

# Spotlight

ON COTTON R&D

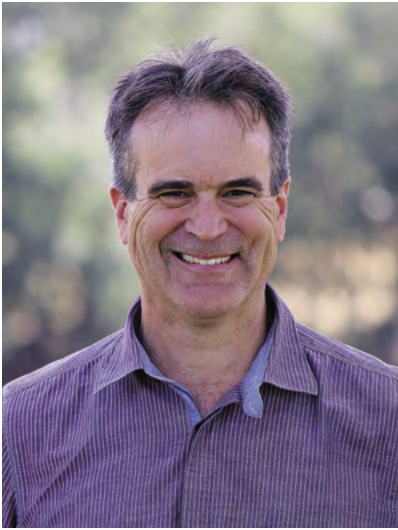
SUMMER 2023-24

Circularity: Advocating  
for sustainability

Billion dollar cost of  
invasive weeds

Growing together  
with grains





Allan Williams

# In the Spotlight

Hello to our readers. As CRDC's Acting Executive Director I have the pleasure of introducing you to this summer edition of *Spotlight*.

It's been a busy time for us as we start to deliver the new strategic plan *Clever Cotton* and welcome a new Board of Directors. We've profiled the new faces in this edition, who along with our Chair Richard Haire and returning board member and cottongrower Ross Burnett, are working with us to achieve our ambitious targets.

Collaboration is a key focus of *Clever Cotton*. In this edition, we discuss some of the many ways CRDC is working with the Grains Research and Development Corporation (GRDC) on cross-industry issues. It's certainly not a new partnership – we've been working together on important research projects for our grain and cotton growers for decades – but we're working more closely than ever to address common issues and invest in shared facilities and projects.

In this edition, we also take a deep dive into one of our new investment areas – the circular economy. In particular, we look at the end-of-life management of cotton garments and fabrics and how returning them to the soil in cotton fields may be a solution to Australia's textile waste problem. We hope you enjoy our story on cottongrower Sam Coulton, who hosts the CRDC-supported circularity trials returning cotton fibre to the soil. Sam is a true champion of cotton and agriculture, his community and his town. This project supports concurrent research to establish the viability of processing textile waste in regional areas and takes a closer look at the soil science behind composting cotton. It's an exciting field of work with huge potential benefits for Australian cotton.

I'd like to take this opportunity to welcome another true champion of cotton, Janelle Montgomery, to the role of CottonInfo Program Lead. Janelle is stepping into the leading role from her most recent position as CottonInfo Regional Extension Officer. While she will certainly be missed in the Gwydir and Mungindi regions, Janelle is looking forward to working with growers across all regions as she works to keep CottonInfo a trusted source of information.

One of the key focuses for CottonInfo and CRDC as we move into summer is weed management. Unfortunately, this time of year can make growers shudder, as it's when the herbicide drift damage danger period can intensify. Rowena cottongrower Bernie Bierhoff shares his thoughts with us on how the new spray management tool WAND is a must-use for all growers. WAND provides crucial information to help growers avoid those hazardous inversions that are often responsible for the most severe and widespread drift events. It may seem counterintuitive, but WAND has actually been proven to find more suitable spraying time, not less. Our 2023 CRDC Grower Survey has some startling figures on the cost of herbicide drift onto cotton last season. We've given you a quick snapshot of the survey, which can be also found online with an interactive digital dashboard to allow you to really dig into the results.

Finally, in this edition you'll see our Annual Report review. It's a quick snapshot of all our investments over the last year and represents so many initiatives delivering impact for you, our growers. The full report is available on the CRDC website.

Happy reading!

Allan Williams  
Acting Executive Director



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



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

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MELANIE JENSON

**ON THE COVER:**  
 CRDC's Acting General Manager, Innovation, Dr Merry Conaty with Goondiwindi cotton grower, clothing producer and innovator Sam Coulton.

## Want to see more of Spotlight?

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

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## 2024 CottonInfo Calendar puts 'water in focus'

AS water use efficiency remains in the spotlight with a forecast El Nino, the CottonInfo team decided the focus of its 2024 calendar would be water. Each month of the calendar features a QR code to link growers and consultants to water-related resources relevant to the season. CottonInfo Technical Lead for Irrigation Lou Gall and new CottonInfo Program Lead Janelle Montgomery advised on the calendar content, based on their wealth of water knowledge.

"The CottonInfo website is an incredible resource, so this is a great opportunity to reconnect growers and consultants to the library of information, trials, tools and outcomes that are housed there," Janelle said.

"With the forecast for drier conditions this season, it's more important than ever to plan, be prepared and have a good connection with your local CottonInfo extension officer."

Of course, at the heart of the calendar are gorgeous images, and this year there were dozens of photo submissions from nearly every cotton growing valley in Australia, from far North Queensland to southern NSW.

The winning shot chosen for the front cover was taken and submitted by Annabel Noonan of Nevertire NSW (Wiradjuri country). Annabel wins a CottonInfo cap and a \$50 voucher for her efforts.

A copy of the calendar is included with this edition of *Spotlight* for our subscribers.

**For more**  
**2024 Cotton Calendar**  
[www.cottoninfo.com.au/cottoninfo-cotton-calendar](http://www.cottoninfo.com.au/cottoninfo-cotton-calendar)



CRDC's new \$10m Australian Cotton Disease Collaboration (ACDC) is overseen by CRDC Innovation Broker Elsie Hudson, who says the call for potential project collaborators has been highly successful.

MELANIE JENSON

## World-class disease program takes shape

THE design of a novel, world-class cotton disease research program is well underway, with plans to create a national centre for disease involving a multi-disciplinary team of experts.

The Australian Cotton Disease Collaboration (ACDC) investment was announced this year by CRDC and is overseen by CRDC Innovation Broker Elsie Hudson. This \$10 million RD&E investment over five years signals a change of approach under the new CRDC Strategic RD&E Plan, Clever Cotton – a long-term, co-invested, co-designed collaboration. This involved an open call expression of interest (EOI) process for partners to collaborate on solutions to mitigate the effects of diseases on Australian cotton production.

"Under the Disease sub-theme in Clever Cotton, our goal by the end of the plan in 2028 is that the economic impact of current and emerging cotton diseases is reduced to less than five per cent of the cost of production through practice change underpinned by efficient and collaborative RD&E," Elsie said.

"Our strategic approach for ACDC is being co-designed by CRDC, senior leaders of the Centre for Crop and Disease Management at Curtin University and the shortlisted strategic partners.

"Through this co-design process we are creating a world-class cotton disease research program that will deliver benefits for the industry and build research capacity for our future."

The focus has been to develop a program logic approach built around the four domains of need identified in the review:

- ◆ Domain A: systems-based disease control packages.
- ◆ Domain B: understanding pathogen behaviour, phenotype, genotype and interactions between the pathogen and host.
- ◆ Domain C: focused on increased adoption of spatial data analytics and advanced modelling capabilities for disease prediction and management.
- ◆ Domain D: investment in supporting the testing and introduction of new actives (fungicides and mediators of plant defence) for disease control.

CRDC's EOI outlined three partnership tiers based on the level of commitment to co-invest in ACDC: strategic, project and associate partners. Strategic partners have been shortlisted in Domains A and B.

"The recommendation is for ACDC to be run as a virtual national centre, with a director for national coordination and oversight, and a national leader for Domain A and for Domain B," Elsie said.

"Domains C and D will be addressed under Domains A and B once finalised."

"Through this co-design process, partners and participants will know exactly what they're bringing to the table and what they're getting in return, so we're aligned and hit the ground running. A lot of effort is required to build these relationships, but it ensures a legacy that lives on."

**For more**  
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# Cotton industry welcomes new CRDC board in Narrabri

**WITHIN** a week of being announced by the Minister for Agriculture, the new CRDC Board met in Narrabri NSW (Kamilaroi country) in October, beginning their journey to grow Australia's cotton industry by \$1 billion over the next five years under CRDC's new Strategic RD&E Plan Clever Cotton.

CRDC has an eight-member Board, consisting of Chair Richard Haire, Acting Executive Director Allan Williams, and six Non-Executive Directors nominated by an independent selection committee and confirmed by the Minister, Senator the Hon. Murray Watt.

The Directors represent an exciting mix of well-known cotton industry faces and those less familiar who will bring their outside expertise to the industry.

Director Ross Burnett, a Central Queensland grower based at Emerald (Gayiri country) has returned to the Board for a second term. Ross is joined by Trangie NSW (Wiradjuri country) cotton grower Sally Ceeney, who has held industry positions within both CottonInfo and Cotton Australia, and 2022 Service to Industry Awardee, Bernie George of Australian Food & Fibre at Narrabri. Bernie has extensive experience in large scale irrigated agriculture, land and water asset development and natural resource management spanning decades.

Joining these directors are Julie Bird, Michelle Tierney and the Hon. Niall Blair.

Julie brings a wealth of research and development experience to the role as current Chair of CRDC's fellow research and development corporation (RDC), Hort Innovation. She has also held roles as Director and Deputy Chair of Plant Health Australia, CEO of the Almond Board of Australia, and Non-Executive Director of United Almonds Limited and the Australian Nut Industry Council.



Hitting the ground running and with a smile are the CRDC Board members (at back) Julie Bird, Ross Burnett, Acting Executive Director Allan Williams, Bernie George, (front) Chair Richard Haire, Niall Blair, Sally Ceeney and Michelle Tierney.

Michelle is an experienced board member and senior executive across ASX and NZX 50 organisations respectively. She is a Director of Stride Property Group, Growthpoint Properties Australia and Peet Limited and has 20 years of executive experience in the property and funds management industry.

And many in NSW may be familiar with the Hon. Niall Blair who is a former NSW Minister for Primary Industries, Trade, Industry and Water. Today, Niall is a Professor of Food Sustainability and an environment, social and governance (ESG) specialist with more than 25 years' experience across government and the private sector, specialising in risk management, food and fibre production systems, circular economy solutions and sustainability.

CRDC's new board will oversee the implementation of Clever Cotton, which will guide CRDC's RD&E investments from 2023 to 2028.

"Clever Cotton is our most ambitious

strategic plan ever – our goal is to turn a \$125 million investment into a \$1 billion return for the industry over the next five years," Chair Richard Haire said.

"The diversity of Directors appointed to our board and the skills they each bring ensures we are totally equipped to take on this challenge.

"The two-day board induction in Narrabri in October enabled us, the CRDC team, growers and key research partners to work out how we can most effectively deliver the Clever Cotton plan by mapping out clear goals, our investment approach and our planned impact.

"It's exciting to welcome a passionate new team of directors to CRDC, and at the same time, it's great to have grower Ross Burnett returning for a second term to provide continuity.

"To our outgoing board members, I express a sincere thank you for the dedication to advancing Australia's cotton industry and helping devise a Strategic Plan that prioritises the things that matter to growers: our paddocks, our people, and our planet."

CRDC Acting Executive Director Allan Williams said the new Directors have come onboard at an exciting time for cotton industry innovation.

***"The two-day board induction in Narrabri in October enabled us, the CRDC team, growers and key research partners to work out how we can most effectively deliver the Clever Cotton plan"***

“Australia’s cotton industry has long been synonymous with innovation, but with the range of technologies available to us now, and more coming online every day, it’s a really exciting time to be a part of CRDC – helping to shape the next iteration of innovations to improve farming efficiencies and meet changing expectations around sustainability and supporting data.

“We are also focused on leveraging grower’s research dollars further by

enhancing our collaboration with fellow RDCs – in particular the Grains Research and Development Corporation (GRDC).

“This was highlighted by the Board’s visit to a new shared pathology facility being built at the Australian Cotton Research Institute here at Narrabri, with support from both CRDC and GRDC, where grains and cotton scientists will work side by side.

“This is just one of the many collaborations underway between our

two RDCs, as together we tackle issues around weed and herbicide resistance management, spray drift and workforce.

“We’re a natural partnership fit given most, if not all, cotton growers are also grain growers.”

**For more**

**Allan Williams**

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## Survey provides link to on-farm views and practices

**WHAT** do you think about the future of the cotton industry and do you ever wonder what other growers think? Do you know how much other growers are spending on herbicides or what tools they are using to better manage weeds, water or emissions? The 2023 CRDC Grower Survey report has the answers to these questions and is available now online.

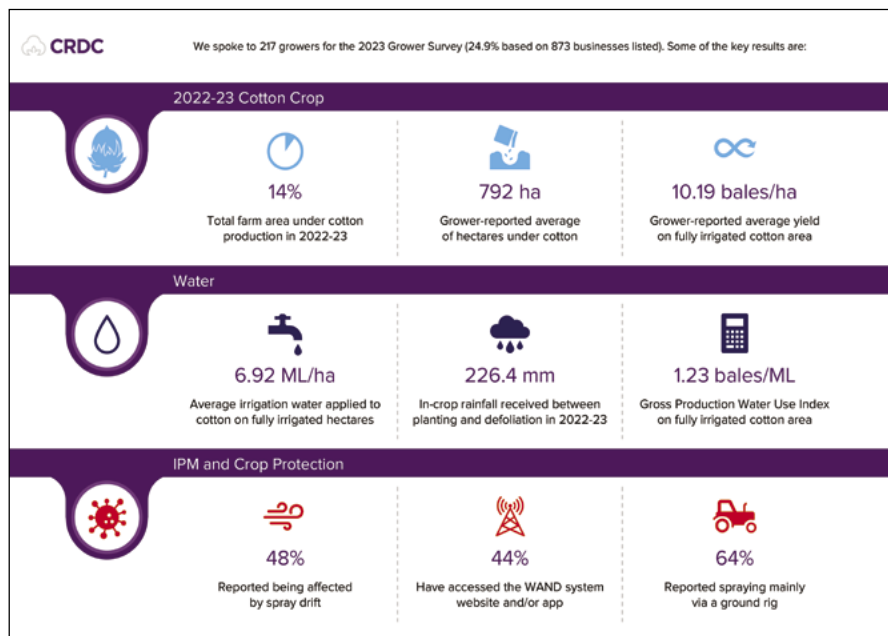
“The surveys are an important avenue for growers and consultants to let CRDC and the industry know what is happening on the ground, on an anonymous individual level,” says CRDC’s Ruth Redfern, General Manager, Communications and Extension.

“The research team spoke to 217 growers for the 2023 survey, which is around 25 per cent of all cotton growers.

“I’d like to extend a thanks to all of the growers who participated, because this information is so important in helping us understand what is happening on-farm, and in identifying research gaps and priorities for future investment.

“Equally as important is that the survey is way for a growers to have their say about on-farm issues, to express their level of satisfaction with their levy investment, and their thoughts on effectiveness of R&D information. The results also provide a great way for growers to look over the fence at what other growers are doing.”

In this year’s survey, CRDC asked growers their opinion on whether the RD&E levy is achieving the outcomes expected. The resulting satisfaction rating was 7.5 out of 10. The survey also found that 82 per cent of growers believe CRDC’s investments in R&D are addressing the challenges that growers face, and 82 per cent feel CRDC and CottonInfo have contributed to improving productivity.



**The full 2023 CRDC Grower Survey is available now for download or go to CRDC’s website to see the Digital Dashboard.**

In terms of practice change, 83 per cent of growers believe CRDC’s investments are creating practical on-farm solutions for growers to adapt into their production systems – and 58 per cent had made changes over the past five years as a result of RD&E outcomes funded by CRDC. A further 20 per cent have plans in progress or intend to make changes.

Of the 217 growers surveyed, 14 per cent of their farm area was under cotton production in 2022-23, with an average yield of 10.19 bales/ha for fully irrigated crops, using on average 6.92 ML/ha. For comparison, industry use has been as high as 12.07 ML/ha in 2019. The Gross Production Water Use Index for 2022-23 was 1.23 bales/ML, which is on par with the industry average of 1.22 bales/ha.

The survey shows that growers

are also inherently researchers, with 74 per cent carrying out their own on-farm experiments using their own data and 68 per cent involved with CRDC research projects or CottonInfo activities. One fifth (21 per cent) of growers hosted industry on-farm trials, and tipped in, on average, \$6600 toward this research.

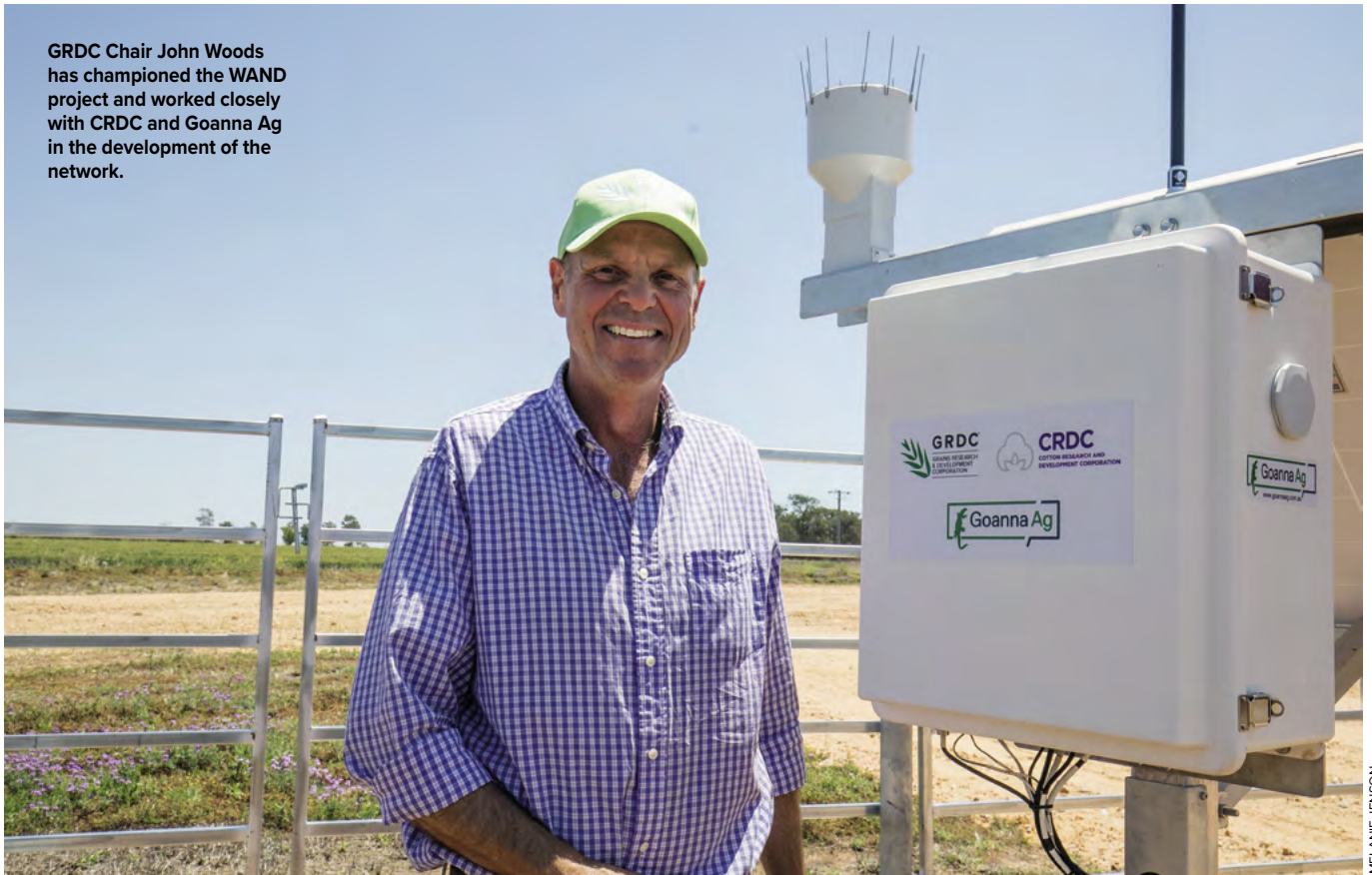
The Grower Survey report is accompanied by an interactive digital dashboard, so, growers can delve into the results on a valley-by-valley basis.

**For more**

**2023 Cotton Grower Survey report and dashboard**

[www.crdc.com.au/publications/cotton-grower-survey](http://www.crdc.com.au/publications/cotton-grower-survey)

GRDC Chair John Woods has championed the WAND project and worked closely with CRDC and Goanna Ag in the development of the network.



MELANIE JENSON

## Working and growing together: GRDC and CRDC ramp up co-investment

**AUSTRALIA'S** 15 Research and Development Corporations (RDCs) have remained instrumental in underpinning the productivity of Australia's agriculture, forestry and fisheries industries through RD&E over four decades. Collectively, the RDCs are responsible for investing around \$800 million each year on behalf of their respective farmers, foresters and fishers and the Australian Government, with almost \$500 million of this from industry levies, and \$300 million from government funding.

Given the importance of this collective RD&E investment, the RDCs are increasingly seeking to work together to ensure the most effective use of levy funds and to create real value from their investments. Obvious bedfellows, CRDC and the Grains Research and Development Corporation (GRDC) are working together to invest in and deliver RD&E, based on the shared threats and opportunities faced by both cotton and grain growers.

In total, nearly \$23 million has been co-invested by CRDC and GRDC into

collaborative cotton and grains RD&E over the past five years. Prospective investments over the next five will surpass that figure with a firm commitment from both RDCs for future collaboration.

The largest co-investment from CRDC's perspective is the Weather and Networked Data (WAND) spray hazard warning system, which remains a collaboration with GRDC not just in monetary terms, but also in people, resources and extension support.

Major investments in the past have been in weed management systems, cover cropping, climate forecasting tools and the cross-sectoral project with the CRC for Developing Northern Australia: the Cotton Grains Cattle program. Ongoing projects include insecticide resistance monitoring, plant industry biosecurity, and tracking community trust and acceptance in agriculture. The big-ticket items for future investment are weeds, emissions and workforce.

In addition to these direct investments with GRDC, CRDC also oversaw and co-invested in several programs

and projects under the Australian Government's Rural R&D for Profit program for nationally coordinated strategic research, which wound up in July. Three of the flagship programs that CRDC led – Smarter Irrigation for Profit, More Profit from Nitrogen and Accelerating Precision Agriculture to Decision Agriculture – delivered tangible benefits to cotton and grains, along with other rural industries.

CRDC also co-invests with GRDC and other RDCs through Agricultural Innovation Australia, with one of the major projects focused on developing a whole-of-agriculture carbon footprint solution. The *Know and Show your Carbon Footprint* initiative will see the development of a cross-commodity platform to help growers calculate baseline carbon emissions and understand their residual footprint (see story in *Spotlight* Winter 2023).

### Getting to the grassroots

Of course, to deliver the growth benefits of RD&E to growers, it must be easily adopted at the grassroots level.

CRDC and GRDC are also collectively covering this angle via projects such as the regional weed management demonstration sites to promote integrated weed management tactics across farming systems.

These demonstration sites at Boomi in north-west NSW (Kamilaroi country) and Emerald in Central Queensland (Gayiri country) are directly linking growers to researchers, research, industry experts and each other. The aim is to reduce the yield impact attributed to weeds in northern region grain-cotton farming systems through improving grower's knowledge of weed ecology and integrated management strategies and understanding the system-wide economic benefits of adopting these options.

The sites will share information and knowledge gathered from many previous weeds research projects from both RDCs, along with the recently completed Area Wide Management (AWM) for Cropping Systems Weeds project. This project received significant funding from both bodies, involving a multi-disciplinary team to investigate the social and economic opportunity for AWM across farms, sectors, public and other privately owned areas. The project investigated many aspects of weed ecology including genetic diversity and found that high rates of gene flow (seed dispersal) combined with the even spread of herbicide resistance across the regions show how weed movement and gene flow spread resistance across a region.

The outcomes of these projects have been extended to growers via industry field days and the demonstration sites, while also being used to inform future research.

This future research could include another significant multi-million-dollar co-investment, as weeds and resistance management remain a leading concern and cost for both cotton and grain growers. Future research is planned in the areas of economic assessments, national herbicide resistance assessments, and investigating weeds of emerging significance. This will include next generation technology, with tenders to be released for collaborators to accelerate technology development for improved weed, disease and pest management such as green-on-green vision and weed mapping using satellite imagery.



MELANIE JENSON

**Weeds management is an issue where collaboration between grains and cotton is essential.**

### Skilled people for a healthy industry

Capable and skilled people make up industries, and a lack of them comes at a cost. CRDC and GRDC are working to attract people to broadacre farms by offering a cotton and grains agricultural traineeship model to increase on-farm workforce capacity and availability. They're also working together on a smaller, grassroots project to support early-career agronomists and agronomy students, helping newcomers to continue their learning journey, create support and professional networks, and find mentors and opportunities. Together with AgriFutures Australia – another of the RDCs – cotton and grains are also a part of the Mapping the Workforce of Australian Agriculture project looking at current and future workforce requirements, and the Rural Safety and Health Alliance for work health and safety research, recruitment and retention strategies and workplace wellbeing.

At the recent CRDC board visit to ACRI at Narrabri where Directors saw the shared pathology facility being built with support from both CRDC and GRDC, researchers raised the issue of workforce capability and the loss of experienced scientists from the industry. CRDC Chair Richard Haire confirmed that the collective RDCs have this issue in their sights, and that the Council of Rural RDCs (which brings together all the CEOs and Chairs from the 15 RDCs) is working on the issue.

“We are looking closely at the lack of researchers coming through and how many top people we've lost recently

through many causes,” Richard said.

“It's not an issue unique to cotton or any other rural industry at the moment and as such the Council has instigated an R&D capacity and capability review to address workforce.”

### Co-designers and developers

CRDC Acting Executive Director Allan Williams said it's telling that the CRDC and GRDC boards formally met for the first time this year.

“CRDC and GRDC have long been collaborators and co-investors in RD&E projects where our cotton and grain growers have overlapping or common interests, such as in the areas of carbon, greenhouse gas emissions, climate and biosecurity – but we are certainly increasing our efforts to work together,” Allan said.

“This is a real driver for us under our new CRDC Strategic Plan Clever Cotton, and through working closely with our partners like GRDC, we have some really exciting, large-scale projects in the works.

“Our new approach is to involve collaborators at the project design stage, and that is working well with GRDC.

“It's a really exciting time for the broadacre grains and cotton industry in terms of where we're co-investing.”

### For more

Allan Williams

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# A career dedicated to cotton grower outcomes

**AFTER** an extensive recruitment process, Dr Janelle Montgomery has been named as the new Program Lead for the cotton industry's extension program, CottonInfo, taking over the reins from Warwick Waters.

Janelle started in the role in early December, bringing with her decades of experience in research and development, water benchmarking, crop management and working with growers.

Janelle lives at Moree (Kamilaroi country), on a grain and grazing property west of town with husband Mike and children. She's a familiar face and a well-respected figure across cotton and agriculture, an industry she has been involved with since the mid 90s. She's perhaps best known for her work over the past decade in the CottonInfo team, first as Technical Lead for water use efficiency and then as Gwydir Valley's Regional Extension Officer (REO), and before that, for her research with NSW DPI into water benchmarking and new irrigation technology such as IrrisAT.

That work led to recognition for Janelle in the form of the CSD Researcher of the Year Award in 2013, and the CRDC-supported NSW DPI water use efficiency benchmarking project continues to be a crucial tool for cotton to demonstrate its continuously improving water use efficiency.

Janelle's journey in agriculture began with a Master of Science in Agriculture from the University of New England, where she studied soil science, agronomy and sustainable land management, with research focusing on soil hydrology. This led to a PhD supported by the then Australian Cotton Cooperative Research Centre (CRC) into measuring the components of the soil water balance under irrigated cotton, and investigating the threat of irrigation-induced salinity in cotton soils. She was awarded her PhD in 2003.

***"It's the growers giving their time, their resources, and their knowledge that is responsible for a great outcome."***

After time with UNE as a research fellow based in Moree, and later with the Border Rivers-Gwydir Catchment Management Authority as a community support officer, Janelle returned to research in 2006 as a water use efficiency (WUE) officer with NSW DPI. It was here she began to assist irrigators to improve on-farm water management and irrigation water use efficiency.

Janelle has been with CottonInfo since its establishment in 2012 and given her extensive experience as a Technical Lead and REO, her knowledge of the program, and the respect she holds from both the CottonInfo team and growers, she was the obvious candidate to lead it forward.

Janelle said she feels incredibly excited by the opportunity to take on the Program Lead position.

"I've built a career on research and development and making sure that growers come on the journey too, by helping them to improve on-farm efficiencies and practices," Janelle said.

"The most enjoyable part of my role with CottonInfo, and actually at all stages of my career, has been working with growers and consultants and the satisfaction of being able to support them in some way.

"All of the benchmarking and WUE research, right through to the disease trials I've been running in the Gwydir as an REO: it's the growers giving me their time, their resources, and their knowledge that is responsible for a great outcome. Without them, it doesn't happen.

"I'm also looking forward to working even more closely with the cotton research community. Our researchers are the people we turn to when we need information and answers, and CottonInfo plays a really important role in being the connection point for growers with our researchers.

"This is a different role for me, and while I will miss being out in the field running trials and organising field days, I will be helping to set the strategic direction of CottonInfo. I'm really looking forward to taking this next step and am very thankful to the CottonInfo partners for the opportunity."

CottonInfo is a joint venture between CRDC, Cotton Seed Distributors, and Cotton Australia. Each party contributes



MELANIE JENSON

**CottonInfo's new Program Lead Janelle Montgomery has dedicated her working life to agriculture and the cotton industry.**

to the CottonInfo program: CRDC employs Janelle as Program Lead, Megan Woodward as Communications Lead and supports each of the Technical Specialists; CSD employs the REOs; and Cotton Australia contributes the best practice component via myBMP.

CRDC Acting Executive Director Allan Williams said Janelle's appointment reflects her incredible mix of RD&E experience and genuine passion for the Australian cotton industry.

"The CottonInfo program is something that other cotton growing areas of the world look at with interest and envy, and Janelle has played a significant role in building the program's strong reputation," Allan said.

"Throughout her decade-plus association with CottonInfo, she's worked tirelessly to not just support growers and consultants, but also the three industry partners.

"To have someone as respected and passionate leading CottonInfo into its 12th year is a massive advantage for the industry, and on behalf of CRDC and the CottonInfo Management Committee, I welcome Janelle to her new role."

#### For more

**Janelle Montgomery**

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Innovation extends to how research is funded. A new partnership in the NT will mirror a scheme in NSW where CRDC invests in planting commercial trials, with income directed back into supporting R&D.



## Commercial crops raise funds for NT research

**CRDC** will support a new cotton research and demonstration site in the Northern Territory (NT) where commercial crops will be grown to increase local research capacity.

In a partnership with the NT Government's Department of Industry, Tourism and Trade (DITT), the commercial trial crops at the Douglas Daly Research Centre (Malak Malak country) will provide an extension and outreach site to demonstrate best practice and enable engagement with potential growers and the community. Revenue from the crops will be used to manage the trial sites, grow further crops and support research and development. The concept is based on a model CRDC has with the University of Sydney (USYD) to grow cotton on its research farms: 'L'Lara' at Narrabri and 'Nowley' at Spring Ridge (Kamilaroi country). CRDC originally provided \$75,000 toward growing 65 hectares of dryland cotton on these two farms in 2020: after harvest, the initial investment and surplus were reinvested by CRDC with USYD for further dryland cotton research

and PhD project support.

In this new northern initiative, revenue will be co-invested by CRDC and the NT Government, providing an ongoing opportunity to support cotton research and PhDs in priority research areas.

CRDC Senior Innovation Broker Susan Maas oversees CRDC's investments in northern cropping systems. She said the partnership will start with a 50-hectare crop at the Douglas Daly Research Station, with potential expansion to 100ha with a site at Katherine (Jawoyn country) the following year.

"As you would expect, the climatic conditions in the North are very different from our traditional growing regions," Susan said.

"We are still learning so much about how to grow and protect crops in the North, from planting through to harvest.

"This site will provide the opportunity for research around establishment, cover cropping, planting density, seed treatments and fungicide sprays at planting and after planting and seed use post-harvest.

"It will be a very valuable asset for the cotton industry in the North: a place where current and potential growers can visit, and a site where field days, research trials, informal events and networking can all take place.

"It will also provide a focal point for broader collaborations with commercial organisations looking to conduct research in the North – like CSD, Cotton Breeding Australia (a partnership between CSD and CSIRO), Goanna Ag and John Deere.

"We're also looking to build relationships with tertiary and research institutions as we do in the south, so in addition to working closely with NT DITT, we'll also be talking to Charles Darwin University and Darwin Innovation Hub about providing further opportunities for learning and in-kind support."

### For more

**Susan Maas**

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# Manage your budget with made to measure tools

**DESPITE** rising input costs, some cotton growers' gross margins budgets will be much higher this 2023-24 season.

The biggest gains are potentially in dryland double skip in NSW and Queensland, with a margin of \$938/ha (up 39 per cent) while furrow irrigated crops in Northern Australia are up 45 per cent to \$2147/ha.

These are the key findings from a suite of Australian cotton industry gross margin budgets, now available for the 2023-24 season. The budgets are updated biennially and are provided for both those within and outside of the industry to gain an understanding of the operations, production costs and margins for the cotton industry.

The gross margin budgets are compiled by economists George Revell and Janine Powell of AgEcon for CottonInfo. They provide an indication of operations, gross income and costs to produce a cotton crop and can be used as a starting point to tailor cotton budgets to the requirements of individual paddocks and growing scenarios. These gross margins do not take into account risk, or overhead costs such as machinery depreciation, interest payments or permanent labour and nor do they calculate farm profit.

## Gross margins increase

For the 2023-24 season, gross margins per hectare have generally increased due to higher lint and seed prices

offsetting input cost increases. Using the conservative lint price of \$594 /bale (the average 2023-24 season lint price to date), plus \$93/bale for seed, all eight budgets return a positive gross margin. These commodity prices reflect a seven per cent increase in per bale income compared to the last gross margin update in 2021-22. This current season has already presented opportunities to market lint at higher prices than this, hopefully indicating upside for many across the industry.

"Operations will vary from field to field, and between farms and regions. These budgets provide an indication only and cotton growers are advised to tailor their own budgets to the requirements of individual paddocks," newly appointed CottonInfo Program Lead Janelle Montgomery said.

"This season, we have also included gross margin budgets for the North (Far North Qld, NT and WA), including rain grown and irrigated based on inputs from farmers, researchers, agronomists and industry specialists across those regions."

Total net costs of each irrigated budget increased by 10 per cent. Increases were in the key areas of: irrigation (to reflect an average cost of water now assuming 82 per cent surface water and 18 per cent groundwater), insurance, picking and ginning.

The operations within the contracted budget mirror the flood irrigated gross margin with the exception of contracting costs, which increased by 3.5 per cent to

***"Gross margins per hectare have generally increased due to higher lint and seed prices offsetting input cost increases."***

\$1167/ha. Both the dryland gross margins were altered to include the cost of stripping with a grower's own plant rather than using a contractor.

## Northern budgets

Net costs within the irrigated northern budget have remained the same with some changes between line items. With the scheduled opening of Katherine (Jawoyn country) gin, freight costs were reduced, however gains were partially offset by an increase in anticipated ginning costs. Crop protection application costs were increased to include more aerial applications, while irrigation costs were reduced to reflect a more typical flood irrigation system gravity fed from scheme channels in the Ord.

The key change within the northern raingrown budget driving the lower gross margin was a reduction in dryland yield to four bales/ha to reflect typical yields being achieved across commercial NT and Qld crops. Net costs for the rain grown gross margin were slightly lower with reductions in costs for the nutrition program, and a small decrease in net freight/ginning costs.

The CottonInfo gross margins complement others also available to growers: Qld DAF's agricultural gross margin calculator AgMargins and NSW DPI's farm budgets and costs.

## For more

### Gross margin budgets

[www.cottoninfo.com.au/publications/australian-cotton-industry-gross-margin-budgets](http://www.cottoninfo.com.au/publications/australian-cotton-industry-gross-margin-budgets)

## Traditional growing areas (Southern Qld & NSW)

Furrow irrigated	\$3840/ha +4%
Furrow semi-irrigated	\$2353/ha +4%
Overhead irrigated	\$3726/ha +4%
Furrow irrigated (all operations contracted)	\$2673/ha +4%
Dryland single skip	\$1043/ha +33%
Dryland double skip	\$938/ha +39%

## Northern Australia (Far North Qld, NT & WA)

Furrow irrigated	\$2147/ha +45%
Rain grown	\$274/ha -46%

The gross margin results and key changes for each growing scenario and region.

# What's the value of our natural and human resources?

A project to assess the value of on-farm natural and human capital across the cotton industry is the first of its kind for Australian agriculture.

The concept of 'natural capital' is potentially more familiar than the term 'human capital', although the notion is not new. They're both economic terms used to define the value of something. In relation to cotton growing businesses, 'natural capital' is the natural resources used on farm, both renewable and non-renewable.

'Human capital' is the individual knowledge, skills and attributes (also known as competencies) that determine how productive people are in their workplace and society. It is a concept that recognises that not all labour is equal, and the quality of workers can be improved by investing in them. The levels of human capital, like natural capital, can be directly linked to productivity and sustainability.

Natural and human capital assessments in cotton are used to assess the value of these types of capital, and changes in the things we depend on to grow the crop (called 'dependencies'); and

## The value of workforce and their 'human capital'

*"As the world economy grows increasingly dependent on digital technology, from agriculture to manufacturing to the service industry, human capital grows increasingly important for stimulating local and national economies."* – Dr. Christopher Murray, director of the Institute for Health Metrics and Evaluation (IHME) at the University of Washington.

Every individual's accumulation of human capital, like physical capital, requires investment of both resources and time. It occurs from an early age and continues over a lifetime. Some of it happens naturally as a consequence of everyday experience and observation. But key drivers are structured environments for learning (education and training) and maintaining wellbeing (the health system).

Findings from a world first study *Measuring human capital: A systematic analysis of 195 countries and territories, 1990 to 2016* show the association between investments in education and health and improved human capital and gross domestic product (GDP). Researchers found that nations with greater improvements in human capital also tended to have faster growth in per capita GDP. The study placed Finland at the top and Australia at number 26. Turkey showed the most dramatic increase in human capital between 1990 and 2016; Asian countries with notable improvements included China, Thailand, Singapore, and Vietnam, and within Latin America, Brazil stood out for improvement. All these countries have had faster economic growth over this period than similar countries with lower levels of human capital improvement.

the positive or negative impacts cotton growing has (called 'impacts'). This is demonstrated in figure 1.

Supported by CRDC, the cotton industry natural and human capital assessments are being done to

benchmark these values to track progress over time. The findings will allow the industry to better communicate its sustainability impacts, and to mitigate the risk of markets using a lack of these sustainability credentials as a trade barrier.

The industry's Sustainability Adviser Chris Cosgrove is leading the project and is using a recognised global methodology called the Natural and Social Capital Protocol to guide work to prioritise what to measure and how to value it. Chris says growers may also choose to carry out their own assessments and he is working to create a methodology for them to do so easily.

"Farmers might do an assessment to compare options for the best use of land, to estimate more accurately the net impact of their operations, or to better assess future risks and opportunities," Chris said.

"The cost and choice of data needs to match the purpose, and the advice is to start small.

"Individual farms can use the same indicators we develop through this project

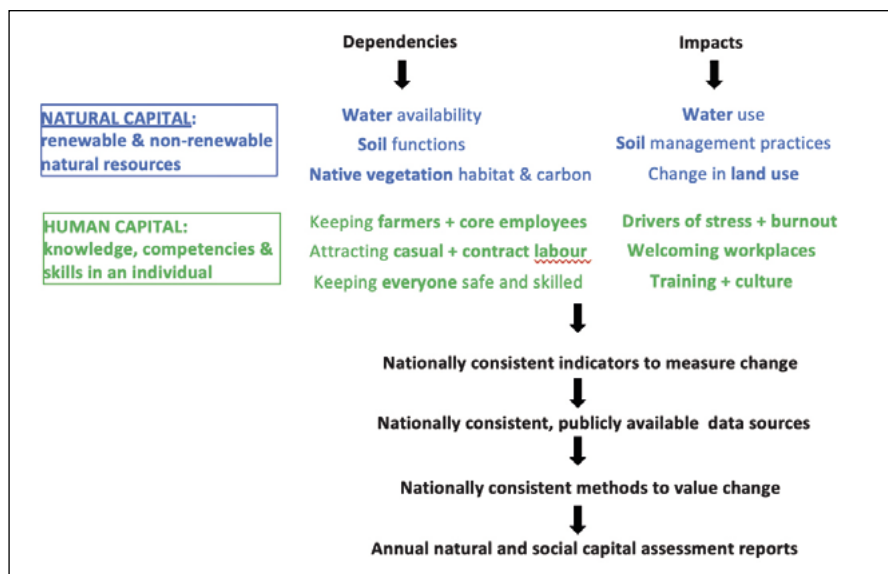


Figure 1. Summary overview of cotton industry natural and human capital assessment process.

and can choose to use the same publicly available data, their own precise farm-level data, or even just use back-of-the-envelope data to get started.”

This industry-scale work will use publicly available data such as soil health data aggregated by the National Soil Strategy, satellite data of woody vegetation on farms, NSW DPI water use efficiency research, and government data on workplace demographics.

“It’s not perfect, but the data we’re using is either cheap or free, growers don’t need to do a thing to provide it, and it’s repeatable and good enough to be able to tell a story at the industry scale of change over time,” Chris says.

“And once we understand how industry can benefit from this work, we can work to improve data quality where it’s most needed.”

Nationally consistent and low-cost data also means this work is a proof-of-concept for other industries: if it can work for cotton, then grains, livestock and other commodities can use the same approach, which will avoid confusion and inconsistency across industries as interest in natural and human capital assessments grow.

Chris has shared proposed indicators and data sources with stakeholders including researchers, natural and human capital experts, and other agriculture sectors, receiving positive feedback. Work is underway with Qld DAF economists to apply recognised valuation methodologies to attempt to put a monetary value on natural and human capital. The results of this work will be shared again with stakeholders for feedback by mid-2024, before preparing a first draft natural and human capital assessment.

This work is part of a broader investment from CRDC to revamp the industry’s sustainability data and reporting framework to deliver data in new and better ways, allowing more informed decisions by all cotton industry stakeholders.

The next steps are to measure change, value impacts, report, and apply this knowledge.

#### For more

Chris Cosgrove

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The health of wellbeing of cotton communities and the industry’s impact on them has been the focus of an in-depth industry study.

## Taking the pulse of cotton’s health and wellbeing

CRDC has supported research into which social and wellbeing indicators are important to monitor and is leading discussions with other agricultural industries to ensure there is consensus.

In 2019, Jacki Schirmer, Melinda Mylek and Helena Clayton at the University of Canberra Health Research Institute were commissioned by CRDC to examine a wide range of wellbeing and social indicators relevant to the cotton industry and create a set of indicators for use in cotton’s Sustainability Framework. The research also measured the social capital built in rural communities as a result of the presence of agricultural industries, and the social contributions made by cotton.

“Wellbeing can be defined as people being comfortable, safe, healthy and happy, and is influenced by a combination of physical, mental, financial and social factors,” Jacki said.

“Wellbeing has implications as wide ranging as productivity of workforces and sustainability of communities, and gives an insight into the resilience of farmers and regional communities to adapt to change.”

The research undertook an extensive review of literature, interviews with industry representatives and communities, testing of the proposed indicators in Regional Wellbeing Surveys from 2020 and 2021 and consultation of the results with industry and cotton communities. The researchers then produced the report *Indicators of social sustainability of the cotton industry: review and proposed framework*.

#### So, how are we?

CRDC Innovation Broker Rachel Holloway said the Wellbeing Survey showed a mixed result in our health,

mental health, safety and work satisfaction.

Cotton growers have higher-than-average confidence in the industry over other agricultural industries, higher-than-average household income, but also higher-than-average farm business stress. Growers also have a higher-than-average community involvement, yet also higher-than-average loneliness.

#### Where to next?

The research identified priority social and wellbeing indicators for consideration in cotton’s sustainability framework, including health and wellbeing, standard of living, safe and satisfying work, confidence in the future of the industry, confidence that cotton communities provide a good quality of life, contribution and connection to community, and whether the cotton industry has a sustainable, diverse workforce.

“The data for this project was collected through the Regional Wellbeing Survey and included employees, employers and cotton communities,” Rachel said.

“Now that we have the priority indicators for wellbeing, and an idea of how individuals and cotton communities are feeling, we are now working with other agricultural industries and cotton communities to understand how we can contribute to a collaborative approach to improve it.

“With a strategy in place, the cotton industry can then understand how it can best contribute to the wellbeing of its people.”

#### For more

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# Spreading the love: Coultons go full circle

Circularity means more to Goondiwindi cotton grower Sam Coulton than most. When we talk about championing the cotton industry, there are few who've been doing it longer or better than Sam.

**Sam's involvement over the years goes beyond the usual of a cotton grower, which is evident in the goings-on on just one morning on his farm 'Alcheringa', on the Queensland-NSW border, when *Spotlight* called in for a visit.**

There's a minibus full of tourists who've come to see how a cotton farm works and the course the crops will take from field to fabric to fashion to create garments for Goondiwindi Cotton, the family's own clothing brand. The Goondiwindi Farm and Town Tours showcase the property to an average of 3500 visitors every year.

This venture is to educate consumers and support local tourism. Sam's totally committed to and relishes in sharing his story. The tour is subsidised by Goondiwindi Cotton and is testament to his unwavering advocacy and support of Goondiwindi, the cotton industry and farming.

After going for a look around Alcheringa farm, the tourists visit a specially set up room at the farm's educational shed. They learn about picking, ginning, ground preparation, planting and the recycling program. They get an overview of the water flow of all the dams and there's even a set up where the visitors can have a go at starting a syphon, which we're told by a few volunteers, "isn't as hard as it looks".

The tourists hop back on the bus to Goondiwindi Customs House for morning tea, then

a trip around town.

Sam's off to meet another group of four-wheel-drives coming down the road. It's his bank's sustainability team, who've come from Brisbane to see the groundbreaking trial underway to return cotton textile 'waste' to the soil in Alcheringa's cotton fields.

Along with Sam, Goondiwindi Cotton and CRDC, this circularity project involves partners Cotton Australia, Sheridan, Coreo and Thread Together. But it's growers like Sam who are key to making it happen. The project is in its third year at Goondiwindi, and for two years has also involved Gunnedah (Kamilaroi country) grower Scott Morgan.

To organise the spreading, it takes thinking outside the box from Sam, which certainly isn't a stretch. He has taken the responsibility for working out how to best take delivery and spread the shredded fibre, which must be done with machinery usually designed for other things. Because the concept is so new there is no specialised machinery for the job. The cotton has been shredded differently this year and has arrived in compacted bales, instead of looser, bagged cotton the previous year. Sam settles on a manure spreader and then the hunt is on for a contractor who is available, as it's also nearly summer crop sowing time.

Then there's the sticky issue of the shower of rain that went through the night before, wetting



IMAGES: MELANIE JENSON

Merry Conaty, Sam and Dr Oliver Knox at 'Alcheringa'.

down the bales of fabric, so after a few blockages and changes of tactic, we're ready for action.

There's a flurry of activity as a crew of contractors get ready to spread the shredded fibres, closely followed by cameras and a film crew. Also there to see the spreading is CRDC Innovation Broker and Acting General Manager, Innovation Dr Merry Conaty who oversees the project for CRDC and CRDC-supported soil scientist Dr Oliver Knox, who undertakes the soil health research for the trial.

In total, 10 tonnes of shredded cotton are returned to the field over around five hectares.

And while a lot hinges on getting the cotton spread onto the field, Sam is the calmest person there. The trials could change how textile waste is managed globally and be of huge benefit to farmers in terms of soil health, and the Australian cotton industry in terms of environmental outcomes. Yet returning clothing to the soil is not new for Sam and the Goondiwindi Cotton crew.

"We've been recycling cotton from our used garments back into the soil for years," he says.

"We have a scheme where we offer a discount on a new item if you bring back a worn out one and have just ramped that up and rebranded it as Farm Fill."

Farm Fill returns end-of-life Goondiwindi Cotton

garments back to where it all began.

"It's our sustainability program that returns end of life Goondiwindi Cotton garments back to the farm to aid soil health and reduce textile waste," Sam said.

"So while this trial, the big brand partners, and the potential for scaleability is really new, and has huge potential, a lot of people don't realise what we already do here, both on farm and with Goondiwindi Cotton clothing, which has been going now for 30 years.

"At the same time, our farm tours have been running consistently for nearly 20 years and the reason we keep it going is to educate people about cotton farming as well as keeping travellers within our town for an extra night or two, this way our community and businesses benefit from it.

"We do it because we need services and people in town and have to support them. If we don't we lose them.

"The only reason Goondi is here is because of farming. The long-term picture is we need to support our local businesses and people to keep our communities together."

But farming isn't the only reason Sam is there. Testament to his tenacity, collaborative nature and passion for keeping the community productive and

**A manure spreader was used to get the shredded cotton onto the fields at a rate of around two tonnes per hectare.**



IMAGES: MELANIE JENSON



prosperous, he built Goondiwindi Cotton to develop a cotton clothing line suited to Australian conditions using his own cotton, based in his hometown of Goondiwindi. He's as passionate about that as he is about his farm and the future.

The seed for the fashion label was sown when Sam took lint from Coulton Farming – which is Sam with his brothers Ben and David – to Indonesia to be spun into yarn for knitting, a concept that was unheard of for a grower in 1989. The effort yielded 43 tonnes of cotton yarn, enough to produce 250,000 t-shirts. Later Sam met a manufacturer with the then surfwear giant Piping Hot, which led Coulton Farming to supply yarn to their Newcastle factory for a number of years. Then there was the prison contract.

“We expanded this by getting involved with Long Bay Prison, and as part of their rehabilitation scheme,” Sam says.

“They did all our sewing on our Goondiwindi Cotton garments and this lasted for about 18 months, until the prisoners thought the bakery trucks also coming in and out as part of the program would be great way to escape.

“So that operation was called off and the rehabilitation program cancelled.”

Then in a chance meeting in 1992, Sam met local designer and pattern maker, Louise Lye, a teacher at Boggabilla TAFE. Sam saw an opportunity to pursue his dream of local clothing production and struck an agreement with TAFE where Louise would train students while overseeing the production of garments for Goondiwindi Cotton.

“For the first time, students were trained with the prospect of real employment as an end result,” Sam says.

“Goondiwindi Cotton opened to diversify operations beyond the family farm gate and add value to the local community.”

And in true “make sure everybody gets a feed” style, in those early days, Goondiwindi Cotton designed and manufactured collections using Australian mills and local seamstresses, weaving and dyeing their own fabrics.

“However, as time went by and the mills closed and skills faded, we moved manufacturing overseas, but the design, logistics, marketing and customer service departments all remain in Goondiwindi and employ local people,” Sam says.

“It was sad to lose making the shirts here because it really did create a connection between people that was just gorgeous.

“The ladies used to give themselves a number that they’d sew hidden under the shirt tag.

“If they thought they recognised one of their shirts they would ask the person wearing it to check the tag for the number and it was a thrill for both of them when it turned out to be a shirt they’d made.



“It’s not every day you get to meet someone who made your clothes or to meet someone who is wearing them. It made me really proud.

“Our business still adds broader value because we also use local businesses for graphic design, printing, postage and freight to deliver over 100,000 garments Australia-wide every year.”

This advocacy and caring for his community and the cotton industry has now extended to ensuring a sustainable future through exploring a closed loop cotton system through circularity.

“Creating a closed loop cotton farming system through circularity and avoiding waste is the next step in looking after our industry, our towns and their people and our land: it’s about sustainability.

“If you’re not sustainable in agriculture you’re out of business and in my lifetime I’ve seen plenty go out the back door and those that are still here are looking ahead, in front and behind.

“We do a lot of things here people don’t really know about, but in this case, the more people who know about what the cotton industry is doing here, the better.

“Education is the only way we can do it.”

**Working with growers on shared visions: CRDC Innovation Broker Merry Conaty and cotton grower Sam Coulton.**

#### **For more**

**Goondiwindi Cotton**

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



# Circularity: is going around in circles a pathway forward?

Cotton has a natural place in the circular economy. It's biodegradable, renewable and recyclable and it doesn't have the microplastics problem associated with synthetic fabrics.

CRDC and Cotton Australia are working together with partner organisations to create a circular industry and to help put cotton back on top as a fibre of choice.

The push towards circularity comes as cotton – as both a fibre for textiles and as an industry – has a responsibility from a social licence, sustainability and consumer perspective to continue to reduce its environmental impact. Meanwhile, cotton's customers, the textile and fashion industry, has found itself the target of increasingly intensifying regulation focused on reducing the environmental impacts of their products, from raw material

production to their end of life.

The three key principles of a circular economy are to design out waste and pollution, keep products and materials in use and regenerate natural systems.

Leading brands, retailers and manufacturers are increasingly focused on these principles, as a means to reduce fashion's significant impact on the natural environment globally – and the Australian cotton industry is too.

## Top consumers, top wasters

Australia ranks second worldwide in textile consumption per capita. Australians spent \$34.7 billion on fashion and apparel in 2022, and throw out around 800,000 tonnes of textiles and clothes annually. Furthermore, 93 per cent of these textiles from Australian wardrobes end up in landfill, oceans, or abroad as landfill. This is in spite of the fact more than 80 per cent of textile waste is recyclable.

A recent report from Textile Exchange says

**ABOVE:** CRDC is supporting PhD research scholar Arun Chandra Manivannan. Arun is a member of the EPIC team and has set up an upcycling process for cotton with a dual objective.



over the next two to four years – or just four cotton harvests away at most – more than 35 new pieces of sustainability-linked regulation are expected to come into effect around the world, targeting import restrictions, product design guidelines, labelling requirements and more. As an exporter of its product, the Australian cotton industry has been taking action to prepare for this future.

So what role does the Australian cotton industry, its growers, scientists and RD&E organisations such as CRDC have to play in ensuring Australian cotton is a fibre of choice based on its sustainability credentials?

“The Australian cotton industry must be able to show and share its credentials, demonstrating that we are working to continually reduce our carbon footprint, and that we proactively support methods to manage ‘waste’,” CRDC Acting Executive Director Allan Williams said.

“As well as farm-focused R&D to improve the efficiency and reduce the environmental impact of cotton production, CRDC’s also working beyond the farm gate with partners on end-of-life solutions for cotton and cotton blend textiles to create a circular cotton economy that benefits our growers, and the retailers and brands that sell cotton clothing.”

The Australian textile industry is on notice that it needs to improve the stewardship of its

## EPIC research

One of the CRDC-supported circularity research projects involves the team at the University of Newcastle’s Environmental Plastics and Innovation Cluster (EPIC). The EPIC team in association with NSW DPI at Narrabri NSW are tackling the textile waste crisis by developing commercially viable solutions that transform waste into a sustainable and circular system.

EPIC’s Dr Thava Palanisami says the team’s focus is on addressing the issue of blended textiles, which are challenging to recycle efficiently.

“Australia’s high textile consumption and production of textile waste contributes to an elevated carbon footprint, microfibre pollution and chemical contamination of ecosystems,” Thava said.

“By chemically treating these textiles and optimising our technology for fabrics of various types, we aim to recover polyester for re-polymerisation while upcycling cotton into valuable chemicals.”

This approach closes the loop in textile waste management, making it a more sustainable, carbon-neutral and circular industry. The team’s future focus is assessing the potential for industrial-scale implementation, with a long-term aspiration to end the practice of textiles ending up in landfill. Instead, they aim to repurpose them into new fabrics or innovative, value-added products.

The EPIC team has also set up an upcycling process for cotton with a dual objective. CRDC is supporting PhD research scholar Arun Chandra Manivannan as a part of this project.

The project, *Closing the loop in textile production by composting textile waste for improved carbon footprint*, is primarily focusing on fixing carbon stored in cotton (captured during growth) into the soil by composting, for the benefit of improved soil health, the carbon economy and productivity.

“So, we are working to reintegrate cotton into the soil as a compost, enhancing soil carbon content,” Arun said.

“We convert cotton into valuable chemicals as part of this chemical recycling strategy.

“This comprehensive approach effectively closes the loop in textile waste management: recycling synthetic components back into fibres and reinvigorating cotton as soil carbon or value-added chemicals.”

products and especially reduce the levels of waste associated with the industry. A National Clothing Product Stewardship Scheme overseen by the Australian Fashion Council (AFC) has been established to support the industry to voluntarily improve textile recovery, re-use and recycling. This has included Extended Producer Responsibility (EPR) and while voluntary in Australia, it is important to note that in other jurisdictions this is being used as a policy strategy to hold producers formally responsible for the end-of-life consequences of their goods.

In addition to working with CRDC, Cotton Australia is working with brands, not-for-profit organisations, universities and businesses to help find solutions to the textile waste problem in Australia, with the ultimate goal of turning textiles into products that can be used back on the farm.

Cotton Australia works with brands and retailers to align priorities and work together on solutions. Through CRDC, they are investing in research and development into this area and have convened the Cotton Converts group that's aligning problems with solutions for textile waste. Cotton Australia has support from the AFC who are working with sustainability organisations and scientists.

Their goal is to achieve circularity within the Australian fashion industry by 2030 through a range of initiatives starting in 2024 and the Australian cotton industry is dedicated to playing a part in this.

Allan said the Australian cotton industry can position itself as a fibre-partner of choice for retailers and brands by working on solutions to manage textile waste.

"This is why we've committed \$2 million to circularity research over the next three years – helping to inform our overall aim of developing a scalable solution for textile waste in Australia.

"This investment is across seven research projects, each designed to be a 'piece of the puzzle' in addressing key research gaps and questions."

The research is overseen by CRDC's Acting General Manager Innovation, Dr Merry Conaty, and a steering committee, comprising of representatives from CRDC, Cotton Australia, researchers, brands and NGOs. The research projects include:

- ◆ Circular cotton field sites: the set of trials at Goondiwindi and Gunnedah with growers Sam Coulton and Scott Morgan and researcher Dr Oliver Knox of the University of New England. These trials are designed to be a proof-of-concept to demonstrate that textile waste can be composted and added to cotton farms without impacts on soil health, soil structure and function, and cotton growth and development. The trials are currently entering their third season at Goondiwindi and second season at Gunnedah.

- ◆ Closing the loop: textile waste composting for improved carbon footprint and sustainability – University of Newcastle/NSW DPI (see EPIC story previous page).
- ◆ An evaluation of cotton fibre waste processing and composting alternatives: Comparison of business models, greenhouse gas emissions and commercialisation opportunities – University of Technology, Sydney/University of New England (See story page 22).
- ◆ The economic benefits of composting textile waste: process mapping and optimal location – RMIT. This project will focus on key questions around the economics and logistics of textile waste transport, processing and composting. This will ensure options being developed for scalability of the composting process are based on actual costs and viable supply chains. The research will establish where and how this process can be located to produce a model of how a scalable solution for textile waste can be developed. A separate proposed project would assess the potential to develop gins for localised shredding and processing of textile waste close to cotton farms, with the potential to provide employment and economic growth.
- ◆ Developing a pathway for the composting and agricultural use of pure cotton textile waste – University of Queensland. This project will focus on assessing different methods to deliver textile waste to cotton fields, through pelletisation techniques and worm farming of the textile waste.
- ◆ CRDC is participating in a working group to develop standards for textile composting and waste processing through Standards Australia.

### Why composting for circularity?

Some solutions to textile waste are simple but not simplistic. As shown in a study commissioned by CRDC and Australian Wool Innovation, consistent environmental improvements are best achieved by minimising unnecessary garment purchases and maximising wear life. It also showed that the climate change impacts could be negated simply by wearing these clothes for longer. In good news for cotton and wool, by increasing the number of wears of a natural fibre garment by 50 per cent, greenhouse gas emissions would be avoided entirely, primarily because of avoided emissions associated with the manufacture of a new garment from polyester or synthetic PET (polyethylene terephthalate, the same type of plastic used in soft drink bottles).

Since the early 1980s, the production of synthetic fibres has increased more than six times, which is 3.6 times that of the global population growth rate. Over the same period, the increase

## What is a circular cotton farming system?

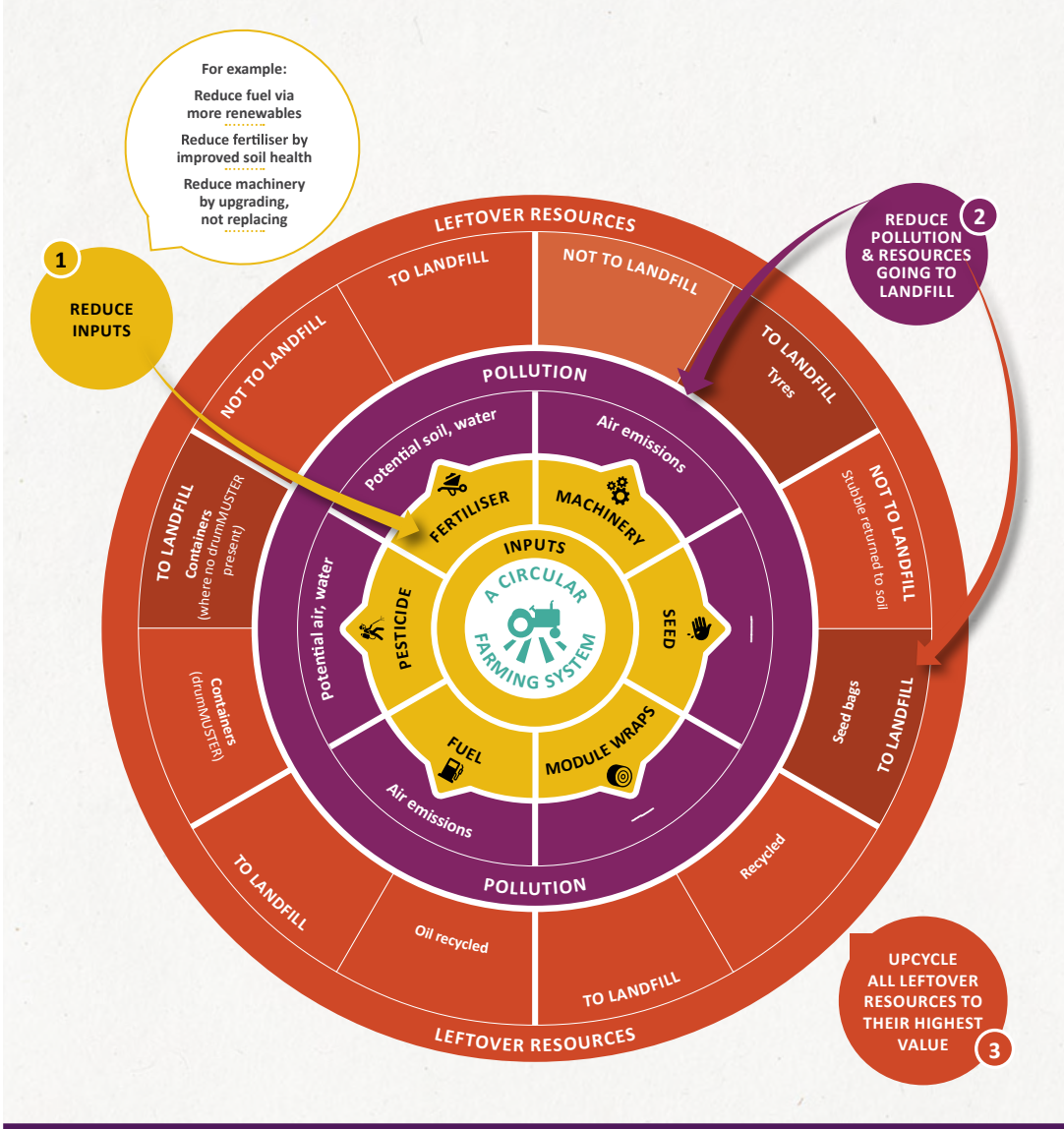


Figure 1. Three steps to a circular cotton farming system.

A circular farm seeks to reduce the consumption of finite resources by eliminating waste and pollution, and recycle resources at their highest value instead of putting them in landfill as ‘waste’. A surprising amount of circularity already takes place on Australian cotton farms.

in cotton production has approximately matched population growth, and wool production increased at less than half the rate of population growth. This highlights that a shift in market share towards synthetic fibres and away from natural fibres has occurred in unison with the increased per capita demand for fibre.

From CRDC’s investment and innovation perspective, while changing buyer behaviour is beyond the scope of RD&E, there is a role for innovative research to close the cotton growing loop.

“We can’t control how many garments people buy, what they are made from and how long they wear them, so we have to focus on what we can influence: and that is the issue of textile waste,” Merry said.

“By redirecting cotton textiles that are currently bound for landfill both here and abroad back into

our cotton fields, we can create a closed loop for cotton production in Australia that helps to avoid emissions and enhance soil health.

“So we need to work out how we do that, and we’re making headway thanks to growers like Sam Coulton and Scott Morgan who are hosting the on-farm trials, and supporting projects and scientists who are using innovative scientific methods such as developing methods of recycling and quantifying the benefits of composting cotton fibre waste/ end-of-life materials.”

**For more**  
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# The real impact of composting over landfill

Composting cotton textile waste by returning it to the soil is emerging as an alternative to sending cotton textiles to landfill, but how much better for the environment is this process and what effect will it have on emissions?

To fully understand this, a new circularity project is bringing together a multi-disciplinary research team from across science and business to investigate the level and impact of greenhouse gas (GHG) emissions in 'return to soil' options compared to landfill, and to test methods for composting textile waste for their commercial viability.

The team from the University of Technology Sydney (UTS) and the University of New England will look at the relationships between inputs, outputs, processes and GHG emissions from the various recycling (return to soil) options. GHG emissions from textile waste in landfill will be used as the benchmark and compared with alternative uses involving the processing and composting of textile waste for use in soils.

The team will also evaluate the commercial viability of these alternative methods of recycling and composting, examining effective ways to close the loop on cotton fibre waste alongside the development of commercialisation strategies that can add value to the Australian cotton industry.

Critical to the analysis will be the integration of economic analysis, helping to identify the likelihood and value of each option to the industry.

"We have a very multifaceted set of objectives and that's why we have such a multi-disciplinary approach to this research," says Chris Bajada from UTS.

"Importantly, we'll also be engaging with cotton growers and industry participants in the current and emerging

circular economy.

"Grower input is vital as we want to deliver relevant information back to growers to help them to make decisions about returning cotton 'waste' to their farms.

"The analysis of commercial viability and relative GHG emission savings (compared to the landfill benchmark) from the different methods of waste processing will provide effective alternatives that will contribute to the circular economy for cotton."

As the Australian cotton industry seeks to provide concrete evidence to customers of positive impacts and action to mitigate climate change, this research will be able to be used to showcase the sustainability credentials of cotton production systems.

Then there's the economics. There's a long list of promising recycling initiatives that have gone by the wayside in recent years as the issue of waste grows. In Australia, REDcycle – best known for working with supermarket chains for soft plastics recycling – went into liquidation this year, and the charity sector incurs a cost of \$13 million per year to transport and sort unsaleable product into landfill.

The project clearly recognises that any potential solutions must be economically viable.

"We've seen a lot of businesses in the recycling industry go under, and methods, while they may work, may become unviable because the numbers just don't stack up," UTS project lead Paul Brown says.

Paul has put out a call to the cotton community.

"If after reading this story anyone would like to know more or to collaborate with our team, we encourage them to contact us," Paul said.

## For more

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# Going gre

Renewable energy, green hydrogen and green ammonia are creating waves in sustainability and farming circles, with on-farm generation creating news in Australia as investment from government, private equity and energy firms ramps up.

Creating green fertilisers and fuels on-farm, especially from renewable sources such as solar, would significantly reduce emissions and improve the industry's carbon footprint.

To understand more about the economics of such ventures, CRDC commissioned AgEcon to undertake an analysis investigating the potential for floating solar photovoltaic arrays (FPV) on cotton farm dams to generate power and green fertilisers to supply on-farm and ginning needs.

The analysis found the potential does exist and would significantly reduce carbon emissions associated with cotton production along with generating enough green ammonia fertiliser to supply an entire valley of growers. However, the downside is, at the moment the technology is new, the cost is high and the payback long without significant investment from government or private equity.

"The four scenarios (see Figure 1) we used in the study all showed a substantial reduction in greenhouse gas emissions by replacing grid-powered energy during the ginning phase, moving to green alternatives from traditional nitrogen (N) fertiliser generated from fossil fuels," AgEcon's Jon Welsh says.

"Generation costs of green hydrogen-based fuels was well in excess of their fossil fuel-based substitutes, so while the potential for generation is there, the cost makes it non-competitive, with an estimated 20-year payback.

"Most growers I talk to will accept a

# en for power and fertiliser



RUTH REDFERN

**“A 46 megawatt FPV could supply enough green hydrogen fuel for almost one-third (23,000 ha) of the Gwydir Valley’s average annual cotton crop.”**

agricultural supply chains are coming under increasing pressure to lower emissions to meet national and sector-wide emissions reduction targets. The Australian cotton industry, through its PLANET. PEOPLE. PADDOCK. Sustainability Framework is committed to reducing on-farm emissions, and CRDC has invested in research into strategies to mitigate emissions at the farm level. The 2022 Sustainability Update reported a 15 per cent per bale increase in GHG emissions. Nitrogen (N) fertiliser accounts for about 70 per cent of emissions from cotton production.

Improving nitrogen use efficiency (NUE) offers the greatest gains for emissions reduction followed by legume rotations and biofuels. Generation of and/or access to affordable, green fertilisers would be a game changer for the cotton industry. As such the case study explored creating a regional source of green hydrogen and ammonia for fuel and fertiliser for cotton growing. The cost of green ammonia proved to be uneconomical with a cost per kg of \$3/kg when compared with \$0.66/kg shown in other models.

While the cost is excessive, the volume of potential production is impressive.

The quantity of green ammonia produced (from a 46 megawatt FPV) easily covered the case study farm’s annual N fertiliser requirements and on a per hectare N rate of 300 kg, could potentially supply the annual N needs to a further 14,000 ha of fully irrigated cotton; 30,435 ha of semi-irrigated; or 132,000 ha of rainfed cotton.

“This represents around half the N needs of the entire Gwydir Valley, where production averages 74,570 ha of irrigated (full and semi-irrigated) and 79,649 ha of

The four scenarios using floating solar arrays in the study showed a substantial reduction in greenhouse gas emissions by replacing grid-powered energy during the ginning phase, moving to green alternatives from traditional nitrogen fertiliser generated from fossil fuels. Unlike stationary panels (pictured) floating panels also save water through the prevention of evaporation.

four, five or six-year payback for creating efficiency gains. There’s a massive gap between those time frames and 20 years.”

Sustainability metrics were improved in Scenarios 1, 2 and 4, with measurable reductions in carbon dioxide (CO<sub>2</sub>) per lint bale of cotton. A small FPV array in Scenario 1 reduced emissions by 34 per cent/bale, or six kg CO<sub>2</sub>/bale by adding

FPV energy to the grid-powered gin. Emissions were further reduced by 15 kg CO<sub>2</sub>/bale from producing green ammonia used as crop nitrogenous fertiliser. Using FPV to power the seasonal demands of cotton ginning and out-of-season green ammonia production lowered emissions by 23 kg CO<sub>2</sub>/bale.

This study comes at a time when

rained cotton per year,” Jon said.

On-site green ammonia production would displace upstream ammonia emissions (14 per cent of N emissions), however, offset potential is limited in two scenarios (2 and 4) because nitrous oxide emissions from N fertiliser practices remained unchanged.

Hydrogen production as a substitute for diesel was shown to be generated at below retail levels and generate an economic return. This study determined the cost per kg of green hydrogen for use in cotton operations for pumping water or field operations of \$11 kg which is still well in excess of the targets set by the Australian Government of \$2 kg.

“Unfortunately, despite bold predictions of future technology cost reductions some years ago consistent with solar PV, the high cost of components, raw

materials and labour has seen hydrogen technology costs rise, negatively impacting investment returns,” Jon said.

The analysis found that a 46 megawatt FPV could supply enough green hydrogen fuel for almost one-third (23,000 ha) of the Gwydir Valley’s average annual cotton crop. While equipment changeover to fuel cells has not been factored in, there is potential for emissions reductions by using green hydrogen or a diesel/gas mix in farm machinery, in irrigation, module/bale transport and ancillary gin energy use.

Jon says having locally produced green ammonia and the abatement potential would be a win for the grower, industry and the supply chain.

“Having locally based green ammonia and hydrogen fuel production using FPV arrays addresses key social issues for the cotton industry, including reducing

emissions, providing water security, and protecting prime agricultural land,” he said.

“The technology for green hydrogen use is available, but as yet not widely used.

“The study also emphasises the reliance on the support by the private sector for industry adoption of green hydrogen, as high carbon prices are needed to achieve positive investment returns.

“Our investment analysis shows that carefully targeted energy policy is needed to attract capital for hydrogen projects and transition away from the reliance on fossil fuel-derived energy sources.

“While the potential is there to create large volumes of green hydrogen and ammonia on Australian cotton farms, at the moment the cost of production makes it unviable for cotton growers without significant outside investment.”

### Reducing evaporation

Installing FPV on dams rather than on the ground has the added benefit of reducing evaporation. While ‘modest’ on an annual basis (for this study site) the water savings should not be understated, according to AgEcon’s Janine Powell.

Janine found 631 megalitres of avoided losses from one reservoir on one cotton farm (extrapolated to 10 per cent of industry storage dams) could create a create a \$41 million dollar benefit, should the saved water be used to grow cotton.

“Water of course has other public and environmental benefits such as flows to riparian areas and wetlands, and for domestic use in nearby rural towns,” Janine said.

“Applying a gross margin of A\$387 per megalitre from furrow irrigated cotton, and a local economic multiplier of one job per 400 megalitres, the dual economic and sustainability benefits of clean energy production warrants further investigation.

“The water saved in this example equates to one year’s domestic water supply for 242 Australian households in Australia.”

### For more:

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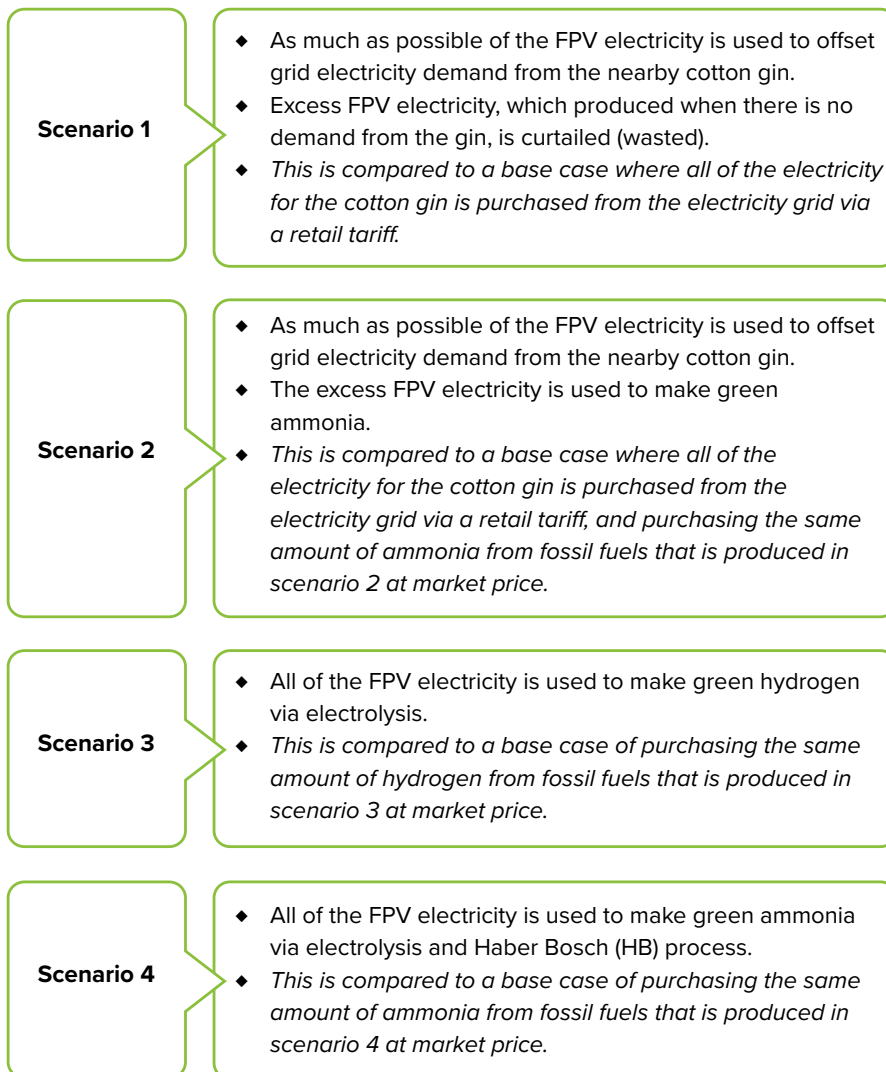


Figure 1. The four scenarios used by the economists to determine the feasibility of on-farm green energy and ammonia production using floating solar voltaic arrays on cotton farm storage dams.



# Scientists meet to share and celebrate

Cotton growers rely heavily on our field of cotton scientists and their past, current and future research to protect and grow their crops.

These scientists work right across Australia – both within our cotton regions and beyond – for many different research organisations and agencies. Yet they have one thing in common – cotton – and once every two years they meet to share and discuss their work at the Association of Australian Cotton Scientists' (AACS) Conference. This year, 170 delegates met in Toowoomba (Barunggam country) over three days and attended a dinner where the contributions and achievements of individuals were acknowledged.

With the theme for the fifth biennial conference '*Australian cotton science – continuing to lead*' the presentations showcased research across the Paddock, People and Planet themes of CRDC's new Strategic RD&E Plan Clever Cotton, along with a focus on technology and the next generation. The 2023 conference committee, co-chaired by University of Southern Queensland's (UniSQ's) Dr Alison McCarthy and Dr Joseph Foley, ensured the conference covered the broad range of research underway – everything from germplasm in cotton to herbicide resistance in weeds and why young scientists join the industry.

"The conference serves as a platform for cotton researchers to present and discuss concepts, key issues and the latest findings in research relevant to the Australian cotton industry with their peers in the cotton research community," Alison said.

"It also encourages networking and collaboration and instills a sense of enthusiasm for cotton research, which our industry is famous for.

"A huge thanks to our official conference sponsors: major sponsors CRDC and CSD, plus CSIRO, Bayer, UniSQ



MELANIE JENSON

**CRDC-supported PhD scholar Mikaela Tilse shared her research on the big stage as a part of the 'Next Gen' session. Mikaela is working on a method to map on-farm cotton fibre quality using remote sensing and geostatistics.**

and INCYT.

"Thanks also to all the delegates who presented and attended, who came to meet old friends and make new ones, and above all, take something useful away from this event."

The dinner and awards evening honoured a range of people, a difficult task given the calibre and range of scientists in cotton. Life memberships were presented to Mary Whitehouse, Danny Llewellyn, Dave Larsen, Peter Gregg, and Liz Dennis.

The AACS Service to Cotton Science Award went to Tonia Grundy for her impact through extension and communication, including producing most of the videos available on the CottonInfo YouTube channel (which has received over three million views) and her role as coordinating editor for the CRDC and CottonInfo Cotton Pest Management Guide since 2021.

The Early Career Scientist Encouragement Award went to Dr Lucy Egan who started as a Post-Doctoral Fellow in the CSIRO Cotton Breeding Group in 2020 to work on a project to further develop cotton germplasm with

increased host plant resistance to pests and disease.

The AACS also presents a Scientific Publication Award that went to *Soil compaction in a new light: Know the cost of doing nothing, A cotton case study published in Soil and Tillage Research*, with research undertaken by Hiz Jamali, Guna Nachimuthu, Blake Palmer, Darin Hodgson, Andy Hundt, Christopher Nunn and Michael Braunack with support from CRDC. Highlights of this research included that compaction reduced yield by 27 per cent in irrigated cotton and reduced crop water use and soil water recharge at 0.3-0.5m depth. This depth is significant as yield was correlated with soil water use at 0.3-0.5m, while crop water stress was correlated with soil water use at 0.3-0.7m depth. (To read the full paper, visit [www.sciencedirect.com/science/article/pii/S0167198721002312](http://www.sciencedirect.com/science/article/pii/S0167198721002312))

#### For more

[www.australiancottonscientists.org/conference-2023/](http://www.australiancottonscientists.org/conference-2023/)

# Creating co-benefits for the environment

Can the delivery of irrigation water through river systems offer an environmental benefit?

In the Northern Murray Darling Basin (northern NSW and southern Queensland), irrigation water is delivered from regional dams via rivers and creeks. While irrigation industries in the region often come under fire for the effects of extracting allocations from these waterways, any positive impacts of irrigation flows are not well documented or understood. Unknown opportunities may exist where irrigation water can be of co-benefit to agriculture and the environment.

“Investigating the actual and potential benefits of irrigation flows for the environment and agriculture is of increasing importance to the Australian cotton industry as it seeks to understand how to sustainably manage riverine systems in the face of a changing climate,” said researcher Rebekah Grieger at the Australian Rivers Institute, Griffith University, who is leading a CRDC-supported project.

“There is a finite amount of water within a river system that is needed for multiple and/or competing uses, so managing all regulated water to increase co-benefits for agricultural and environmental goals is vital for river ecology in the face of a drier, warmer climate.

“Research hasn’t considered how irrigation water delivered via rivers may be benefiting the river system and sustaining riparian vegetation.

“Understanding the specific consequences of irrigation flows on riverine ecology can assist in better management of ecosystems.”

This project aims to identify environmental benefits and consequences of irrigation water delivery, particularly for riparian and floodplain vegetation in the Northern Murray-Darling Basin.

Interviews with water managers were undertaken to gauge their considerations of environmental outcomes when delivering water for irrigation, as well as a

G. KING

Field work research team in the floodplain along the Namoi River.



literature review of relevant knowledge . This identified a general lack of knowledge on the environmental benefits of irrigation delivery.

“Irrigation water is typically not managed for environmental outcomes and the environmental benefits of irrigation flows are not accounted for in current monitoring and evaluation programs,” Rebekah said.

“Downstream connectivity and management of water quality (including erosion) were the key environmental considerations of water managers when delivering irrigation water.

“We found that the two lowest-scoring environmental considerations were the most ecologically targeted co-benefits: the timing of water requirements for different

species of plants and animals; and the timing of ecological processes, such as spawning in fish or flowering of flora.”

The concept of environmental co-benefit is not to be confused with ‘environmental flows’, which Rebekah says was at first confusing to stakeholders they’ve worked with through the project.

“This observation highlights the mindset of environmental water for environmental outcomes and irrigation for agriculture, which further confirms the need for a holistic approach to managing water to increase sustainable use and highlights the importance of improving our knowledge,” she said.

“Water delivery would need to be tailored to different regions’ climate, agricultural activity and water

# ent through irrigation



## Soil scientist becomes a Fellow

Professor Brajesh Singh has received the highest scientific recognition in Australia by being elected as a Fellow of Australian Academy of Science.

Braj is the Director, Global Centre for Land-Based Innovation at Western Sydney University, where he's an expert in functional ecology and soil biology and has undertaken several CRDC-supported projects. As an internationally recognised expert in the field of microbial ecology, his research interests encompass functional microbial ecology, climate change and environmental biotechnology with particular focus on the role of microbes in ecosystem function and environmental sustainability.

"Through my research I have shown how the loss of microbial diversity in soils can reduce the functioning of ecosystems," he said.

"My multidisciplinary connection to the cotton industry has included climate adaptation of cotton farming and disease management through developing nature-based solutions.

"I'm currently undertaking a CRDC project to create drought resilient cotton using synthetic biology to improve productivity under future water limited and heatwave conditions and have previously investigated biological based products for disease management with CRDC support."

Braj's research on plant pathogens and climate change was recently published in *Nature Reviews Microbiology*, which references his work on Verticillium and Fusarium wilt.

Fellows are elected by their peers for ground-breaking research and contributions that have had clear impact. Braj's research has been translated into products and guidelines to improve soil health and led to changes in farm management practices. He's conducted global studies that demonstrated the central role of soil microbes in predicting, mitigating and adapting to climate change. He has also recently received fellowships from the Soil Science Society of Australia and its equivalent in America.

management techniques."

The research team is now exploring the effects of water delivery options on the early development and growth of the soil seed bank and common riparian vegetation species, both native and exotic, to identify flow regimes which benefit or detriment the riparian zone.

As part of the project, PhD student Jaiden Johnston-Bates is seeking to untangle the complexity of plant invasions in the northern Murray Darling Basin, namely the interaction between irrigation flows and the traits of invasive weeds.

CRDC Innovation Broker Stacey Vogel manages the project and has encouraged cotton growers and water managers to reach out and share their thoughts on water delivery regimes which optimise

environmental co-benefits and economic benefits.


"Improving our knowledge of how irrigation flows influence riparian ecosystem function, structure and composition will enable us as an industry to better manage these important cotton landscape ecosystems and meet the challenges that climate variability impacts will have into the future.

"If you wish to be involved in further consultation and an engagement workshop, please contact Rebekah," Stacey said.

### For more

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Tridax daisy in the Ord,  
where it is becoming  
problematic to manage.

# Weed status in the far north under the microscope: glyphosate doing the heavy lifting

With limited understanding of the species and number of weeds in Northern Australian cotton fields, industry researchers have been undertaking surveys to build a clearer picture and create baseline measures.

NSW DPI's Eric Koetz and Dr Graham Charles visited Kununurra (Miriwoong country), Katherine (Jawoyn country) and Mareeba (Djabugandji country) in the far north, where they met with agronomists and growers, undertaking surveys as they went. They found that the weeds and resistance status in the north was quite different to other growing regions.

Tridax daisy (*Tridax procumbens*), which is not common in the south, is prolific and already a problem weed in Kununurra, while around Mareeba, cotton was being used by some as a rotation crop to manage high weed numbers from sugarcane. In all these regions, the heavy reliance on glyphosate has garnered a warning from Eric and Graham that this approach is a sure-fire way to increase the likelihood and rate of resistance developing.

Attention especially needs to be paid to irrigation channels and on-farm delivery drains as weed pressure was high on these, with the problem exacerbated by how ownership of some of these structures is set up and who has responsibility for maintaining them. Whole farm hygiene is just as important as in-field weed control as many incursions come from non-crop areas.

"Across the three regions, glyphosate is doing all the heavy lifting for weed management at the moment, with limited other modes of action in use," Eric said.

“We may already be seeing the effect of this, with some populations of tridax daisy and barnyard grass alive and well after two glyphosate applications, although the origin of the seed is unknown, so we can’t definitively link this to in-crop management.

“We’ve acknowledged the need to update the Herbicide Resistance Management Strategy for northern cotton systems and promote the use of integrated weed management (IWM) strategies to include more specific options for pre-emergent and residual weed control at planting and early post-emergence.

“Our industry strategy of ‘2+2&0 survivors’ still applies in the north as it does in other growing regions.

“With that in mind, the use of residuals in a monsoonal climate offers its own set of challenges, and we need to explore residual options taking into account large rainfall events and soil properties.”

The issues of run-off and resistance are magnified in the new northern cotton areas where weeds are growing under tropical conditions, potentially allowing multiple generations of weeds each year. Soil type and proximity to sensitive areas, including the Great Barrier Reef, makes it very challenging to use many of the older residual herbicides.

“It is essential to understand the issues around weeds in the north to enable a management plan to be developed for this,” Eric said.

“At Mareeba especially, we saw high weed numbers and other issues coupled with limited experience around residual herbicide options.

“Options for weed control under an integrated system, such as cultivation, can be tricky in some northern soils which can be fragile and susceptible to erosion.”

**Inherited issues**

Previous management strategies to control vegetation regrowth could be creating emergence issues around Katherine. The use of metsulfuron prior to cotton growing over a 20-year-plus period is suspected to be one of the issues Graham and Eric observed. In addition to the residual carryover, many fields are left with grassy regrowth prior to planting to control erosion from the monsoonal rains and help to cool the soil surface at planting. It was noted during the survey that several fields had weeds that survived glyphosate application prior to planting and were now an issue in-crop. This is placing a lot of selection pressure on glyphosate.

“While I feel we can make a clear connection between residues in the plants and damage, we have no idea what levels of residual herbicides in the soil are dangerous for a subsequent cotton crop, so more work on residuals is needed to



**Cotton fields at Mareeba, where sugar cane is rotated with cotton to control weeds.**

help us better manage this group of herbicides,” Graham said.

Graham noted that the northern expansion of cotton growing is coinciding with the introduction of XtendFlex and its herbicide tolerance traits for glufosinate, dicamba and glyphosate. He said given what they observed, it looks like XtendFlex could be a good fit for those farming systems.

“We feel there is a place for XtendFlex in the north, as glufosinate works well in humid environments and dicamba may be an option to control tridax daisy, but we have the same concerns as in the south around off-target movement. If we are to use these herbicides, we have to get the applications right every time,” he said.

“While I have seen Tridax in the Namoi (Kamilaroi country), and it occurs as a background weed in the south, it was particularly bad in the Ord, where it is a problem especially along channel banks, which aren’t managed as well as weeds in-crop.

“We also saw an area in field where it had been missed with a spray and taken hold and has survived multiple applications of glyphosate, so the potential for this weed to become more problematic exists.

“There is an opportunity in the north to avoid the widespread resistance issues we see in the southern states because of the potentially lower levels of past herbicide exposure, however we are concerned about an over-reliance of glyphosate and the lack of understanding around how to integrate residuals into the system.”

**For more**

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## We've now got the tools to help prevent spray drift. Are we willing to use them?

Cottongrower Bernie Bierhoff from Rowena NSW (Kamilaroi country) shares his thoughts on solving the spray drift challenge with *Spotlight*. Bernie is the TIMS Technical Bt Panel chair, sits on the Biosecurity and Stewardship Advisory Panel, and is a Director of Cotton Australia.

Talk to any cotton grower, and it won't take long for the conversation to turn to WAND: a network of 101 individual inversion profiling towers that could make spray drift a thing of the past.

Stretching from Emerald in Qld (Gayiri country) to the Victorian border (Wiradjuri country), WAND towers identify, in real time, whether a hazardous inversion is present, helping operators to inform their decision to spray in accordance with label requirements – and in a way that minimises off-target impacts on neighbouring crops.

More than 2400 cotton and grain growers and spray operators have already signed on, keen to explore how they can claw back more control over the complex decision of when not – or, more critically, when – to spray.

Until now, working out if an inversion is present has come down to guesswork. Visual cues like fog and dust all help to make it an educated guess. But it's still just a guess.

And with 48 per cent of cotton growers reporting spray drift damage to CRDC in 2023, it's

evident that we aren't always getting it right.

When we don't, the consequences to other growers (from right next door to tens of km away) can be colossal: an average of \$855,000 in lost production per grower in the McIntyre-Balonne region last year. The feedback I've had from growers more broadly suggests that figure is the tip of the iceberg, with losses from cumulative inversion drift events easily running into the millions.

WAND can give us the information we need to avoid sending the rig out during a hazardous inversion. What it can't do, is turn the spray rig for home when conditions have deteriorated. That requires a cultural change.

Growers know that the peak time for spray damage is in the lead up to Christmas. For most operators, December 25 is a hard deadline; staff go on leave and no one wants to be on a spray rig, missing the family Christmas dinner. So the boundaries sometimes get pushed.

But you only have to push the boundaries a little bit to cause a lot of problems – and give your neighbours a pretty ordinary New Year's present when the damage rears its head two weeks later.

It isn't just Christmas, of course. Modern farming has created a perfect storm: bigger farms, more cropping and less labour makes growers and operators time poor in a way we've probably never been. And when you've got a quarter tank of chemical left and the wind drops away and an

inversion sets in – it’s tempting to just spray those last few hectares.

But that’s where the damage is done. And that’s the culture we’ve got to change.

WAND can’t do that on its own, although it’s making a pretty good tilt at it. Taking the guesswork out of identifying hazardous inversions is expanding the spray window by an average four hours per day. And WAND’s nowcasting function goes a step further – giving growers and operators a two-hour forecast of whether you’re safe to go back and refill the tank to keep spraying or should knock off until conditions improve.

Updated every 10 minutes, Nowcast means we’re no longer taken by surprise when conditions change; we can plan for it.

WAND is a great tool, and a credit to CRDC, GRDC and Goanna Ag who’ve put it in the hands of growers. But it will only be a game changer if we all

***“Data gathered from WAND shows it has opened up an additional four hours of spray window every day”***

get behind it – *and* we all make the cultural change needed to prioritise safe spraying.

I love growing cotton, and like most growers I know, I’m always optimistic that the next season will be better than the last. And the chatter about WAND has me optimistic, too.

More growers are talking about spray drift than ever. More growers are becoming aware of the impacts than ever. And more growers are cottoning on to the fact we all have a role to play in making inversion drift a thing of the past.

## Open the window with WAND

The WAND system is a game-changer for spray operators and has the power to change the way cotton and grain farmers think – and spray.

Data gathered from WAND (Weather and Networked Data) system shows it can potentially open up an additional four hours of spray window every day. This is based on the roughly 720,000 hours of observations it has gathered since its launch in December 2022.

“Translated to a practical outcome, that means one spray rig covering 50 hectares per hour, could theoretically cover an additional 200 hectares per day,” says Jay Jalota, CEO of Goanna Ag, the Goondiwindi-based (Bigambul country) commercial partner who supplies software, hardware and expertise.

“WAND takes the guesswork out of knowing when conditions are suitable or not – and particularly the presence and/or likelihood of a hazardous temperature inversion.

“It’s also alerted us to the fact that we can’t make assumptions about the presence of hazardous inversions – that often there isn’t a pattern or set time frame when they arrive. WAND has allowed us to now link what we see in the field to what the stations are telling us.”

WAND is a world-first network of 101 Profiling Automatic Weather

Stations (PAWS) across the grain and cotton regions of NSW and Qld. The PAWS’ remote sensing capability and proprietary software provides growers and spray contractors with real-time weather data, updated every 10 minutes. This ‘Nowcast’ feature is a predication of presence or absence of a hazardous inversion within the coming two hours.

It is the result of six years of collaborative research and significant investment by the Grains Research and Development Corporation (GRDC) and CRDC.

“WAND represents CRDC’s single largest investment of nearly \$6 million, which given the cost to the industry in damaged cotton and lost yield, is justifiable,” CRDC Senior Innovation Broker Susan Maas said.

“Our 2023 Grower Survey paints a pretty disturbing picture of how much damage was caused by spray drift last season.

“Nearly half the respondents were affected by spray drift, and on average, 48 per cent of their crops were affected, so it goes without saying that we are keen to see cotton and grain growers spreading the word about WAND and making good use of it.

“Of the 200 growers who completed the survey, this translates to 1.2 bales, or \$783 per hectare lost to spray drift

damage, with the McIntyre/Balonne region growers reporting a huge average loss of \$885,000 per grower.”

On this average yield impact of 1.2 bales/ha, it is estimated that the total production loss for the affected growers surveyed for the season was 33,354 bales. Based on an average price of \$600 per bale, this equates to an approximate \$20 million loss.

The CRDC Grower Survey also shows that of those who have accessed WAND, three in five (60 per cent) report making a change due to the information provided by the system. The two most common changes reported were to change the timing of planned spraying (45 per cent of growers) and to stop spraying (also 45 per cent).

“The aim is now to get more people using the technology, sticking to the label requirements and following the guidelines for best practice spraying when the conditions are right,” Susan said.

### For more

#### WAND

[www.goannaag.com/wand-network](http://www.goannaag.com/wand-network)

#### CRDC Grower Survey

[www.crdc.com.au/publications/cotton-grower-survey](http://www.crdc.com.au/publications/cotton-grower-survey)

# Weeds: Australia's largest invasive threat

Invasive weeds outside cropping areas and particularly in native vegetation are a worrying issue for landholders as numbers increase and they come under increasing pressure to manage them, particularly in riparian zones on cotton farms.



Environmental weeds, particularly the exotic and invasive kind, are costing the cotton industry \$90 million per year. Growers in the Gwydir and Namoi valleys would be familiar with lipia, which was sold as a no-mow lawn option and used for bank stabilisation.

Under each state's respective biosecurity acts, all land managers have a duty to prevent, eliminate or minimise the risk of invasive species.

Termed 'environmental weeds', they can be more problematic to manage and eradicate than cropping weeds because they cannot be controlled in the same manner, can be hard to spot and access, are in land that is considered 'unproductive', and it's costly. Plus, there are a lot. Weeds have been estimated to account for 21 per cent of the total vegetation of NSW alone.

The issue with any invasive pest either animal or weed is their ability to negatively impact ecosystems and biodiversity. Since 1788, over 3000 introduced plants have established populations in Australia. More than 1750 of these have been recorded in NSW, with over 340 recognised as threats to native biodiversity. There are now more introduced plant species (27,500) in Australia than natives, with an estimated 20 species becoming naturalised in every year.

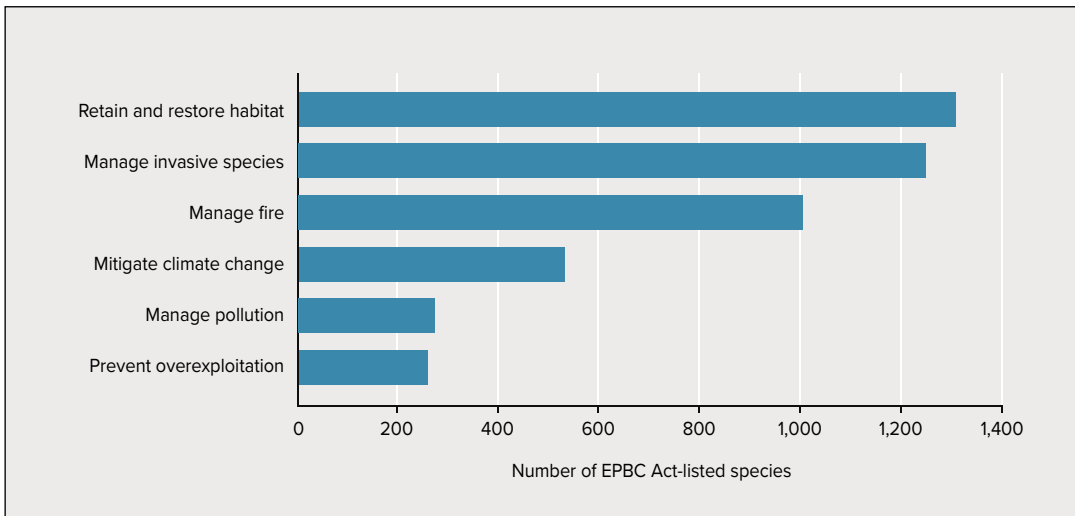
As Australian farmers look to take advantage of biodiversity schemes, manage riparian zones and repair sections of their farms, the problem of environmental weeds is becoming more visible on the radar. They can harm our most vulnerable species and, as they continue to spread, add to other pressures on the natural environment such as the addition of nutrients, monocultures, changed hydrologic regimes, bushfires and climate change.

Surprisingly, weeds also have a greater impact on threatened species than animals. The recent *NSW State of the Environment Report* says weeds have a negative impact on 45 per cent of threatened species, populations and ecological communities in NSW, whereas pest animals directly threaten 40 per cent. Considered individually, pest animals such as feral cats and foxes have a far greater impact on threatened species than individual weed species, but the overall number of weed species is much greater than pest animals and their combined impact is broader.

The most recent available data suggests that in NSW, weeds account for \$1.8 billion a year in lost production, compared to the annual economic loss to the economy from the impact of pest animals at \$170 million.

Nationally, invasive plant control costs the cropping sector \$3.7 billion annually according to the 2023 ABARES report. *Cost of established*





**Figure 1**  
Number of Australian species that would benefit from different conservation responses.

pest animals and weeds to Australian agricultural producers.

**New and emerging weeds**

Emerging weed threats are identified in regional plans and prioritised for surveillance and control. Between 2015 and 2020, more than 70,000 surveillance inspections and over 2600 control responses were conducted to eradicate or contain new incursions of emerging, high-risk weeds, such as Mexican feather grass, Amazon frogbit, kidney-leaf mud plantain, parthenium weed, boneseed and tropical soda apple.

Worryingly, many invasive species have not yet reached their potential spread limit. Weeds like African olive, alligator weed, cabomba and many exotic vines occupy only a small part of their potential range, and some weeds generally regarded as already widespread, like lantana, bitou bush, blackberry and Coolatai grass, could spread even further without strategic control to contain them.

CRDC Innovation Broker Stacey Vogel has been involved in grower consultation around native vegetation targets as a part of the cotton industry’s PLANET. PEOPLE. Paddock. Sustainability Framework.

“Managing environmental weeds in native vegetation was one of the major concerns voiced during the consultations,” Stacey said.

“Environmental weed management has been highlighted as a big challenge, as growers struggle for options. As a result, CRDC is supporting research to get a better understanding of the problem, and look at solutions and avenues for alternative control methods.”

PhD scholar Jaiden Johnston-Bates of Griffith University is investigating the impact that irrigation releases and environmental flows have on the spread of weeds as part of a broader project (see page 26) assessing the co-benefits of irrigation flows in rivers.

**Key programs**

**Help is at hand: response programs are important in mitigating the threats from invasive species. They include:**

- the State Weed Committees responsible for ensuring a coordinated and strategic approach to weed management
- Regional Weed and Pest Animal Committees which coordinate regional pest and weed management activities
- Saving our Species which manages projects to protect threatened species from pests and weeds

**“Nationally, invasive plant control is estimated at nearly \$5 billion, with control in agricultural areas accounting for most costs.”**

“I’m looking at how irrigation events influence the patterns and processes of plant invasion in riparian and floodplain habitats in areas of the Murry-Darling Basin,” Jaiden said.

“Surveys will also give us a better understanding of the distribution of invasive plant species in the Basin and key drivers of these.

“Exotic species are a priority as they have the potential to significantly impact the Basin environmentally and economically, noting any shifts in key vegetation communities.”

**For more**  
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# Problem weeds need new approach to management

Weed management is often seen as the solitary domain of farmers, however the entire community has a role in successfully halting the spread of weeds, off-target spray drift and herbicide resistance. Could area wide management (AWM) hold the key to landscape-scale weed and resistance management?

The cotton and grains sectors collaborated to address the ever-evolving challenge of weed control and the spread of herbicide resistance across private and public land, through a cross-sectoral project: *Area Wide Management for cropping systems weeds: investigating the weed management, social and economic opportunity*.

The project, which wound up in June, investigated and demonstrated the agronomic, economic and social benefits of tackling the problem of mobile weeds on a cross-industry scale. Using a multi-disciplinary approach, it gave cotton and grain growers an understanding of key weeds in cropping systems, their mobility, herbicide resistance status, and the costs of managing herbicide resistance.

AWM involves private and public land managers working together to control weeds on a broad, cross-industry and community scale, rather than farm by farm. University of Wollongong researchers initially looked at the attitudes of a range of stakeholders to collaborative weed management approaches, such as AWM.

Led by Associate Professor Sonia Graham, the research team explored the attitudes of grain, cotton and mixed enterprise growers to weeds and AWM.

“The ease with which weeds spread and increasing herbicide resistance among different weeds and modes of action means that weed management is a landscape-scale challenge that requires area wide solutions,” Sonia said.

“Weeds are not just an on-farm issue or single industry issue and neither is resistance.

“Australia is second only to the US in terms of number of resistant weeds, and control costs Australian agriculture more than \$4 billion dollars per year.”

Sonia found growers largely believe ‘weeds are everybody’s problem’ and that each land manager has a responsibility to a region to effectively control weeds, which requires working together. Almost half of cotton growers surveyed indicated that they believe that AWM of weeds occurs in their area but less than a quarter participate in weed management that involve other land managers.

With cotton growers spending up to 21 per cent of their total farm costs on weed control, the top concern around an AWM approach is the cost of participating, which factors higher than concerns about increasing herbicide resistance. There is also concern AWM might require too much time in meetings and having to change spraying operations to accommodate neighbours. On the whole, the research found that cotton growers don’t think that working with other land managers would result in reduced management costs.

Growers nonetheless see benefits in AWM such as managing weed spread and herbicide resistance, increased awareness of new weeds and of herbicide resistant

weeds in the area, along with getting ahead of any potential weed spread. More local social interactions with other land managers is also seen as a positive.

The three top concerns of growers related to weed management are the financial cost, herbicide resistant weeds on their land, and the spread of weeds to their land. Growers are least concerned about herbicide resistance spreading from their land.

“The results presented in this report indicate high levels of agreement among cotton growers about the benefits that can come from working together on weeds,” Sonia said.

“Yet there are also common concerns about the costs of participating in AWM.

“Other potential hurdles include differing financial resources, identifying common weed priorities, achieving co-ordinated control, and communication between various groups,” Sonia said.

The results provide a snapshot of what is important to a sample of Australian cotton growers, which may help the design and implementation of area wide weed management strategies.

“Considering all aspects of this project, the findings support a collaborative approach to tackling the shared challenge of herbicide resistance,” Sonia said.

The research was supported by the Australian Government’s Rural R&D for Profit program in partnership with CRDC, its sister research and development corporations (RDCs) GRDC and AgriFutures Australia, and research partners.

Stay tuned for the next edition of *Spotlight* as we profile the outcomes of this project and investigate the levels of resistance and genetic makeup of cotton’s problem weeds.

**For more**  
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**“Australia is second only to the US in terms of number of resistant weeds, and control costs Australian agriculture more than \$4 billion dollars per year.”**



# As weeds evolve the need for correct ID grows

## Managing for in-crop weeds is a key role of consultants.

The latest ABARES report, *Cost of established pest animals and weeds to Australian agricultural producers*, released in November puts the cost of weed control coupled with losses at \$90 million a year for the cotton industry and \$3.7 billion for cropping in total. When examined at an on-farm level, it is easy to see how this figure can quickly add up, but it is difficult to capture all of the related expenses within a dollar figure.

As consultants, we aim to achieve not just the best yield possible, but also the highest economic return to our growers in any given season. When it comes to weed management, some other considerations are now becoming pivotal in decision making, meaning that production limitations and yield loss are not the only cost of weeds in a farming system that should be taken into account.

According to the *Australia State of the Environment Report (2021)*, introduced species now represent the majority of all species identified in every one of Australia's bioregions, but pleasingly, through strict biosecurity measures, Australia has now seen a substantial decline in the appearance of 'new' introduced weed species. With fewer 'new' incursions, it could be assumed that the experienced consultant should be more than familiar with both local weeds and their tried and tested management options. If only it were that simple.

Climate change is playing its part in the spread of weeds in Australian agriculture – be they native or invasive. As average daily temperatures rise, and the life cycles of pollinators alter, 'new' weeds which were previously found in northern regions are making their way south. Poor machinery hygiene, seed spread in fodder, and increased natural disasters are also contributing to the spread of weed species. Even the most experienced of consultants can suddenly find themselves dealing with a completely new species to their region.

Further to the climate change impact, as Australia progresses down the path of emissions accountability, the associated costs of weed management will be part of the equation – another currently hidden cost of the national problem. Also added to the bill are the crop loss and litigation costs of spray drift events.

Herbicides remain the mainstay of weed management in Australia with ABARES reporting in 2019 that 90 per cent of landholders for who manage weeds use herbicides as their first line of defence. The increasing incidence of resistance to herbicides is well documented in Australia and the industry initiative WeedSmart – supported by CRDC and CottonInfo

– continues to provide much needed research and education resources in the form of its Big 6 program.

Resistance aside, there is also an increased social pressure to regulate the availability and registered use of some of the traditional chemistries which have formed the basis of these weed management strategies.

In response to the environmental and economic impact of weed management, the Australian Government in conjunction with the Australian Invasive Plants and Animals Committee developed the *Australian Weeds Strategy 2017-2027*. The strategy aims to provide a guide to best practice in weed management in Australia. It identifies seven key principles underpinning effective weed management, the first of which is 'effective weed management is a responsibility shared between landholders'.

The findings of a recent collaborative project between GRDC and CRDC highlighted the important role area wide management can play in the management of feather top Rhodes grass, and this has long been the recommended practice in natural resource management. Issues arise, however, when weeds of concern in a cropping system are not a priority for neighbours, be they local councils or other agricultural operations. Communication is therefore key when it comes to reducing the combined seed bank of a region. The starting point for this whole process is a basic one – the timely and accurate identification of weeds – which is an essential skill for consultants and growers alike.

Tell-tale seed heads are always a giveaway, but by the time weeds are at that stage, it is too late. Early and accurate identification and a timely response is critical. Technology such as apps can be useful but should not replace firsthand observation and recognition.

Listed below are some of the many resources available for the less experienced observer, or for the more experienced who have stumbled across something new.

The importance of weed management should not be underestimated by consultants or land managers at any stage of their career. Weeds by their very nature are an ever-changing enemy and we are still coming to grips with their true cost to agriculture.

### For more

[www.cottoninfo.com.au/weed-management](http://www.cottoninfo.com.au/weed-management) (including links to WEEDpak)

[www.weeds.org.au](http://www.weeds.org.au) (including links to download the WeedsScan App)

[www.weedsmart.org.au](http://www.weedsmart.org.au) (including the Big 6 and links to GRDC's common weeds of grain cropping: ute guide)

Goanna Ag's Tom Dowling,  
CRDC Senior Innovation  
Broker Susan Maas, and  
GRDC's Gordon Cumming.



MELANIE JENSON

# Year in review: Investing in world-leading cotton RD&E

As growers know, the Australian cotton industry is highly-regarded for its innovation and its commitment to investing in RD&E.

CRDC's role to turn this investment in innovation into impact: helping to increase the productivity and profitability of Australian cotton farms, improve our sustainability and value chain competitiveness, build our adaptive capacity, and strengthen our partnerships and the adoption of our research outcomes.

The just-published CRDC Annual Report and Performance Report look back at the major developments in Australian cotton RD&E during 2022–23. In this *Spotlight* feature, we highlight some of these key investments.

## CRDC RD&E achievements 2022-23

### Spray hazard warning system now live

CRDC, GRDC and Goanna Ag's five-year collaboration to help minimise spray drift reached a major milestone in 2022–23, with all 100 Weather and Networked Data (WAND) towers going live across Queensland and NSW. The hazardous weather warning system provides real-time weather data and alerts to growers and spray operators about the presence of hazardous temperature inversions. The warning system builds on breakthrough research supported by GRDC and CRDC and is delivering on-the-ground benefit to growers via improved information and decision-making. In its first six months of operation, over 1,800 cotton and grain growers and spray contractors signed up to access the system. A CRDC study found that WAND could help the cotton industry avoid \$40 million in losses and costs associated with drift over five years.

### Major northern Australia research collaboration underway

A major four-year \$27 million collaboration to boost agricultural production in Northern Australia was announced in 2022–23, bringing together CRDC, GRDC and the Cooperative Research Centre for Developing Northern Australia (CRCNA). Comprising six interlinked projects across the three focus industries of cotton, grain and cattle, the program is designed to address pressing research gaps in the emerging broadacre regions of Northern Australia, while also boosting the value delivered to the cattle industry, creating a robust and sustainable sector that will benefit the local economy. It involves around 30 partners, including universities, state/territory governments and industry stakeholders across Western Australia (WA), the Northern Territory (NT), and Queensland.

### CRDC RD&E delivering return on investment for growers

CRDC commissioned an impact assessment of projects completed under the current Strategic RD&E Plan in 2022–23. Impact assessments were completed for 10 project clusters, comprising 24

***“WAND is estimated to have a benefit-cost ratio of \$12.54 to \$1 – \$12.54 in benefit returned to growers and the wider industry for every one dollar invested via CRDC.”***

individual RD&E projects, with a combined CRDC investment of \$10.7 million (38 per cent of CRDC's investment from 2018–22). The project clusters included smart sensing and automation for irrigation, canopy temperature sensors for irrigation, integrated pest management, community resilience, Bt resistance, integrated weed management, sustainability, the WAND spray hazard tower network, the silverleaf whitefly decision support tool, and nitrogen management. WAND was estimated to have a benefit-cost ratio of \$12.54 for every dollar invested over the period 2023–2030, while the overall benefit-cost ratio was estimated at \$5.98 to \$1 – \$5.98 in benefit returned to cotton growers and the wider industry for every \$1 invested.

### Update on cotton's sustainability progress released

CRDC and Cotton Australia released the second annual progress update against cotton's key sustainability indicators, outlined in the PLANET. PEOPLE. PADDOCK. Sustainability Framework in 2022–2023. The annual update, which looks at the year ending June 2022, provides a snapshot of cotton's performance against the nine indicators – PLANET: water, greenhouse gases, biodiversity, pesticides and soil health; PEOPLE: wellbeing and workplace; and PADDOCK: productivity and profitability. The annual updates are designed to fit between cotton's comprehensive five-yearly sustainability reports, giving important insights into progress, so the industry can keep track of areas performing well, and those that need more emphasis. The Sustainability Update 2022 shows that improvements have been made in water-use efficiency, the reduction in the hazard of pesticides to bees and algae, and the proportion of female and First Nations workers in the cotton industry.

### CottonInfo celebrates 10 years of connecting growers with research

CottonInfo, the Australian cotton industry's joint extension program, celebrated 10 years of delivering outcomes for the Australian cotton industry in 2022–23. Officially established at the 2012 Australian Cotton Conference by CRDC, Cotton Australia and CSD, CottonInfo is a unique industry partnership that communicates the outcomes of research, encourages grower adoption of technology and innovation, and improves industry practices. The team comprises Regional Extension Officers, Technical Leads and myBMP experts and works across issues including biosecurity, climate, crop nutrition, disease management, energy-use efficiency, fibre quality, integrated pest management, natural resource management, pesticide-application efficiency, soil health, stewardship, water management and weed

control. The CottonInfo team are a highly trusted source of information for 94 per cent of growers.

### New mode of action for insect control

A new plant-based compound for combating common insect pests in cotton, horticulture and broadacre crops has been developed by the University of Western Sydney (WSU), with support from CRDC. Researchers have uncovered a plant extract that shows tremendous promise in lab tests and in early field trials in controlling common crop insect pests. Code-named N68, the commercially cultivable native plant compound shows excellent insecticidal activity in controlling cotton aphids as well as good activity on whitefly, thrips, two-spotted mites, olive lace bug, diamondback moth, and Queensland fruit fly. The compound also has favourable off-target traits – low phytotoxicity, low impact on non-target organisms and a low eco-toxicological profile. Current testing suggests N68 is a new mode of action for insect control and potentially an entirely new tool in the challenge of resistance. A patent has been lodged, and a commercial partner contracted to further develop this novel biopesticide.

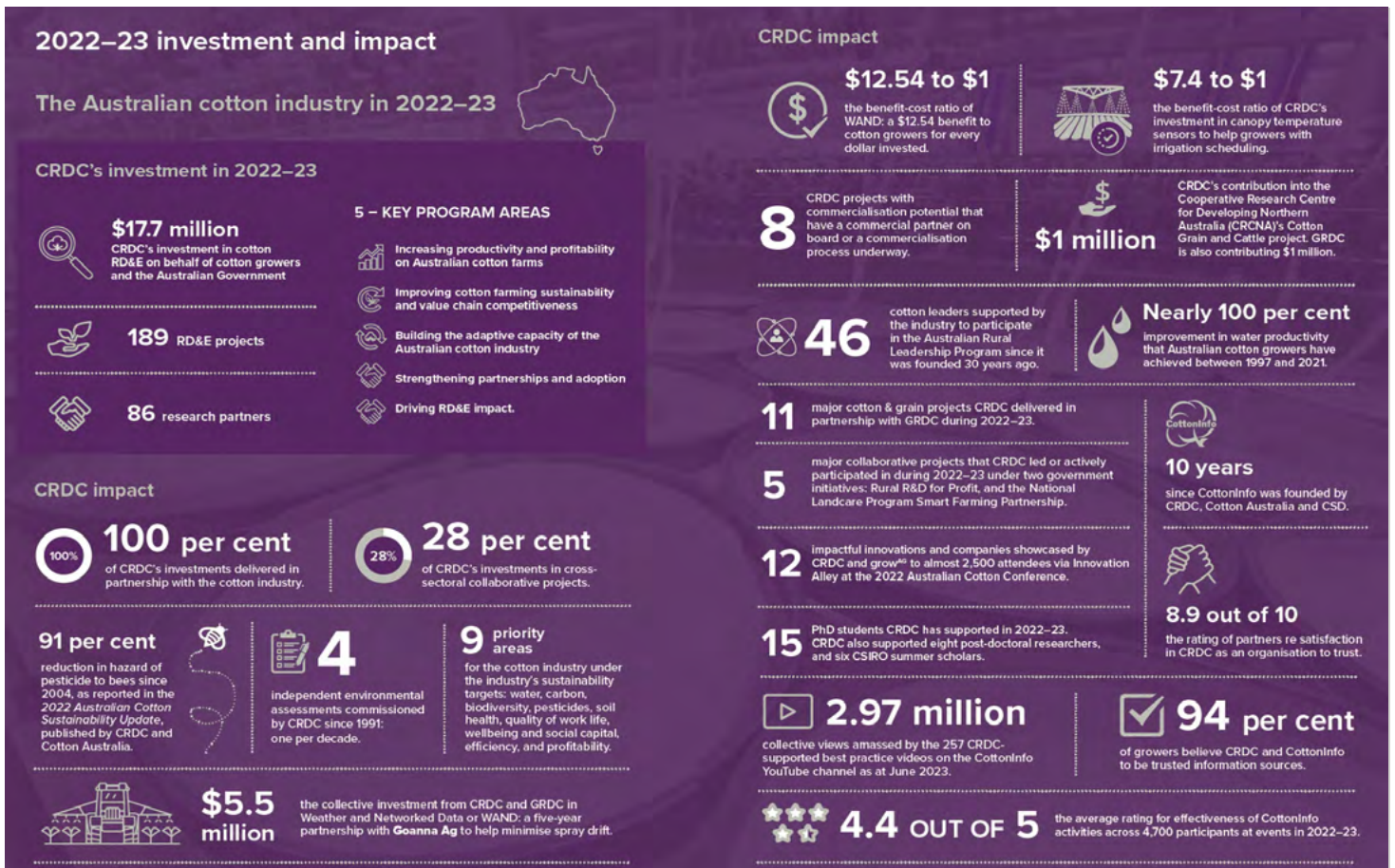
### Collaboration to tackle major cross-sectoral challenges

All of CRDC's 2022–23 investments were

delivered in partnership with the cotton industry, and 28 per cent involved cross-commodity collaborative projects with fellow RDCs. CRDC led three major collaborations during the year: Smarter Irrigation for Profit Phase 2 under the Australian Government's Rural R&D for Profit Program; Cotton Landcare Tech Innovations, under the National Landcare Program Smart Farming Partnership; and Better Information and Better Decisions, under the National Agriculture Traceability Grants Program. CRDC has also partnered in two other projects under Rural R&D for Profit, addressing cross-sectoral issues in weeds and biosecurity. In addition, CRDC is a partner in major RDC initiative grow<sup>AG</sup>, and partnered with GRDC on 11 research projects in 2022–23, totalling \$21 million in collective investment.

### Progress towards commercialisation: R&D on path towards commercial release

In 2022–23, several CRDC-supported R&D innovations continued their progress towards commercial release: Pest Detect, the artificial intelligence smartphone app to help identify silverleaf whitefly; BioClay<sup>™</sup>, the non-toxic, clay-based biodegradable product for crop pests and pathogens; AquaTill Injeticide, the ultra high-pressure water-cutting technology for crop termination in dryland crops; VARlwise, the software that combines in-season imagery with





CRDC Senior Innovation Broker Susan Maas oversees the Cotton Grain Cattle program, a four-year collaboration between CRDC, GRDC and the Cooperative Research Centre for Developing Northern Australia (CRCNA). She is pictured here at the launch of the program in May.

crop production models to provide yield predictions throughout the season; and the CRDC-GRDC-Goanna Ag spray drift hazardous weather warning system, WAND. These innovations were among 12 technologies and companies showcased by CRDC in partnership with grow<sup>AG</sup> to over 2,500 attendees at the 2022 Australian Cotton Conference's Innovation Alley.

### Developing a Strategic Roadmap for Australian Cotton

A collaboration to develop a strategic roadmap for the Australian cotton industry commenced in 2022–23 via Cotton Australia, CRDC and the Australian Cotton Shippers Association (ACSA). The roadmap is focused on helping Australian cotton remain competitive in changing international markets. Five key topic areas are being addressed via broad consultation with growers and the industry: traceability; industry data; sustainably-certified cotton/the *myBMP* program; human rights; and Australian cotton marketing. The need for the roadmap has emerged from new requirements in global markets, including legislative changes, global frameworks, and social and environmental reporting requirements. The roadmap's development is supported via an Australian Government Agricultural Trade and Market Access Cooperation (ATMAC) grant.

### Developing standardised carbon accounting across commodities

CRDC is a partner in a new initiative, announced in 2022–23, to enable Australian farmers to understand their enterprise's carbon footprint and to make better informed decisions to reduce emissions and capture new opportunities. The discovery phase of the project is being led by Agricultural Innovation Australia in partnership with 12 RDCs. Carbon accounting is an important aspect



of natural capital along with biodiversity and native vegetation, so the move to develop a cross-sectoral standardised on-farm carbon accounting system aligns with CRDC and the Australian cotton industry's cross-sectoral approach to setting biodiversity and native vegetation targets based on standardised definitions and calculations. The initiative has already garnered interest from the private sector, including supply chain organisations and commercial providers.

#### For more

**2022-23 Annual Report and Performance Report**

[www.crdc.com.au/publications/crdc-annual-report](http://www.crdc.com.au/publications/crdc-annual-report)



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