broker Susan Maas was a judge.

"The winning team proposed approaching on-farm biosecurity by creating 'Biosecurity Champions' which is very similar to the Cotton Guardians program," Susan said.

"And while all landholders and people working on farms are our eyes and ears, biosecurity is not just on their shoulders, as CRDC is continuing to support RD&E to both thwart and prepare for exotic incursions of insect and disease threats.

"We monitor for exotics through our resistance surveillance of endemics, for example NSW DPI's Dr Lisa Bird's *Helicoverpa* monitoring, as a lot of the pests we worry about are worse versions or very similar looking to our existing pests.

"We support research projects to learn more about HPP such as cotton leaf curl virus and boll weevil, so we are prepared should they arrive, along with managing industry scenarios to test our collective response to incursions.

"In many cases researchers must travel overseas to study exotics, which we also support.

"Preparedness is a major aspect of a successful biosecurity plan."

For more

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CottonInfo biosecurity resources.
www.cottoninfo.com.au/biosecurity
www.cottoninfo.com.au/publications/exotic-cotton-pests-2024
National Biosecurity Training Hub
www.biotraininghub.com.au/

Why should you make a farm biosecurity plan?

Sharna Holman says most people have only a passing interest in biosecurity until a biosecurity problem takes an interest in them...

As CottonInfo's Biosecurity Technical Lead, Sharna has helped hundreds of growers get on board with an on-farm biosecurity plan.

"Exotic and endemic pests, weeds and diseases can severely impact yields, profitability, and overall farm management and once established, diseases like Verticillium wilt and black root rot cannot be eradicated and must be managed instead," Sharna says.

"This makes prevention the best defence, and the first step in protecting yourself is developing a plan.

"Planning and implementing biosecurity measures will reduce the risk of pests, weeds and diseases spreading and establishing on your property regardless of whether they are new to Australia or just new to you and your farm.

"Every farming enterprise is unique, so your biosecurity risks and even how you implement management practices may be different to your neighbour.

"The key question is: have you considered why you're carrying out certain biosecurity measures, or identified the biosecurity risks and pathways for your farming business?"

The are several specific questions that Sharna works through in helping growers develop a biosecurity plan: Do you operate farms in different regions with varying pest and disease challenges? Do you own your machinery, or do you rely on contractors? What facilities, like a wash-down bay, do you have on-farm? How many and what kind of visitors are accessing production areas?

"Growers are seeing that by developing a farm biosecurity plan they can identify and assess the biosecurity risks to their business, allowing them to prioritise and implement the most appropriate measures to minimise these risks," Sharna said.

"Developing a plan also stimulates biosecurity discussions among people working on farm in different capacities such as employees, agronomists and contractors."

To help growers, CottonInfo has developed a Farm Biosecurity Management Plan template. It's an easy-to-use document that provides an overview of potential biosecurity risks and different biosecurity measures to implement to manage them.

"Effective biosecurity measures don't have to be

RUTH REDFERN

Pest Hotline

Any unusual plant pest should be reported immediately to the relevant state/territory agriculture department through the Exotic Plant Pest Hotline (1800 084 881). Early reporting enhances the chance of effective control and eradication.

"While it may not be a top priority on everyone's to-do list, it absolutely should be, as biosecurity risks are persistent and won't disappear."

expensive, but they do need to be straightforward and practical to be adopted," Sharna said.

"For example, you can manage the biosecurity risk posed by people entering production areas by ensuring that visitors' vehicles, equipment, and boots are clean before entering the farm. Visitor sign-in systems can be customised to suit your farm's needs – it could be a QR code online check-in, a physical sign-in sheet located in the office or shed, or even a simple text message to the farm manager that can be logged later in a diary, to record visitor movements.

"If you're just starting to develop a farm biosecurity plan or implement biosecurity measures, focusing on measures that address your most significant biosecurity risks and pathways will ensure your efforts have the greatest impact in reducing the spread and establishment of pests, weeds and diseases on your farm."

Sharna said over the past two seasons, CottonInfo and the Grains Farm Biosecurity Program have been conducting farm biosecurity planning workshops to help growers develop their farm biosecurity plans.

"The workshops we've held on the Darling Downs have seen great attendance and positive feedback from growers," says CottonInfo Darling Downs Regional Extension Officer, Annabel Twine.

"They provide an invaluable opportunity to connect with other growers and industry experts, learn about biosecurity risks and create a tailored farm biosecurity plan for your farm.

"While it may not be a top priority on everyone's to-do list, it absolutely should be, as biosecurity risks are persistent and won't disappear. Farm biosecurity plans are crucial for protecting our properties, our region and our industry."

Developing a farm biosecurity plan is also a core component of the *my*BMP biosecurity module. If you're interested in having a farm biosecurity planning workshop in your region, reach out to your local CottonInfo REO.

For more

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Farm Biosecurity Management Plan template
www.cottoninfo.com.au/publications/biosecurity-management-plan

CLEMSON UNIVERSITY - USDA - BUGWOOD.ORG

Boll weevil lays eggs inside cotton bolls, where larvae feed on them, causing serious damage and economic loss in countries where it is found.

Beating boll weevil: staying ahead of a high priority exotic pest

The cotton boll weevil is a high priority exotic pest for the Australian cotton industry. If it arrives in Australia, it would significantly impact cotton production and farming practices, changing integrated pest management (IPM) as we know it.

Improving the industry's preparedness for such a biosecurity threat is important to ensure the likelihood of earlier detection and to have a well-planned response in the instance of an incursion. Cotton boll weevil is listed as a High Priority Pest in the Cotton Industry Biosecurity Plan, which has just been revised and released.

"Cotton boll weevil is serious pest of cotton in Brazil, however a precedent for successful eradication has been set by the United States. Efforts would definitely be made to eradicate this destructive pest if it were ever detected in Australia," Sharna said.

Biosecurity preparedness efforts are continuing by building on previous CRDC-funded research conducted by Dr Dean Brookes, previously of the University of Queensland, who developed a contingency plan for boll weevil by adapting international strategies to the Australian environment.

"In the contingency plan, Dean identified strategies for the surveillance and detection of boll weevil, together with actions that would need to be taken in the broader farming system, such as removal of host plants with clean production breaks to minimise the ability of this pest to reproduce and establish," Sharna said.

Sharna will deliver a scenario-testing workshop with growers, consultants and industry members in early 2025. This workshop will road-test biosecurity strategies to identify gaps and practical concerns related to the theoretical implementation of a response to a major biosecurity incursion from both a logistical and grower perspective.

"I'll be investigating barriers and gaps to our knowledge and capacity to implement strategies that would likely be required in an eradication program," Sharna said.

"For example, are pheromone lures and traps easily accessible and available in the country? Do these lures have a by-catch? What are growers' perspectives on different management strategies, and can they be implemented on farm?"

To express interest in participating in the workshop, please contact Sharna.

To find out more about cotton boll weevil, check out the CottonInfo Crop to Top podcast featuring IPM Technical Lead, Dr Paul Grundy, where he shares his experiences in Brazil and explains more about this exotic pest.

Scan this QR code using your smartphone camera to link to the podcast

The ‘so what’ of workplace indicators

Social sustainability is essential for any business, but it often seems a bit vague or ‘nice to have’. Australian cotton industry sustainability expert Chris Cosgrove sheds light on what it means for people who manage people and the future of the industry.

MELANIE JENSON

Cotton industry sustainability advisor Chris Cosgrove says human and intellectual capital are fundamental – but often overlooked – for every farm.

The clear strategic value of measuring and managing workplace sustainability is not always obvious. This makes no sense when you consider two of the most important assets of any farm are its soil and the ability of a farmer to use their soil to produce food and fibre. So human and intellectual capital are fundamental – but often overlooked – for every farm.

The Australian cotton industry’s PLANET. PEOPLE. PADDOCK. Sustainability Framework, which identifies and manages social, economic and environmental risks and opportunities for the industry as a whole, is aiming to change this with new thinking.

The catalyst for this change has been the industry’s work to revamp its sustainability data framework into the ‘dependencies’ and ‘impacts’ cotton’s customers are increasingly using in sustainability reporting.

Some quick background is needed here. Every business or industry relies on different assets to produce its goods or services. For cotton production, that includes financial capital, natural capital (like soil and water), and human resources. ‘Dependencies’ are the functions provided by assets we rely on; for soil for example, we depend on it to grow cotton but also to optimise water infiltration and nutrient cycling. ‘Impacts’ are the drivers that increase or decrease the assets we depend on; soil health for example is impacted by drought and floods, but also by management practices that positively or negatively impact the habitat and food sources of soil.

This dependency and impact framework has allowed us to look at CRDC-funded research in a new way.

Recent research by Dr Ruth Nettle of the University of Melbourne into the resilience and flexibility of cotton farming business models spoke about cotton growers of all sizes aiming to continue farming until they wish to stop, keeping their ‘core’ employees (if they have them) as an absolute priority, and using casual or contract labour to fill in seasonal gaps.

This lends itself to three obvious dependencies: keeping farmers and core employees on farms, attracting casual and contract labour when needed, and keeping everyone safe and skilled.

Now, this is hardly rocket-science thinking. But to our knowledge, farm workplace sustainability hasn’t been clearly articulated like this before. And by identifying these as dependencies – what a farm relies on to operate well – it allows us to think about what impacts those dependencies and how to measure them.

Keep farmers & core employees

- Research shows us the impact drivers of keeping people in the industry are things like financial security, water availability, workplace culture, and community liveability.

Attract casual & contract labour as needed

- Casual labour will normally come from the broader community (e.g. cities, backpackers, migrant workers) and as a result, the availability of casual labour will be impacted largely by the perception the community has of the industry. This logic gives us two key drivers of attracting labour when needed:
  - environmental responsibility (the main driver of community trust and acceptance in agriculture)
  - providing safe, inclusive and fulfilling workplaces – i.e. having evidence of good human rights (diversity, fair pay, no exploitation etc)

Keep everyone safe & appropriately skilled

- Training and having plans are important (and for safety, are a legal requirement), but researchers are giving us insights into factors that have more impact on safety and skills.

In August, CRDC facilitated a workshop of some of the smartest brains in agricultural social research to pull our logic apart and refine our list of the most important impact drivers, and the most important indicators to measure these.

This refined list of farm workplace sustainability indicators will be shared with peers in other agriculture industry sustainability frameworks. Our aim is to contribute to rapid cross-sector agreement on social sustainability indicators, and to collaborate on how best to source data for these indicators.

We want to make sure we measure only what matters – moving past indicators we know are important but may have unclear value, to a compelling framework of what we need to measure and manage to keep, attract, protect and support human and intellectual capital on farms right around Australia.

For more

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Cotton growers have their say on safety

The *FarmSafe Safer Farms Report 2024* has been released, featuring cotton growers Jamie and Susie Grant discussing mitigating the risks of ageing on-farm, while Bernie Bierhoff talks about the need for growers to contribute to a fatigue management project, a first for cotton and agriculture.

Jimbour (Barunggam country) cotton grower Jamie Grant talks ageing in the new Safer Farms Report.

The Safer Farms Report is an annual report that cover topics like support and wellbeing, child safety, remote working, first aid, livestock handling, aging on farm, and vehicle and machinery safety. Key risks continue to centre around vehicles and machinery, large animals, and exposure to severe weather events, with farm property damage claims stemming from natural peril events increasing by 32 percent over the past year.

Every cotton grower can do their part to embed safety culture by focusing on integrating safer habits into their daily routines; put the helmet on every time, clip the seatbelt across you, check for bystanders and actively supervise children. Don't circumvent safety features, check in on each other, eat healthy foods and get some rest!

Cotton Australia represents the industry as a member of FarmSafe helping to advocate farm safety messaging in line with the industry's *my*BMP program. With FarmSafe, CRDC is a member of the Rural Safety & Health Alliance (RSHA), who are leading a new work health and safety (WHS) research project Farming and Fatigue: Growing Sensible Solutions. This research will help the industry to understand, measure and manage fatigue on-farm, and develop safe use guidelines for mobile plant and meaningful metrics for farm safety (see next story).

Fatigue on-farms was identified as an industry-wide priority for the RSHA, which leads the important research needed to underpin solid technical information.

Another priority topic is ageing. Recognising ageing on the farm as a safety risk is crucial for maintaining a safe and productive agricultural environment. As farmers age, physical and cognitive changes can increase the risk of injuries. Reduced strength, slower reaction times, and declining vision and hearing can all impact the ability to perform tasks safely. Jamie Grant has some wise words.

"The young people learn that the old people still have a lot to give," he says, "So, the younger ones have to nurture the older fellows, like the older fellows used to nurture the young fellows.

"You know, it all goes around the circle to ensure everybody is safe on farm."

The Safer Farms Report 2024 includes useful information and statistics around safety on farms and is suggested reading for anyone involved in working and living on-farm. The report can be downloaded from the FarmSafe website, and the Cotton Australia team are available to assist with implementing the *my*BMP WHS module.

"So, the younger ones have to nurture the older fellows, like the older fellows used to nurture the young fellows..."

For more
www.farmsafe.org.au/safer-farms-report-2024

Tailored fatigue management: a first for agricultural industries

MELANIE JENSON

Cotton growers have the opportunity to contribute to a fatigue management project for the industry, which has just kicked off in September.

Fatigue on-farm has been identified as an industry-wide priority for the Rural Safety & Health Alliance (RSHA), a partnership between CRDC and fellow Research and Development Corporations (RDCs) to improve primary production's health and safety record.

The project will deliver a practical, user-friendly guide to assist agricultural enterprises of all sizes to understand, measure and manage fatigue on farms.

Walgett (Kamilaroi country) cotton grower Bernie Bierhoff emphasised that fatigue presents in many different ways.

"As people get fatigued their sense of what is safe and what is not is blurred," he said.

"Employers limit work to a maximum number of days before a break, however senior staff like owners, supervisors and managers often don't take the time off they need, despite the best efforts of employers.

"Their day doesn't end with physical labour; it continues with planning and office work at home before the next day even starts."

The Farming and Fatigue: Growing Sensible Solutions project aims to guide industry to understand, measure and manage fatigue on-farm. The project is a collaboration between the Appleton Institute, the ag education and extension team at CQUniversity and AgHealth Australia at the University of Sydney.

Director of the Appleton Institute, Professor Sally Ferguson, is leading the project.

"Many Australian industries have been doing this for years – analysing specific elements of their operators' work that cause fatigue, understanding the specific consequences based on how their performance is impacted and managing that risk," Sally explained.

"That's what we want to learn for the farming sector."

Managing fatigue is not about "downing tools after X number of hours", as fatigue is inevitably higher at some times of the year and at certain parts of the day for different individuals working in different industries.

"The RSHA wants growers to have a clear understanding of what causes fatigue and how their current working patterns can be tweaked a little bit to manage the risk better," Sally says.

"It's not about saying to farmers, 'You have to change your entire schedule', it's about asking, 'What do you need to be thinking about while you're working to keep yourself safe, happy and productive?'"

The fatigue management guide will help growers identify 'hot spots' – where and why fatigue might be an issue in their operation, and how to deploy controls to reduce potential harm of fatigue without impacting production. Ultimately the goal is to support health and safety, both short term wellbeing as well as longer term, because work practices that challenge your body not only affect productivity, but also put pressure on physical and mental health. By extension it is hoped that this work will reduce on-farm injuries and even deaths.

ABOVE: Technology is changing the way we farm. Prior to the advent of John Deere round bale cotton pickers, harvest saw paddocks full of people and machinery. While efficiency gains have been huge, it has created a situation where people are often working in more isolated conditions.

Bernie looks forward to the outcomes of the project and hopes it will improve safety outcomes for all agricultural workers.

"'No job is worth getting killed over' is something I hear constantly from my wife when she is telling me to slow down," Bernie said.

"She's absolutely right, and that's what makes this such a worthwhile project.

"At the end of the day, we want all of our employees to be safe at work and be able to go home to their families, and this project is working towards that goal."

The Farming and Fatigue project is supported by the RSHA which is a partnership between CRDC, AgriFutures Australia, Australian Eggs, Australian Wool Innovation, Australian Pork Ltd, Dairy Australia and the Grains Research and Development Corporation.

For more

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Setting her sights on the future

Long-term profitability and resilience are priorities for cotton growers across Australia, where irrigation water reliability varies considerably from season to season.

Kate (centre) with Nuffield Chair Jane Bennet and former cotton industry supported Nuffield Scholar and Director Nigel Corish at the awards evening in early September.

Under her 2025 Nuffield scholarship, agronomist Kate Lumber will study how Australia's cotton industry can use water more efficiently to help strengthen resilience in a changing climate.

Kate is a part of Poole Ag Consulting, based in Moree in northern NSW (Kamilaroi country) servicing the cotton, grains, grazing and citrus industries. Her Nuffield study topic is centred around growing cotton in limited water scenarios and gaining a better understanding of manipulating cotton physiology and the farming system to grow reliable semi-irrigated crops.

"My role in involves agronomic and farm business consulting, working with growers to address their key constraints and providing a solutions-based approach to implementing change, to improve the productivity, efficiency and sustainability of their farming system," Kate said.

"Long-term profitability and resilience is a priority for cotton growers not only in the Gwydir Valley but across all valleys where irrigation water reliability varies considerably from season to season.

"Moving forward we must adapt to a changing climate and maintain productivity with fewer inputs.

"I'm really interested in how we can make improvements to the semi-irrigated cotton production system to maximise return per megalitre of water and maintaining productivity and profitability in low water years."

Kate is keen to travel to Texas and California as part of her scholarship to see farming systems that implement limited water irrigation and manipulate growth to manage water use efficiency.

"I'm looking to engage with researchers at Cotton Incorporated in the US to best understand the current research and technical services available to growers.

"From here I'll look towards countries like Brazil, Greece, Argentina, Turkey and Egypt, to increase understanding my understanding of growth regulation in limited water scenarios.

"To gain a well-rounded understanding of the subject I want to engage with growers, industry personnel and researchers alike observing farming practices, analysing field trials and observing key technologies employed in managing water use efficiency.

"My proposed area of study builds on work by Nuffield Scholar and cotton grower Richard Quigley who explored how to increase the viability of rain grown and semi-irrigated production systems by maintaining crop residues.

"I am very passionate about this and look forward to expanding my understanding further."

Kate is no stranger to learning or leading. She was a University of New England country scholar, completing a Bachelor of Rural Science in 2015. Testament to Kate's proactive role in agriculture and the cotton industry over many years, she was a finalist in the CRDC Chris Lehmann Young Cotton Achiever award in 2023. She is the vice chair and major event co-ordinator for the Gwydir Valley Cotton Growers Association, and a founding member of Young Aggies Moree, holding executive positions including chair since 2016. Most recently, Kate has just graduated from the Australian Future Cotton Leaders program.

Her Nuffield scholarship is supported by Cotton Australia and CRDC.

"We are so fortunate to have a collaborative and proactive research body in the CRDC, who prioritise being at the forefront of innovative solutions, technologies and practices to ensure productivity and resilience in an evolving climate," Kate said.

"I have gained a considerable understanding of the subject already through published and extension-driven research and experiences growing cotton in multiple valleys and under varied management systems over the past decade – and I look forward to learning more through my Nuffield travels and studies."

CRDC Executive Director Allan Williams said Kate's study topic strongly aligns with CRDC's commitment to grow the sustainable future of cotton.

"Supporting people like Kate who have practical experience in the industry and understand the agronomic and scientific aspects of cotton growing is of great value," Allan said.

"Kate is passionate about growing cotton and invested in the success of others.

"Kate has said that in 10 years, she would like to be a leading cotton consultant in the Gwydir Valley, a collaborative leader in the Australian cotton industry and helping to engage and foster the next generation of young agricultural professionals in our community and industry.

"With our co-sponsors Cotton Australia, we are delighted to be supporting her on this journey."

For more
www.nuffield.com.au

MELANIE JENSON

Future leaders graduate to full house of support

Cotton's emerging leaders showed why the cotton industry is regarded as innovative and progressive at packed event on the eve of the Australian Cotton Conference in August at the Gold Coast (Bundjalung country).

The Australia Future Cotton Leaders Program (AFCLP) program is run by Cotton Australia with support from CRDC. This year, a record 46 people applied for the opportunity, resulting in the selection panel extending the participant number from 15 to 16 due to the number and quality of applicants.

Run by leadership specialist Jo Eady of RuralScope, the course is designed to prepare people for leadership in any sector of the industry. The 2024 cohort featured a record number of cotton growers, along with consultants, merchants, and research and extension personnel. Each participant develops and implements a project of personal interest as part of the course, providing an opportunity to develop and practice leadership skills through real-life scenarios.

As participants are situated over a large area, spanning the cotton growing valleys, the course consists of interactive online discussions, one-on-one coaching and integration with industry activities and some face-to-face meetings. This culminates with final activities and leadership events at the Gold Coast prior to graduation at conference.

Cotton Australia CEO Adam Kay said he is excited about the potential of the 2024 graduates to advance the already outstanding reputation of Australian cotton.

"Half of the 16 participants are growers, and they will be able to immediately apply what they have learned to their respective farms and share that knowledge with their local farming communities," he said.

"Likewise, those graduates from other parts of the industry will also be able to positively impact their own areas of focus."

Nothing but praise

Gunnedah (Kamilaroi country) cotton grower George McCalman said he enjoyed learning about leadership.

"The course helped me to fully understand other parts of the industry and also how to be an effective leader, and if I think that will help me to be a better farmer and business operator," George said.

"I created a list of barriers and solutions that I'm sharing by email with all Cotton Grower Association (CGAs) and will then have a zoom call with reps from across CGAs to encourage sharing and uptake of solutions.

"A key one is for CGAs to have a dedicated young person for others to contact, alongside office bearers, as other young people are not likely to contact the current office bearers."

Jo said George was a great young industry leader, who was a finalist in the Australian Cotton Awards this year with his family business including parents Scott and Jo.

"George is working on supporting his CGA and has now extended to other CGAs also to support them to be more inclusive of young people," Jo said.

Narrabri (Kamilaroi country) cotton grower Sam Carberry is working on a project to build himself and his family business as an employer of choice.

Growing up on a cotton farm as a fourth-generation cotton farmer, Sam is closely tied to the industry. Keen on improving leadership skills and expanding professional networks, he decided to join the Future Cotton Leaders Program. Pursuing industry advancement, Sam attended Marcus Oldham Ag College under an Upper Namoi CGA scholarship, completing a gap year at a property near Boggabri.

Now managing his family farm's cotton growing and irrigation, Sam uses his knowledge for sustainable growth. Actively participating in groups like Namoi Water, he understands the importance of youthful representation in steering positive change within their regions.

"I see the AFCLP as crucial for enhancing my role in the family farm business," Sam said.

"The skills I have gained will not only benefit our farm but also enables me to be more actively involved in upcoming industry initiatives.

"I have developed and am trialling ideas like a monthly photo comp on our farm to encourage a healthy group dynamic between our staff, and engaged in activities like AgCAREERSTART to help build our business as we transition the management from my dad Mike to myself."

Assistant farm manager Sarah Vivers has a really strong interest in the non-technical skills area, which showed during the program.

"Sarah has done a great project about working out the needs of new entrants into the industry/cotton enterprise," Jo said.

"She has also provided input into the Australian Cotton Enterprise Non-Technical Guide for New Entrants that was launched at the conference as part of the CRDC-supported SHIFT project."

Sarah and her employer, Weemelah (Kamilaroi country) cotton grower Sam Heagney of South Bunarba Ag, also joined a SHIFT workforce panel at conference. Sarah has recently been promoted to Assistant Manager at South Bunarba Ag and as such shared her insights.

Graduate Georgie Flick, an agronomist from Goondiwindi (Bigambul country), said the course was definitely beneficial.

"I really improved my communication skills and how to be effective with varying personality types in the industry," Georgie said.

"What I gained will help my career because I will be better able to serve the local cotton community."

Some of the participants could already be considered leaders in their field, such as Dr Alison McCarthy. Alison is a former CRDC-supported PhD student and mechatronic research engineer in irrigation and cropping systems within the Centre for Agricultural Engineering at the University of Southern Queensland. She has developed novel sensor processing algorithms to automate irrigation in cotton and pasture, and machine vision systems.

Alison received the 2021 International Young Professionals Award and was a co-recipient of the 2018 Cotton Seed Distributors (CSD) Researcher of the Year Award. So what does this course offer such an accomplished scientist like Alison? She says this program has given her an opportunity for self-reflection and personal development to enhance her leadership into the future.

"The program has enabled me to step back and take the time to focus on understanding my life and career goals, core values, strengths and opportunities for growth," Alison said.

MELANIE JENSON

MELANIE JENSON

ABOVE: Grace Griffiths was one of the emcees for the evening, which included a guest speaker and panel session.

OPPOSITE PAGE: Celebrating the future with their graduation (at rear) Angus Whittaker (grower, Darlington Point NSW), Hayden Petty (crop consultant, Leeton NSW), Sam Carberry (grower, Narrabri NSW), Georgie Flick (crop consultant, Goondiwindi Qld), Angus Marshall (cotton extension, Katherine NT), Rhys Herbert (grower, Warra Qld) and Jack O'Neill (grower, Narrabri).
At front: Prue Byrnes (grower, Rowena NSW), Sarah Vivers (assistant farm manager, Weemelah NSW), Alison McCarthy (cotton researcher, Toowoomba Qld), Grace Griffiths (grower/consultant, Goondiwindi), Jacob Booby (merchant, Narrabri), Kate Lumber (crop consultant, Moree NSW), Brendan Murray (merchant, St George Qld) and George McCalman (grower, Gunnedah NSW).
Absent: Greg Pearce (crop consultant, Goondiwindi).

"This culminated in me developing a five-year research plan and identifying strategies to achieve these goals to maximise impact of my research for the cotton industry."

History of success

Previous AFCLP participants have moved into senior positions within Australian cotton, with many former graduates on boards including Cotton Australia, CRDC and CSD, as well as CGAs and other industry committees and projects.

Held every two years, the AFCLP is run and coordinated by Cotton Australia with funding from CRDC. The program, designed for emerging leaders, has produced 116 graduates since the concept was devised back in 2006. Leadership is one of the key priorities in both the Cotton Australia and CRDC five-year Strategic Plans, showing the importance of building human capacity to the industry. CA and CRDC jointly support the AFCLP, and other leadership programs, including the Australian Rural Leadership Foundation's TRAIL and Australian Rural Leadership Programs, and Nuffield Australia Farming Scholarships. One of the 2024 ARLP graduates, crop consultant Kate Lumber, has recently been announced as cotton's latest Nuffield scholar (see story page 29).

CRDC's Innovation Broker Rachel Holloway oversees human capacity and leadership projects and said it was fantastic to see the AFCLP graduation event so well supported.

"Leadership is one of the key priorities in both the Cotton Australia and CRDC five-year Strategic Plans."

"The buzz from this next generation is inspiring," she said.

"Future leaders are certainly lining up for this program, and graduates thoroughly enjoy being part of it which is evident in the program evaluation – 100 percent of participants would recommend it to others.

"CRDC congratulates the 2024 participants on their graduation and their leadership projects that will make positive impact on the industry."

For more

Profiles for each of the 16 current participants can be found here www.cottonaustralia.com.au/2024-australian-cotton-leadership-program-participants

A panel session at the graduation included Cotton Australia's Paul Sloman, Nuffield Australia's CEO Jodie Redcliffe, current Australian Rural Leadership Foundation (ARLF) participant Sam Lee, ARLF Chief Executive Matt Linnegar, workplace researcher and SHIFT creator Dr Nicole McDonald, grower and Nuffield scholar Renee Anderson and Cotton Australia Policy Manager Mike Murray.

MELANIE JENSON

Stopping the rot: many causes of a complex disease

Cotton industry pathologists have been surprised to find that boll rot is being caused by unexpected pathogens, adding to the complexity in offering growers solutions to manage the disease.

Boll rot is a deceptively generic term that covers a complex disease that can be caused by one of 170 (known) bacterial and fungal species or pathogens. Symptoms vary dependent on the pathogen, yet the outcome is the same: yield loss due to boll drop and/or bolls failing to open resulting in tight lock.

Boll rot development is favoured by rainfall and humidity deep in the plant canopy, hence yield losses are more significant with frequent rainfall and dense crop canopies. Fungicide applications have limited efficacy in managing boll rots as there are no cost-effective fungicides known to control such a wide range of pathogens. Furthermore, it may be difficult for fungicide sprays to reach the target as most rotten bolls are in the lower canopy of dense crops.

Surveys uncover impact

NSW DPI pathologist Dr Duy Le undertakes the early and late season disease surveys in NSW, while Dr Linda Smith of Qld DAF covers Queensland, with ongoing support from CRDC. Duy says it's during surveys that he is seeing the broad impact along with the variation of symptoms and causes of boll rot, which he felt he should share with growers and consultants.

"In Australia, thanks to breeding successes, boll rot associated with the bacterial blight pathogen is no longer a concern for crop managers," Duy said.

"On the other hand, fungal species such as *Colletotrichum, Diplodia, Fusarium*, *Phytophthora* and *Sclerotinia* are known pathogens of cotton boll rot yet limited knowledge exists about species identification and the diversity of these primary pathogens.

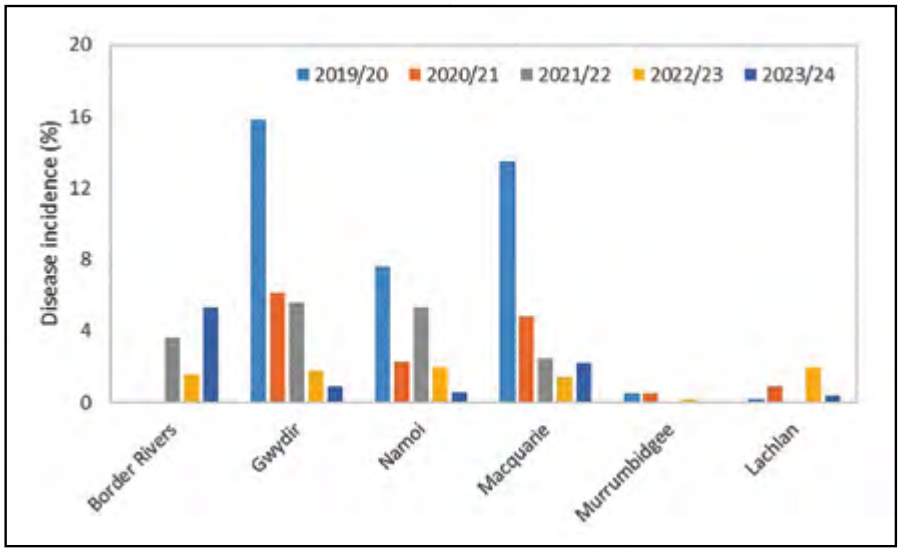

Figure 1: Prevalence and distribution of cotton boll rot across NSW in the past five seasons from 2019 to 2024.

"For example, *Colletotrichum* (anthracnose) boll rot was deemed to be associated with *Colletotrichum gossypii*; however, we recently isolated and identified *Colletotrichum truncatum* as the main pathogen species in NSW.

"Similarly, in bolls exhibiting Fusarium boll rot we found a predominant population of *Fusarium incarnatum-equiseti* species complex, which was deemed to be a minor fungal species in the literature."

The surveys also show that the pathogen dynamic varies annually.

During the 2020-21 season, pathologists recovered a large number of *Phytophthora* isolates, but not in other seasons. Similarly, *Sclerotinia*-like isolates were recovered more in the 2021-22 season due to the prevalence of the *Sclerotinia* boll rot. In the past five seasons, *F. incarnatum-equiseti* was the most common pathogen recovered.

Boll rot is a serious issue for growers, with reports of significant yield losses. Duy's surveys over the past five seasons showed boll rot impact peaked in northern NSW valleys in the wet 2019-20 season when disease incidence was more than 25 per cent in many fields. In the Macquarie, up to 48 per cent of one dense canopy crop was affected. Subsequently, Duy says, yield losses were estimated up to 20 per cent in many fields.

"In wet seasons from 2019 and 2022, boll rot was of more concern in term of its effect on yield than wilt diseases," Duy said.

"The CRDC and Crop Consultants Australia 2021-22 survey report showed only seven per cent of respondents reported no yield penalty caused by boll rot in their clients' crops.

"The worst we saw this 2023-24 season was devastating yield loss of up to 30 per cent in a field near Forbes, again highlighting the potential for this disease to have a significant impact.

"Thankfully over the past two seasons, we are seeing a relatively minor presence during our late season surveys, taken between the last irrigation and the first defoliation (Figure 1)."

Managing variability

Duy says the more they begin to discover what causes boll rots, it becomes

ever more complex which makes it challenging to manage.

Dr Linda Smith said previous research and data collected by the late industry pathologist Dr Stephen Allen during disease surveys from 2000 to 2011 (Figure 2) highlight the variability in the incidence of boll rots from season to season across Qld and NSW. The impact of seasonal variability on boll rot incidence is still monitored during disease surveys.

Linda said the variability in boll rot incidence in Emerald (Gayiri country) in Central Queensland (CQ) was related to planting date and number of rainy days in January and early February.

"Crops planted after October 16 had less than five per cent boll rot," she said.

"Prior to the 16th, boll rot incidence was likely related to whether it was a wet or dry season, therefore, we can assume there will be challenges for managing boll rot in CQ if planting is early and in growing long-season cotton."

Stephen also examined the incidence of boll rot and tight lock (also known as hard lock) in CQ on normal and okra leaf cotton. Okra leaf cotton had a lower incidence of disease than normal leaf cotton and is recommended as a good option for managing these diseases.

"It is timely that okra leaf varieties are becoming available to growers," Linda said

"There is also increasing interest in fungicide options to manage boll rot and tight lock, however numerous studies conducted overseas have shown

A generic boll rot comes with an array of signs and symptoms induced by one of 170 different pathogens.

that results are extremely variable and have limited efficacy in managing these diseases.

"Trials conducted in Emerald investigating fungicide and insecticide application alone and in combination did not have any significant effect on tight lock incidence."

Further trials at Emerald to examine the potential of a fungicide applied as a foliar treatment during early flowering in cotton had no effect on the incidence of tight lock.

"However, when the diversity of fungi present in seed were examined, it appeared that the fungicide reduced *Alternaria spp.* and increased *Fusarium spp.* compared to the control treatment," Linda said.

"It is possible that the proportion of isolates belonging to a particular genus or species may be altered following application of fungal treatments, with no effect on the overall incidence of disease."

Duy says row spacing could also be a preventative measure, based on what he's seen during the surveys.

"We noticed that boll rot was a minor concern in a wide row configuration (60 inch) and single-skip, even in the peak boll rot season," he said.

"These configurations opened the canopy and facilitated better air circulation and drying. However, they may not be a feasible option in many irrigated crops since yield can be compromised in a low-pressure season for boll rot."

For more
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Options for management

Dr Linda Smith says there are options for management.

"Many species of microorganisms (mostly fungi) have been implicated as causes of boll rots," Linda says.

"Many are opportunistic wound pathogens that cause rots following insect damage or other wounds to bolls, while others are secondary invaders of already-diseased tissue.

"A few are described as primary pathogens since they can enter intact bolls directly or through natural openings. So suggested management practices are focused on pests, planting configurations and irrigation timing."

Linda recommends considering:

- **Field selection – as poorly drained soil will retain more water and have higher relative humidity.**
- **Variety selection – which helps to determine plant growth potential and risk for rank growth. Other variety characteristics associated with reduced boll rot include okra leaf for improved sunlight penetration.**
- **Skip-row planting patterns and lower in-row plant density – improves air movement and drying which reduces the relative humidity within the canopy.**
- **Planting date – to avoid potential rainfall during the square and boll formation stage based on historical data if available.**
- **Balanced nitrogen fertilisation – to supply the developing crop without promoting excessive vegetation.**
- **Vigilant insect scouting and prompt response to confirmed outbreaks – to diminish injury and subsequent boll rot.**
- **Pix applications – to maintain desirable growth characteristics.**
- **Thorough incorporation of crop residues – as soon as possible after harvest.**
- **Crop rotation with non-hosts – avoiding back-to-back cotton.**

For more
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Protecting the north: learning more about a major threat

Since the introduction of Bollgard 3 varieties, cotton production has expanded across several regions in northern Australia.

Learning to live with pests: Sharna Holman has been developing industry knowledge about cluster caterpillar to safeguard production in the north.

While Bollgard 3 (only registered in Australia for the control of *Helicoverpa*) effectively controls a range of moth pests, cluster caterpillar *(Spodoptera litura)* larvae have been observed surviving intermittently in cotton crops.

Cluster caterpillar can cause damage to a wide range of agricultural crops and has been a frequent and historical pest concern of non-Bt cotton in northern Australia since the 1950s. In the Ord River Irrigation Area, the regular use of synthetic insecticides for controlling a caterpillar complex including cluster caterpillar ultimately resulted in resistance in cotton bollworm *(Helicoverpa armigera)* leading to industry failures by 1974.

These historical challenges with pests and weeds have ensured sustainable crop protection remains a high priority for northern growers. CRDC is supporting Qld DAF and CottonInfo Biosecurity Technical Lead, Sharna Holman, to conduct research to identify the factors influencing larval survival as part of her PhD studies. This research will inform pest and resistance management strategies for cluster caterpillar in tropical growing regions.

Sharna's research has examined the effects of Bt proteins in different combinations – such as Cry1Ac only, Cry1Ac and Cry2Ab, and Cry1Ac, Cry2Ab and Vip3A – against key caterpillar pests, *H. armigera, S. litura* and *S. frugiperda* found in tropical regions. Results demonstrated that Bollgard 3 cotton provides effective crop protection against all species, with very few individuals able to successfully emerge as moths.

However, for *Spodoptera* species, Vip3A was primarily responsible for providing control with a lesser contribution from Cry2Ab. The reliance on two of the three proteins in Bollgard 3 is likely a contributing factor to the intermittent survival of larvae observed in cotton fields. Additionally, it highlights the importance of preserving the susceptibility of Vip3A in *Spodoptera* species for sustainable pest management in northern Australia.

Building off these results, further work has been conducted over the past three seasons in Kununurra (Miriwoong country) in WA to better understand other factors that might contribute to survival such as crop stage, selection of feeding site and environmental stress.

"Another key finding from my research is that when cluster caterpillar larvae have the option of alternating between Bollgard 3 and non-Bt leaves, the likelihood of survival is much greater compared to larvae feeding exclusively on Bollgard 3 leaves," Sharna said.

"The potential for greater survival where non-Bt food sources are available within Bollgard 3 crops, for example weeds, may have implications for management although further research is needed."

This PhD research program brings together different stakeholders including Qld DAF, the Western Australia Department of Primary Industries and Regional Development (WA DPIRD) and the University of Queensland (UQ). As part of this project, Qld DAF are collaborating with Dr James Hereward from UQ to better understand the genetic structure and potential gene flow of cluster caterpillar populations across northern Australia to help inform resistance management strategies for this species.

Although Bollgard 3 is not registered for cluster caterpillar, growers and consultants can still apply best management practices to delay the evolution of resistance. This may include planting unsprayed cotton refuges for cluster caterpillar (pigeon pea is not considered to be a host), or using an alternative mode of action, such as an insecticide, if larval populations are high.

"While Australia has its own endemic *Spodoptera* species, like cluster caterpillar, other exotic *Spodoptera* species, such as *Spodoptera littoralis, Spodoptera cosmioides* and *Spodoptera ornithogalli,* could also arrive and establish," Sharna said.

"This research may provide insights into the potential management of other Spodoptera species in cotton if they were to arrive in Australia."

For more

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