CRDC

ANNUAL REPORT 2022–23

Case study

CRDC's largest single investment delivers on-farm solution to help solve spray drift

A major milestone has been reached in the effort to help minimise spray drift, with a hazardous weather warning system now live for Queensland and NSW grain and cotton growers.

The system – named Weather and Networked Data, or WAND – is the result of six years of collaborative research by the Grains Research and Development Corporation (GRDC) and CRDC into meteorological conditions and the spray application of crop protection products.

In early 2022, GRDC and CRDC announced a $5.5 million five-year partnership with Goanna Ag to deliver this new technology to growers and spray applicators: the largest single investment in CRDC's 33-year history. By March 2023, all 100 WAND towers were live across the grain and cotton regions of Queensland and NSW.

The technology provides real-time weather data about the presence and absence of hazardous temperature inversions. For growers and spray contractors, the ability to accurately identify the presence of hazardous temperature inversions will reduce their spray drift risk.

The technology builds on breakthrough research, conducted and published by Drs Graeme Tepper and Warwick Grace with support from GRDC and CRDC, and is delivering on-the-ground benefit to growers via improved information and decision-making.

CRDC

CRDC ANNUAL REPORT

2022-23

Contents

CRDC

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If you are interested in learning more about CRDC and our investments, visit our website or subscribe to our quarterly magazine, *Spotlight.* With thanks to the photographers and organisations who contributed photos to this report: Ali Kuchel, Jem Hawker, Kym Redfern, Lewis Wilson, Melanie Jenson, Paul Grundy, Ruth Redfern, Steve Keough, Cotton Australia, Nuffield Australia and the University of Queensland.

Front cover photo: Goanna Ag Chief Operating Officer Tom Dowling, CRDC Senior Innovation Broker Susan Maas, and GRDC Manager Chemical Regulation, Gordon Cumming.

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About CRDC and the Australian cotton industry

The Cotton Research and Development Corporation (CRDC) delivers outcomes in cotton research, development and extension (RD&E) for the Australian cotton industry.

A partnership between the Australian Government and cotton growers, CRDC invests in world-leading RD&E to benefit Australia's dynamic cotton industry and the wider community. We invest in innovation and transformative technologies to deliver impact, and as an organisation we are ambitious, agile, and adaptive.

Cotton is a major contributor to the economic, environmental and social fabric of rural Australia. The industry's national exports generate an average of $1.9 billion in annual revenue, and the industry is a major employer in rural and regional communities.

Australia's cotton production is closely tied to water availability, making cotton growers naturally adaptive to Australia's seasonal conditions. In 2019–20, the industry grew the smallest cotton crop in 37 years. Just two years later, with a return to more favourable conditions and greater water availability, the 2021–22 crop was the second-largest on record.

Geographically, the industry continues to go through a period of growth, continuing its expansion from its predominant growing base in New South Wales (NSW) and southern and central Queensland (Qld) to northern Victoria (VIC), far north Qld, the Northern Territory (NT) and northern Western Australia (WA).

RD&E and its resulting innovations are a key driving force behind our industry's continued success – and CRDC's purpose is to power the success of Australian cotton through world-leading RD&E.

Vision

Powering the success of Australian cotton through world-leading RD&E.

Mission

Investing in world-leading RD&E to benefit Australia's dynamic cotton industry.

Purpose

Outcome statement: Increased economic, social and environmental benefits for the Australian cotton industry and the wider community, by investing in knowledge, innovation and its adoption.

Investment, innovation, impact.

Report from the Chair and Executive Director

Investing in world-leading RD&E to benefit Australia's dynamic cotton industry.

The Australian cotton industry has built a culture of innovation, driven by its commitment to RD&E and uptake by our highly adaptive growers. CRDC's role is to ever strengthen this culture by delivering impact – helping to increase the productivity and profitability of Australian cotton farms, improve our sustainability and value chain competitiveness, build our adaptive capacity, strengthen our partnerships and the adoption of our research outcomes, and ultimately drive RD&E impact.

There have been some major developments in Australian cotton RD&E during 2022–23, delivering tangible benefits for our levy payers.

The five-year CRDC, GRDC and Goanna Ag collaboration – Weather and Networked Data, or WAND – is a ground-breaking project that has the potential to solve the spray drift challenge. This project represents the biggest single investment in CRDC's history and the most significant move to improve spray application via RD&E. WAND provides real-time weather data and alerts about the presence of hazardous temperature inversions, and its uptake by growers and spray contractors could help cotton avoid $40 million in losses and costs associated with drift over five years.

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.

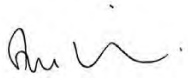
Another major investment is the four-year, $27 million, 30-partner collaboration focused on boosting agricultural production in Northern Australia – including enhancing cotton's productivity, profitability and sustainability in the north. The Cotton Grain Cattle project again brings together CRDC and GRDC, this time with the Cooperative Research Centre for Developing Northern Australia (CRCNA), to address pressing research gaps in Northern Australia's emerging broadacre regions.

These are just two of 189 projects that CRDC has invested in during 2022–23, all designed to deliver impact to growers, the wider cotton industry, and the community.

As these investments show, collaboration is central to all of CRDC's activity. 100 per cent of the research projects that we invest in are delivered in partnership with our growers, collaborators and cotton researchers. We also partner with those outside our sector to solve issues that are bigger than cotton alone. In 2022–23, 28 per cent of our investments were in cross-sectoral RD&E. Of this, 11 projects were in partnership with our fellow broadacre RD&E organisation, GRDC, totalling $21 million in collective investment.

In this report, we outline the fifth and final year of our investment under the CRDC Strategic RD&E Plan 2018–23. We bring you an update on our progress towards our goals, our 2022–23 investments, innovations and impacts.

Richard Haire
CRDC Chair



Allan Williams
CRDC A/Executive Director

PROGRESS AGAINST CRDC STRATEGIC R&D PLAN 2018–23

Our Annual Performance Statement

2022–23 marked the fifth and final year under the CRDC Strategic RD&E Plan 2018–23, which provided an ambitious roadmap for our 2018–23 investments. Through this plan, we aimed to contribute to creating $2 billion in additional gross value of cotton production for the benefit of Australian cotton growers and the wider community.

Progress towards this goal was tempered by dry conditions during the first half of the strategic plan period, and the challenges associated with COVID-19 in the second, but a return to positive seasonal conditions at the end of this period brought renewed optimism.

The strategic RD&E investments that CRDC made in 2022–23 are helping to drive the Australian cotton industry towards a future of innovation, increased commercialisation and digital transformation.

In 2022–23, Australian cotton growers and the Australian Government co-invested $17.7 million through CRDC into cotton RD&E, across 189 projects, and in collaboration with 86 research partners.

The investments were made in the five key areas identified in the Strategic RD&E Plan:

- Increasing productivity and profitability on Australian cotton farms
- Improving cotton farming sustainability and value chain competitiveness
- Building the adaptive capacity of the Australian cotton industry
- Strengthening partnerships and adoption
- Driving RD&E impact.

This Annual Report outlines progress against these areas in the 2022–23 year.

Our progress is measured and performance is analysed through evaluation techniques outlined in the *CRDC Monitoring and Evaluation Framework* and targets set in the Strategic Plan. The green, amber and red traffic light system is used to track overall performance against the CRDC Strategic Plan.

The specific measure has been achieved.

On target to deliver against the measure.

Not on target to deliver against the measure.

The following table provides a snapshot of CRDC's performance against the Strategic Plan measures. Further details about how our performance aligned with the Strategic Plan and our key focus areas are outlined in Section 4 of this Annual Report: the RD&E portfolio.

It is important to note that while this Annual Report focuses on the final year of the Strategic Plan, some metrics for the 2022–23 year are not yet available, so some measures will still show as 'on target'. A full report of CRDC's achievements for the 2018–23 Strategic Plan period, including our performance against the $2 billion in additional gross value target, will be published in 2023–24.

GOAL ONE: Increasing productivity and profitability on Australian cotton farms

Increasing the productivity and profitability of Australian cotton farms was CRDC's aim within this goal under the 2018–23 Strategic RD&E Plan. The five years of the plan have been marked by pandemics, mouse plagues, drought, floods and historically high fertiliser prices across the industry, and the theme of off-farm challenges, variability and extremes continued in the plan's final year. As a result, total production fluctuated more than nine-fold. In 2022–23, labour and fertiliser shortages, heavy rains, flooding and cool conditions marked the start of the cotton season in many regions, while the end of the season was marked by mostly warmer and drier weather. The result was a mix of record-breaking irrigated yields, but also some very low yields in both irrigated and dryland crops: impacting the achievement of this goal's targets.

Outcomes	Performance Indicator	Measures	2018 benchmark	2023 target	2022-23 progress
KEY FOCUS AREA: Optimised farming systems					
Improved yield and quality	Increase in yield over 5 years	Assessment of average bales/ha	9.86 bales/ha (irrigated) 4.0 bales/ha (dryland)	11.6 bales/ha (irrigated) 4.7 bales/ha (dryland)	
Improved input efficiencies	Positive input/output ratios resulting from adoption of new practices	Assessment of bales per unit input for irrigated cotton (water productivity and nitrogen use)	1.1 bales/ML (GPWUI)	1.32 bales/ML (GPWUI)	
			10 kg of lint/kg of nitrogen	11.5 kg of lint/kg of nitrogen	
On-farm sustainable development is supported	New farming systems are sustainable and productive	Number of bales produced on new farming systems	—	2 million bales	
KEY FOCUS AREA: Transformative technologies and *my*BMP					
Improved reliability of production	Increase in five-yearly average production	Rolling annual average production (number of bales)	3.4 million bales/year (5-year average)	3.9 million bales/year (5-year average)	
New technologies are adapted for use in cotton	Increased number of technologies are available for cotton growers	Number of new technologies entering commercial use	1	5	
Cotton farms are digitally enabled	Increase in on-farm use of digital technology	Percentage of farms using digital technologies	100% connected to internet. 46% devices linked to office	85% devices linked to office	
KEY FOCUS AREA: Protection from biotic threats					
Increased understanding of the impact of pests, diseases and weeds, and environmental stresses	Impact information is available to inform improved management practices for growers and industry	R&D investments reflect the potential impact of biotic and environmental stresses to inform management practices	60%	85%	
Improved identification, surveillance & management systems	New management practices and systems are available for growers, consultants and industry	Economic impact of pests, weeds and diseases reduced by 40 per cent	—	40%	
Industry is prepared for a biosecurity incursion	Delivery of effective biosecurity preparedness scenarios/exercises (undertaken by cotton industry)	Number of biosecurity preparedness activities undertaken	—	2	
		Percentage of participants reporting increased preparedness	—	85%	

The specific measure has been achieved. On target to deliver against the measure. Not on target to deliver against the measure.

GOAL TWO: Improve cotton farming sustainability and value chain competitiveness

Improving value chain competitiveness and sustainability to derive greater value for Australian cotton growers was CRDC's aim within this goal under the 2018–23 Strategic RD&E Plan. In 2022–23, the importance of being able to provide high-quality metrics to the supply chain to meet anticipated regulatory and general market requirements has increased dramatically, and current CRDC investments in both understanding and addressing these requirements provide a solid foundation for being able to report on the impact of cotton production. Looking forward to the next Strategic RD&E Plan 2023–28, the development of a data platform will be key to collating and reporting this information down the supply chain.

Outcomes	Performance Indicator	Measures	2018 benchmark	2023 target	2022-23 progress
KEY FOCUS AREA: Sustainability of cotton farming					
Improved environmental footprint for cotton farms	Increase in sustainability metrics and improved carbon footprint	Percentage of farm native vegetation managed for conservation	6%	6.6%	
		Carbon footprint (kg/CO_2e)	383 kg of CO_2e per bale	325 kg of CO_2e per bale	
KEY FOCUS AREA: Create higher value uses for cotton					
Increased value for Australian cotton	Increase in the number of new commercialised products	Number of new commercialised products	—	2	
Increased understanding of market requirements & opportunities throughout the value chain	Information is publicly available on market requirements and value chain opportunities	CRDC research identifies opportunity to increase the value of cotton by 25 per cent	—	25%	
KEY FOCUS AREA: Measurement and reporting throughout the value chain					
CRDC collaborates in global leadership: sustainability initiatives	Evidence of involvement in global initiatives	Number of global initiatives participated in	4	6	
The value chain is transparent and understood by participants to improve market opportunities	Economic and sustainability implications of transparency throughout the value chain are published and understood	Reports and sustainability information published	1	3	

The specific measure has been achieved. On target to deliver against the measure. Not on target to deliver against the measure.

GOAL THREE: Build adaptive capacity of the cotton industry

Building the adaptive capacity of the Australian cotton industry and enabling the industry to achieve its future vision was CRDC's aim within this goal under the 2018–23 Strategic RD&E Plan. The removal of travel restrictions following COVID-19 has allowed for an increase in scientific exchanges, while a confluence of challenges during this Strategic Plan have tested grower resilience.

Outcomes	Performance Indicator	Measures	2018 benchmark	2023 target	2022-23 progress
KEY FOCUS AREA: Science and innovation capability and new knowledge					
Science and innovation capacity is strengthened & strategically fit for a digital future	Increase in the number of researchers supported through strategic career pathways	Number of PhD, post-doctoral and early career researchers supported	30	50	
	Increase in the number of scientific exchanges	Number of scientific exchanges	10	20	
Increased understanding of & participation from diverse human capital	Information is available on the diversity of social and business networks (age, gender, roles, culture, range of service providers, occupations and skills)	Report released	—	1	
Increased opportunities for innovation skills development	Degree to which innovation is supported by CRDC	Number of participants in innovation initiatives	100	600	
		Number and details of new ideas generated that provide benefit for the cotton industry	1	5	
KEY FOCUS AREA: Futures thinking					
Australian cotton growers are able to adapt to change	Growers report improved capacity to manage unknown or unexpected events (resilience)	Percentage of growers that report improved general resilience	—	60%	
Increased opportunities for strategic foresighting	Futures workshops lead to recommendations for future opportunities	Number of futures workshops	1	2	
		Number and details of future opportunities to be followed up	18	40	

The specific measure has been achieved. On target to deliver against the measure. Not on target to deliver against the measure.

ENABLING STRATEGY ONE: Strengthening partnerships and adoption

Further strengthening our collaboration and relationships with our partners and working together to ensure the effective adoption pathway for research outcomes were CRDC's aims within this enabling strategy. CRDC's partnerships remain strong, as reflected in the 2022 Partner Relationship Review, which found partner satisfaction in CRDC as an organisation to trust was 8.9 out of 10, and overall partner satisfaction remained on par with the 2018 benchmark of 8.2 out of 10. The review found that CRDC is widely considered an industry custodian. In addition, CRDC's co-investment in CottonInfo and its regionally based extension officers continue to support direct engagement with cotton growers and crop consultants to great effect, with 2022–23 data showing that 94 per cent of growers and 88 per cent of consultants agree CottonInfo is a trusted information source. In addition, dedicated support for commercialisation activities has been developed over the course of the Strategic RD&E Plan.

Outcomes	Performance Indicator	Measures	2018 benchmark	2023 target	2022-23 progress
KEY FOCUS AREA: Partnerships & collaboration					
Growers/ consultants value CRDC farming systems research outcomes	Maintain or increase the number of growers/consultants that value CRDC research outcomes	Percentage of growers/ consultants that report valuing CRDC outcomes	Growers: 77% Consultants: 72%	85%	
CottonInfo partnership is maintained and practice change improved	R&D outcomes are demonstrated through extension and adoption activities	Number of demonstration sessions	150	200	
		Percentage of participants that report increased knowledge, skills and intention to change behaviour as a result	70%	85%	
Partnerships are strengthened to engage multi-disciplinary & multi-institutional resources	Evidence of effective collaborative projects	Percentage of investments that include cross-sectoral partnerships	25%	40%	
		Number of new international and national partnerships	2	5	
		Partner satisfaction ranking	8.2 out of 10	8.5 out of 10	
KEY FOCUS AREA: Best practices (*my*BMP)					
Best practice is based on science and measured impact	*my*BMP practice modules reflect latest R&D outcomes	Percentage of topics within *my*BMP modules (that CRDC contributes to) that have been updated with CRDC R&D outcomes	95%	100%	
KEY FOCUS AREA: Innovation & commercialisation					
Improved R&D innovation & commercialisation	CRDC supports researchers to innovate & become more commercially focused	Number of projects with commercialisation potential	3	5	
	Research partners are supported through the commercialisation process (to ensure successful knowledge transfer)	Researchers report satisfaction with CRDC commercialisation support	—	85%	
	Commercialisation & knowledge transfer is accelerated	Percentage improvement in duration from conception to market entry (per product category)	—	20%	

 The specific measure has been achieved.  On target to deliver against the measure.  Not on target to deliver against the measure.

ENABLING STRATEGY TWO: Driving RD&E impact

Ensuring CRDC's investments deliver impact and effectiveness, therefore creating value for our stakeholders, was CRDC's aim within this enabling strategy. To work towards this, CRDC aimed to ensure our RD&E investments met grower, industry and government needs and our projects aligned with stakeholder priorities. In 2022–23, 90 per cent of growers and consultants provided positive feedback on the relevance and value of CRDC's investments, and stakeholders ranked satisfaction with CRDC's communications as 8 out of 10. While these scores have not reached the ambitious 2023 targets, they do reflect strong results and stakeholder satisfaction with CRDC's impact and effectiveness, as demonstrated by additional results from 2022–23 that show 90 per cent of cotton growers believe CRDC invests in innovative RD&E, and 89 per cent believe CRDC provides thought leadership for the cotton industry. In addition, the draft CRDC Independent Performance Review, conducted by Forest Hill Consulting in 2022–23, says: "CRDC is well engaged with and highly supported by the cotton industry and has delivered demonstrable benefits to its stakeholders."

Outcomes	Performance Indicator	Measures	2018 benchmark	2023 target	2022-23 progress
KEY FOCUS AREA: Impact and effectiveness					
CRDC's RD&E investments meet grower, industry and government needs	Funded projects align with identified research priorities	Percentage of aligned projects	100%	100%	
	Positive stakeholder feedback on the relevance and value of CRDC investments	Percentage of positive responses	Growers: 88% Consultants: 92%	95%	
CRDC monitors and evaluates RD&E impact	Monitoring and evaluation evidence demonstrates RD&E impact	RD&E impact reports	5	5	
CRDC-funded projects demonstrate value and return on investment	Positive return on investment	Investments demonstrate a minimum ratio of benefit/cost	5:1 ROI	> 5:1 ROI	
Growers, the cotton industry & government are informed and aware of RD&E outcomes	Stakeholders report that CRDC communications meet their needs	Communications satisfaction ranking	8.3 out of 10	8.5 out of 10	

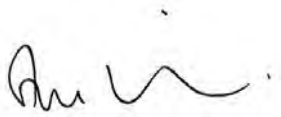
The specific measure has been achieved. On target to deliver against the measure. Not on target to deliver against the measure.

NB: A dash indicates that no benchmark exists for 2018.

Certification by the Executive Director

I, Allan Williams, as the accountable authority of Cotton Research and Development Corporation (CRDC), present the 2022–23 Annual Performance Statement of CRDC, as required under paragraph 39(1) (a) of the *Public Governance, Performance and Accountability Act 2013*.

In my opinion, this Annual Performance Statement is based on properly maintained records, accurately reflects the performance of the entity, complies with subsection 39(2) of the PGPA Act 2013, and is in accordance with 16F of the PGPA Rule 2014.



Allan Williams
A/ Executive Director
Cotton Research and Development Corporation

27 September 2023

CRDC wishes to acknowledge the contribution of Dr Ian Taylor, who stepped down from his role as the Executive Director of CRDC on 25 August 2023. Dr Taylor had been an integral member of the CRDC team since September 2012, having originally joined as Development and Delivery Manager, where he helped establish the CottonInfo extension program – a partnership between CRDC, CSD and Cotton Australia. He then led CRDC's research and development investment portfolio as General Manager R&D for five years, before becoming Executive Director in March 2019.

2022–23 investment and impact

The Australian cotton industry in 2022–23

CRDC's investment in 2022–23

$17.7 million
CRDC's investment in cotton RD&E on behalf of cotton growers and the Australian Government

189 RD&E projects

86 research partners

5 – KEY PROGRAM AREAS

- Increasing productivity and profitability on Australian cotton farms
- Improving cotton farming sustainability and value chain competitiveness
- Building the adaptive capacity of the Australian cotton industry
- Strengthening partnerships and adoption
- Driving RD&E impact.

CRDC impact

100 per cent
of CRDC's investments delivered in partnership with the cotton industry.

28 per cent
of CRDC's investments in cross-sectoral collaborative projects.

91 per cent
reduction in hazard of pesticide to bees since 2004, as reported in the *2022 Australian Cotton Sustainability Update*, published by CRDC and Cotton Australia.

4
independent environmental assessments commissioned by CRDC since 1991: one per decade.

9 priority areas
for the cotton industry under the industry's sustainability targets: water, carbon, biodiversity, pesticides, soil health, quality of work life, wellbeing and social capital, efficiency, and profitability.

$5.5 million
the collective investment from CRDC and GRDC in Weather and Networked Data or WAND: a five-year partnership with **Goanna Ag** to help minimise spray drift.

CRDC impact

$12.54 to $1

the benefit-cost ratio of WAND: a $12.54 benefit to cotton growers for every dollar invested.

$7.4 to $1

the benefit-cost ratio of CRDC's investment in canopy temperature sensors to help growers with irrigation scheduling.

8 CRDC projects with commercialisation potential that have a commercial partner on board or a commercialisation process underway.

$1 million CRDC's contribution into the Cooperative Research Centre for Developing Northern Australia (CRCNA)'s Cotton Grain and Cattle project. GRDC is also contributing $1 million.

46 cotton leaders supported by the industry to participate in the Australian Rural Leadership Program since it was founded 30 years ago.

Nearly 100 per cent improvement in water productivity that Australian cotton growers have achieved between 1997 and 2021.

11 major cotton & grain projects CRDC delivered in partnership with GRDC during 2022–23.

5 major collaborative projects that CRDC led or actively participated in during 2022–23 under two government initiatives: Rural R&D for Profit, and the National Landcare Program Smart Farming Partnership.

12 impactful innovations and companies showcased by CRDC and grow^{AG} to almost 2,500 attendees via Innovation Alley at the 2022 Australian Cotton Conference.

15 PhD students CRDC has supported in 2022–23. CRDC also supported eight post-doctoral researchers, and six CSIRO summer scholars.

10 years since CottonInfo was founded by CRDC, Cotton Australia and CSD.

8.9 out of 10 the rating of partners re satisfaction in CRDC as an organisation to trust.

2.97 million collective views amassed by the 257 CRDC-supported best practice videos on the CottonInfo YouTube channel as at June 2023.

94 per cent of growers believe CRDC and CottonInfo to be trusted information sources.

4.4 OUT OF 5 the average rating for effectiveness of CottonInfo activities across 4,700 participants at events in 2022–23.

YEAR IN REVIEW

RD&E highlights

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 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 *my*BMP 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^{AG}, 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™, 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; VARIwise, the software that combines in-season imagery with 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^{AG} 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 *my*BMP 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.

Letter of transmittal

27 September 2023

Senator the Hon. Murray Watt
Minister for Agriculture, Fisheries and Forestry
Parliament House
Canberra ACT 2601

Dear Minister

It is with great pleasure that I submit the Corporation's Annual Report for 2022–23, prepared in accordance with the provisions of section 28 of the *Primary Industries Research and Development Act 1989*, section 46 of the *Public Governance, Performance and Accountability (PGPA) Act 2013*, and the *Funding Agreement 2020–30*.

The activities of the Corporation are reported against the objectives, strategies, outputs and outcomes of the CRDC Strategic RD&E Plan 2018–23, and are consistent with CRDC's 2022–23 Annual Operational Plan and Portfolio Budget Statement.

Under section 46 of the PGPA Act, CRDC Directors are responsible for the preparation and content of the Annual Report being made in accordance with the PGPA Rule 2014. The report of operations was approved by a resolution of the Directors on 27 September 2023.

Yours sincerely

Richard Haire
Chair
Cotton Research and Development Corporation

COTTON RESEARCH AND DEVELOPMENT CORPORATION
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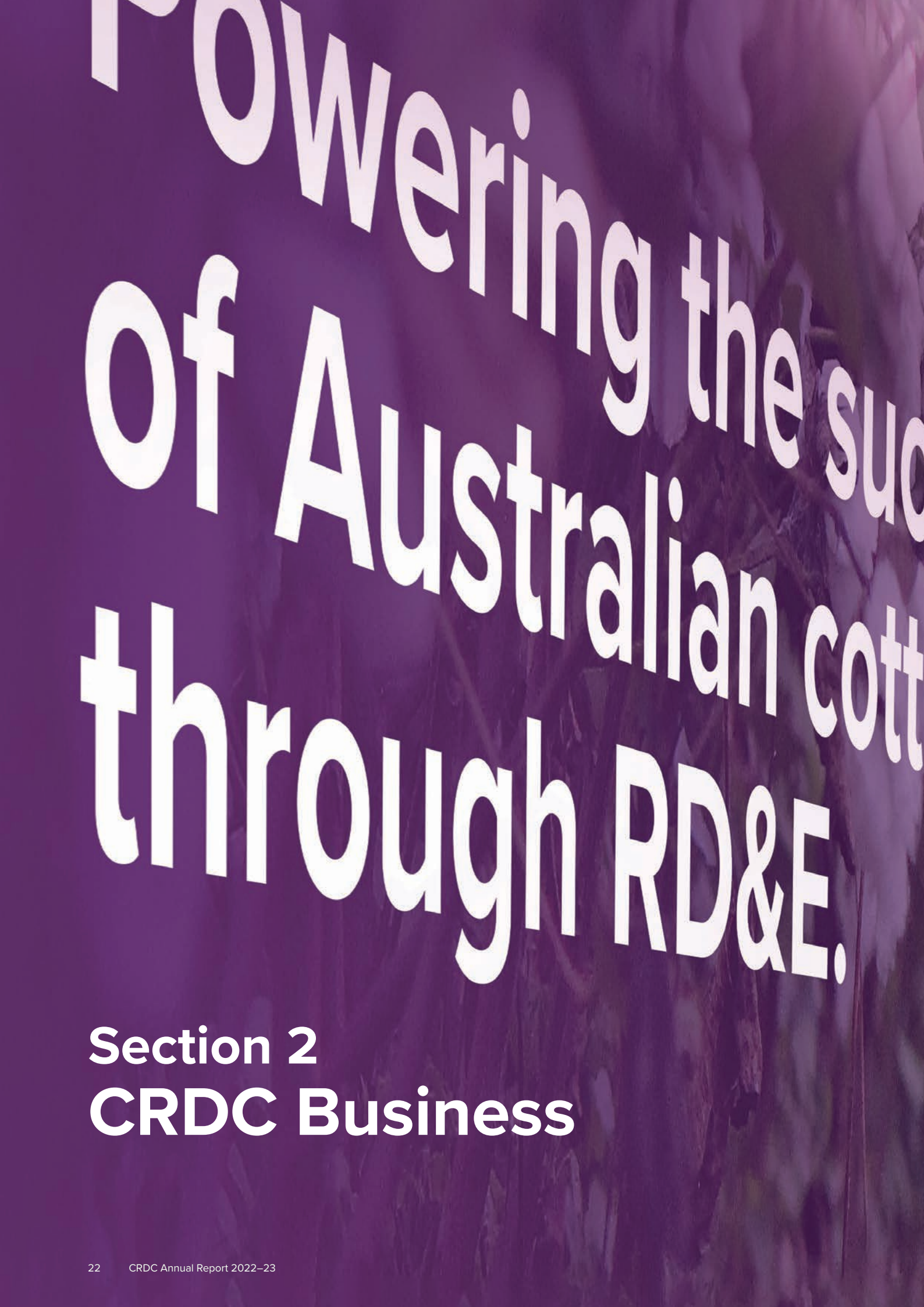
SECTION 1 Executive Summary



Section 2
CRDC Business

Our role

CRDC's role is to invest in and manage a portfolio of RD&E projects on behalf of cotton growers and the Australian Government. These investments are designed to enhance the environmental, social and economic contribution of cotton, for the benefit of cotton growers, the wider cotton industry, regional communities and the Australian public.

Our corporate outcome is to achieve increased economic, social and environmental benefits for the Australian cotton industry and the wider community, by investing in knowledge, innovation and its adoption.

We have four key stakeholders: the Australian Government through the Minister for Agriculture, Fisheries and Forestry; the Department of Agriculture, Fisheries and Forestry; the cotton industry's representative organisation, Cotton Australia; and cotton growers, including Cotton Grower Associations. We are funded through an industry levy and matching Commonwealth contributions. In 2022–23, we invested $17.7 million in RD&E into 189 projects.

We recognise that collaboration is essential to the delivery of RD&E outcomes. As such, we partner with researchers, research organisations, and growers to deliver RD&E projects and outcomes.

In 2022–23, CRDC partnered with 86 research partners, including:

- Department of Agriculture, Fisheries and Forestry (Commonwealth)
- Department of Agriculture and Fisheries (QLD)
- Department of Primary Industries (NSW)
- Other state government departments
- CSIRO
- Cooperative Research Centres (CRCs)
- Cotton Grower Associations
- Cotton Innovation Network
- Cotton Seed Distributors Ltd
- Crop Consultants Australia
- Australian Association of Cotton Scientists
- Australian Farm Institute
- Australian Rural Leadership Foundation
- Grains Research and Development Corporation (GRDC)
- other Rural Research and Development Corporations (RDCs)
- universities
- agribusinesses
- supply chain and trade partners
- international partners, including Cotton Incorporated
- specialised consultants.

Cotton growers across all valleys directly contribute to RD&E through conducting on-farm trials, a critical component of the RD&E process. In addition to their financial contribution through direct on-farm costs and opportunity costs, growers also provide their time, knowledge and expertise to research trials.

Our operations

We have five strategic outcomes that we seek to achieve under our 2018–23 Strategic RD&E Plan – these in turn are the key focus areas in which we invested during 2022–23:

GOAL 1: Increase productivity and profitability on Australian cotton farms

GOAL 2: Improve cotton farming sustainability and value chain competitiveness

GOAL 3: Build the adaptive capacity of the Australian cotton industry

ENABLING STRATEGY 1: Strengthening partnerships and adoption

ENABLING STRATEGY 2: Driving RD&E impact

Our achievements against these outcomes have been monitored, evaluated and reported annually in the Portfolio Budget Statement and the Annual Report.

Strategic Plan goals	Performance criteria	2022-2023 targets	End of Plan targets (to achieve by 2023)
GOAL 1: Increase productivity and profitability on cotton farms	Improved yield and quality	Annual increase of 0.35 bales/ha for irrigated cotton, and 0.14 bales/ha for dryland cotton	Increase in average bales/ha from 9.86 to 11.6 bales/ha for irrigated cotton, and 4.7 bales/ha for dryland cotton
GOAL 2: Improve cotton farming sustainability and value chain competitiveness	CRDC collaborates in global leadership for sustainability initiatives	CRDC to participate in 6 global initiatives per annum	CRDC participates in 6 global initiatives
GOAL 3: Build adaptive capacity of the cotton industry	Science and innovation capacity is strengthened and strategically fit for a digital future	10+ new/early career researchers supported through strategic career pathways per annum	50+ researchers supported through strategic career pathways
ENABLING STRATEGY 1: Strengthening partnerships and adoption	Partnerships are strengthened to engage multi-disciplinary and multi-institutional resources (centres of excellence)	40 per cent of CRDC investments to include cross-sectoral partnerships per annum	40 per cent of CRDC investments include cross-sectoral partnerships
ENABLING STRATEGY 2: Driving RD&E impact	CRDC monitors and evaluates RD&E impact	One RD&E impact report per annum	CRDC delivers 5 RD&E impact reports

Setting the research priorities

We work with the Australian cotton industry to determine the sector's key RD&E priorities, with government to determine its overarching agricultural RD&E priorities, and with the industry and government to determine the Cotton Sector RD&E Strategy. In turn, these priorities help to shape our strategic RD&E priorities, which were formalised under the 2018–23 CRDC Strategic RD&E Plan.

Industry accountability

We are accountable to the cotton industry through our representative organisation Cotton Australia. As the industry peak body, Cotton Australia is responsible for providing advice on industry research priorities.

We consult formally with Cotton Australia in the development and implementation of the Strategic RD&E Plan, including R&D investments. This engagement ensures four main actions: industry research priorities are regularly reviewed; emerging issues are actively considered; the uptake of research in the form of best practice is facilitated; and the overall performance of the Australian industry is enhanced.

Cotton industry priorities for RD&E are to:

- Invest in the skills, strengths and occupational health and safety of the human resources in the cotton industry and its communities.
- Improve the sustainability of the cotton industry and its catchments.
- Improve the profitability of the cotton industry.
- Create and support a strong, focused and committed research program.

Our investment process

The collaborative process of deciding where to invest our annual RD&E funding involves all major stakeholders.

Each year, we work closely with the industry's peak representative body, Cotton Australia, and the Australian Government to identify and evaluate the cotton industry's requirements for RD&E. Cotton Australia provides ongoing advice on research projects and where research dollars should be invested, guided by the priorities established in the 2018–23 CRDC Strategic RD&E Plan.

In line with this, we hold an annual research priority forum, bringing together the Cotton Australia research and development advisory panels to identify gaps in the existing research portfolio and opportunities for new research. We also hold a series of discipline forums with research partners to identify emerging research priorities.

From here, we issue targeted calls for research proposals against these identified priorities. In determining which proposals are successful, we again consult with growers via the Cotton Australia panels. The final decision-making authority lies with the CRDC Board.

Successful proposals become contracted projects and are delivered by our research partners. Critically, our success in delivering RD&E outcomes to growers and the industry is contingent upon strong relationships with our research partners.

RD&E priorities

The 2022–23 priorities forum, held in June 2021, identified key areas of focus for future RD&E investment. These key areas were prioritised for investment considering strategic research gaps, maintenance of core industry research capacity (given the previous impact of prolonged dry conditions on CRDC's budget), and feedback received from the advisory panels in November 2021.

These key areas included:

- Benchmarking water-use productivity for irrigated and dryland cotton
- Optimising irrigation performance in bankless channel cotton layouts to improve water management and nitrogen-use efficiency
- Assessing the critical nitrogen and phosphorus values of cotton cultivars for improved yield and fertiliser efficiency
- Supporting the sustainable development of the Northern Australian cotton industry
- Benchmarking soil carbon, soil properties and best practice soil management
- Seeking regionally specific guidelines for cover crops through farmer-led best practice
- Supporting fibre quality research for southern crops
- Improving cotton management via advanced field sensing
- Surveying key diseases, including verticillium, fusarium and reoccurring wilts, and providing tactical management
- Demonstrating integrated weed tactics across farming systems
- Improving insecticide resistance monitoring for key pests to support sustainable insect management
- Investigating textile waste composting for improved carbon footprinting and sustainability
- Evaluating the economic and environmental return on investment of fish screens
- Benchmarking carbon and biodiversity in native vegetation on cotton farms
- Integrating deep learning AI software with hardware for next-generation acoustic biodiversity monitoring, and
- Capacity building, including exploring a cotton and grains agricultural traineeship model, understanding diversity in the cotton industry, and investigating how to attract and retain young people on cotton farms.

Through the 2022–23 procurement process, CRDC invested in projects to address these key needs.

Importantly, in addition to immediate cotton industry priorities, CRDC also identified and invested in longer term priorities, specifically around ensuring a future for the industry that is profitable, sustainable and competitive.

Government accountability

We are accountable to the Australian Government through the Minister for Agriculture, Fisheries and Forestry. The Government communicates its expectations of CRDC through Ministerial direction, enunciation of policy, administration of the *Primary Industries Research and Development (PIRD) Act 1989*, and priorities (Science and Research Priorities and National Agricultural Innovation Priorities). We respond to government expectations in three main ways: regular communication; compliance with the Funding Agreement, policy and legislated requirements; and the development of Strategic RD&E Plans, Annual Operational Plans, and Annual Reports.

Under the 2020–30 Funding Agreement, the Australian Government has set five key performance principles for CRDC and its fellow RDCs: stakeholder engagement; research and development; collaboration; governance; and monitoring and evaluation. In 2022–23, Forest Hill Consulting undertook an Independent Performance Review of CRDC against these principles. As at 30 June 2023, the review is still being finalised, but the draft has found that "CRDC is a high-performing RDC. Its governance processes are very sound and attention to compliance and risk is strong. Planning and reporting processes are excellent. Management is very well regarded by cotton growers and RD&E providers, with many of the latter believing that CRDC is the best of the RDCs to work with. Collaboration with other industry participants and other RDCs, particularly GRDC, is a feature of CRDC's approach and appreciated by levy payers. CRDC is well engaged with and highly supported by the cotton industry and has delivered demonstrable benefits to its stakeholders."

Australian Government research priorities

The PIRD Act makes provision for funding and administration of primary industry research and development with a view to:

- increase the economic, environmental and social benefits to members of primary industries, and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries
- achieve the sustainable use and sustainable management of natural resources
- make more effective use of the resources and skills of the community in general and the scientific community in particular
- support the development of scientific and technical capacity
- develop the adoptive capacity of primary producers
- improve accountability for expenditure on R&D activities in relation to primary industries.

The Australian Government Science and Research Priorities and National Agricultural Innovation Priorities are:

The Science and Research Priorities

- Food*
- Cybersecurity
- Environmental change
- Soil and water
- Energy
- Health
- Transport
- Resources
- Advanced manufacturing

** The Food Science and Research Priority includes fibre.*

National Agricultural Innovation Priorities

- Australia is a trusted exporter of premium food and agricultural products
- Australia will champion climate resilience to increase the productivity, profitability and sustainability of the agricultural sector
- Australia is a world leader in preventing and rapidly responding to significant pests and diseases through future-proofing our biosecurity system
- Australia is a mature adopter, developer and exporter of digital agriculture

National Primary Industries RD&E Framework and the Cotton Sector RD&E Strategy

The Australian state and territory governments, Rural RDCs, CSIRO, and universities have jointly developed the National Primary Industries Research, Development and Extension Framework to encourage greater collaboration and to promote continuous improvement in the investment of RD&E resources nationally.

National research, development and extension strategies have been developed across primary industry and cross-industry sectors, including cotton, animal biosecurity, animal welfare, biofuels and bioenergy, climate change and variability, food and nutrition, soils, plant biosecurity, and water use in agriculture.

CRDC, research organisations, industry and government are committed to the implementation of the Cotton Sector RD&E Strategy and its five research priorities:

- Better plant varieties
- Improved farming systems
- People, business and community
- Product and market development
- Development and delivery.

CRDC provides the secretariat for the Cotton Innovation Network, which is responsible for implementing the Cotton Sector RD&E Strategy. CRDC is also committed to supporting the implementation of the cross-sectoral strategies, including climate change, soils, plant biosecurity, and water use.

Vision 2029: the industry's vision for a sustainable future

The industry has also developed its own 20-year vision for the future that encompasses industry priorities around better industry performance, collaboration and capacity. Developed in 2009 and updated in 2019, this Vision uses a 20-year timeframe to ensure a long-term focus. The Vision 2029 elements (differentiated, responsible, tough, successful, respected, capable and innovative) were central to the development of the CRDC Strategic RD&E Plan, and continue to play a key role in guiding CRDC's investments each year to ensure CRDC is contributing to their achievement.

Collaboration and co-investment

Cooperation and collaboration are fundamental to our operation. We work in partnership with industry bodies, commercial entities and RDCs to achieve strategic outcomes for the industry, and to leverage higher returns for our investments.

This collaborative approach underpins our investment strategy. We partner in over 80 per cent of RD&E projects conducted in the cotton sector, and in 2022–23, 28 per cent of CRDC investments were in cross-sectoral RD&E.

CRDC's cooperation extends from national and international initiatives to cotton industry-specific and local initiatives – from participating in national cross-sectoral collaborations on water and soils; to the industry-specific extension joint venture, CottonInfo; and at the local level, partnerships with Cotton Grower Associations on CRDC Grassroots Grants.

Cotton Australia

Cotton Australia and its members provide advice to CRDC on research strategy and investments from the perspective of cotton growers. This is achieved through research advisory panels, organised by Cotton Australia and aligned with CRDC's programs.

Research partners

All CRDC projects are delivered in partnership with key research partners. In 2022–23, CRDC partnered with 86 research partners to deliver RD&E projects and outcomes to cotton growers and the wider industry. The full list of partners can be found in Appendix 3: RD&E Portfolio of this report.

Growers

In addition to the Cotton Australia research advisory panels, cotton growers also contribute to RD&E through participation in other industry committees, such as the Cotton Australia Transgenic and Insect Management Strategy (TIMS) Committee and Technical Panels, to provide practical guidance on the implementation of stewardship practices for GM traits.

Growers are also actively involved in RD&E by conducting on-farm trials – a critical component of the RD&E process. This involves a financial contribution through direct on-farm trial costs and opportunity costs, and the provision of growers' time, knowledge and expertise. Thirty-five per cent of growers host research trials on their farms, with growers contributing an average of 19 hours and $5,500 towards their on-farm trials.

Cotton industry programs: CottonInfo and *my*BMP

CottonInfo, the cotton industry's joint extension program, is a collaboration between joint venture partners CRDC, Cotton Australia and CSD Ltd. CottonInfo is the conduit between researchers and growers, communicating research results and encouraging their adoption.

Similarly, *my*BMP, the industry's program for best management practices, is a collaboration between CRDC and Cotton Australia. This program links RD&E outcomes to best management practice and provides self-assessment mechanisms, practical tools and resources to help growers grow cotton using best practice. It is an integral part of the CottonInfo program.

CSD: the Richard Williams Commercial Research Initiative

In 2022–23, CRDC and CSD Ltd announced a partnership to support the delivery of research via the Richard Williams Commercial Research Initiative. The initiative honours the late Richard Williams for his contributions to cotton research, CSD and the former Australian Cotton Growers Research Association; a legacy that is continued today via his son Allan Williams, CRDC's General Manager of Innovation (pictured below with CRDC's Executive Director Ian Taylor and CSD's Managing Director Peter Graham). The partnership has commenced with two investments: one focused on disease and the establishment of grower action groups; the other on water and the creation of a water dashboard for on-farm water management. These initiatives are anticipated to be the first in an ongoing series of joint investments between CSD and CRDC.

Council of Rural Research and Development Corporations

CRDC is one of 15 Rural RDCs that come together under the banner of the Council of Rural RDCs (CRRDC) to coordinate efforts, collaborate and co-invest in projects and achieve consistency in communication. The focus is on improving efficiencies, maximising the impact of research outcomes, and avoiding duplication in research. The scale of this collaboration extends from large national research programs to small local projects, bringing a national focus in dealing with climate variability, soil health, irrigation, plant biosecurity, crop protection, farm safety and human capacity. CRDC continues to work with CRRDC to investigate administrative efficiency gains within the RDCs and the rural R&D system as a whole.

Within the RDC family, CRDC's key collaborative partner is GRDC. In 2022–23, CRDC and GRDC partnered on 11 projects, totalling $21 million in collective investment. The projects covered major RD&E priorities for cotton and grain growers, including spray drift prevention, biosecurity surveillance, integrated weed management, insecticide resistance monitoring, Northern Australian production, greenhouse gas accounting and carbon footprinting, seasonal outlook services, agricultural traineeships and community trust. The CRDC and GRDC Directors also held a joint board meeting in 2022–23 and agreed to repeat this regularly, demonstrating their commitment to collaboration.

grow^{AG}

The collective RDCs and the Department of Agriculture, Fisheries and Forestry also collaborate on grow^{AG}. Led by AgriFutures Australia, grow^{AG} is designed to create a global gateway into the Australian research and innovation system, with a focus on deal-flow, attracting capital investment, and driving collaboration. It makes RD&E outcomes transparent for growers and the community, positions Australia as a global agrifood innovation hub, and makes it easy to explore, find and connect with potential partners and opportunities. In 2022–23, CRDC and grow^{AG} co-hosted 'Innovation Alley' at the Australian Cotton Conference, showcasing companies and innovations supported by CRDC and its fellow RCDs that will (or already) deliver an impact for growers to almost 2,500 attendees.

Agricultural Innovation Australia

CRDC collaborates with Agricultural Innovation Australia (AIA), a not-for-profit public company established by Australia's RDCs to facilitate joint investment and collaboration in cross-sectoral agricultural issues of national importance. In 2022–23, CRDC partnered in three AIA-led projects, focused on agri-climate outlooks, the development of the Know & Show Your Carbon Footprint tool, and the creation of a common approach to greenhouse gas accounting.

Australian Government grants

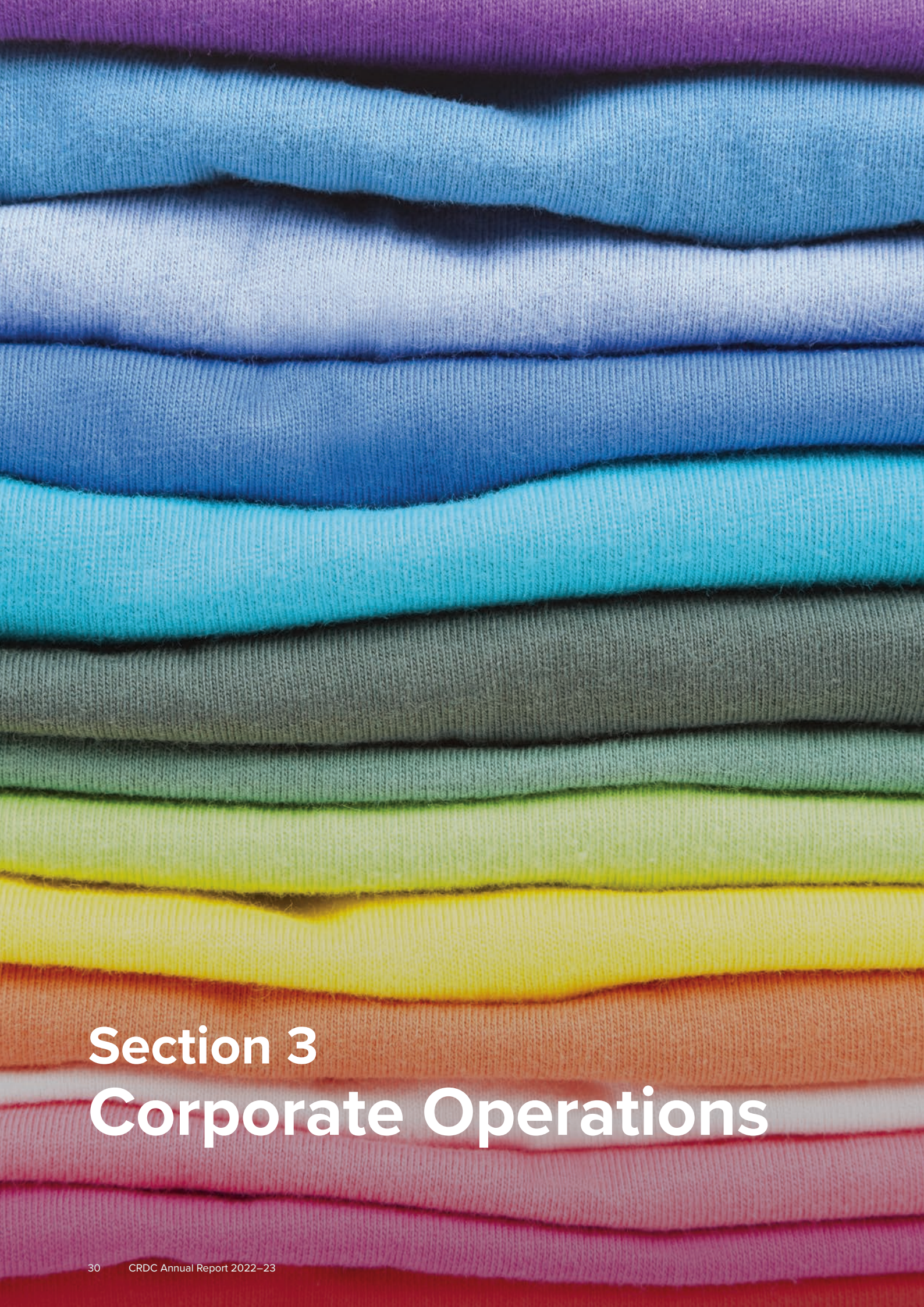
CRDC works in partnership with the Australian Government and fellow RDCs on a number of ongoing grant projects.

CRDC managed three programs in 2022–23 under government grants, contributing a combined $8.5 million into RD&E funding across the life of the programs, for the benefit of the Australian cotton industry, the community and other industries:

- Smarter Irrigation for Profit – Phase 2 *(funded 2019–23, with $7.1 million from the Rural R&D for Profit program – round four)*. Involves fellow RDCs Dairy Australia, Sugar Research Australia, AgriFutures Australia, GRDC and other research partners. Administered by the Department of Agriculture, Fisheries and Forestry.
- New technologies to improve natural resources (biodiversity) on Australian cotton farms – Cotton Landcare Tech Innovations *(funded 2018–23, with $1.1 million from the National Landcare Program: Smart Farming Partnerships initiative – round one)*. Administered by the Department of Social Services Community Grants Hub.
- Better information and better decisions: a proof of concept for Australian agriculture *(funded 2023-25, with $0.3 million from the National Agriculture Traceability Grants Program – Sustainability Reporting Uplift Program: Better Sustainability Reporting Uplift Grant round)*. Includes support from Cotton Australia and Terrestrial Ecosystems Research Network. Administered by the Department of Agriculture, Fisheries and Forestry.

CRDC was also involved in two other programs led by other RDCs through Rural R&D for Profit program grants during 2022–23:

- Area-wide management for cropping systems weeds, investigating the weed management, social and economic opportunity *(funded 2019–23, led by GRDC in partnership with CRDC; $1.9 million in funding from the Rural R&D for Profit program – round four).*
- Boosting diagnostic capacity for plant production industries *(funded 2019–23, led by GRDC in partnership with CRDC; $4.6 million in funding from the Rural R&D for Profit program – round four).*



Section 3
Corporate Operations

Business financials

Our investment in RD&E is funded through an industry levy and matching Commonwealth contributions. In 2022–23, we invested $17.7 million in cotton RD&E throughout the industry supply chain. In 2023–24, our estimated cotton RD&E expenditure will be $25.3 million, with an additional $30 million grant currently under negotiation to further increase cotton's water-use efficiency and reduce system losses. This brings the estimated expenditure to $55.3 million.

Revenue

Cotton levy revenue is collected either on cotton lint bales at the point of ginning or on the export of seed cotton. Cotton farmers pay a levy of $2.25 for each 227 kilogram bale of cotton lint (including $0.04 per bale for industry membership of Plant Health Australia), or for seed cotton, a levy of $4.06 per tonne of exported seed cotton. Australian ginning and export of seed cotton occurs from March to October of each calendar year. Therefore, cotton levy revenue in any financial year is drawn from two consecutive cotton crops.

The Australian Government provides a contribution of up to 50 per cent of the cumulative total eligible expenditure on RD&E. The maximum contribution is generally capped at 0.5 per cent of a three-year rolling average of the gross value of production for the cotton industry.

The setting and collection of the industry levy is enabled by the *Primary Industries (Excise) Levies Act 1999* and the *Primary Industries Levies and Charges Collection Act 1991*, respectively. The Australian Government's matching contributions in 2022–23 were capped at the value of levies collected because it was lower than the 0.5 per cent of the three-year average gross value of production.

Revenue (Actuals)	2022–23 ($m)
Industry levies	$12.693
Australian Government	$12.692
Royalties	$0.272
Interest	$0.837
Research Grants	$1.387
Other	$1.215
TOTAL	**$29.096**

Total revenue for 2022–23 of $29.096 million was $2.647 million (10 per cent) above budget of $26.449 million. Total 2022–23 revenue comprised:

- Industry levy revenue of $12.693 million, which includes $10.895 million (86 per cent) of the 2021–22 crop and $1.797 million (14 per cent) of the 2022–23 estimated crop.
- Australian Government matching contribution of $12.692 million, which was capped at the value of levies collected.
- $0.272 million in royalties from the commercialisation of intellectual property.
- Interest revenue of $0.837 million, which was $0.762m higher than budget, due to higher than anticipated interest rates.
- Research grants of $1.387 million, which included Rural R&D for Profit, other Commonwealth grants and co-investments from program partners.
- Other revenue of $1.215 million, which includes project refunds.

Expenditure and investment

Actual expenditure for 2022–23 was $17.661 million, which is $1.098 million below the budgeted expenditure of $18.760 million.

Actual ($m)	2022–23 ($m)
Cotton crop size (millions of bales)*	5.518m
Total revenue	$29.096
Industry levies	$12.693
Australian Government	$12.692
Royalties	$0.272
Interest	$0.837
Research grants	$1.387
Other**	$1.215
Expenditure total	$17.661
Cotton RD&E activities	$13.856
Total equity position	**$34.899**

* ABARES estimate, Agricultural Commodities June 2023: 1,252,480 kt.
** Includes project refunds.

Cost Allocation Policy

CRDC has a Cost Allocation Policy for allocating direct and indirect costs to activities across its program. Expenditure in 2022–23 was allocated to the following activities:

Cost Allocation Activity	2022–23 ($m)
Direct R&D Expenditure (project costs)	$13.856
Indirect R&D Expenditure (administration costs)	$3.805
Total Expenditure	**$17.661**

Portfolio Budget Statement

The CRDC 2022–23 Portfolio Budget Statement provided an estimate of CRDC's outcomes, outputs, performance and financial position for 2022–23 to 2026–27. The statement was consistent with the CRDC Strategic R&D Plan 2018–23 and the Annual Operational Plan 2022–23.

Outcomes and outputs 2022–23

CRDC works to achieve this outcome on behalf of the Australian Government:
Adoption of innovation that leads to increased productivity, competitiveness and environmental sustainability through investment in research and development that benefits the Australian cotton industry and the wider community.

Outcome	2022–23
TOTAL Budgeted Revenue	$26,448,705
TOTAL Actual Revenue	$29,095,752
TOTAL Budgeted Cost of Outputs	$18,759,591
TOTAL Actual Cost of Outputs*	$17,661,460

* Total cost is shown rather than total price because CRDC is primarily funded through industry levies rather than on the basis of the price of its outputs. Each research project and its funding contributes to the outcome. Total research expenditure for the outcome is calculated, with the remaining expenditure attributed to the outcome on a pro-rata basis.

Forecast revenue

Future revenue from levies and Commonwealth-matching contributions are directly affected by cotton production. Commodity prices, water availability, and water prices are significant factors in forthcoming cropping decisions. Above-average cotton production is expected in 2023–24, due to current storage levels of irrigation dams across the Australian cotton-growing regions and strong cotton prices.

CRDC has budgeted for a $4.642 million operating surplus for 2023–24. This reflects revenue of $59.958 million ($29.958 million, plus the proposed $30 million water grant) and expenditure of $55.316 million ($25.316 million, plus the proposed $30 million water grant). Industry levy revenue and Commonwealth contributions will continue to be drawn from two crop seasons, 2022–23 and 2023–24.

Forecast expenditure

Budgeted expenditure for 2023–24 is $55.316 million, which is $37.655 million above the 2022–23 actual expenditure (including the proposed $30 million water grant). The forecast expenditure for the next two years is budgeted at $28.804 million in 2024–25 and $27.284 million in 2025–26.

Forecast deficits

CRDC is a statutory body enabled by the PIRD Act with the rights of a body corporate, and has the right to retain surplus funds. However, as a corporate Commonwealth entity, CRDC may be required to seek approval from the Minister of Finance for a deficit in any year.

Our investments in RD&E

We use the CRDC Strategic RD&E Plan 2018–23 to guide our investments. Through this Strategic Plan, in 2022–23 we invested to help increase productivity and profitability on Australian cotton farms; improve cotton farming sustainability and value chain competitiveness; build the adaptive capacity of the Australian cotton industry; strengthen partnerships and adoption; and drive RD&E impact.

We achieved a balanced RD&E portfolio that considers the distribution of our investment across:

- the RD&E strategies
- the type of research, including innovation, knowledge creation, knowledge transfer and application, benchmarking, industry capacity, and education
- in-project risks
- researcher experience and capacity
- research providers
- timeframe to outcomes
- the likely return on investment for projects and programs
- expenditure on RD&E management.

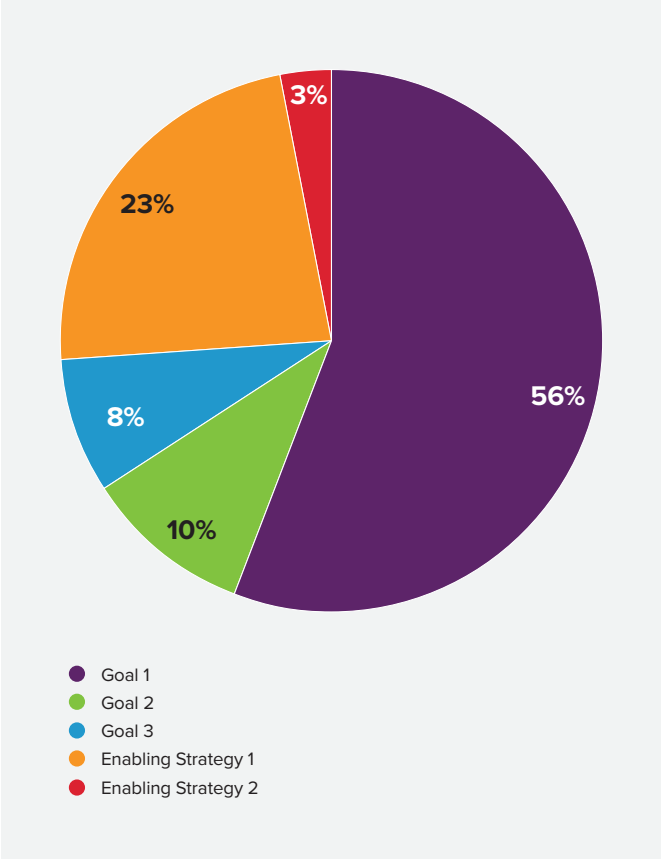
In 2022–23, we invested $12.85 million in RD&E. Of this, $6.56 million was invested in new research commencing in 2022–23.

Projects by CRDC program area

CRDC program area	Goal 1	Goal 2	Goal 3	Enabling strategy 1	Enabling strategy 2	TOTAL
Number of projects	63	31	55	26	14	189
Expenditure per program area ($m)*	$7.24	$1.23	$1.03	$3.00	$0.35	$12.85
Percentage of expenditure per program area	56%	10%	8%	23%	3%	**100%**

* Refer to Note 1.1C in the financial statements.

Investment by program area



Total number of CRDC projects

CRDC projects	2020–21	2021–22	2022–23
Active projects	116	123	106
New projects funded	62	90	83
Projects completed	64	107	98
Continuing projects	123	106	91

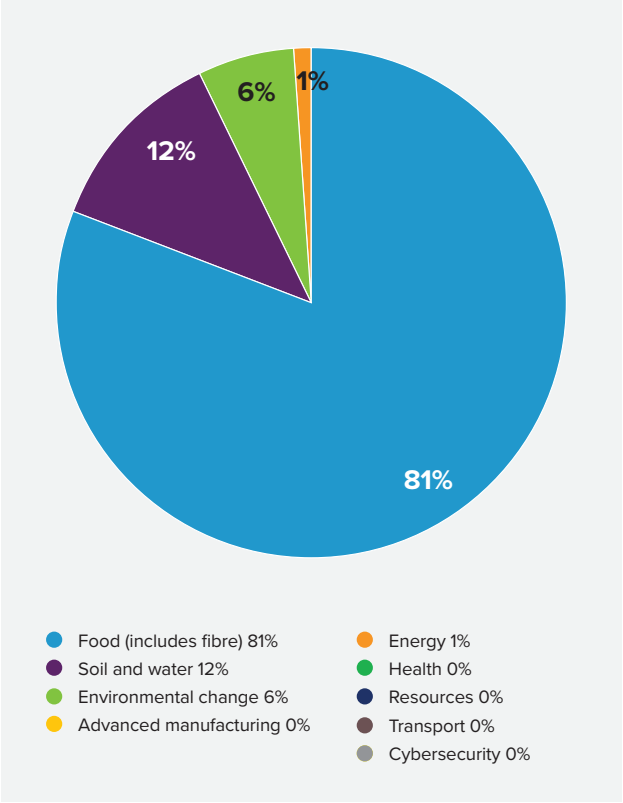
Further detail on CRDC's projects can be found in Section 4: RD&E Portfolio, and in Appendix 3: RD&E Portfolio.

Investments against Government priorities

CRDC's investments in RD&E support the achievement of the Australian Government's Science and Research Priorities, and National Agricultural Innovation Priorities.

CRDC investment by Science and Research Priorities

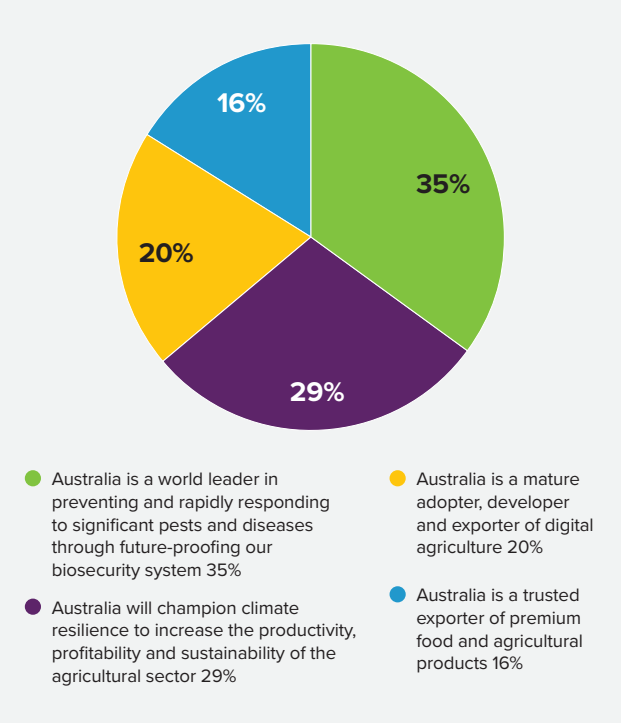
Science and Research Priorities (SRP)	CRDC investment ($'000)
Food (includes Fibre)	$10,409
Soil and water	$1,591
Advanced manufacturing	$0
Environmental change	$795
Energy	$59
Health	$0
Resources	$0
Transport	$0
Cybersecurity	$0
Total	**$12,854**



CRDC investment by National Agricultural Innovation Priorities

National Agricultural Innovation Priorities	CRDC investment ($'000)
Australia is a trusted exporter of premium food and agricultural products	$2,077
Australia will champion climate resilience to increase the productivity, profitability and sustainability of the agricultural sector	$3,723
Australia is a world leader in preventing and rapidly responding to significant pests and diseases through future-proofing our biosecurity system	$4,532
Australia is a mature adopter, developer and exporter of digital agriculture	$2,522
Total	**$12,854**

Further detail on how CRDC's RD&E investments align with these priorities can be found in Appendix 1: Australian Government priorities.



Section 4
RD&E Portfolio

Section 4: RD&E Portfolio - Goal 1

Goal 1: Increase productivity and profitability on cotton farms

Increasing the productivity and profitability on Australian cotton farms was CRDC's aim within this goal. CRDC focused on investments in RD&E to deliver optimised farming systems, adapt transformative technologies, and protect our industry from biotic threats and environmental stresses.

In 2022–23, CRDC invested in 63 projects within this goal, accounting for 56 per cent of our total RD&E expenditure.

Performance against the Strategic Plan

Key Focus Areas	Outcomes	Performance Indicator	Measures	2022–23 progress
1.1 Optimised farming systems	1.1.1 Improved yield and quality	Increase in yield over 5 years	Assessment of average bales/ha	The 2018 baseline yield for irrigated cotton was 9.86 bales per hectare (ha). The average yield of the 2022 crop is similar to the 2021 average of 11.3 bales per ha, resulting in the five-year rolling average irrigated yield increasing slightly to 10.6 bales per ha – an increase on the 2018 baseline, but below the target of 11.6 bales per ha. The 2018 baseline yield for dryland cotton was four bales per ha. The average yield of the 2022 crop was 4.6 bales per ha – close to the target of 4.7 bales per ha. This lifted the five-year rolling average yield to three bales per ha – below the baseline due to a run of very dry seasons from 2018 to 2020.
	1.1.2 Improved input efficiencies	Positive input/ output ratios resulting from adoption of new practices	Assessment of bales per unit input for irrigated cotton (water productivity and nitrogen-use efficiency)	The water-use efficiency (productivity) target is on track to be achieved. 2021 data estimates a gross production water-use efficiency of 1.25 bales per megalitre, close to the target of 1.32 bales per megalitre. The nitrogen-use efficiency (productivity) target is 11.5 kilograms (kg) of lint per kg of nitrogen (N). The 2022 data shows a result of 9.3 kg of lint per kg of N: between the low of 6.6 in 2019 and the high of 9.8 in 2021, but still below the 2018 baseline of 10 and the 2023 target of 11.5.
	1.1.3 On-farm sustainable development is supported	New farming systems are sustainable and productive	Number of bales produced on new farming systems	CRDC continued to support RD&E on new farming systems including bankless irrigation, tropical cotton farming systems, and the incorporation of cover cropping (46 per cent of growers surveyed via the CRDC Grower Survey in 2022 stated that they planted cover crops). Northern Australia represents a new farming system, with almost 20,000 ha planted in 2022–23. 90 per cent of growers in the 2022 survey stated that they were supportive or very supportive of CRDC's research investments and activities, and agreed that CRDC invests in innovative RD&E.
	1.1.4 Improved reliability of cotton production	Increase in five-yearly average production	Rolling annual average production (number of bales)	Following the record 2022 crop of 5.6 million bales, the five-year rolling annual average has increased, but remains just below the 2018 baseline of 3.4 million bales. This is due to three successive years of below-average production, including the smallest cotton crop in 37 years in 2019–20.

1.2 Transformative technologies	1.2.1 New technologies are adapted for use in cotton	Increased number of technologies are available for cotton growers	Number of new technologies entering commercial use	The target of five new technologies entering commercial use is on track, with the following technologies becoming available to growers over the life of the Strategic RD&E Plan: • John Deere See & Spray™ Select for targeted weed management • The Pest Detect App for enhanced silverleaf whitefly monitoring • The stress time algorithm for improved irrigation scheduling • Enhanced image segmentation, extending the stress time algorithm's use-period • Spray hazard towers for improved pesticide application – Weather and Networked Data (WAND). A patent has also been lodged for a novel biopesticide, and a commercial partner has been contracted to develop the technology.
	1.2.2 Cotton farms are digitally enabled	Increase in on-farm use of digital technology	Percentage of farms utilising digital technologies	In the 2021 grower survey, 69 per cent of respondents indicated that they used sensors and/or automation that required digital connectivity. In addition, in 2022–23, the WAND app has engaged about 40 per cent of the target user base of cotton and grain growers across Qld and NSW since its launch.
1.3 Protection from biotic threats and environmental stresses	1.3.1 Increased understanding of the impact of pests, diseases and weeds, and environmental stresses	Impact information is available to inform improved management practices for growers and industry	R&D investments reflect the potential impact of biotic and environmental stresses to inform management practices	CRDC has invested in a number of projects to collect information to assess the impact of pests, diseases, weeds and environmental stresses, and the impact of associated RD&E investments. These include data on farm rate-of-return, the benefit-cost ratio of CRDC investments, and the collection of economic data. Integrated weed management RD&E, for example, has returned a benefit-cost ratio of $5.51–$1. In addition, pesticide data collected from the CRDC and Crop Consultants Australia (CCA) survey indicates that the 2022 five-year rolling average for Environmental Toxic Load as measured against bees continues to decline, while the measure for algae increased due to increased herbicide use associated with wetter conditions, more weed growth and managing herbicide resistance.

1.3 Protection from biotic threats and environmental stresses	1.3.2 Improved identification, surveillance and management systems for pests, diseases and weeds, and environmental stresses	New management practices and systems are available for growers, consultants and industry	Economic impact of pests, weeds and diseases reduced by 40 per cent	Weed, insecticide resistance and disease surveillance has informed best practice recommendations to industry. New best practice information includes a defoliation booklet that addresses an information gap identified in the 2022 review. New guidelines for retention in high-yielding crops have been developed, with a focus on improving early season pest management and reducing pesticide use.
	1.3.3 Industry is prepared for a biosecurity incursion	Delivery of effective biosecurity preparedness scenarios/ exercises (undertaken by cotton industry)	Number of biosecurity preparedness activities undertaken	Following on from the successful Exercise Blueprint biosecurity scenario activity in 2019, CRDC and CottonInfo have held regional exercises that have supported growers to build their individual farm preparedness, including two grower workshops during 2022–23. CRDC also supported cross-industry preparedness as a partner in the Rural R&D for Profit's Boosting National Diagnostics project. This included an incursion scenario intensive workshop and PestBlitz workshops. In addition, supported by CRDC, Plant Health Australia concluded the five-year review of the Cotton Industry's Biosecurity Plan which included a review of pest threat lists and prioritisation of RD&E gaps. CRDC also renewed its commitment to participate in the Plant Biosecurity Research Initiative (PBRI). Also in this year, CRDC supported the training of researchers and agronomists in the identification of the exotic pest brown marmorated stink bug.
			Percentage of participants reporting increased preparedness	The 2021 CRDC Grower Survey indicated that 56 per cent of growers have a farm biosecurity plan and another 7 per cent were in the process of developing one. 84 per cent of growers are using at least one of nine listed practices to manage biosecurity, with 40 per cent implementing all nine.


ASSOCIATION OF AUSTRALIAN COTTON SCIENTISTS

Case study

CRDC partners on Northern Australia RD&E

Agricultural production in Northern Australia will be bolstered with research beginning on the collaborative Cotton Grain Cattle (CGC) program.

This four-year, $27 million project is a collaboration between CRDC, the Grains Research & Development Corporation (GRDC) and the Cooperative Research Centre for Developing Northern Australia (CRCNA) who will oversee the program. It involves around 30 partners including universities, state/territory governments and industry stakeholders, to enhance the productivity and sustainability of the northern regions of Western Australia (WA), the Northern Territory (NT), and Queensland.

Comprising six interlinked projects, 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. The program is based on an analysis by the CRCNA that highlighted the importance of integrated agricultural systems in the north. It revealed that the greatest RD&E investment value is achieved when cropping is coordinated with other activities, such as beef production. By focusing on these key areas, the CGC is set to elevate the agricultural profile of Northern Australia, creating a robust and sustainable sector that will benefit the local economy.

The six projects of CGC are:

- Crops for cattle to increase the efficiency of Northern Australian cattle production systems using local crops to improve dry season weight gain (NT)
- Fundamentals of cropping systems that deliver sustainable growth (NT)
- Cropping-enabled cattle production enabled by feed products from irrigated cropping (WA)
- Ord River Irrigation Area (ORIA) sustainable systems for diversification of ORIA cropping (WA)
- Extension capacity of cropping systems, enhancing to sustain growth (NQ)
- Cotton, Grains, Cattle farming systems (NQ).

CRDC Senior Innovation Broker Susan Maas (pictured at the CGC launch in May 2023) took a secondment from CRDC to help CRCNA develop the CGC program. She says the project aims to unlock the potential of the north's agricultural capabilities while ensuring responsible resource management and environmental stewardship. It also recognises the increasing importance of local cotton and grain production to optimise the northern cattle industry.

Susan was involved in creating the six linked projects that will be based across tropical North Qld, Douglas Daly in the NT, and the Ord in WA.

"This initiative represents a major step forward in building on past crop-specific northern research to support the establishment of a robust and sustainable farming system," Susan said.

"The project engages with local stakeholders and has ongoing local oversight: both essential components in ensuring the project delivers on the needs of northern growers and producers, and contributes to the long-term growth and prosperity of the northern agricultural sector.

"CRDC's committed to the sustainable development of cotton in the north, underpinned by RD&E, the adoption of best practice and the meeting of community expectations, so we're thrilled to be part of the CGC program," Susan said.

GRDC and CRDC are investing approximately $1 million each into CGC, demonstrating their commitment to northern broadacre production.

For more: read the full article in the Winter 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

Water benchmarking shows near 100% improvement

Between 1997 and 2021, Australian cotton growers have shown a nearly 100 per cent improvement in water productivity.

In 1997, the average Gross Production Water Use Index (GPWUI) was 0.62 bales per megalitre (ML). In 2021, it was 1.22 bales/ML. This means growers are producing twice the amount of cotton lint than they did in 1997, with the same amount of water.

The cotton industry has been tracking its water productivity since the 1990s. This research is currently led by NSW DPI's Water Productivity research team with support from CRDC. The most recent figures were released in December 2022 and included results from the 2021 harvest.

The research team collected farm and water records from key cotton-growing regions. For the 2021 harvest, 31 growers took part in the survey, representing 5.5 per cent of irrigated cotton bales produced in Australia for the year. The most recent figures show that growers used 52 per cent less water in 2021 to produce every kilogram of cotton lint than they did in 1997.

These gains have been driven by a combination of factors: the genetic improvements in cotton itself, the growers' commitment to improved water management, and CRDC's significant investment in effective RD&E.

The continued tracking has also shown that the improvement is not reflected in year-on-year GPWUI increases. NSW DPI researcher Dr Malem McLeod (pictured) says that water productivity improvement has been tapering off since 2007. GPWUI was 1.13 bales/ML in 2007; 1.14 in 2008; 1.120 in 2013; 1.19 for 2018 and 1.22 in 2021.

"Although the long-term trend of cotton water productivity is increasing, there is annual fluctuation – negatively affected by low rainfall years, and bouncing back in wetter years.

"The average GPWUI dropped from 1.19 bales/ML in 2018 to 0.94 bales/ML in the drought-affected 2019, when in-crop rainfall was the lowest it has been since 1993.

"To counter the effect of drought and heat stress on the crop, growers increased the frequency of irrigation, from an average of eight to 10.4 applications. This resulted in a 1.5 ML increase in average total water input per hectare – from 10.62 ML/ha in the 2018 season to 12.07 ML/ha in 2019."

At the same time, average yield dropped from 12.35 bales/ha in 2018 to around 11.19 bales/ha in 2019. The 9.7 per cent drop in lint yield and 13.7 per cent increase in average total water use led to a 21.7 per cent drop in GPWUI from 2018 to 2019.

In the more favourable rainfall season of 2020–2021, yield climbed back to an average of 11.87 bales/ha, while the average total water input in 2021 decreased by 2.2 ML/ha – equating to an increase of 29 per cent in water productivity.

"This indicates the resilience of the industry as it bounced back during the favourable 2021 season, which produced around 5.5 million bales, while also highlighting the vulnerability of the cotton industry to climate change," Malem said.

"We are looking forward to analysing the 2022 data to assess how the extensive flooding across cotton-growing regions in late 2022 affected GPWUI."

For more: read the full article in the Winter 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

Trials returning textile waste to cotton fields expanded

An important step in identifying a scalable long-term solution to the issue of textile waste in landfill is now underway, with cotton farmers launching phase two trials in NSW as well as at Goondiwindi (Bigambul country) in Queensland.

Inspired by the environmental benefits of diverting 800,000 tonnes of textile from landfill each year, Goondiwindi Cotton's Sam Coulton, who hosted the phase one trial, is being joined by Scott Morgan at Gunnedah (Kamilaroi country).

Scott, already a leading cotton grower in terms of sustainability, said his decision to take part was an easy one. He's been proactive in investigating and installing renewable energy options as an early adopter of a large-scale solar generation and has undertaken numerous water conservation projects.

"I'm excited about returning 100 per cent cotton back to farms because I think it's the right thing to do for the environment by helping close the circularity gap. My strong hope is that the cotton waste can improve soil health and microbial activity – thereby improving crop yields," Scott said.

The growers will be spreading the shredded material once their cotton has emerged, rather than pre-planting, due to constraints caused by the recent continued wet weather.

"Phase one trials were positive, but with COVID and poor weather we were limited in what we could achieve. I am hopeful this next phase will provide some vital answers to questions and lead to a regular process that will be seen as the start of a major transformation in cotton circularity," Sam said.

CRDC-supported soil scientist Dr Oliver Knox (pictured at the Goondiwindi trial site with Sam Coulton) oversaw phase one, finding that cotton textile waste had no adverse impact on soil health or cotton yields and that in healthy soils, a huge volume of shredded cotton could be broken down completely by soil microbes.

"This work is very important in helping to resolve the issues caused by Australians throwing away around 25 kilos of textile waste per person each year. We hope the next phase will prove this concept across a wider landscape, and it will also see us divert 10 times the amount of textile waste from landfill compared to the initial phase," Oliver said.

For the 2022-23 trial, program partners CRDC, Cotton Australia, Goondiwindi Cotton and Sheridan have been joined by Thread Together. While Thread Together's primary purpose is to partner with the fashion industry to divert brand new clothing from landfill and provide it to people in need, in some circumstances, the amount of new clothing for some product lines far exceeds demand. So, rather than dealing with cotton waste, they are dealing with excess stock. As part of the phase two trial, the cotton stock is shredded and sent to Gunnedah.

Leading the project is Cotton Australia's Brooke Summers, who works closely with brands through the Cotton to Market program.

"The results from phase one show it's possible to find a scalable solution to cotton textile waste right here in Australia. Our farmers want this, and cotton consumers want it too. They are demanding environmental solutions as part of their purchasing decisions. Phase two should bring us a step closer," Brooke said.

For more: read the full article in the Summer 2022–23 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

Is Australia's world-leading IPM future-ready?

Australian cotton has long had an enviable reputation as a world leader in integrated pest management (IPM). Making sure the IPM strategies and knowledge are robust and future-ready is the focus of a recent CRDC-supported project.

As growers know, IPM is an integration of biological, cultural and pesticide control methods, and it forms the bedrock of cotton's pest management. To ensure ongoing efficacy, CRDC engaged Crop Consultants Australia (CCA) and Paul Horne from IPM Technologies to review, adapt and improve current pest management and monitoring techniques, and measure the impacts of these and future technologies on beneficial insects across all production regions.

This review is part of the broader Novel Options and Strategies for Integrated Pest Management in Australian Cotton project, supported by CRDC.

The review involved meeting with consultants to discuss IPM and their strategies. It found that right now, there are no immediate problems with pest management, for three main reasons:

- *Helicoverpa* and other caterpillars are now well controlled by Bt cotton.
- Mirids, the key pest nominated across all cotton regions, can be controlled with fipronil or sulfoxaflor.
- Other pests such as whitefly, mites, thrips, mealybugs and green vegetable bug are not regarded as major pests across the industry and are still able to be controlled.

However, CCA's executive officer Doug McCollum said this state of pest management is not guaranteed to continue and is at risk from factors including potential resistance in *Helicoverpa* to Bt cotton, and loss of access to pesticides, particularly for mirid control.

"We know there's been Bt resistance in *Helicoverpa* in other countries, and there is not a lot of cultural control for mirids so we rely on the available chemistry – there is no Plan B," Doug said.

"The continued registration of pesticides for mirid control such as fipronil cannot be relied upon, and some of the current alternatives are facing regulatory pressures as well.

"The other main risk the review uncovered was that 'minor' pests are seen by some to be increasing and could be flared by either seasonal conditions or use of broad-spectrum insecticides, such as those used to control mirids."

Doug oversaw the review on behalf of CCA and said it was interesting to see the attitudes and practices of consultants across the regions. Although there is widespread awareness of IPM, there are differing levels of commitment across regions and between individuals to minimal use of insecticides using an IPM approach.

"One person's IPM may not be someone else's. When you get down to the finer details, some consultants may use higher or lower thresholds. For example, there are some who have a low tolerance level for insects such as mirids, while others will push compensation boundaries. Those on each end of that spectrum might say they are practising IPM, but have a different approach to risk."

CRDC Senior Innovation Broker Susan Maas said the findings of the project will help CRDC identify and close research gaps, evaluate extension, and monitor IPM from a sustainability angle.

"As we set priorities for CRDC's new Strategic RD&E Plan, this type of information helps us identify research, development and extension projects to support IPM's ongoing robustness," Susan said.

For more: read the full article in the Autumn 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Section 4: RD&E Portfolio - Goal 2

Goal 2: Improve cotton farming sustainability and cotton value chain competitiveness

Improving value chain competitiveness and sustainability to derive greater value for Australian cotton growers was CRDC's aim within this goal. CRDC focused investments in RD&E to create higher value uses for cotton, to ensure the sustainability of cotton farming, and to support measurement and reporting through the value chain.

In 2022–23, CRDC invested in 31 projects within this goal, accounting for 10 per cent of our total RD&E expenditure.

Performance against the Strategic Plan

Key Focus Areas	Outcomes	Performance Indicator	Measures	2022–23 progress
2.1 Sustainability of cotton farming	2.1.1 Improved environmental footprint for cotton farms	Increase in sustainability metrics and improved carbon footprint	Percentage of farm native vegetation managed for conservation	The percentage of farm area set aside for native vegetation (not normally grazed) rose to eight per cent in the 2022 CRDC Grower Survey, up from the three to four per cent recorded for several years prior, and above the target of 6.6 per cent. Further assessments will be undertaken to determine whether this is a longer-term trend. Improving native vegetation condition on farms is a steady process, and can be hindered by many factors including drought, excessive grazing, cost, time, or lack of knowledge of which practices have the greatest impact in the regional landscape, such as the most appropriate species of trees to plant. To address these issues, CRDC has invested in two important projects with the aim of enhancing biodiversity: 1. Working with regional Natural Resource Management organisations to understand how cotton growers and the industry can contribute to regionally specific biodiversity priorities; and 2. Commissioning behavioural research to better understand how to encourage growers to invest time and money in improving biodiversity in the cotton landscape.
			Carbon footprint (kg of CO_2e per bale)	The estimated emissions footprint of Australian cotton production for 2022 rose to 303 kg of CO_2/bale (close to the five-year rolling average): an increase from 2021's 255 kg of CO_2/bale, but better than the target of 325 kg of CO_2/bale. The target is an emissions target, and does not consider sequestration, for example, native vegetation on farm. While the industry does not yet assess sequestration at the industry scale, case studies have highlighted that individual farms can be carbon positive when carbon sequestration is taken into account. Accurately measuring sequestration at the industry level continues to be a focus to ensure that a complete picture of the industry's footprint can be calculated. CRDC is also collaborating in the development of a cross-sectoral farm carbon footprint calculator, which builds on the previous investment in a common methodology across agricultural industries.

2.2 Create higher value uses for cotton	2.2.1 Increased value for Australian cotton	Increase in the number of new commercialised products	Number of new commercialised products	Preliminary investment in adding value to cotton-rich textile waste by using it as a soil amendment was undertaken in 2022–23, in preparation for the focus on cotton's participation in a more circular economy under the new CRDC Strategic RD&E Plan 2023–28.
	2.2.2 Increased understanding of market requirements and opportunities throughout the value chain	Information is publicly available on market requirements and value chain opportunities	CRDC research identifies opportunities to increase the value of cotton by 25 per cent	Premiums are available to *my*BMP-certified growers through participation in Better Cotton Initiative. As part of the preliminary investigation into the potential for textile waste to be returned to cotton fields there has been extensive engagement with retailers and brands about their needs and drivers.
2.3 Measurement and reporting throughout the value chain	2.3.1 CRDC collaborates in global leadership for sustainability initiatives	Evidence of involvement in global initiatives	Number of global initiatives participated in	The target of six initiatives has been met. CRDC continued its participation directly in six global initiatives: • The International Cotton Advisory Committee (ICAC's) Expert Panel on the Social, Economic and Environmental Performance of Cotton • ICAC'S Private Sector Advisory Committee • The Sustainable Agriculture Initiative • The Sustainable Apparel Coalition • The Better Cotton Initiative • The Textile Exchange. CRDC also continued to participate indirectly in the EU's Product Environmental Footprint processes via collaboration with our fellow RDCs, Australian Wool Innovation (AWI), Meat & Livestock Australia (MLA) and the Grains Research and Development Corporation.
	2.3.2 The value chain is transparent and understood by participants to improve market opportunities	Economic and sustainability implications of transparency throughout the value chain are published and understood	Reports and sustainability information published	The *Australian Cotton Sustainability Update 2022* was published in collaboration with Cotton Australia and the Sustainability Working Group, reporting against the industry's nine sustainability indicators. The information underpinning the Update comes from a number of CRDC-supported projects. CRDC also supported the industry's Fourth Environmental Assessment in 2022–23, with the results set to be published in 2023–24.

Case study

First of its kind guide for cotton farm revegetation

The Native Revegetation Guide for Australian Cotton Growers is a new resource, now available to download from the CottonInfo website.

The guide is the first cotton catchment-specific guide based on research for revegetation, and will help growers plan, prepare, plant, grow and monitor revegetation sites.

Based on research by Dr Rhiannon Smith from the University of New England, it also identifies other relevant research and extension products and tools that can help inform revegetation projects on cotton farms and, as an interactive online resource, has a 'click through' function to take users to them.

The guide comes as more and more cotton growers look into revegetation to boost their on-farm biodiversity.

"Protecting and enhancing biodiversity is essential because biodiversity delivers ecosystem services that growers and communities enjoy and depend on," CRDC Innovation Broker for Natural Resource Management Stacey Vogel said.

"Revegetation supports habitats for natural pest control agents, soil stabilisation and carbon sequestration, and provides shade and shelter for stock and windbreaks. It also strengthens ecosystem functions that sustain healthy environments, such as nutrient cycling, microclimate regulation and waste improvement.

"More landholders are looking to attract economic benefits, such as agroforestry, natural capital and carbon accounting."

Stacey also said that revegetation plays an important role in meeting sustainability goals and demonstrating good environmental stewardship.

"Australian cotton recognises that sustainability is integral to the industry's future and is setting targets to improve farm and cotton landscape biodiversity conditions. This new guide will help growers and the industry meet those important targets."

This guide is an outcome of the Cotton Landcare Tech Innovations 2021 project, funded by CRDC with support from the Australian Government's National Landcare Program Smart Farming Partnership Initiative Round 1. CRDC has invested in several projects to support land managers to understand, measure and protect biodiversity.

Available on the CottonInfo website, Managing Biodiversity in Cotton Landscapes is one such resource, providing biodiversity information for every Local Government Area (LGA) in Australian cotton-growing regions.

In total, 490 vegetation types were mapped across cotton landscapes, 348 of which occur on cotton properties. The mapping showed approximately 26 per cent of the cotton landscape and 21 per cent of the combined extent of all cotton properties retains a cover of remnant native vegetation.

The Native Revegetation Guide for Australian Cotton Growers, and Managing Biodiversity in Cotton Landscapes are both available via the CottonInfo website: www.cottoninfo.com.au.

For more: read the full article in the Autumn 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight

Case study

Developing standardised carbon accounting across commodities

Cotton growers and mixed farming operators who have been searching for a way to understand their whole-of-farm carbon emissions will be supported through a new Know & Show Your Carbon Footprint initiative, supported by CRDC.

The cross-sectoral initiative is underway to develop a solution that enables Australian farmers to understand their enterprise's carbon footprint and to make better informed decisions to reduce emissions and capture new opportunities.

It is being led by Agricultural Innovation Australia (AIA). AIA is a not-for-profit public company established by Australia's rural research and development corporations (RDCs) to facilitate joint investment and collaboration in cross-sectoral agricultural issues of national importance.

While there has been much work at a scientific and academic level to understand the carbon footprint of agricultural commodities, tools have not been readily accessible to growers, prompting the RDCs, through AIA, to focus on a whole-of-agriculture solution.

"Access to this information can support growers with market access, carbon market opportunities as well as increased confidence when dealing with stakeholders around natural capital and asset management," AIA CEO Sam Brown said.

AIA starts all initiatives with an in-depth discovery phase to ensure they fully understand the problem to be solved. Twelve RDCs are participating in this phase to give AIA a deeper understanding of current gaps, pain points and specific needs of the growers, commercial players and solution providers across the different commodities.

"What we are already hearing is that many farmers are operating mixed enterprises or are keeping that option open to manage risk into the future. This is why it was important for us to focus on a common and standardised carbon accounting framework. Growers are also concerned about potential future market access issues and being able to identify ways to reduce the carbon footprint of their entire enterprise," Sam said.

This move aligns with CRDC and the Australian cotton industry's cross-sectoral approach to setting biodiversity and native vegetation targets that are based on standardised definitions and calculations. Carbon accounting is an important aspect of natural capital along with biodiversity and native vegetation. The AIA strategy is consistent with feedback from recent grower forums held by CRDC to develop an industry biodiversity strategy.

The design of the Know & Show Your Carbon Footprint solution is being informed by agricultural carbon accounting situations in other countries. AIA analysis has shown that Australian agriculture is in a prime position to move early and together create a common, consistent platform, and to avoid the fragmentation, duplication and inconsistences other markets are now faced with.

The initiative has already garnered interest from the private sector, including supply chain organisations and commercial providers.

"We've held discussions with potential private sector investors and partners. They see clear efficiencies in bringing the RDCs' commodity-specific carbon research and knowledge together and want to be able to include this type of carbon footprint solution in their own client service offerings."

For more: read the full article in the Winter 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

Supporting workers' rights around the world: who handles our cotton fibre?

Australian cotton enjoys a reputation as a crop grown under decent working conditions. However, once our cotton is shipped and enters the global value chain, visibility is lost in an opaque system.

Textile manufacturing is one of the industries in which modern slavery occurs, with women and children disproportionally represented. Are workers in our value chain treated fairly? Or are they among an estimated 50 million people across the world working under modern slavery conditions? And can Australian cotton growers help prevent this exploitation?

A commitment to positive action – demonstrating Australian cotton's commitment to human rights and sustainability – is why CRDC commissioned research to better understand labour issues along the Australian cotton value chain and to recommend strategies for the industry to explore. The research was led by Dr Alice Payne of the Queensland University of Technology (QUT), with colleagues from QUT, University of Technology Sydney, and University of Notre Dame Australia.

The project aimed to highlight the connection between critical labour conditions in the textile and apparel industry and the cotton grown in Australia, creating an opportunity for Australian cotton to support improvements. The study particularly focused on the manufacturing segment of the value chain, noting that labour abuses may occur anywhere; however, garment manufacturing, as the most labour-intensive part of the supply chain and employing an estimated 60 million workers globally, is an area of particular concern.

"There is a unique opportunity to involve Australian cotton growers, merchants and spinners in the global campaign for fair working conditions throughout the textile and garment supply chains. The Australian cotton industry could play a part in helping to stop slavery and human rights abuses once cotton leaves our shores," Alice said.

"In doing so, Australian cotton would become one of the first agricultural industries in the world to show due diligence by approaching labour conditions in the value chain with a new perspective – by looking downstream."

Generally, the scrutiny of the product is from retailers seeking to look 'upstream' all the way back through the supply chain to cotton growers. Alice's proposal flips this around and suggests instead scrutiny looking 'downstream' from growers to retailers.

"It's an opportunity for our industry to contemplate what happens to Australian cotton fibre when it leaves our shores – and why this matters," CRDC General Manager Innovation Allan Williams said.

"Whose hands does our cotton move through, and what conditions are they working under? While slavery through the post-farmgate value chain will not be solved by the Australian industry alone, that's no reason not to take measures to strengthen the sustainability credentials of our fibre. This research allows us to better understand the risks that post-farmgate labour issues may represent to the Australian cotton industry and to assess targeted strategies to address them."

The research report, Solutions Approaches to address Downstream Labour Abuses in the Australian Cotton Value Chain, proposes seven pathways for the industry to consider.

"The big goal we propose for the industry is that no Australian cotton will enter supply chains with labour abuses. The opportunity is to enhance the reputation of Australian cotton," Alice said.

For more: read the full article in the Autumn 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

Developing a Strategic Roadmap for Australian cotton

CRDC is collaborating with Cotton Australia and the Australian Cotton Shippers Association (ACSA) to develop a strategic roadmap for the Australian cotton industry that will help the industry remain competitive in a changing fashion and textiles market.

Five key topic areas will be addressed via broad consultation with growers and the industry: traceability, industry data, sustainably certified cotton/*my*BMP program, human rights, and Australian cotton marketing.

The industry will work together to determine where it would like to be on these key topics, how it will get there, who will be responsible and how any new initiatives may be funded.

The need for this strategic roadmap has emerged from changes in the global cotton and textile landscape. These changes include new overseas legislation affecting market access, companies being required to report on social and environmental impacts, and global frameworks requiring evidence of social and environmental governance back to farm level.

Cotton Australia Chair, cotton grower Nigel Burnett, said that Australia has a unique opportunity to capitalise on its small, geographically contained industry, three decades of sustainability work, and a strong human rights record through the roadmap.

“We’re excited to be working across the industry on these key topics to create value for our farmers and the industry as well as delivering a product our customers want,” Nigel said.

“Put simply, this important process is about responding to our customer requirements and enabling Australian cotton to secure market access by demonstrating our commitment to a sustainable and responsible supply chain.”

CRDC’s General Manager of Innovation Allan Williams said the supply chain is shifting its focus from physical cotton to information about where and how the cotton was produced.

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

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

“This roadmap will help us answer these questions, and ensure we have the programs and systems in place to deliver the product and assurances our spinners, brand and retail customers want and need – ensuring our cotton remains a product of choice because of its excellent fibre qualities and its sustainable production practices.”

The Australian Cotton Strategic Roadmap will develop over a series of phases and include broad stakeholder engagement and industry consultation.

The Roadmap is being undertaken by independent consultants Aither, with oversight by an industry steering committee made up of representatives from Cotton Australia, ACSA and CRDC. Funding for the project has been made available via an Australian Government Agricultural Trade and Market Access Cooperation (ATMAC) grant.

For more: read the full article in the Autumn 2023 edition of CRDC’s *Spotlight* magazine www.crdc.com.au/spotlight.

Section 4: RD&E Portfolio - Goal 3

Goal 3: Build adaptive capacity for the cotton industry

Building the adaptive capacity of the Australian cotton industry and enabling the industry to achieve its future vision was CRDC's aim within his goal. CRDC focused its investments to deliver science and innovation capability and new knowledge, and to facilitate futures thinking.

In 2022–23, CRDC invested in 55 projects within this goal, accounting for eight per cent of our total RD&E expenditure.

Performance against the Strategic Plan

Key Focus Areas	Outcomes	Performance Indicators	Measures	2022–23 progress
3.1 Science and innovation capability and new knowledge	3.1.1 Science and innovation capacity is strengthened and strategically fit for a digital future	Increase in the number of researchers supported through strategic pathways	Number of PhD, post-doctoral and early career researchers supported	CRDC supported six summer scholars, 15 PhD students and eight post-doctoral researchers in 2022–23. CRDC continues to support the introduction and development of early-career researchers. We run a Postgraduate Cotton Careers Tour to Narrabri to provide researchers interested in a career in cotton with access to industry organisations, and to enhance their understanding of the industry, networking and career opportunities. In the 2022–23 year, CRDC also supported 12 early-career researchers to attend the 2022 Cotton Conference.
			Number of scientific exchanges	The lifting of travel restrictions after COVID-19 enabled CRDC to support three researchers to attend international conferences in 2022–23, and to support 12 early-career researchers to attend the 2022 Australian Cotton Conference. CRDC also continues to support the Association of Australian Cotton Scientists Conference, which is being held in 2023–24.
	3.1.2 Increased understanding of and participation from the diverse human capital in regional communities	Information is available on the diversity of social networks (age, gender, roles, culture, range of service providers, occupations and skills)	Report released	The target of one report being released was met in 2021–22, with the finalisation of a post-doctoral project focused on developing an understanding of the needs of a future cotton workforce. Findings from the work were incorporated into a subsequent research project that was ongoing in 2022–23.

	3.1.3 Increased opportunities for innovation skills development	Degree to which innovation is supported by CRDC	Number of participants in innovation initiatives	CRDC supported CSIRO's summer scholars program, which included participation in AgCatalyst. CRDC sponsored and participated in AgriFutures Australia's evoke[AG].
			Number and details of new ideas generated that provide benefit for the cotton industry	Innovations in the areas of textile waste management, spray drift management, volunteer cotton control, insect control, plant sensing to inform water-use efficiency, management of abiotic stress and biodiversity monitoring are continuing their development. CRDC invested in two scoping studies for novel approaches to mitigating evaporation from farm storages, the single largest water loss pathway. Further investment in the identified concepts is planned. CRDC continued its support of the Department of Agriculture, Fisheries and Forestry and ABARES Science and Innovation Awards.
3.2. Futures thinking	3.2.1 Australian cotton farmers are able to adapt to change	Growers report improved capacity to manage unknown or unexpected events (resilience)	Percentage of growers who report improved general resilience	A lag in Regional Wellbeing Survey results means that there is no new data since 2021. The 2021 results highlighted that while mental health had improved from 2020, there were declines in the scores for wellbeing and life satisfaction. These likely highlight the challenges being faced by both cotton growers and their communities in dealing with a succession of challenges, such as drought and COVID-19.
	3.2.2 Increased opportunities for strategic foresighting	Futures workshops lead to recommendations for future opportunities	Number of futures workshops	The target of two workshops has been met. These were workshops considering a future scenario of reduced access to pesticides and reduced input systems, and a 'novel farming systems' workshop. In addition, CRDC hosted two virtual workshops with industry – a horizon scanning and a scenario planning workshop – to help inform the new CRDC Strategic RD&E Plan 2023-28. CRDC also led multiple multi-stakeholder workshops to underpin development of the Climate Initiative, now handed over to Agricultural Innovation Australia. In addition, a workshop investigating the opportunity to enhance on-farm experimentation using novel statistical techniques was held in 2022–23.
			Number and details of future opportunities to be followed up	Future opportunities resulting from these workshops are set to be explored through the new CRDC Strategic RD&E Plan 2023–28. These include the establishment of a data platform to facilitate new research approaches and insights; the role of hormones, polymers and synthetic biology to mitigate biotic and abiotic stresses; novel approaches to reducing evaporation; and minimising the environmental impacts of pesticides and nitrogen.

Case study

Looking for new alternatives

Boomi (Kamilaroi country) dryland farmer and grazier Tim Houston hasn't officially started his Nuffield global focus program studies, yet he's already champing at the bit to get going.

Tim has recently returned from New Zealand's South Island, where, as the 2023 CRDC and Cotton Australia-supported Nuffield Australia scholarship awardee, he joined around 200 alumni at the Nuffield International Triennial Conference. With the 2023 theme 'Beyond', the conference provided an opportunity to learn, experience, share and debate during a nine-day trip from Christchurch to Queenstown across some of NZ's most scenic routes. The conference attracts key decision makers, investors and ag influencers from around the world, and offers the Nuffield alumni the chance to continue to learn, innovate and build international networks and business connections.

It wasn't just the incredibly scenic landscape and diverse farms in the South Island that blew Tim away.

"The New Zealand trip was above and beyond my expectations. Farmers over there wake up to million-dollar views every morning, and we saw diverse businesses that are great at value-adding to their products with on-farm processing and marketing," Tim said.

"But I was really blown away by the intelligence, knowledge and insights of the Nuffield alumni on the tour – what an amazing group of people. I met people from all countries of all ages, some in their eighties, which is testament to the saying that 'Nuffield Scholars are scholars for life'. The conversations I had and the breadth of their experience and knowledge was amazing. Nuffield says their scholars are innovative, free-thinking people, and I found this out this in NZ."

Tim says there is common thread that ties such a diverse demographic together: a passion for agriculture, a thirst for knowledge, and a drive for improvement. For Tim (pictured with Nuffield Australia Chair Robert Bradley and 2006 Nuffield scholar and cottongrower Andrew Watson), this ethos is part of farming.

"Here at home, we are always looking over the fence to see what others are doing. I believe there's always a way to do things better, so we look outward to bring relevant info back to our own operations. After the tour in NZ, I am really keen to now go on my global focus program and to see these other countries and meet people."

Tim's Nuffield global focus program will take him to Argentina, Ireland, France and Poland to explore his topic of how farmers in other parts of the world are navigating the challenges of 'sustainable intensification', or doing more with existing land, without creating negative impacts on the business, the environment or communities.

"I want to know how landholders are managing this concept in a way that actually provides positive social, economic and environmental outcomes – a triple bottom line. I'll be keen to share new knowledge and my experience with others in the industry through my final report when I'm finished, along with taking up other opportunities for learning that Nuffield offers that I really experienced in NZ."

As part of Tim's studies, he will be meeting with CRDC Innovation Broker and CottonInfo NRM Technical Lead Stacey Vogel to discuss cotton's proposed native vegetation model.

For more: Read the full article in the Winter 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

How medicine met ag in an innovator's mind

Nanoparticles that were originally created to treat cancer in humans are being further developed to protect cotton crops from drought, and to deliver agrochemicals and fertilisers directly into plants, avoiding environmental exposure.

This innovative approach is the brainchild of this year's CRDC-supported ABARES Science and Innovation award winner, Dr Cong Vu (pictured with the Minister for Agriculture, Fisheries and Forestry, Senator the Hon. Murray Watt), who is applying his expertise in biomedical science to the cotton industry.

"We are able to use nanoparticles to deliver various types of agrochemicals, pesticides and fertilisers into a precise location in a cotton plant, which minimises residues in the environment," Cong said.

"The agrochemicals are loaded inside nanoparticles, to guard against pesticide loss or degradation in the environment. This will enhance efficiency of these products over an extended duration and protect crops for longer."

Cong completed his PhD in nano-medicine at the University of NSW, as part of a world-leading group using nanotechnology to deliver anti-cancer drugs to cancerous cells while leaving healthy cells alone. One afternoon in the lab, while researching the history of cancer drugs, Cong realised that anti-cancer drugs and pesticides share many characteristics, such as poor water solubility and off-target toxicity.

"It got me thinking: if I can develop nanoparticles to promote drugs to targeted cancer cells in the human body, why can't I do the same for agrochemicals in plants, while reducing the effects of pesticides on the environment? We can control the morphology (structure) of the nanoparticle, and by doing that we can control where the nanoparticle can get inside the plant."

In the true spirit of modern innovation, in 2021 Cong founded the start-up Nanosoils Bio to develop these agri-nanoparticles. Nanosoils was incubated by NSW DPI and the GATE program, and accelerated by Sparklabs Cultiv8.

"I realised we can expand and translate our technology from medicine to agriculture by developing nano-agrochemicals, and now we are also looking at the drought-resilience aspect using silica nanoparticle technology," Cong said.

"The nanoparticle helps the plant tolerate drought stress and can also be a nutrient for the plant. My aim is to maximise the uptake of silica nanoparticles in cotton to help the plants deal with drought stress, which accounts for 67 per cent of yield loss, according to industry studies."

Cong says the technology could be used as a seed coating, replacing traditional methods, and nanoparticles could also be added to fertiliser. While the technology is still at the early testing stage, results are promising. Cong is enjoying working in agriculture for the first time as a part of a start-up.

"I find it is very interesting, and surprising, as I didn't think I'd be working with the cotton industry here. I came to Australia from Vietnam to study nano-medicine and expected to be a medical researcher at a university.

"But this discovery happened and I'm now looking forward to applying my research for the cotton industry. Instead of being a medical researcher providing technology to doctors and surgeons to treat patients, I'm providing agricultural research to farmers to treat their plants," he said.

For more: read the full article in the Winter 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

Celebrating 30 years of creating the foundations for leadership

Based on the belief that the success of a community or industry lies in the capacity and willingness of individuals to become leaders, the Australian Rural Leadership Foundation (ARLF) was founded 30 years ago, with the specific aim to develop leaders for rural, regional and remote Australia.

The idea for ARLF came out of the then newly formed Rural Industries Research and Development Corporation (RIRDC) – now known as AgriFutures Australia, CRDC's fellow research and development corporation – which was looking at how to encourage the development of new rural industries, support existing industries, and create thriving communities.

Not least of these was the Australian cotton industry and the communities it operates within. RIRDC's Board identified that a key difference between successful rural communities and those perceived as struggling was not due to inherent natural resources or strategic position, but to an individual or group of individuals. These individuals were standing up and taking on leadership roles.

The resolution was that leaders were required, not only in state and national political roles, but within local schools, on hospital boards, within community and sporting groups, and local industries. With that, the ARLF was formed, as an organisation that could influence change across Australian rural industries as a whole, and rural communities in general.

Today, ARLF runs the Australian Rural Leadership Program (ARLP), Australia's longest running and most in-depth experiential leadership program for rural Australia, which this year has celebrated 30 years.

Applying to the ARLP is competitive and rigorous. Those who are selected attend 50 days of experiential learning and mentoring in four sessions over a 15-month period, under the ARLF remit to nurture and advance rural Australia: to take an ethical approach; to challenge assumptions; and to seek to respectfully influence change for the greater good of Australia.

The cotton industry has supported participants in 28 of the 30 cohorts. There have been 46 cotton industry participants in total supported variously over the years by CRDC, Cotton Australia, Auscott/Australian Food and Fibre, Twynam Pastoral, Namoi Cotton, Cotton Seed Distributors, Cotton Grower Services, Paraway Pastoral and Prime Super.

Two growers in the first cohort (1993-94) were Mike Logan, who went on to become CRDC Chair, and fellow Namoi Valley (Kamilaroi country) grower Jack Warnock, a stalwart who has served on many groups associated with the industry.

Many graduates from the cotton industry, like Mike and Jack, have gone on to help lead it. They include Cotton Australia CEO Adam Kay, former CRDC Executive Director Bruce Finney, former CRDC R&D Manager Bruce Pyke, current CRDC General Manager of Innovation Allan Williams, CRDC Executive Manager of Communications Ruth Redfern (pictured), CSIRO entomologist Dr Sharon Downes, and Cotton Australia board members and growers Barb Grey, Liz Stott and Fleur Anderson. The 2022 Incitec Pivot Fertilisers Service to Industry Award recipient Bernie George is also a graduate of ARLP.

Current participants are growers Aaron Kiely and Jack Brennan, who will graduate from course 29 in 2023, and Henry Lavender, who starts his course 30 journey in 2023 with support from CRDC, Cotton Australia and Australian Food and Fibre.

For more: Read the full article in the Summer 2022–23 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

Cotton and grains explore agricultural traineeship model

CRDC and GRDC have taken the lead in exploring strategies to increase on-farm workforce capacity to help address shortages of skilled workers on farms.

The 'Exploring a cotton and grains agricultural apprenticeship/traineeships model' project is investigating how vocational educational training (VET) and formal apprenticeships and traineeships can support pathways for young people in the cotton and grains industry and opportunities for a traineeship model for on-farm staff.

The CRDC/GRDC project is identifying the skills required through collaboration with farmers, current apprentices or trainees and registered training organisations. This will enable the Central Queensland University (CQU) research team to investigate the complex issues that exist for multiple stakeholders and that, up till now, have prevented the establishment of an agricultural apprenticeship that is fit-for-purpose for the cotton and grains industries.

"It is well known that there is a significant workforce shortage across the Australian agricultural industry," says Associate Professor Amy Cosby at CQU, who is leading the project.

"While enrolments in agricultural university degrees have increased recently, this trend has not occurred in VET. And yet accredited education and training through VET and higher education are deemed critical to upskilling the next-generation agricultural workforce.

"We are examining how agricultural apprenticeships/traineeships operate in Australia and abroad and in other competing industries, such as mining and construction. We are speaking with key stakeholders in cotton, grains and broader agricultural industry about what they perceive to be the ideal model for an on-farm apprenticeship/traineeship that meets the needs of farmers and young people entering the industry."

It's a move supported by Andrew Watson (pictured) at Boggabri, who grows cotton and grain. He's concerned about where their on-farm workforce is going to come from amid competition from other sectors, particularly mining, for staff and housing. These issues are common across primary industries, as outlined in the community perceptions research project.

"We set ourselves up as a place where people want to work, but it's getting harder to get people out here," Andrew said.

"Young people are being taken up by mining jobs, and housing is a major issue for prospective staff of all ages. To have a pathway for upskilling staff in both cotton and grain production while on the job would be something I would support," he said.

"Young people, especially those who've been out of school for a couple of years, need to be earning money to survive, possibly supporting families, so it can't just be an educational model. I see value in making training vocational, with some formal training to support it. It makes sense to have training across the cropping systems, as we don't have one without the other: they are intertwined.

"The basics are the same: we plant the seed, nurture the seed, protect the crop and then harvest it. A VET program would be really helpful – it would give us some backup in upskilling new staff, while acknowledging their skills development with a qualification."

For more: read the full article in the Winter 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

RD&E Portfolio - Section 4: Enabling strategy one

Enabling strategy one: Strengthening partnerships and adoption

Within this enabling strategy, CRDC's aims were further strengthening our collaboration and relationships with our partners, and working together to ensure effective adoption pathways for research outcomes. CRDC focused investments in strengthening partnerships and collaboration, best practice through *my*BMP, and supporting innovation and commercialisation.

In 2022–23, CRDC invested in 26 projects within this goal, accounting for 23 per cent of our total RD&E expenditure.

Performance against the Strategic Plan

Key Focus Areas	Outcomes	Performance Indicators	Measures	2022–23 progress
4.1 Partnerships and collaboration	4.1.1 Growers/ consultants value CRDC farming systems research outcomes	Maintain or increase the number of growers/consultants that value CRDC research outcomes	Percentage of growers/ consultants that report valuing CRDC outcomes	The 2022 CRDC grower and consultants surveys have found that those valuing CRDC's research outcomes has increased from the Strategic Plan baseline. 82 per cent of growers value CRDC outcomes (up from the baseline of 77 per cent), and 83 per cent of consultants (up from the baseline of 72 per cent). In addition, the CRDC Grower Survey found that 90 per cent of growers believe CRDC invests in innovative RD&E, and 89 per cent believe CRDC provides thought leadership for the cotton industry.
	4.1.2 CottonInfo partnership is maintained and practice change improved	R&D outcomes are demonstrated through extension and adoption activities	Number of demonstration sessions	The CottonInfo extension program joint venture celebrated its tenth year at the 2022 Cotton Conference. In 2022–23, the CottonInfo team worked directly with 35 CRDC-supported projects as well as supporting growers and consultants with regionally specific information needs. They delivered 45 extension activities, and directly supported a further 46 industry group meetings. These activities included over 2,000 direct grower interactions, and over 1,000 consultant and 300 researcher attendances.
			Percentage of participants that report increased knowledge, skills, and intention to change behaviour as a result	Across the 4,700 participants at events that CottonInfo have organised or supported during 2022–23, the average rating for the effectiveness of the activity was 4.4 out of 5. Specific issues addressed included nutrition management guidance during a very difficult start to the season, the monitoring and practice change recommendations due to a sharp increase in aphid resistance levels, collaborative research on disease with CSD's Richard Williams Research Initiative, and the continuation of the participatory research on siphonless irrigation system efficiency at St George.
	4.1.3 Partnerships are strengthened to engage multi-disciplinary and multi-institutional resources (centres of excellence)	Evidence of effective collaborative projects	Percentage of investments that include cross-sectoral partnerships	In 2022–23, 28 per cent of CRDC's investments were in cross-sectoral partnerships.

			Number of new international and national partnerships	New national collaborations entered into during 2022–23 included a multi-year collaboration on weeds research with GRDC, investment in a cross-sectoral carbon footprint calculator via Agricultural Innovation Australia, and disease and water projects with CSD's Richard Williams Research Initiative. New international partnerships included membership of the Better Cotton Initiative, and support for a PhD with Cotton Inc.
			Partner satisfaction ranking	CRDC's partnerships remain strong, as reflected in the 2022 CRDC Partnership Relationship Review, which found partner satisfaction in CRDC as an organisation to trust was 8.9 out of 10, and overall partner satisfaction remained on par with the 2018 benchmark of 8.2 out of 10. The review found that CRDC is widely considered an industry custodian.
4.2 Best practice (*my*BMP)	4.2.1 Best practice is based on science and measured impact	*my*BMP practice modules reflect latest R&D outcomes	Percentage of topics within *my*BMP modules (that CRDC contributes to) that have been updated with CRDC R&D outcomes	All *my*BMP modules were updated during the year with relevant R&D outcomes.
4.3 Innovation and commercialisation	4.3.1 Improved R&D innovation and commercialisation	CRDC supports researchers to innovate and become more commercially focused	Number of projects with commercialisation potential	Eight of the 20 projects that have been identified as having commercialisation potential either have a commercial partner on board or have commercialisation processes underway.
		Research partners are supported through the commercialisation process	Researchers report satisfaction with CRDC commercialisation support	A commercialisation adviser (contractor) continues to work with CRDC to review commercialisation approaches. Researcher satisfaction results from the CRDC Partner Relationship Review identified areas for strengthening, and the results are being assessed.
		Commercialisation and knowledge transfer is accelerated	Percentage improvement in duration from conception to market entry (per product category)	A commercialisation adviser (contractor) is advising and enacting a process to reduce time from conception to market entry. The percentage improvements are being assessed.

Case study

Spray hazard warning network goes live

A major milestone has been reached in the effort to help minimise spray drift, with a hazardous weather warning system now live for Qld and NSW grain and cotton growers.

The system – named Weather and Networked Data, or WAND – is the result of six years of collaborative research by the Grains Research and Development Corporation (GRDC) and CRDC into meteorological conditions and the spray application of crop protection products.

In early 2022, GRDC and CRDC partnered with Goanna Ag to deliver this new technology to growers and spray applicators. The technology will provide real-time weather data about the presence and absence of hazardous temperature inversions.

Goanna Ag has now completed construction of 100 WAND towers across the grain and cotton regions of Qld and NSW.

“A significant amount of the Qld and NSW cotton cropping belt is now within 40km of a WAND tower, providing critical information for spray hazard identification to the grain and cotton regions,” said Goanna Ag CEO Alicia Garden (pictured with GRDC’s John Woods and CRDC’s Dr Ian Taylor).

“WAND will deliver growers and their spray contractors weather data that is updated every 10 minutes, identifying hazardous temperature inversion periods, giving them confidence to proceed with spray operations.”

GRDC Chair John Woods said having the WAND system live would provide enormous benefits to grain and cotton growers.

“This is an important and progressive step for agriculture. GRDC are really pleased to have partnered with CRDC to support researchers Dr Graeme Tepper and Dr Warwick Grace to develop the first – and only – reliable and accurate method to determine when hazardous inversions are present,” John said.

“We have now brought the technology and analysis to the market, into growers’ hands, through our enabling partner Goanna Ag.”

CRDC’s Executive Director Dr Ian Taylor said the network going live was the culmination of six years of collaborative research and development, and he urged cotton and grain growers to begin using WAND.

“This type of research and innovation is exactly why GRDC and CRDC exists – to make a real, tangible difference to our growers and their communities,” Ian said.

“WAND is available to all growers and contractors free-of-charge, and we encourage them to sign up today.”

For more: read the full articles re WAND in the Summer 2022–23, Autumn 2023 and Winter 2023 edition of CRDC’s *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

A decade of serving the industry

CottonInfo, the Australian cotton industry's joint extension program, is celebrating 10 years of delivering outcomes for the Australian cotton industry.

Officially established at the 2012 Australian Cotton Conference, CottonInfo is a joint initiative of CRDC, CSD and Cotton Australia. It's 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 *my*BMP experts. This team 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.

CRDC Executive Director Dr Ian Taylor said the CottonInfo model was something that most other agricultural industries did not have.

"CottonInfo's greatest strength is the collaboration and cooperation between the partner organisations CRDC, CSD and Cotton Australia," Ian said.

"Through CottonInfo, we have a high level of experience in the field with our Technical Leads and Regional Extension Officers. These people have built trust and respect with growers and advisors, which is helping to accelerate outcomes for the industry."

In its first decade of operation, CottonInfo has become well known across the industry and sought after for its information, which includes weekly email newsletters, hard copy publications, a comprehensive website, a YouTube channel with almost three million views, and a podcasting service.

According to industry surveys, 94 per cent of consultants and 90 per cent of growers believe CottonInfo provides useful and credible information.

Major activities planned for the season ahead include a crop nutrition research tour, multiple soil health workshops, irrigation efficiency toolbox talks and events, helping growers with early-season pest management strategies, and much more.

Cotton Australia CEO Adam Kay congratulated the CottonInfo team on the milestone and said that one of the biggest achievements of the partnership was its established relationships with growers and advisers.

"The team has had strong continuity of staff who continue to work on innovative ways of improving best practice on farm. This is especially important in connecting growers with advice in areas of market failure. The team has a strong connection with the *my*BMP program and continues to help the industry showcase its very strong credentials around sustainable production," Adam said.

Managing Director of CSD, Peter Graham, said CottonInfo offered a path to market for innovation and best practice.

"The CottonInfo partnership ensures that industry activities are coordinated and effective. It is also a great vehicle for showcasing the excellent work that is occurring within our industry," Peter said.

Pictured: CottonInfo's Janelle Montgomery with cottongrower Tom Quigley and cotton researcher Dr John Hornbuckle.

For more: read the full article in the Spring 2022 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

Latest Sustainability Update shows target gains and room for improvement

The *Australian Cotton Sustainability Update 2022*, released by Cotton Australia and CRDC, reveals the complexity of sustainability in farming systems and the extent of the industry's investment in collaborative initiatives to accelerate positive impacts.

A 52 per cent improvement in water-use efficiency since 1997, reductions of 91 per cent and 66 per cent respectively in the hazard of pesticides to bees and algae since 2004, and an increase in the proportion of female and First Nations workers since 2016 are some of the mainly positive trends reported, while annual data shows a decrease in yield and increase in greenhouse gas emissions from 2021 to 2022.

Cotton Australia CEO Adam Kay said the 2022 Sustainability Update provides evidence of an industry seeking to give its stakeholders a transparent and balanced review.

"Since becoming the first Australian agricultural industry to independently assess its environmental impacts in 1991, the Australian cotton industry is proud of long positive trends in many areas but also knows it needs to keep looking at ways to improve," Mr Kay said.

"Our latest update clearly shows what we're doing well, but just as importantly it shows what challenges we have and what we're doing to address areas where we can better manage risks and opportunities.

"The data shows we have more to do in reducing greenhouse gas emissions, and while we have witnessed a significant decline in the negative impact of herbicide use since 2004, there has been an increase in herbicide hazard over the past two years and as an industry our goal is to minimise the environmental impact of herbicide use."

The 2022 Sustainability Update also reveals the five-year average irrigated yield of Australian cotton increased by 55 per cent from 1994 to 2002, compared to an 8 per cent dryland yield increase in the same period.

This highlights how efficient use of irrigation water, within sustainable river and groundwater system limits, can meet a growing global call for sustainable intensification of agriculture: to produce more food and fibre while reducing negative impacts and increasing benefits on people and nature.

CRDC Executive Director Dr Ian Taylor said collaboration and coordination were key parts of the cotton industry's work to deliver sustainable intensification.

"The PLANET. PEOPLE. PADDOCK. framework is the Australian cotton industry's tool to deliver sustainable intensification by improving the resilience and productivity of farming systems while maintaining nature's contributions to people," Dr Taylor said.

"Collaborating with others inside and outside the industry to get the environmental, social and economic balance right is absolutely essential, and we are investing time and money to make this happen. Working with Natural Resource Management Regions Australia to develop regionally appropriate native vegetation targets, supporting the work of the National Soil Strategy to improve soil health, and advocating for a whole-of-agriculture approach to promoting human rights on Australian farms are examples of the collaborative approach the industry is taking."

The Australian Cotton Sustainability Update 2022 and Data Pack are available on the industry's online sustainability hub: www.crdc.com.au/growers/sustainability.

For more: read the full article in the Spring 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

Novel biopesticide on the horizon

A new plant-based compound for combating common insect pests in cotton, horticulture and broadacre crops has been developed with support from CRDC.

The novel biopesticide compound could revolutionise not just cotton pest control, but the global agricultural pesticides market. In partnership with Western Sydney University (WSU), CRDC has uncovered a plant extract that shows tremendous promise in lab tests and in early field trials in controlling common crop insect pests.

WSU looked at about 250 plant species – both native and exotic – and tested around 450 extracts for insecticidal activity against key pest species. Successful extracts were then tested for off-target traits such as impacts on beneficial insect species and phytotoxic effects on the crop.

What has emerged is a commercially cultivable native plant compound code-named N68, which 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.

WSU has already uncovered a simple, safe and economical method for extracting N68 from the plant. The compound gives good insect control at relatively low concentrations and because the compound can be cultivated on a commercial scale to produce and harvest the active metabolites, this increases the chances that it will be a commercially viable product in the future.

Current testing suggests N68 is a new mode of action for insect control, and potentially an entirely new tool in the challenge of resistance because it has proven effective against insecticide-resistant aphid populations. The development of N68 is in line with CRDC's commitment to supply growers with new methods of pest control to strengthen integrated pest management (IPM) systems as they evolve and change, often because of actions outside the industry's control.

The adoption of GM cotton, coupled with the adoption of IPM practices, has enabled Australian cotton growers to reduce their use of synthetic pesticides. But as agronomist and CRDC consultant Doug McCollum explained, pest control isn't a 'tick a box' item. From regulatory changes to insect resistance, and market pressures from importers and ecologically conscious consumers – the race is on to develop alternatives.

"We also see both long-term and seasonal change in the ecology of cotton fields, where things that were once a major problem fade into the background, but other pests pop up in their place. CRDC knows we need to keep working in this area, creating new options that protect our growers into the future," Doug said.

With the typical research timeline from discovery to commercialisation taking anywhere up to 10 years, the work already done by CRDC and partners significantly shortens that period. While initiated by CRDC to find new insect control options for cotton, this compound has a much broader application with non-cotton pest species, such as the diamondback moth. This broadens N68's market potential from Australian cotton to cotton, vegetable and broadacre crops worldwide.

Investing in research to create novel, biological pesticides is a part of CRDC's longer-term plan to help reduce reliance on pesticides.

For more: read the full article in the Spring 2022 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Section 4: RD&E Portfolio - Enabling strategy two

Enabling strategy two: Driving RD&E impact

Ensuring CRDC's investments delivered impact and effectiveness, therefore creating value for our stakeholders, was CRDC's aim within this enabling strategy. To achieve this, CRDC worked to ensure our RD&E investments met grower, industry and government needs, and projects aligned with stakeholder priorities.

In 2022–23, CRDC invested in 14 projects within this goal, accounting for three per cent of our total RD&E expenditure.

Performance against the Strategic Plan

Key Focus Areas	Outcomes	Performance Indicator	Measures	2022–23 progress
5.1 Impact and effectiveness	5.1.1 CRDC investments meet grower, industry and government needs	Funded projects align with CRDC research priorities	Percentage of aligned projects	All funded projects aligned with CRDC research priorities and were supported by growers.
		Positive stakeholder feedback about the relevance and value of CRDC investments	Percentage of positive responses	The 2022 CRDC grower and consultants surveys found that CRDC investments are relevant and highly valued by 90 per cent of growers and consultants.
	5.1.2 CRDC monitors and evaluates RD&E impact	Monitoring and evaluation evidence demonstrates RD&E impact	RD&E impact reported	In 2022-23, CRDC commissioned an impact assessment of selected projects completed under the 2018–23 Strategic RD&E Plan. Project selection was aligned with the Council of RDC's random selection methodology. Impact assessments were completed of 10 project clusters, comprising 24 individual RD&E projects, with a combined CRDC investment of $10.7 million (equalling 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.
	5.1.3 CRDC-funded projects demonstrate value and return on investment	Positive return on investment (ROI)	Investments demonstrate a maximum ratio of benefit/cost	From the impact assessment, the collective benefit-cost ratio was found to be $5.98 to $1.
	5.1.4 Growers, the cotton industry and government are informed and aware of R&D outcomes and CRDC's progress and performance	Stakeholders report that CRDC communications meet their needs	Communications satisfaction rating	The 2022 CRDC Partner Relationship Review found that CRDC's communications satisfaction ranking is 8.0 out of 10. The 2022 CRDC Grower Survey found 94 per cent of growers believe CRDC to be a trusted information source.

Case study

CRDC RD&E delivering return on investment for growers

CRDC investments in projects to alleviate damaging spray drift, improve irrigation productivity and manage pests have provided the greatest economic impact to the Australian cotton industry over the past five years.

That is the finding of economic impact assessments of major RD&E projects, commissioned by CRDC and undertaken by agricultural economists at AgEcon.

The Weather and Networked Data (WAND) spray hazard tower network represents CRDC's largest single project investment in CRDC's 33-year history. It's a collaboration with GRDC and Goanna Ag with a total investment of $5.5 million over five years. The AgEcon analysis estimated a benefit-cost ratio of $12.54 for every dollar invested over the period 2023–2030.

Canopy temperature sensors developed to aid irrigation scheduling had an estimated benefit of $7.40 for every dollar invested. Closely following was the development of the automated management tool for silverleaf whitefly, the Pest Detect app, with a ratio of $6.61–$1.

The analysis found that these three projects had both the highest net present value and the highest benefit-cost ratio. Collectively, they accounted for more than 85 per cent of the estimated value, and benefited from having a commercial partner on board to drive the desired outcome.

The assessment report comes on the back of one of the worst seasons for spray drift damage the cotton industry has experienced. Spray drift damage totalling millions in lost income was reported in every growing valley, with an estimated $100 million damage on the Darling Downs alone. Mitigating spray drift and the damage caused by herbicides, particularly to cotton crops, has been a difficult issue to rectify from an R&D perspective.

The WAND spray hazard tower network saw the development of software and hardware to support 100 towers erected across Qld and NSW cotton growing regions. It came online in late 2022, with the full network of towers live by March 2023. It is free for use by producers from the cotton and grains sectors to predict and warns of hazardous spray conditions, taking any guesswork out of whether conditions are suitable for spraying or not.

While past investments into initiatives, such as spray application training and certification, educational campaigns, pesticide volatility and propensity for damage to cotton have created tools to understand the nature of spray drift and give spray operators the best chance to mitigate it, the issue has persisted. WAND was developed as a result.

CRDC commissioned the independent impact assessment of RD&E projects completed under the 2018-23 Strategic RD&E Plan. Assessments were completed of 10 project clusters, comprising 24 individual RD&E projects, with a combined CRDC investment of $10.7 million – equalling 38 per cent of CRDC's investment from 2018 to June 2022.

Along with the three most effective investments, the project clusters included: smart sensing and automation for irrigation, integrated pest management, community resilience, Bt resistance, integrated weed management, sustainability, the silverleaf whitefly decision support tool, and nitrogen management. In total, the collective benefit-cost ratio was estimated to be $5.98 to $1 – or $5.98 in benefit returned to cotton growers and the wider industry for every $1 invested.

For more: read the full article in the Spring 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Case study

CRDC-supported innovations take centre stage at Cotton Conference

It was a long overdue get-together for the Australian cotton industry when the 2022 Cotton Conference kicked off in August. Evident in a record crowd of nearly 2,500, including 130 speakers and 125 exhibitors, the event was a clear reminder that the industry is 'here for good', which was the 2022 theme.

CRDC is one of two foundation sponsors of the conference. As part of its support, CRDC and AgriFutures grow^{AG} co-hosted 'Innovation Alley', showcasing companies and innovations supported by CRDC and its fellow RCDs that will (or are already) deliver an impact for growers. These are:

- AgriFutures grow^{AG}: grow^{AG} is a partnership between the 15 RDCs and the Department of Agriculture, Fisheries and Forestry. It's the gateway to Australia's agrifood innovation system.
- Goanna Ag's WAND: A five-year partnership between CRDC, GRDC and Goanna Ag delivering a hazardous inversion warning system for growers and spray operators, called WAND: Weather and Networked Data.
- LX 'Maverick' & SwarmFarm: CRDC and GRDC partnered with the Department of Industry on the Business Research and Innovation Initiative (BRII) to solve a major challenge: revolutionising spray applications to reduce drift. LX and SwarmFarm Robotics were chosen for the 'proof of concept' phase, receiving $1 million each.
- Pest Detect App: CRDC, University of Southern Queensland, Queensland Department of Agriculture and Fisheries, and tech specialists Clevvi are creating a novel machine vision tool for use in the field. The Cotton Pest Detect App is a digital tool to help with sampling for silverleaf whitefly (SLW) nymphs.
- iMapPESTS: The cross-industry R&D program, iMapPESTS: Sentinel Surveillance for Agriculture, brings together Australia's plant RDCs (including CRDC), to research and develop a smart national surveillance system for airborne pests and diseases.
- Regrow Ag: CRDC has been partnering with Dr Anastasia Volkova (pictured with grow^{AG}'s David Lord and CRDC's Ian Taylor) and her company since 2017, when we supported her through a series of start-up workshops that enabled her to incubate and grow her project. Since then, she's gone on to secure millions in investment to further develop the state-of-the-art remote sensing and crop/soil modelling technology.
- Smarter Irrigation for Profit 2: The cross-industry Smarter Irrigation for Profit Phase 2 program, led by CRDC with support from the Rural R&D for Profit program, tackled the challenge of reduced water availability by focusing on practical, cost-effective strategies to improve water productivity. The cotton industry is commercialising a number of resulting innovations, like VARIwise and SISCOweb.
- Cotton Landcare Tech Innovations: This project focused on enhancing biodiversity on Australian cotton farms with support from the Australian Government's National Landcare Program Smart Farming Partnership Initiative.
- Australian Research Council (ARC) Hub for Sustainable Crop Protection: The Hub was established to address challenges of fungicide resistance, chemical residues, off-target effects and environmental harm. The team are taking on the global challenge of transforming crop protection technology by developing and commercialising BioClay™, the innovative biological alternative to chemical fungicide.
- AquaTill: AquaTill is ultra high-pressure waterjet technology developed as an alternative post-harvest crop destruction tool in dryland cotton. CRDC and the Dryland Cotton Research Association (DCRA) have supported trials, and AquaTill is progressing towards commercialisation.
- John Deere See & Spray™ Select: Vision-based plant detection technology released by John Deere in 2021 was developed through projects supported by CRDC with researchers from USQ. The technology rapidly detects green plants and automatically triggers a spray application, using 77 per cent less herbicide than traditional spraying.

For more: read the full article in the Spring 2022 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight and via www.crdc.com.au/innovation-alley-meet-innovators.

Case study

Surveys show pests have greatest impact on profitability

With 200 cotton growers, 60 consultants and 38 research partners taking part in CRDC surveys in 2022, thoughts and data on everything from the cost of weed control to the level of trust in CRDC have been gathered.

CRDC conducts three regular surveys – the annual cotton grower survey; the annual consultant survey with Crop Consultants Australia (CCA); and a survey of other key stakeholders, such as researchers, industry bodies and partners, every three years. In 2022, all three surveys took place, collecting valuable insights to help CRDC identify RD&E priorities and investments, better understand what's happening on-farm and in the field, determine impact and performance, and evaluate the strength and health of its partnerships.

In light of recent research by CRDC, reviews of integrated pest management systems by CCA and CSIRO, and concerns over growing resistance in key weed species to pesticides, the grower and consultant surveys offer further valuable insights. In the 2022 CRDC Grower Survey, almost 100 per cent of growers said that they conserve beneficial insects whenever possible, while 97 per cent follow the Insecticide Resistance Management Strategy. The percentage using recommended sampling strategies, however, drops back to 78 per cent.

The grower survey also covered water use, crop and soil management, biodiversity and thoughts on CottonInfo. It shows that 90 per cent of growers are supportive of CRDC's research investments and activities, and nearly 95 per cent agree that CRDC is a trusted information source.

The 60 consultants who completed the survey for the CCA Qualitative Report represent 413 cotton growers covering 285,000 hectares – 52 per cent of the Australian cotton production area for the 2021-22 season. The report provides valuable data for agronomists, which they can reference when planning workshops. The survey covered thoughts on CRDC and CottonInfo, along with questions on planting, farming systems, crop protection, defoliation, nutrition management, water and yield impact.

According to the consultants, mirids have the greatest average impact on their clients' profitability through management costs and yield loss, with the cost in 60 per cent of cases ranging from $11 to $50 per hectare. Green vegetable bug has been reported in growing numbers this current season, and last year represented a significant ($51-$100/ha) cost to control. Insects also rated highest in impact on grower profitability over weeds and diseases, at more than $300/ha.

In terms of the impact of weeds and weed control, feathertop Rhodes grass, fleabane and sowthistle continue to top the charts. And, when it comes to confirmed herbicide resistance, 18 per cent of the consultants' clients have confirmed Group 9, and 12 per cent have Group 1 resistance. This is reflected in the impact on profitability via management costs and yield loss, with fleabane representing anywhere between $11 and $300 per hectare in losses.

Consultants in general are happy with the level and quality of CRDC's R&D, but would like to see more locally specific trials and participatory on-farm research to ground-truth industry projects. CRDC is seen by consultants as a good collaborator driving continuous change in the industry.

"With the current CRDC Strategic Plan coming to an end and a new plan now being developed, there's no better time to understand the improvements we can make," CRDC'S Dr Ian Taylor said.

The results of the 2022 Grower Survey, the 2021-22 CCA Qualitative Report, and the 2022 CRDC Partner Relationship Review are now available on the CRDC website.

For more: read the full article in the Autumn 2023 edition of CRDC's *Spotlight* magazine www.crdc.com.au/spotlight.

Section 5

CRDC People and Governance


CRDC

CRDC Board

Mr Richard Haire – Chair

BEc, FAICD, FAIM

Mr Haire has held many leadership positions within the cotton industry, most recently as Managing Director and regional head of Olam International, a global leader in the supply chain management of agricultural products and food ingredients. He was formerly the Chief Executive of Queensland Cotton Corporation Pty Ltd, and a member of the Rabo Australia Food and Agribusiness Advisory Board. Mr Haire is a Fellow of the Australian Institute of Company Directors and the Australian Institute of Management. He formerly served as a Director on the CRDC board from 2011 to 2014.

Appointed: 29/08/2016 until 29/08/2019.
Reappointed: 30/08/2019 until 29/08/2022.
Reappointed: 29/08/2022 until 28/08/2025.
Chair of the Remuneration Committee.

Ms Rosemary Richards – Deputy Chair

BAgEc, MBA, GAICD

Ms Richards is an agribusiness consultant with extensive experience in broadacre cropping, in particular, oilseeds and downstream processing sectors. Ms Richards is principal of Bowman Richards & Associates, which undertakes strategic planning, supply chain management and trade and market access services for private companies, industry, and government organisations to support market and business growth.

She also has extensive experience in the biotechnology sector, and was actively involved in the introduction of GM canola to Australia as CEO of the Australian Oilseeds Federation. Ms Richards continues to be involved in biotechnology policy and advocacy through work with Australian and international representative organisations.

Ms Richards currently consults on trade and market access, commercialisation of biotech crops and business strategy. She is a passionate advocate for the agricultural sector, and maintains close linkages with a range of agribusiness industry organisations.

Appointed: 01/10/2017 until 30/09/2020.
Reappointed: 01/10/2020 until 30/09/2023.
Chair: IP & Commercialisation Committee.

Emeritus Professor Les Copeland AM – Non-Executive Director

BSc, PhD, GradDipAICD

Emeritus Professor Copeland has been conducting research and teaching in agricultural and food science in the University of Sydney for over 40 years. His research on plant, grain and food chemistry, and the origins of the human diet, has resulted in over 180 publications and 34 PhD completions. He is a member of the Research Advisory Committee of the Australian Farm Institute, and Editor-in-Chief of the scientific journals *Cereal Chemistry* and *Agriculture*.

Emeritus Professor Copeland was Chair of the Cotton Catchment Communities Participants' Forum, and a Director of the Australian Cotton and Value Added Wheat CRCs. He is a former Dean of Agriculture, and he was the Foundation President of the Australian Council of Deans of Agriculture. He is the immediate past President of the University of Sydney Association of Professors.

Emeritus Professor Copeland holds BSc and PhD degrees from the University of Sydney and a Graduate Diploma from the Australian Institute of Company Directors. He has held research positions at Yale University, the University of Buffalo, the University of California in Davis, and the Australian National University. He is a Fulbright Alumnus, the recipient of an Excellence in Teaching Award from the American Association of Cereal Chemists-International, and has had international experience in capacity building. Emeritus Professor Copeland was awarded a Member (AM) in the General Division in the 2019 Queen's Birthday Honours, recognising his significant service to agricultural science as an academic and researcher.

Appointed: 01/10/2017 until 30/09/2020.
Reappointed: 01/10/2020 until 30/09/2023.
Chair: Audit Committee.

Mr Ross Burnett – Non-Executive Director

BAgSc, GAICD

Mr Burnett has considerable experience in crop production, having successfully operated and grown his cropping business in Emerald Qld for over 16 years. Mr Burnett primarily farms cotton on his *my*BMP-certified property, and has developed extensive hands-on knowledge of cotton production over the years by being heavily involved in all areas of the process. Beyond the farmgate, he has been an active advocate for the cotton industry, representing the industry at local, state and national levels. He has a passion for sustainability and research, implementing both in his farming business and as a grower representative for the industry in these areas.

His understanding of corporate governance, business management and stakeholder engagement has been developed through operating his own business and past/current board and executive roles, including as the Vice President of the Qld Farmers' Federation; the former President of the Central Highlands Cotton Growers and Irrigators Association; a grower representative for Cotton Australia; Director of the Local Management Arrangements Board for Emerald; and Chair of the CRDC Industry Research Advisory Panel. Mr Burnett holds a Bachelor of Agricultural Science and is a Graduate of the Australian Institute of Company Directors.

Appointed: 01/10/2020 until 30/09/2023.

Dr Gary Fitt – Non-Executive Director

BSc (Hons), PhD, ATSE, AICD

Dr Fitt has extensive research experience in agricultural sustainability, particularly focused on pest management and biotechnology. His in-depth research on the ecology of *Helicoverpa* species greatly assisted in the development of resistance management strategies, which provided a foundation for the successful introduction and management of transgenic cotton varieties in Australia. Dr Fitt started his career as an Experimental Scientist with CSIRO, and went on to hold leadership positions within the organisation, including Program Leader for Cotton, Deputy Chief CSIRO Entomology, Director of the CSIRO Biosecurity Flagship, and Science Director and Deputy Director for CSIRO Health and Biosecurity. He is now a CSIRO Honorary Fellow.

Dr Fitt has also held leadership positions within the wider research community, including as the Chief Executive Officer of the Australian Cotton Cooperative Research Centre (CRC), a Board Director of the Cotton Catchment Communities CRC, and Chair of the Science Advisory Body of the OECD Cooperative Research Program. Dr Fitt holds a Bachelor of Science and PhD from the University of Sydney, and has served as an Adjunct Professor at both his alma mater and the University of New England.

Appointed: 01/10/2020 until 30/09/2023.

Dr Danielle Kennedy – Non-Executive Director

BSc (Hons) (Chem), PhD, MAICD

Dr Kennedy is a scientist and entrepreneur with extensive experience in the R&D sector, specialising in data analysis, advanced materials, chemistry and robotics. Dr Kennedy holds BSc (Hons) and PhD degrees from the University of New South Wales, and spent 12 years in R&D at CSIRO working across chemical, health, energy and agricultural applications, including in cotton processing. Dr Kennedy also has qualifications in portfolio management and change management, which she applies in her role as managing partner for Digital Agency DDSN Interactive, where she works with companies large and small, not-for-profits and government agencies to craft and implement digital transformation with web-facing systems at the heart.

Dr Kennedy was previously the director of the CSIRO AIM Future Science Platform, which sought transformational research advances by bringing scientists together in the fields of materials, processing, robotics and data to address some of the nation's largest challenges. In 2017 for this work, Dr Kennedy was awarded the WALA Emerging Leader in the Public Sector and was finalist in the WALA Influencer of the Year Award. She has previously held positions as a member of the CSIRO Manufacturing Business Unit leadership team, chair of the IOT Alliance Australia Manufacturing workgroup, Vice-President of the Catalysis Society of Australia, and a member of the working group for the Decadal plan for Women in STEM delivered in 2019.

Appointed: 01/10/2020 until 30/09/2023.

Ms Peta Slack-Smith – Non-Executive Director

BAppSc, GAICD

Ms Slack-Smith has operated at the executive level of global businesses for over a decade. She has worked in numerous agricultural industries – cotton, grains, dairy, wool and livestock – and has extensive experience working with government and the rural Research and Development Corporation (RDC) model.

Ms Slack-Smith has advised CEOs, boards, ministers, companies and industries through threats to reputation, new operating environments, and changes to consumer and stakeholder expectations. She has managed sensitive issues, including the environment, pesticide use, GMOs, food safety, Wheat for Weapons Royal Commission, and PeTA's animal welfare campaign. For over a decade, she worked closely with textile manufacturers, international fashion and apparel businesses, providing guidance on traceability and corporate social responsibility issues.

Ms Slack-Smith has worked in not-for-profits, ASX-listed corporates, industry associations, state and federal government departments, and as chief of staff to a federal minister. She holds a Bachelor of Applied Science (Wool & Pastoral Science), a Post-Grad Cert in Rural Science (Cotton Production), and is a graduate of the Australian Institute of Company Directors, Mt Eliza Business School, and Harvard Business School. She is the recipient of two prestigious awards, including a Churchill Fellowship and the Fairfax Fellowship in Ethical Leadership.

Appointed: 01/10/2020 until 30/09/2023.

Dr Ian Taylor – Executive Director

BAppSc, PhD

Dr Taylor has extensive experience across the cotton RD&E pipeline, having worked as a researcher specialising in integrated weed management before progressing to management positions within the cotton industry's extension program, CottonInfo and CRDC. Before being appointed Executive Director, Dr Taylor performed the role of CRDC's General Manager of R&D Investments for five years, overseeing CRDC's investment in cotton RD&E to deliver impact, and leading the development of the CRDC Strategic RD&E Plan 2018–23.

Dr Taylor holds BAppSc and PhD degrees from UQ, is a graduate of the Australian Rural Leadership Program, and is Deputy Chair of the Summit Community Services board. He has extensive stakeholder management, strategy development, leadership and governance experience, combined with national and international networks, in part from his time as the Technology Development Lead and Asia-Pacific Technical and Stewardship Lead with Monsanto. In his former career, Dr Taylor was an avionics technician in the Australian Defence Force, where he developed a sound understanding of digital and advanced complex systems.

Appointed: 7 March 2019 by virtue of his appointment as Executive Director of CRDC. Dr Taylor attended the Audit, Intellectual Property, and Remuneration Committees as an observer. Dr Taylor completed his term as CRDC Executive Director on 25 August 2023.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RD&E.
CRDC

Composition

CRDC has an eight-member Board, consisting of a Chair (appointed by the Minister for Agriculture, Fisheries and Forestry), the Executive Director (selected by the Board), and six non-executive Directors nominated by an independent Selection Committee. Appointment of non-executive Directors is subject to Ministerial approval, and Directors (other than the Executive Director) are appointed for three-year terms.

Board

CRDC Board at 30 June 2023:

1	Mr Richard Haire, Chair
2	Ms Rosemary Richards, Deputy Chair
3	Emeritus Professor Les Copeland, Non-Executive Director
4	Mr Ross Burnett, Non-Executive Director
5	Dr Gary Fitt, Non-Executive Director
6	Dr Danielle Kennedy, Non-Executive Director
7	Ms Peta Slack-Smith, Non-Executive Director
8	Dr Ian Taylor, Executive Director

Responsibilities of Executive Director

The Executive Director is responsible for day-to-day management of the CRDC, implementation of CRDC's plans, and liaison between the Board and management. The Executive Director is also a member of the Board with the responsibilities of a Director.

Responsibilities of Non-Executive Directors

The roles and responsibilities of Directors are set out in the Board Charter, which includes a governance statement, conduct and ethical standards provisions. Internal reviews of Board performance are conducted annually. The Board also obtains an external review of its performance periodically.

Expertise

The CRDC Board is a skilled-based board, with Directors collectively bringing expertise in cotton production, processing and marketing, conservation/management of natural resources, science and technology and technology transfer, environmental and ecological matters, economics, finance and business management, administration of research and development, sociology, and public administration. The PIRD Act requires the CRDC Selection Committee to specify how its Board nominations will ensure that CRDC collectively possesses experience in board affairs, adding to the existing requirement for an appropriate balance of expertise.

Directors may obtain independent legal and professional advice at CRDC's expense to enable them to discharge their duties effectively, subject to prior approval from the Chair, in consultation with the Board and Executive Director. This advice may relate to legislative and other obligations, technical research matters, and general skill development to ensure there is a sufficient mix of financial, operational and compliance skills among Board members.

Induction

Following appointment to the Board, each Director is provided with an appropriate level of information about CRDC, its history and operations, and the rights, responsibilities and obligations of Directors. This information includes the Board Charter, Strategic RD&E Plan, and relevant legislation.

The induction process is tailored to the needs of new Directors. It may include an initial visit to the CRDC office in Narrabri to meet with the Chair and staff for a comprehensive overview of corporate activities and practices, and a tour of key industry research facilities.

Training

Where necessary and appropriate, CRDC sources training for Directors, either individually or as a group. The Board generally establishes the need for such training during the first meeting of Directors.

Functions

- Establishing strategic directions and targets.
- Monitoring and evaluating the research and development needs of the industry and ensuring CRDC's research program is effective in meeting those needs.
- Approving policies, plans, performance information and budgets.
- Monitoring policies, procedures and internal controls to manage business and financial risk.
- Ensuring compliance with statutory and legal obligations and corporate governance standards.

Conflicts of interest

In accordance with section 131 of the PIRD Act, Directors are appointed on their expertise and do not represent any particular organisation or interest group.

The Board follows section 29 of the PGPA Act regarding Directors' disclosures of interests. A Director who considers that he or she may have a direct or indirect pecuniary or non-pecuniary interest in a matter to be discussed by the Board must disclose the existence and nature of the interest before the discussion.

All disclosures are recorded in the minutes of the meeting and, depending on the nature and significance of the interest, Directors may be required to absent themselves from the Board's deliberations.

The Board is keenly aware of its responsibilities about conflict of interest and duty of care, and has adopted a very cautious approach. A Board Charter clearly outlines the roles and responsibilities of Directors in terms of potential conflicts of interest. Further, the Board has a standing notice of Director's interests that is tabled and reviewed at each meeting.

Board Charter of Corporate Governance

The CRDC Board Charter assists Directors in carrying out their duties and setting out the roles and responsibilities of Directors and staff.

Indemnities and insurance premiums for Directors and officers

The Board has taken the necessary steps to ensure professional indemnity cover is in place for present and past officers of CRDC, including Directors of the CRDC, consistent with provisions of the PGPA Act. CRDC's insurance cover is provided through Comcover; however, the insurance contract prohibits CRDC from disclosing the nature or limit of liabilities covered. In 2022–23, Directors' and officers' liability insurance premiums were paid, and no indemnity-related claims were made.

Board Committees

The Board operated the Audit, Intellectual Property and Commercialisation, and Remuneration Committees in 2022–23. In addition to face-to-face meetings, the Board and its Committees conduct much of their work via email, video conference and telephone, supported by a secure online information portal. CRDC finds this arrangement to be effective, productive and cost effective.

Board meeting	Date	Location
Meeting 5 – 2022	31 August 2022	Video-conference
Meeting 6 – 2022	28 September 2022	Video-conference
Meeting 7 – 2022	23-24 November 2022	Chinchilla Qld
Meeting 1 – 2023	11 January 2023	Video-conference
Meeting 2 – 2023	15-16 February 2023	Sydney NSW
Meeting 3 – 2023	18-19 April 2023	Warren NSW
Meeting 4 – 2023	21-22 June 2023	Brisbane Qld

Attendances at Board meetings

Director	Meeting 5 2022	Meeting 6 2022	Meeting 7 2022	Meeting 1 2023	Meeting 2 2023	Meeting 3 2023	Meeting 4 2023	TOTAL
Richard Haire	✓	✓	✓	✓	✓	✓	✓	7 of 7
Les Copeland	✓	✓	✓	✓	✓	✓	✓	7 of 7
Rosemary Richards	✓	✓	✓	✓	✓	✓	✓	7 of 7
Ross Burnett	✓	✓	✓	✓	✓	✓	✓	7 of 7
Gary Fitt	-	✓	✓	✓	✓	✓	✓	6 of 7
Danielle Kennedy	✓	✓	-	✓	✓	✓	✓	6 of 7
Peta Slack-Smith	✓	✓	-	✓	✓	✓*	✓	6 of 7
Ian Taylor	✓	✓	✓	✓	✓	✓	✓	7 of 7

**Attended via video conference due to illness.*


QAAFI
Queensland Alliance for
Agriculture and Food Innovation

Audit Committee

Established under section 89 of the PIRD Act and section 45 of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act), the Audit Committee's primary role is to ensure CRDC's financial reporting is a true and fair reflection of its financial transactions. The Committee also provides a forum for communication between the Directors, the senior managers of CRDC, and the internal and external auditors. It carries responsibility for identifying areas of significant business risk, and stipulating the means of managing any such risk. In addition to CRDC Directors, the Board has appointed a skill-based member on the Audit Committee, Samuel Skelton.

The CRDC Charter of Corporate Governance, which includes the Audit Committee functions, is available at the CRDC website: www.crdc.com.au/content/crdc-charter-corporate-governance.

Mr Samuel Skelton (non-board member) BBus, BComm, GAICD, Grad Dip Fraud & Financial Investigation, ASSI Cert III Investigative Services, Cert IV Govt Investigations

Consultant for assurance, integrity, investigation, risk management, internal audit, compliance frameworks, and audit committee advisory, training and support services. Experience includes Director of Fraud Investigation & Dispute Services with EY, and Assistant Secretary, Governance Audit & Reporting Branch for Department of the Prime Minister and Cabinet.

Appointed: 01/12/2018 (reviewed annually)
Non-board member total consultancy for 2022–23 $6,494 ex. GST

Non-Executive Directors who are members of the Audit Committee are not remunerated by the entity for any duties performed as part of the committee.

Attendances at Audit Committee meetings

Member	10 Aug 2022 *Sydney NSW*	11 Oct 2022 *Video-conference*	2 Feb 2023 *Video-conference*	17 May 2023 *Video-conference*	TOTAL
Les Copeland	✓	✓	✓	✓	4 of 4
Rosemary Richards	✓				1 of 1
Peta Slack-Smith	✓	-	✓	-	2 of 4
Ross Burnett	✓	✓	✓	✓	4 of 4
Samuel Skelton	✓	✓	✓	✓	4 of 4

Intellectual Property and Commercialisation Committee

The role of the Intellectual Property (IP) and Commercialisation Committee is to help CRDC's Board fulfil its responsibilities and strategic objectives for IP management and commercialisation of project outputs to maximise the benefits to the Australian cotton industry. The Committee's specific responsibilities are to review the operation of CRDC's IP and commercialisation policy and operating principles, and to consider IP and commercialisation matters directed to it by the Board for consideration. Non-Executive Directors who are members of the IP and Commercialisation Committee are not remunerated by CRDC for any duties performed as part of the committee.

Attendances at Intellectual Property and Commercialisation Committee meetings

Member	13 July 2022 *Video-conference*	19 Oct 2022 *Video-conference*	22 Mar 2023 *Video-conference*	TOTAL
Rosemary Richards	✓	-	✓	2 of 3
Les Copeland	✓			1 of 1
Danielle Kennedy	✓	✓	✓	3 of 3
Gary Fitt	✓	✓	✓	3 of 3

Remuneration Committee

The Remuneration Committee advises the Board on the Executive Director's remuneration and senior staff remuneration adjustments. Non-Executive Directors who are members of the Remuneration Committee are not remunerated by CRDC for any duties performed as part of the committee.

Attendances at Remuneration Committee meetings

Member	10 Aug 2022 *Video-conference*	TOTAL
Richard Haire	✓	1 of 1
Les Copeland	✓	1 of 1
Rosemary Richards	✓	1 of 1

Statement of principles

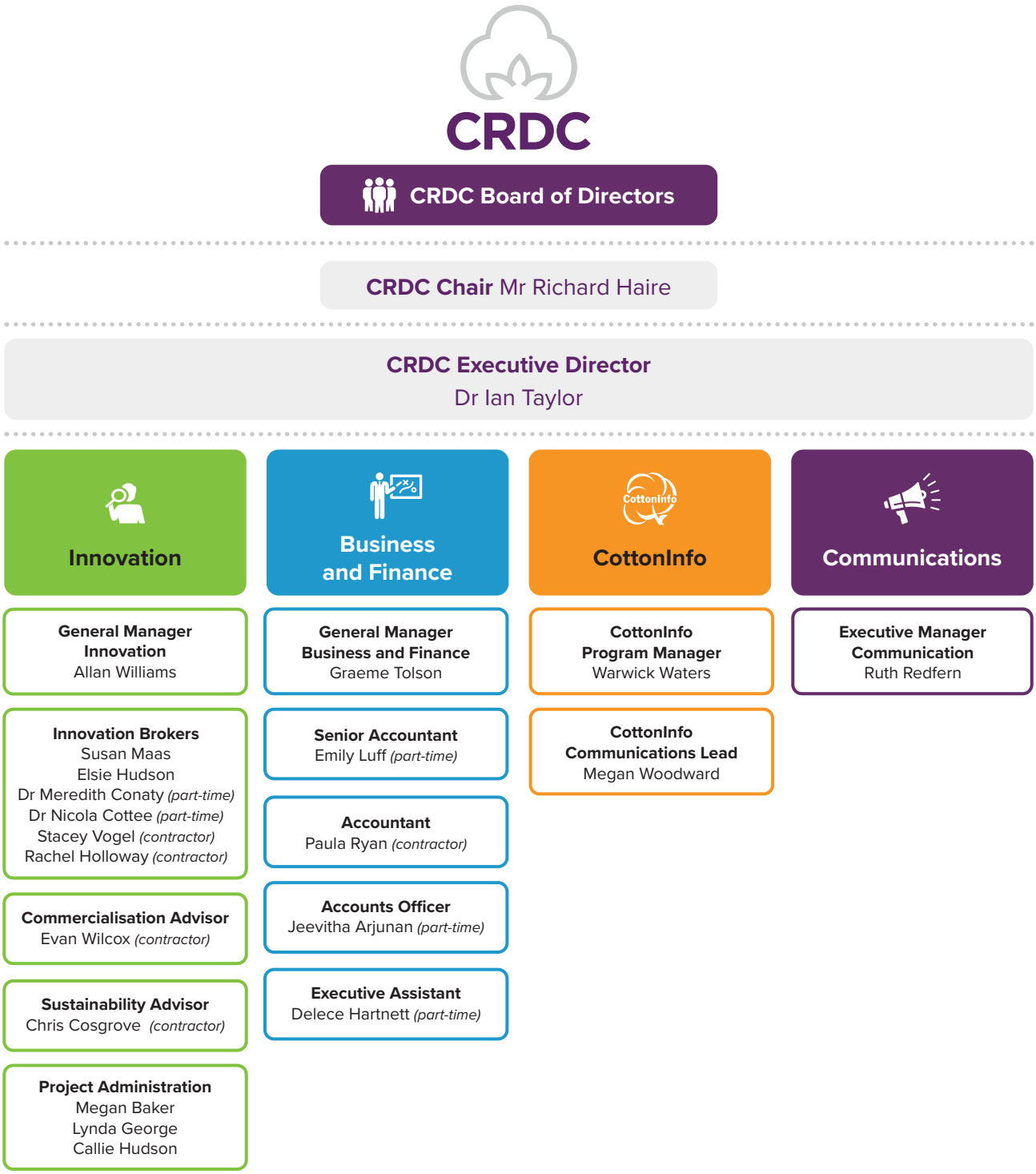
CRDC Directors and staff members are required to:

- Commit to excellence and productivity.
- Be accountable to stakeholders.
- Act legally, ethically, professionally and responsibly in the performance of duties.
- Strive to maximise return on investment of industry and public funds invested through CRDC.
- Strive to make a difference in improving the knowledge base for sustainable cotton production in Australia.
- Value strategic, collaborative partnerships with research providers, other research and development bodies, industry organisations, stakeholders and clients for mutual industry and public benefits, including cooperation with kindred organisations to address matters of national priority.
- Value the contribution, knowledge and expertise of the people within our organisation and that of our contracted consultants, external program coordinators and research providers.
- Promote active, honest and effective communication.
- Commit to the future of rural and regional Australia.
- Comply with and promote best practice in corporate governance.
- Commit to meeting all statutory obligations and accountability requirements in a comprehensive and timely manner.

CRDC Employees

CRDC's small but dedicated team of skilled and experienced staff actively manages RD&E investment portfolios to achieve the cotton industry's strategic goals. Our internal capacity is an essential element of the overall effectiveness of RD&E investment for the cotton industry.

CRDC Organisational Structure as at 30 June 2023:



Employment

Staff members are employed under section 87 of the PIRD Act, which provides that the terms and conditions of employment are to be determined by the Corporation. The terms and conditions of employment incorporate the Fair Work National Employment Standards and the Australian Government Industry Award 2016. CRDC complies with the Australian Government Bargaining Framework when exercising its power to engage employees in relation to sections 12 and 87 of the PIRD Act.

Including the Executive Director, there were 11 full-time employees and five part-time employees as at 30 June 2023.

CRDC employees

Employee type	2018–19	2019–20	2020–21	2021–22	2022–23
Full-time employees	9	9	8	11	11
Part-time employees	1	3	2	4	5
Casual	0	0	0	0	0
TOTAL employees*	**10**	**12**	**10**	**15**	**16**

*CRDC employees as of 30 June each year, excluding contractors. For 2022–23, contractors equalled 2.0 full time equivalents (FTE).

All ongoing (permanent) employees

	Male			Female			Total
Employees	**Full time**	**Part time**	**Total Male**	**Full time**	**Part time**	**Total Female**	**Total**
Location							
NSW	2	0	2	4	5	9	11
Qld	1	0	1	3	0	3	4
TOTAL	**3**	**0**	**3**	**7**	**5**	**12**	**15**

All non-ongoing (fixed term contract) employees

CRDC	Male			Female			Total
Employees	**Full time**	**Part time**	**Total Male**	**Full time**	**Part time**	**Total Female**	**Total**
Location							
NSW	1	0	1	0	0	0	1
TOTAL	**1**	**0**	**1**	**0**	**0**	**0**	**1**

Staff training and development

In 2022–23, CRDC spent $29,354 on training and $1,749 on recruitment. Areas of direct training activities were the Australian Institute of Company Directors course, cyber security training, Microsoft short courses, first aid training, employee and executive coaching, and policy and procedural training. Throughout the year, Directors and staff participated in a wide range of CRDC-related activities involving other organisations, providing valuable experience, as well as skills and knowledge upgrades for the personnel involved.

Equal employment opportunity

CRDC is committed to a merit-based, non-discriminatory recruitment and promotion policy. Staff members are chosen strictly according to their qualifications for the job.

CRDC's Equal Employment Opportunity, Discrimination and Harassment Policy defines prohibited discrimination and harassment, and sets out a complaints procedure to be followed if there is a breach of this policy, including details of what action can be taken once the complaint has been made. The policy applies to all employees, whether full-time, part-time, casual or temporary, to Directors, and to contractors and customers (clients).

Key Management Personnel

During the reporting period ended 30 June 2023, CRDC had 10 key management personnel. These included seven non-executive directors, and one executive director, and two senior executives who remained in their current roles for the full year.

The Chair and Non-Executive Directors' remuneration is determined by the Remuneration Tribunal, an independent statutory authority established under the *Remuneration Tribunal Act 1973*. The Executive Director and senior executives' remuneration is determined by the Board.

In accordance with the PGPA Rule, the Key Management Personnel information in Note 3.2 of the Financial Statements is further disaggregated in the table below:

		Short-term benefits			Post-employment benefits	Other long-term benefits		Termination benefits	Total remuneration
Name	**Position title**	**Base salary**	**Bonuses**	**Other benefits & allowances**	**Superannuation contributions**	**Long service leave**	**Other long-term benefits**		
Richard Haire	Chair	$54,130			$5,684				$59,814
Rosemary Richards	Deputy Chair	$27,070			$2,842				$29,912
Les Copeland	Non-executive Director	$27,070			$2,842				$29,912
Ross Burnett	Non-executive Director	$27,070			$2,842				$29,912
Gary Fitt	Non-executive Director	$27,070			$2,842				$29,912
Danielle Kennedy	Non-executive Director	$27,070			$2,842				$29,912
Peta Slack-Smith	Non-executive Director	$27,070			$2,842				$29,912
Ian Taylor	Executive Director	$272,859		$17,731	$28,159	$16,004			$334,753
Allan Williams	GM R&D Invest.	$194,188		$2,470	$20,124	$11,033			$227,815
Graeme Tolson	GM Business & Finance	$193,344			$19,914	$12,524			$225,782
Total		**$876,941**	**-**	**$20,201**	**$90,933**	**$39,561**	**-**	**-**	**$1,027,636**

CRDC does not have any other senior executive staff or highly paid staff.

Governance and accountability

CRDC was established in 1990 as a partnership between the Australian people (through the Australian Government) and the Australian cotton industry (through Cotton Australia, its legislated representative industry body).

Location

CRDC is based in one of Australia's major cotton-growing areas, Narrabri, in north-west NSW. Being centrally located within the Australian cotton industry, CRDC benefits from developing and maintaining important relationships with cotton growers, researchers, processors, and members of regional cotton communities.

PIRD Act legislation

CRDC began operations in 1990 under the PIRD Act.

Charter

CRDC's charter under the PIRD Act is to invest in and manage a portfolio of RD&E projects and programs in order to secure economic, environmental and social benefits for the Australian cotton industry and the community. This is to be conducted in a framework of improved accountability for R&D spending in relation to the cotton industry.

PIRD objects

The objects of this PIRD Act are to:

(a) make provision for the funding and administration of research and development relating to primary industries with a view to:

  (i) increasing the economic, environmental and social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries; and

  (ii) achieving the sustainable use and sustainable management of natural resources; and

  (iii) making more effective use of the resources and skills of the community in general and the scientific community in particular; and

  (iv) supporting the development of scientific and technical capacity; and

  (v) developing the adoptive capacity of primary producers; and

  (vi) improving accountability for expenditure on research and development activities in relation to primary industries; and

(b) make provision for the funding and administration of marketing relating to products of primary industries.

Powers

Under section 12 of the PIRD Act, CRDC has the power to do all things necessary to carry out its functions, including but not restricted to:

- Entering into agreements for the carrying out of R&D or marketing activities;
- Applying for patents, either solely or jointly;
- Charging for work done, services rendered, and goods and information supplied;
- Acquiring, holding and disposing of real and personal property; and
- Anything incidental to any of its powers.

Functions

Function	Application
Investigating and evaluating the cotton industry's requirements for R&D, and the preparation, review and revision of an RD&E plan on that basis	This is achieved by continuing interaction with CRDC's legislated industry body, Cotton Australia, which undertakes a range of functions relating to CRDC, including an annual review to ensure the CRDC Strategic Plan remains current and relevant. The cotton industry and cotton researchers are closely involved in the development of the CRDC Strategic RD&E Plan, which incorporates Australian Government and cotton industry RD&E priorities, as well as advice from the Minister and the Department of Agriculture, Fisheries and Forestry.
Preparing an Annual Operational Plan for each financial year	An Annual Operational Plan is submitted to the Australian Government and Cotton Australia before the start of each financial year.
Coordinating and funding RD&E activities consistent with current planning documents	RD&E projects are approved or commissioned in line with the Annual Operational Plan each year. The Annual Operational Plan is devised to address the objectives and strategies outlined in the current Strategic RD&E Plan.
Monitoring, evaluating and reporting to Parliament, the Minister for Agriculture, and to industry on RD&E activities coordinated or funded by the Corporation	CRDC reports formally to the Australian Parliament through its Annual Report. In addition, CRDC informs the Minister for Agriculture, Fisheries and Forestry of any matters of interest or concern in the current operating environment. This occurs in written and, where possible, face-to-face communication. CRDC is also in communication with the Department of Agriculture, Fisheries and Forestry on a range of issues. Communication with the industry and Cotton Australia occurs continually, both formally and informally, as outlined above. Communication with the broader community is a key focus of CRDC's communication activities. To ensure stringent evaluation of its RD&E activities, CRDC is committed to the ongoing Council of Rural Research and Development Corporation's Impact Evaluation process.
Facilitating the dissemination, adoption and commercialisation of R&D results in relation to the cotton industry	CRDC plays a pivotal role in facilitating fast and effective dissemination of cotton RD&E outcomes. CRDC undertakes detailed analysis and planning for determining the most appropriate adoption pathway for the results of research projects. While the majority of research results are extended as information, CRDC actively works with its research partners to develop commercial adoption pathways where that is preferred. CRDC is a founding partner in the industry's joint extension program, CottonInfo, along with co-partners Cotton Australia and CSD Ltd. Formed in 2012, the CottonInfo team works to improve responsiveness to grower needs through improved communication and regional representation, focusing on delivering research directly to growers and consultants. The model recognises the importance of supporting adoption of RD&E through multiple delivery pathways, and is underpinned by the industry's best management practices program, *my*BMP. In addition, CRDC hosts forums and on-farm events, participates in roadshows and the cotton trade show, produces publications, sponsors the biennial Australian Cotton Conference and Australian Cotton Research Conference, and has a communication strategy to extend and enhance the adoption of RD&E. CRDC also collaborates in the successful commercialisation of RD&E, where possible.

The PGPA Act

CRDC has been subject to the *Public Governance, Performance and Accountability Act 2013* since 1 July 2013, which provides enhanced levels of accountability as well as a planning and reporting framework.

Other legislation

The setting and collection of levies on the cotton industry are enabled by the *Primary Industries (Excise) Levies Act 1999* and the *Primary Industries Levies and Charges Collection Act 1991.*

Cotton R&D levy

The Australian Government introduced an R&D levy at the request of industry. The cotton levy funds CRDC research and development programs and the subscription for industry membership of Plant Health Australia (PHA). The levy is payable on cotton produced in Australia, and the producer (the person who owns the cotton immediately after harvest) is liable to pay the levy.

The levy rate for cotton is $2.25 per 227 kilogram bale of cotton, including $0.04 per bale for industry membership of PHA. The Australian Government contributes matching funds up to set limits. There is also a separate levy for seed cotton exports of $4.06 per tonne of exported seed cotton.

Minister

During 2022–23, CRDC has been accountable to the Australian Parliament through the Minister for Agriculture, Fisheries and Forestry, Senator the Hon. Murray Watt.

Minister's responsibilities

The Minister's powers and responsibilities, as outlined under various sections of the PIRD Act, include appointing CRDC's Chair and Directors and, under certain conditions, terminating these appointments; approving CRDC's Strategic R&D Plan and any variations to it; appointing a person as Presiding Member of CRDC's Selection Committee, as well as other members of that Committee; and transferring to CRDC any assets held by the Commonwealth that the Minister considers appropriate and that would assist its performance and function.

Ministerial directions

CRDC complies with all Ministerial directions, legislative and policy requirements of the Australian Government that it has been able to ascertain. CRDC received no Ministerial directions during 2022–23.

CRDC role, responsibilities and accountabilities

- CRDC is formally accountable to the Australian people through the Australian Parliament and to the cotton industry through its industry representative body, Cotton Australia.
- CRDC's stakeholders set broad objectives, which the Corporation addresses through its Strategic R&D Plan and Annual Operational Plan.
- CRDC has used these objectives as a basis for the development of its planned outcomes and the identification of key outputs.
- CRDC's reporting processes include the presentation of a formal report to its industry stakeholder. Part of this presentation includes an opportunity for questioning and debating Board decisions.
- CRDC reports on investments, project outcomes, operation activities, and financial statements every year via its Annual Report.
- CRDC publishes an Annual Operational Plan, Strategic R&D Plan, and Annual Report on the outcomes of investments, projects, operations and financials.

Policies, procedures and charters

CRDC has policies, procedures and charters to assist with the effective governance of the organisation. These documents are available from CRDC's internal shared folders, and are made available to all Directors and new staff during induction training. In addition, staff receive policy training on an annual rolling basis at monthly staff meetings.

Corporate reporting

In accordance with the PIRD Act and the PGPA Act, CRDC prepares a five-year Strategic RD&E Plan, as well as an Annual Operational Plan for each financial year.

CRDC submitted the Annual Operational Plan for 2022–23 to the Minister on 27 June 2022, with the plan commencing 1 July 2022. The Annual Report for 2021–22 was submitted to the Minister on 30 September 2022, and the Minister tabled the report in Parliament on 21 October 2022.

Fraud control

Active fraud control is a major responsibility of all staff, and clear standards and procedures have been established. All personnel engaged in the prevention, detection and investigation of fraud receive appropriate fraud control training, consistent with the Australian Government's Fraud Control Guidelines.

The Audit Committee endorse, monitor and review the Fraud Control Plan, which is read in conjunction with the Risk Management Plan and the Board Charter for Directors, and Statement of Principles for staff.

CRDC's Audit Committee, Executive Director, and General Manager Business and Finance (the nominated fraud control officer) carry out the functions of a fraud investigation unit collectively, as described in the Commonwealth Fraud Investigation Model. The support of the Australian Federal Police would be sought if CRDC felt there was a prima facie case of fraud, and further investigation was required. No such action was necessary in 2022–23.

Service charter

CRDC does not provide services directly to the public, and thus does not have a service charter; however, CRDC has a Board Charter that includes a Governance Statement and a Statement of Principles that embody the set of values underlying our decisions, actions and relationships.

National Disability Strategy

CRDC's working conditions and procedures for employees and stakeholders align with the *Commonwealth Disability Discrimination Act 1992* in the broader context of the National Disability Strategy 2021–2031. CRDC has ensured that any person with a disability could be properly accommodated and carry out all functions, as either a staff member or a visitor. Should a future staff member or visitor need more-specialised disability assistance, CRDC will assess and meet these needs.

Equal Employment Opportunity, Discrimination and Harassment Policy

CRDC's Equal Employment Opportunity, Discrimination and Harassment Policy defines prohibited discrimination and harassment, and sets out a complaints procedure.

Significant events

CRDC had no significant events in 2022–23.

Significant changes in the state of affairs

CRDC had no significant changes in its state of affairs in 2022–23.

Judicial decisions

CRDC had no judicial decisions in 2022–23.

Reviews by outside bodies

CRDC had two reviews by outside bodies in 2022–23. Forest Hill Consulting undertook an Independent Performance Review of CRDC against the five performance principles outlined under the Australian Government's 2020–30 Funding Agreement for CRDC: stakeholder engagement; research and development; collaboration; governance; and monitoring and evaluation. As at 30 June 2023, the review is still being finalised, but a draft report found CRDC is a high-performing RDC. In addition, Blackhall & Pearl undertook an Independent Board Evaluation, which found the Board was performing well.

Commercialisation

CRDC has detailed policies and procedures for determining its involvement in the commercialisation of the results of R&D projects where that is the preferred adoption pathway. Project technology that underwent commercialisation activities in 2022–23 included improved irrigation management, improved application of pesticides, improved monitoring of pests, and the development of novel pesticides.

Work Health and Safety

CRDC has a strong culture of achieving best practice and continuous improvement in Work Health and Safety (WHS), as required by the *Work Health and Safety Act 2011*. This is achieved by providing the necessary resources (both human and financial) to ensure that WHS functions effectively.

In accordance with Schedule 2 Part 4 of the WHS Act, CRDC details notifiable incidents reported each year. In view of its WHS record, CRDC remains vigilant in maintaining its safety performance by conducting audits and reviews of policies and procedures.

Work Health and Safety summary

Legislative reporting requirements Schedule 2 Part 4 of the ***Work Health and Safety Act 2011***	Action undertaken 2022–23
Initiatives during 2022–23 and outcomes	• First aid training. • Warden and fire training. • Safety issues discussed at quarterly Work Health and Safety (WHS) staff meetings, workplace inspections held (including vehicles) and staff consulted in resolving safety issues and physical conditions of the workplace. • A flu vaccination program for all CRDC staff was offered. • CRDC continued supporting flexible work-from-home arrangements.
Statistics of any notifiable incidents as defined by s38 of the WHS Act	• CRDC had no notifiable incidents in 2022–23.
Details of any investigations conducted during the year, including details of all notices under Part 10 of the WHS Act	• CRDC conducted no investigations, and no notices were received from, or given to, an employee in 2022–23.

Freedom of information

General enquiries regarding access to documents or other matters relating to freedom of information should be made in the first instance to the Executive Director.

Funding information on individual projects funded by CRDC is available on request unless that information has been classified as commercial-in-confidence. Information about CRDC projects is also available at the CRDC website.

During 2022–23, CRDC had one freedom of information request, relating to the briefing pack for the October-November 2022 Senate Estimates. CRDC manages requests in accordance with the provisions of its freedom of information plan, in compliance with subsection 8(1) of the *Freedom of Information Act 1982*.

Categories of documents held

Category	Nature	Access
Administration	Files	D
Annual Operational Plans	Files, Publications	C
Annual Reports	Files, Publications	C
Applications, Guidelines and Contracts	Files, Publications	C, D
Assets Register	Files	D
Financial Management	Files	D
Five-Year Plans	Files, Publications	C
Project Lists	Files, Publications	C, D
Research Reports	Files, Publications	C, D
Workshop Reports	Files, Publications	C, D

C: Documents customarily made available

D: Documents not customarily made available for reasons of privacy or commercial-in-confidence.

Contractors and consultants

CRDC employs consultants and contractors as needed, and after background checks, to ensure proposed appointees have the necessary skills and experience. During 2022–23, CRDC spent $1,064,647 exclusive of GST, to remunerate consultants and contractors.

Privacy and confidentiality arrangements require that CRDC policy is not to disclose amounts paid to individual consultants. A list of contractors and consultants with remuneration of $10,000 or more, exclusive of GST, can be found in the following table.

Contractor	Service provided
Ahurei Pty Ltd	Intellectual Property management services
Argo Fibre Processing	Secretariat services
C&J Phelps Consulting	Program management services
Carolyn Martin	Communications and publications services
Computers Now Pty Ltd	Information and Technology services
Earth Up Consulting	Program management services
Ionize Pty Ltd	Cybersecurity services
KEOwned Pty Ltd	Website services
Macpherson Agronomy Services Pty Ltd	Program management services
Melanie Jenson	Communications and publications services
Neil Deacon Graphic Design	Communications and publications services
Nexia Sydney Audit Pty Ltd	Internal audit services
Paula Ryan Bookkeeping	Accounting services
Rachel Holloway	Program management services
ST Strategic Services Pty Ltd	External investment consulting
Stacey Vogel Consulting	Program management services
Sustenance Asia Pty Ltd	Sustainability Advisor
The Nickelle Family Trust	Human Resources services
The Strategic Directions Group Pty Ltd	Grant management software consultancy

Payments to advertising agencies

CRDC engaged the Government's Central Advertising System in 2022–23 to support the CRDC Board Selection Committee and the recruitment of new CRDC Directors. Outside of this, CRDC did not engage the services of any advertising agency, market research organisation, polling organisation, direct mail organisation, or media promotion organisation during the reporting year.

Payment to representative body

Cotton Australia is CRDC's industry representative body and cotton's declared representative organisation under the PIRD Act. In 2022–23, CRDC contributed $101,840 to Cotton Australia for industry consultation, capacity building of advisory panel members, and RD&E projects. These funds assist Cotton Australia in their industry consultation role, including several specific activities:

- Industry consultation and participation in CRDC forums to review RD&E funding applications and scoping of future directions in research.
- Support for capacity building and training for the Cotton Australia research advisory panels.
- A meeting to receive and discuss the CRDC Annual Report for the preceding year. This enables the industry representative body to ensure CRDC's activities for that year have met its strategic objectives and to question senior staff on any matters of interest or concern.
- Joint publications with CottonInfo.

While CRDC does not pay a fee for service to the industry representative body for these activities, it contributes to the expenses they incur in carrying them out, as authorised by section 15 of the PIRD Act, which relates to consultation with the industry stakeholder. In 2022–23, CRDC contributed a total of $101,840 to Cotton Australia for the following co-funded project activities:

- $27,000 to support the CRDC Chris Lehmann Young Cotton Achiever Award as part of the Australian Cotton Industry Awards
- $9,840 for joint media monitoring services for CRDC and Cotton Australia, provided by iSentia
- $20,000 towards the development of the Australian Industry Strategic Roadmap
- $45,000 towards the joint Cotton Australia and CRDC Australian Future Cotton Leaders Program.

Selection Committee Report

Mike Logan AM
Presiding Member
Cotton Research and Development Corporation
Board Selection Committee

July 2023

Senator the Hon. Murray Watt
Minister for Agriculture, Fisheries and Forestry
Parliament House
Canberra ACT 2600

Dear Minister Watt

In accordance with the requirements of Section 141 of the *Primary Industries Research and Development Act 1989* (PIRD Act), I write to advise that there were no activities performed by the Cotton Research and Development Corporation (CRDC) Board Selection Committee during the year 1 July 2022 to 30 June 2023.

The terms of the CRDC Directors, with the exception of CRDC Chair Richard Haire, are due to complete on 30 September 2023. As such, upon my appointment as the Presiding Member of the Selection Committee from 28 April 2023, I commenced the selection process for the CRDC Director positions.

The Committee's nominations for six Directors were provided to your office on 14 July 2023.

Details of the operation of the Selection Committee and the process conducted by the Committee are outlined in the following report.

Yours sincerely,

Mike Logan AM
Presiding Member

COTTON RESEARCH AND DEVELOPMENT CORPORATION
office address 2 Lloyd Street, Narrabri NSW 2390, Australia **postal address** PO Box 282, Narrabri NSW 2390
P 02 6792 4088 **E** crdc@crdc.com.au ABN 71 054 238 316 **www.crdc.com.au**

Establishment of Selection Committee

The CRDC Selection Committee was established under the PIRD Act for the purpose of nominating to you persons for appointment as Directors of the CRDC.

On 28 April 2023, you appointed me as the Presiding Member of the CRDC Selection Committee until 31 December 2026.

On 14 June 2023, following nominations made by me, in consultation with Cotton Australia as CRDC's representative organisation, you appointed the following persons to the Selection Committee:

- Mr Robert Dugdale, Director, Cotton Australia
- Ms April Cavanagh, Director, Cotton Australia
- Ms Jo Shephard, CEO, Queensland Farmers' Federation.

Selection Process

At the commencement of this process, I consulted with CRDC Chair Mr Richard Haire and Executive Director Dr Ian Taylor on the strategic direction of the organisation, current and emerging industry issues, particular challenges facing the industry, and CRDC's role in contributing to solutions or participation in resolving these issues. I also consulted with officers at the Australian Government Department of Agriculture, Fisheries and Forestry. The Committee discussed in detail the skills and experience that were likely to be required to deal with the organisational and industry challenges likely to emerge over the next three years.

The board positions were advertised in the national press as well as through a wide range of electronic media, industry and professional organisations, including the networks of Cotton Australia and CRDC.

The advertisements called for written applications against the criteria specified in the PIRD Act, which included:

- Data governance and application
- Digital literacy – ability to learn, adapt and apply digital innovation
- Science, technology and technology transfer
- Social science and change management
- Innovation and commercialisation
- Cotton production and processing
- Environmental stewardship
- Economics or finance
- Public administration and corporate governance
- International marketing and trade.

The Committee sought candidates who also had a sound understanding of the role and responsibilities of Directors, as well as good communications skills and the capacity to represent the CRDC to its stakeholders.

In addition, it was considered important that applicants understood the research and development environment in Australia, industry structures and, importantly, the role of the Australian Government as a stakeholder in the CRDC.

In total, 201 applications were received and considered by all members of the Selection Committee. A meeting was held on 29 May 2023 to agree on a list of suitable candidates for interview. In developing the list of candidates for interview, the Selection Committee considered the core selection criteria contained in the PIRD Act, as well as the other criteria agreed to be important, including a level of industry experience and strategic skills that would be useful in supporting and supplementing CRDC's management in dealing with the range of issues outlined above.

The Selection Committee unanimously agreed to interview 12 candidates, of whom six were women. Interviews were conducted on 27-28 June 2023 at the Pullman Sydney Airport Hotel. Reference checks were carried out after the interviews in respect of the candidates selected by the Committee for nomination.

Board nominations

Upon completion of the selection process, in accordance with section 130 of the PIRD Act, the CRDC Selection Committee provided for your consideration six nominations for appointment.

Expenses

The following expenses (excluding GST) were incurred in the selection process:

Item	Expense
Presiding Member fees	$9,000
Advertising	$11,846
Venue and catering	$2,182
Travel expenses (Selection Committee members and applicants)	$4,539
Total	**$27,567**

Mike Logan AM
Presiding Member

Section 6
Financials

Contents

INDEPENDENT AUDITOR'S REPORT

To the Minister for Agriculture, Fisheries and Forestry

Opinion

In my opinion, the financial statements of the Cotton Research and Development Corporation (the Entity) for the year ended 30 June 2023:

(a) comply with Australian Accounting Standards – Simplified Disclosures and the *Public Governance, Performance and Accountability (Financial Reporting) Rule 2015*; and

(b) present fairly the financial position of the Entity as at 30 June 2023 and its financial performance and cash flows for the year then ended.

The financial statements of the Entity, which I have audited, comprise the following as at 30 June 2023 and for the year then ended:

- Statement by the Accountable Authority, Executive Director and Chief Financial Officer;
- Statement of Comprehensive Income;
- Statement of Financial Position;
- Statement of Changes in Equity;
- Cash Flow Statement;
- Overview; and
- Notes to the financial statements, comprising a summary of significant accounting policies and other explanatory information.

Basis for opinion

I conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. My responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of my report. I am independent of the Entity in accordance with the relevant ethical requirements for financial statement audits conducted by the Auditor-General and his delegates. These include the relevant independence requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants (including Independence Standards)* (the Code) to the extent that they are not in conflict with the *Auditor-General Act 1997*. I have also fulfilled my other responsibilities in accordance with the Code. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Accountable Authority's responsibility for the financial statements

As the Accountable Authority of the Entity, the Board is responsible under the *Public Governance, Performance and Accountability Act 2013* (the Act) for the preparation and fair presentation of annual financial statements that comply with Australian Accounting Standards – Simplified Disclosures and the rules made under the Act. The Board is also responsible for such internal control as the Board determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Board is responsible for assessing the ability of the Entity to continue as a going concern, taking into account whether the Entity's operations will cease as a result of an administrative restructure or for any other reason. The Board is also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting, unless the assessment indicates that it is not appropriate.

GPO Box 707, Canberra ACT 2601
38 Sydney Avenue, Forrest ACT 2603
Phone (02) 6203 7300

Auditor's responsibilities for the audit of the financial statements

My objective is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian National Audit Office Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements.

As part of an audit in accordance with the Australian National Audit Office Auditing Standards, I exercise professional judgement and maintain professional scepticism throughout the audit. I also:

- identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Entity's internal control;
- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Accountable Authority;
- conclude on the appropriateness of the Accountable Authority's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Entity's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my auditor's report. However, future events or conditions may cause the Entity to cease to continue as a going concern; and
- evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

I communicate with the Accountable Authority regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

Australian National Audit Office

Fiona Sheppard
Executive Director

Delegate of the Auditor-General

Canberra
25 August 2023

Cotton Research and Development Corporation

Statement by the Accountable Authority, Executive Director and Chief Financial Officer

In our opinion, the attached financial statements for the year ended 30 June 2023 comply with subsection 42(2) of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act), and are based on properly maintained financial records as per subsection 41(2) of the PGPA Act.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Cotton Research and Development Corporation will be able to pay its debts as and when they fall due.

This statement is made in accordance with a resolution of the Directors.

Signed

Richard Haire
Chair
23 August 2023

Les Copeland
Director
23 August 2023

Ian Taylor
Executive Director
23 August 2023

Graeme Tolson
Chief Financial Officer
23 August 2023

STATEMENT OF COMPREHENSIVE INCOME

for the period ended 30 June 2023

	Notes	2023 $	2022 $	Original Budget $
NET COST OF SERVICES				
Expenses				
Employee benefits	1.1A	**2,485,534**	2,288,478	2,487,000
Suppliers	1.1B	**1,229,395**	1,057,381	1,402,000
Grants	1.1C	**13,856,473**	14,835,113	14,658,000
Depreciation and amortisation	2.2A	**90,058**	128,116	213,000
Total expenses		**17,661,460**	18,309,088	18,760,000
OWN-SOURCE INCOME				
Own-source revenue				
Revenue from contracts with customers	1.2A	**1,658,471**	3,514,349	846,000
Interest	1.2B	**837,340**	90,735	75,000
Project refunds	1.2C	**1,128,035**	997,837	250,000
Other revenue		**36,127**	1,445	-
Total own-source revenue		**3,659,973**	4,604,366	1,171,000
GAINS				
Gains from sale of assets	1.2D	**51,243**		
Total gains		**51,243**		
Total own-source income		**3,711,216**	4,604,366	1,171,000
Net (cost of)/contribution by services		**13,950,244**	13,704,722	17,589,000
Revenue from Government				
PIRD Act 1989 Contribution	1.2D	**12,691,732**	6,551,777	11,930,000
Levies and penalties	1.2E	**12,692,804**	6,556,360	13,348,000
Total revenue from Government		**25,384,536**	13,108,137	25,278,000
Surplus/(Deficit) attributable to the Australian Government		**11,434,292**	(596,585)	7,689,000
OTHER COMPREHENSIVE INCOME				
Items subject to subsequent reclassification to net cost of services				
Gain/(Losses) on financial assets at fair value through other comprehensive income		**1,004,024**	(120,436)	-
Total other comprehensive income/(loss)		**1,004,024**	(120,436)	-
Total comprehensive income/(loss) attributable to the Australian Government		**12,438,316**	(717,021)	7,689,000

The above statement should be read in conjunction with the accompanying notes.

STATEMENT OF COMPREHENSIVE INCOME (CONTINUED)

for the period ended 30 June 2023

Budget Variances Commentary

Statement of Comprehensive Income for not-for-profit Reporting Entities

The original budget is the Corporation's October 2022-23 Portfolio Budget Statements (PBS).

Suppliers expense is lower than budget by $0.173 million due to reduced consulting services and IT services.

Grants expense is lower than budget by $0.802 million due to a decrease in RD&E projects in last year of 2018-23 R&D Plan.

Revenue from contracts with customers is $0.812 million above budget. Royalites contributed $0.239 million above budget and the Grants revenue $0.573 million above budget.

Interest is higher than budget by $0.762 million as a result of increased interest rates and increase investments in term deposits using additional cash reserves.

Project refunds is higher than budget by $0.878 million as a result of an increase in surplus project funds returned by research organisations.

Commonwealth Contributions and Industry Contributions, comprising of Commonwealth contributions $0.762 million above budget and partly off-set by industry levies and penalties below budget by $0.655 million.

Gain/(Losses) on financial assets at fair value through other comprehensive income, comprising of revaluation of shares by $1.004 million based on level 3 information (refer to note 4.1).

STATEMENT OF FINANCIAL POSITION

as at 30 June 2023

	Notes	**2023 $**	2022 $	Original Budget $
ASSETS				
Financial assets				
Cash and cash equivalents	2.1A	**5,549,414**	15,403,644	8,453,000
Investments	2.1B	**27,000,000**	8,000,000	18,000,000
Trade and other receivables	2.1C	**4,215,659**	2,584,766	6,138,000
Other investments	2.1D	**1,097,000**	92,976	93,000
Total financial assets		**37,862,073**	26,081,386	32,684,000
Non-financial assets				
Land and buildings	2.2A	**756,418**	764,719	874,000
Plant and equipment	2.2A	**402,695**	204,330	213,000
Computer software	2.2A	**12,460**	26,492	116,000
Total non-financial assets		**1,171,573**	995,541	1,203,000
Total assets		**39,033,646**	27,076,927	33,887,000
LIABILITIES				
Payables				
Suppliers	2.3A	**93,737**	195,726	115,000
Grants	2.3B	**3,305,015**	3,775,146	3,000,000
Other payables	2.3C	**74,422**	62,705	-
Total payables		**3,473,174**	4,033,577	3,115,000
Provisions				
Employee provisions	3.1A	**661,785**	582,979	623,000
Total provisions		**661,785**	582,979	623,000
Total liabilities		**4,134,959**	4,616,556	3,738,000
Net assets		**34,898,687**	22,460,371	30,149,000
EQUITY				
Reserves		**347,081**	347,081	330,000
Other reserves		**987,000**	(17,024)	-
Retained surplus		**33,564,606**	22,130,314	29,819,000
Total equity		**34,898,687**	22,460,371	30,149,000

The above statement should be read in conjunction with the accompanying notes.

STATEMENT OF FINANCIAL POSITION (CONTINUED)

as at 30 June 2023

Budget Variances Commentary

Statement of Financial Position for not-for-profit Reporting Entities

The original budget is the Corporation's 2022-23 Portfolio Budget Statements (PBS).

Cash and cash equivalents is below PBS by $2.904 million was a result of increase investment in Term Deposits to harness the increased interest rates currently offered. **Investments** in Term Deposits is $9.000m above budget.

Trade and other receivables below PBS by $1.922 million is represented by a decrease in Commonwealth contributions held by the Department at 30 June 2023.

Other investments above PBS by $1.004 million is represented by an increase in the valuation of unlisted shares at 30 June 2023.

Plant and equipment above PBS by $0.190 million as a result of replacement motor vehicles with hybrid vehicles and ICT infrastructure upgrade.

Grants payable above PBS by $0.305 million as a result of COVID-19 impacted projects being extended and part of 2022-23 funding being transferred to 2023-24.

Other reserves above PBS by $0.987 million as a result of the revaluation of unlisted shares.

STATEMENT OF CHANGES IN EQUITY

for the period ended 30 June 2023

	2023 $	2022 $	Original Budget $
RETAINED EARNINGS			
Opening balance			
Balance carried forward from previous period	**22,130,314**	22,726,899	22,130,000
Adjusted opening balance	**22,130,314**	22,726,899	22,130,000
Comprehensive income			
Surplus/(Deficit) for the period	**11,434,292**	(596,585)	7,689,000
Total comprehensive income	**11,434,292**	(596,585)	7,689,000
Closing balance as at 30 June	**33,564,606**	22,130,314	29,819,000
ASSET REVALUATION RESERVE			
Opening balance			
Balance carried forward from previous period	**347,081**	347,081	347,000
Closing balance as at 30 June	**347,081**	347,081	347,000
OTHER RESERVES			
Opening balance			
Balance carried forward from previous period	**(17,024)**	103,412	(17,000)
Adjusted opening balance	**(17,024)**	103,412	(17,000)
Comprehensive income			
Other comprehensive income	**1,004,024**	(120,436)	-
Total comprehensive income	**1,004,024**	(120,436)	-
Closing balance as at 30 June	**987,000**	(17,024)	(17,000)

The above statement should be read in conjunction with the accompanying notes.

STATEMENT OF CHANGES IN EQUITY (CONTINUED)

for the period ended 30 June 2023

	2023 $	2022 $	Original Budget $
TOTAL EQUITY			
Opening balance			
Balance carried forward from previous period	**22,460,371**	23,177,392	22,460,000
Adjusted opening balance	**22,460,371**	23,177,392	22,460,000
Comprehensive income			
Surplus/(Deficit) for the period	**11,434,292**	(596,585)	7,689,000
Other comprehensive income	**1,004,024**	(120,436)	-
Total comprehensive income	**12,438,316**	(717,021)	7,689,000
Closing balance as at 30 June	**34,898,687**	22,460,371	30,149,000

The above statement should be read in conjunction with the accompanying notes.

Budget Variances Commentary

Statement of Changes in Equity for not-for-profit Reporting Entities

The original budget is the Corporation's October 2022-23 Portfolio Budget Statements (PBS).

Surplus for the period above PBS surplus by $3.745 million is a result of the higher than budget interest revenue, project refunds and revenue from contracts with customers, and reduced expenditure, as noted in the budget variance commentary on the Comprehensive Income Statement.

Other comprehensive income above PBS surplus by $1.004 million is a result of the revaluation of unlisted shares.

CASH FLOW STATEMENT

for the period ended 30 June 2023

	Notes	**2023 $**	2022 $	Original Budget $
OPERATING ACTIVITIES				
Cash received				
Industry levies and penalties		**12,188,402**	6,390,391	12,535,000
Commonwealth contributions		**12,187,330**	6,385,808	9,445,000
Royalties		**275,929**	63,940	33,000
Grants		**1,534,460**	3,905,875	813,000
Interest		**515,118**	68,037	76,000
Net GST received		**1,255,454**	993,010	822,000
Other		**973,488**	1,063,112	144,000
Total cash received		**28,930,181**	18,870,173	23,868,000
Cash used				
Employees		**2,398,037**	2,185,537	2,447,000
Grants		**15,713,281**	14,345,525	16,405,000
Suppliers		**1,436,762**	1,006,913	1,546,000
Total cash used		**19,548,080**	17,537,975	20,398,000
Net cash from/(used by) operating activities		**9,382,101**	1,332,198	3,470,000
INVESTING ACTIVITIES				
Cash received				
Proceeds from sales of property, plant and equipment		**144,140**	-	36,000
Investments		**23,000,000**	19,000,000	20,000,000
Total cash received		**23,144,140**	19,000,000	20,036,000
Cash used				
Purchase of property, plant and equipment		**380,471**	58,462	457,000
Investments		**42,000,000**	20,000,000	30,000,000
Total cash used		**42,380,471**	20,058,462	30,457,000
Net cash from/(used by) investing activities		**(19,236,331)**	(1,058,462)	(10,421,000)
Net increase/(decrease) in cash held		**(9,854,230)**	273,736	(6,951,000)
Cash and cash equivalents at the beginning of the reporting period		**15,403,644**	15,129,908	15,404,000
Cash and cash equivalents at the end of the reporting period	2.1A	**5,549,414**	15,403,644	8,453,000

The above statement should be read in conjunction with the accompanying notes.

CASH FLOW STATEMENT (CONTINUED)

for the period ended 30 June 2023

Budget Variances Commentary

Cash Flow Statement for not-for-profit Reporting Entities

The original budget is the Corporation's 2022-23 October Portfolio Budget Statements (PBS).

Industry levies and Commonwealth contributions increased by $2.396 million as a result of higher than budget Commonwealth contribution determined in accordance with the PIRD Act 1989.

Grant receipts higher than budget by $0.721 million as a result of new research grants being contracted with Commonwealth and private entities.

Net GST receipts higher than budget by $0.433 million as a result of an increase in project milestones payable to research organisations.

Other receipts higher than budget by $0.829 million as a result of an increase in surplus project funds returned by research organisations.

Grant payments lower than budget by $0.692 million as a result of an increase in grants payable at the end of year and decrease in new RD&E grants contracted.

Investments cash used, net of cash received, is above PBS as a result of an increase in levies and Commonwealth contributions received.

OVERVIEW

Notes to the Financial Statements

The Basis of Preparation

The financial statements are general purpose financial statements and are required by section 42 of the *Public Governance, Performance and Accountability Act 2013*.

The financial statements have been prepared in accordance with:

a) Public Governance, Performance and Accountability (Financial Reporting) Rule 2015 (FRR); and

b) Australian Accounting Standards and Interpretations – including Simplified Disclosures for Tier 2 Entities under the AASB 1060 issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

The financial statements have been prepared on an accrual basis and in accordance with the historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

The financial statements are presented in Australian dollars and values are rounded to the nearest dollar unless otherwise specified.

References to 'Corporation' or 'CRDC' are references to the "Cotton Research and Development Corporation".

New Australian Accounting Standards

All new standards, amendments to standards or interpretations that were issued prior to the sign-off date and are applicable to the current reporting period did not have a material effect, and are not expected to have a future material effect, on the Corporation's financial statements.

Adoption of New Australian Accounting Standard Requirements

Two amending standards (AASB 2021-2 and AASB 2021-6) were adopted earlier than the application date as stated in the standard. These amending standards have been adopted for the 2022-23 reporting period.

Standard / Interpretation	Nature of change in accounting policy, transitional provisions, and adjustment to financial statements
AASB 2021-2 Amendments to Australian Accounting Standards – Disclosure of Accounting Policies and Definition of Accounting Estimates (AASB 2021-2) and	AASB 2021-2 amends AASB 7, AASB 101, AASB 108, AASB 134 and AASB Practice Statement 2. The amending standard requires the disclosure of material, rather than significant, accounting policies, and clarifies what is considered a change in accounting policy compared to a change in accounting estimate.
AASB 2021-6 Amendments to Australian Accounting Standards - Disclosure of Accounting Policies: Tier 2 and Other Australian Accounting Standards (AASB 2021-6)	AASB 2021-6 amends the Tier 2 reporting requirements set out in AASB 1049, AASB 1054 and AASB 1060 to reflect the changes made by AASB 2021-2. The details of the changes in accounting policies and adjustments are disclosed below and in the relevant notes to the financial statements. This amending standard is not expected to have a material impact on the entity's financial statements for the current reporting period or future reporting periods.

Taxation

The Corporation is exempt from all forms of taxation except Fringe Benefits Tax (FBT), and the Goods and Services Tax (GST).

Events after the Reporting Period

There was no subsequent event that had the potential to significantly affect the ongoing structure and financial activities of the Corporation.

Accounting Judgements and Estimates

In the process of applying the Corporation's accounting policies, management has made a number of judgements and applied estimates and assumptions to future events. Information around judgements and estimates which are material to the financial statements are found in the following notes:

- *Note 4.1 Available-for-sale financial assets*

1. FINANCIAL PERFORMANCE

This section analyses the financial performance of the Corporation for the year ended 2023.

1.1 EXPENSES

	2023 $	2022 $
1.1A: EMPLOYEE BENEFITS		
Wages and salaries	**2,150,498**	1,964,063
Superannuation:		
Defined contribution plans	**230,845**	201,731
Leave and other entitlements	**104,191**	122,684
Total employee benefits	**2,485,534**	2,288,478

Accounting Policy

Accounting policies for employee related expenses are contained in the People and Relationships section.

1.1B: SUPPLIERS		
Goods and services supplied or rendered		
Corporate governance	**148,694**	178,942
Consultants	**264,831**	97,547
Corporate services	**30,213**	21,166
Information technology	**419,304**	461,236
Legal services	**114,733**	87,257
Levy management	**11,196**	14,927
Personnel services	**54,678**	41,633
Property services	**88,273**	91,256
General administration	**67,723**	32,625
Total goods and services supplied or rendered	**1,199,645**	1,026,589
Goods supplied	**149,838**	121,822
Services rendered	**1,049,807**	904,767
Total goods and services supplied or rendered	**1,199,645**	1,026,589
Other suppliers		
Remuneration of auditors	**27,000**	27,000
Workers compensation expenses	**2,750**	3,792
Total other suppliers	**29,750**	30,792
Total suppliers	**1,229,395**	1,057,381

Lease commitments

The Corporation does not have any current lease arrangements.

1.1 EXPENSES (CONTINUED)

	2023 $	2022 $
1.1C: GRANTS		
Research, Development & Extension (RD&E) Projects		
Australian Government entities	**898,108**	1,713,810
State and Territory Governments	**3,870,276**	3,699,980
Universities and Colleges	**2,952,402**	4,533,995
Commercial entities	**5,133,266**	4,218,687
Total contracted RD&E Projects	**12,854,052**	14,166,472
Corporate extension activities	**581,696**	418,803
Total RD&E projects & activities	**13,435,748**	14,585,275
Grant acquittal	**420,725**	36,505
Transfer from (to) contract asset	**-**	213,333
Total grants	**13,856,473**	14,835,113
Research grant commitments The Corporation in its capacity as grantor has agreements for research grants payable that are commitments tied to the future performance of RD&E activities. Research grant commitments are Agreements Equally Proportionately Unperformed.		
Internally funded	**13,612,742**	9,460,608
Funded through research grant revenue	**1,283,888**	1,884,450
Total research grant commitments payable	**14,896,630**	11,345,058

1.2 OWN-SOURCE REVENUE AND GAINS

OWN-SOURCE REVENUE	2023 $	2022 $
1.2A: REVENUE FROM CONTRACTS WITH CUSTOMERS		
Rendering of services		
Research grants	**1,386,711**	3,465,004
Royalties	**271,760**	49,345
Total revenue from rendering of services	**1,658,471**	3,514,349
Total revenue from contracts with customers	**1,658,471**	3,514,349

Accounting Policy

Revenue from the sale of goods or services is recognised when control has been transferred to the customer.

The following is a description of principal activities from which the Corporation generates its revenue:

Research grants received from the Commonwealth require the Corporation to generate and deliver knowledge, technologies, products or processes that will benefit primary producers. AASB 1058 is applied as the performance obligation is not sufficiently specific. Revenue is recognised when received.

- Research grant revenue recognised - AASB 1058	**863,105**

Research grants received from program partners require the Corporation to generate and deliver knowledge, technologies, products or processes that will benefit primary producers. The service is the management of the program for the partners and the intellectual property licence for reporting and activity materials that is granted at the commencement of the contracts. Revenue is recognised against performance of the obligation over the time of each grant. Progress towards complete satisfaction of the performance obligation is based on an input method, payment of sub-contract project milestones.

- Research grant revenue recognised at point in time - AASB 15	**523,606**
Total research grants	**1,386,711**

Royalties received from intellectual property licences collected by the co-licensors are paid within 30 days after receiving an invoice from the Corporation. The royalties are sales-based or usage-based and are recognised as revenue when received or receivable.

- Royalties - usage-based	**260,615**
- Royalties - donation	**11,145**
- Royalties recognised at point in time - AASB 15	**271,760**

The transaction price is the total amount of consideration to which the Corporation expects to be entitled in exchange for transferring promised goods or services to a customer. The consideration promised in a contract with a customer may include fixed amounts, variable amounts, or both.

Receivables for goods and services, which have 30-day terms, are recognised at the nominal amounts due less any impairment allowance account. Collectability of debts is reviewed at the end of the reporting period. Allowances are made when collectability of the debt is no longer probable.

1.2 OWN-SOURCE REVENUE AND GAINS (CONTINUED)

Research grant commitments receivable

The Corporation in its capacity as grantee has agreements for research grants receivable that are commitments tied to the future performance of RD&E activities and project milestones.

	2023 $	2022 $
Rural R&D for Profit - Smarter irrigation for profit	**150,000**	-
Rural R&D for Profit - Smarter irrigation for profit phase 2	**-**	713,105
Other research grant commitments	**563,163**	200,000
Total research grant commitments receivable	**713,163**	913,105

1.2 OWN-SOURCE REVENUE AND GAINS (CONTINUED)

	2023 $	2022 $
1.2B: INTEREST		
Deposits	**837,340**	90,735
Total interest	**837,340**	90,735

Accounting Policy

Interest revenue is recognised by using the effective interest method.

1.2C: PROJECT REFUNDS		
Project refunds	**1,128,035**	997,837
Total Project Refunds	**1,128,035**	997,837

Accounting Policy

Project refunds are surplus or unused research grants returned to CRDC.

GAINS

1.2D: GAINS FROM SALE OF ASSETS		
Property, plant and equipment		
Proceeds from sale	131,036	-
Carrying value of asset sold	**(79,793)**	-
Total gains from sale of assets	**51,243**	-

Accounting Policy

Sale of Assets

Gains from disposal of assets are recognised when control of the asset has passed to the buyer.

REVENUE FROM GOVERNMENT

1.2D: REVENUE FROM GOVERNMENT		
Department of Agriculture, Fisheries and Forestry		
PIRD Act 1989 Contribution	**12,691,732**	6,551,777
Total revenue from Government	**12,691,732**	6,551,777
1.2E: LEVIES AND PENALTIES		
Industry Levies	**12,691,732**	6,551,794
Penalties	**1,072**	4,566
Total levies and penalties	**12,692,804**	6,556,360

Accounting Policy

Revenue from Government

Funding received or receivable from non-corporate Commonwealth entities (appropriated to the Department of Agriculture, Fisheries and Forestry as a corporate Commonwealth entity payment item for payment to this Corporation) is recognised as Revenue from Government unless the funding is in the nature of an equity injection or a loan. Revenue from the Department of Agriculture, Fisheries and Forestry is recognised on an accrual basis from the date that the Department of Agriculture, Fisheries and Forestry notifies the Corporation of the amount receivable. Revenue from Government includes:

a) Industry Levies: Under section 30(1)(a) of the *Primary Industries Research and Development 1989 Act* (PIRD Act), CRDC received cotton industry levies. This contribution to the Corporation is collected and distributed by the Australian Government under the *Primary Industries (Excise) Levies 1999 Act*.

b) PIRD Act 1989 Contributions: Under section 30(1)(b) of the PIRD Act, the Australian Government provides matching payments, within certain parameters, equal to one half of the amount expended by the Corporation. Matching payments are recognised as Revenue from Government when the necessary expenditure is recognised.

2. FINANCIAL POSITION

This section analyses the Corporation's assets used to conduct its operations and the operating liabilities incurred as a result. Employee-related information is disclosed in the People and Relationships section.

2.1 FINANCIAL ASSETS

	2023 $	2022 $
2.1A: CASH AND CASH EQUIVALENTS		
Cash on hand or on deposit	**5,549,414**	15,403,644
Total cash and cash equivalents	**5,549,414**	15,403,644

Accounting Policy

Cash is recognised at its nominal amount. Cash and cash equivalents includes:
a) cash on hand; and
b) demand deposits in bank accounts with an original maturity of 3 months or less that are readily convertible to known amounts of cash and subject to insignificant risk of changes in value.

2.1B: INVESTMENTS		
Term deposits	**27,000,000**	8,000,000
Total investments	**27,000,000**	8,000,000

Accounting Policy

Non-derivative financial assets with fixed or determinable payments and fixed maturity dates that the Corporation has the positive intent and ability to hold to maturity are classified as investments. Investments are recorded at amortised cost using the effective interest method less impairment, with revenue recognised on an effective yield basis.

2.1C: TRADE AND OTHER RECEIVABLES		
Goods and services receivables		
Goods and services	**438,101**	163,786
Total goods and services receivables	**438,101**	163,786
Government receivables		
Department of Agriculture, Fisheries and Forestry		
- PIRD Act 1989 Contributions receivable	**1,624,412**	1,120,010
- Industry levies receivable	**1,624,412**	1,120,010
Total government receivables	**3,248,824**	2,240,020
Other receivables		
GST receivable from the Australian Taxation Office	**175,866**	150,314
Interest	**352,868**	30,646
Total other receivables	**528,734**	180,960
Total trade and other receivables	**4,215,659**	2,584,766

No indicators of impairment were found for trade and other receivables.

2.1 FINANCIAL ASSETS (CONTINUED)

	2023 $	2022 $
2.1D: OTHER INVESTMENTS		
Shares in unlisted companies	**1,097,000**	92,976
Net other investments	**1,097,000**	92,976

Accounting Policy

The Corporation has invested in seed preference shares in an unlisted start-up company over which it does not have significant influence or control. The company has been established for the purpose of commercialisation of intellectual property that may benefit the Australian cotton industry and other agriculture sectors in Australia and worldwide.

Investments in unlisted companies are accounted for in accordance with AASB 9 *Financial Instruments*, and have been designated as 'investments in equity instruments at fair value through other comprehensive income' financial assets and are expected to be recovered in more than 12 months. See note 4.1 for further information.

2.2 NON-FINANCIAL ASSETS

2.2A: RECONCILIATION OF THE OPENING AND CLOSING BALANCES OF PROPERTY, PLANT, EQUIPMENT AND INTANGIBLES

	Land $	Buildings $	Material plant and equipment $	Minor plant and equipment $	Total plant and equipment $	Computer software[1] $	Total $
As at 1 July 2022							
Gross book value	**210,000**	**570,455**	308,651	342,593	**651,244**	**875,497**	**2,307,196**
Accumulated depreciation, amortisation and impairment	**-**	**(15,736)**	(155,119)	(291,795)	**(446,914)**	**(849,005)**	**(1,311,655)**
Total as at 1 July 2022	**210,000**	**554,719**	153,532	50,798	**204,330**	**26,492**	**995,541**
Additions – Purchases	**-**	**7,493**	259,597	78,793	**338,390**	**-**	**345,883**
Depreciation and amortisation	**-**	**(15,794)**	(35,205)	(25,027)	**(60,232)**	**(14,032)**	**(90,058)**
Disposals:							
Gross book value	**-**	**-**	(173,575)	-	**(173,575)**	**-**	**(173,575)**
Accumulated depreciation and impairment	**-**	**-**	93,782	-	**93,782**	**-**	**93,782**
Total as at 30 June 2023	**210,000**	**546,418**	298,131	104,564	**402,695**	**12,460**	**1,171,573**
Total as at 30 June 2023 represented by							
Gross book value	**210,000**	**577,948**	394,673	421,386	**816,059**	**875,497**	**2,479,504**
Accumulated depreciation, amortisation and impairment	**-**	**(31,530)**	(96,542)	(316,822)	**(413,364)**	**(863,037)**	**(1,307,931)**
Total as at 30 June 2023 represented by	**210,000**	**546,418**	298,131	104,564	**402,695**	**12,460**	**1,171,573**

1. The carrying amount of computer software included $nil (2022: $nil) purchased software and $26,492 (2022: $26,492) internally generated software.

No indicators of impairment were found in 2023 (2022: $nil).

No non-financial assets are expected to be sold or disposed of within the next 12 months.

Revaluations of non-financial assets

All revaluations were conducted in accordance with the revaluation policy stated below. On 30 June 2021, an independent valuer conducted the revaluation of land and buildings.

Accounting Policy

Fair value measurement of non-financial assets are based on Level 2 inputs that are observable for the asset either directly or indirectly. The fair value of these assets do not have quoted prices in active markets (Level 1 inputs).

Land is assessed using market comparables being the sale prices of comparable land for similar land size and long-term land appreciation rates.

Buildings on freehold land are assessed using the discounted cash flow of future potential rental income adjusted for the market rate of interest.

Motor vehicles in material plant and equipment are assessed using quoted prices for similar motor vehicles.

Other material plant and equipment is assessed using the depreciated replacement cost based on market prices of similar assets less depreciation.

2.2 NON-FINANCIAL ASSETS (CONTINUED)

Accounting Policy

Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets are initially measured at their fair value plus transaction costs where appropriate.

Assets acquired at no cost, or for nominal consideration, are initially recognised as assets and income at their fair value at the date of acquisition, unless acquired as a consequence of restructuring of administrative arrangements. In the latter case, assets are initially recognised as contributions by owners at the amounts at which they were recognised in the transferor's accounts immediately prior to the restructuring.

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the statement of financial position, except for purchases costing less than $1,000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

The initial cost of an asset includes an estimate of the cost of dismantling and removing the item and restoring the site on which it is located.

Revaluations

Following initial recognition at cost, property, plant and equipment are carried at fair value less subsequent accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure that the carrying amounts of assets did not differ materially from the assets' fair values as at the reporting date. The regularity of independent valuations of land and buildings depended upon the volatility of movements in market values for the relevant assets.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under the heading of asset revaluation reserve except to the extent that it reversed a previous revaluation decrement of the same asset class that was previously recognised in the surplus/deficit. Revaluation decrements for a class of assets are recognised directly in the surplus/deficit except to the extent that they reversed a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date is eliminated against the gross carrying amount of the asset and the asset was restated to the revalued amount.

Depreciation

Depreciable property, plant and equipment assets are written-off to their estimated residual values over their estimated useful lives to the Corporation using, in all cases, the straight-line method of depreciation.

Depreciation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation rates applying to each class of depreciable asset are based on the following useful lives:

	2023	2022
Buildings on freehold land	**40 years**	40 years
Plant and equipment	**3 to 10 years**	3 to 10 years

Impairment

All assets were assessed for impairment at 30 June 2023. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs of disposal and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the Corporation were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

Derecognition

An item of property, plant and equipment is derecognised upon disposal or when no further future economic benefits are expected from its use or disposal.

Intangibles

The Corporation's intangibles comprise of purchased and internally developed software for internal use. These assets are carried at cost less accumulated amortisation and accumulated impairment losses.

Software is amortised on a straight-line basis over its anticipated useful life. The useful lives of the Corporation's software are 3 to 5 years (2022: 3 to 5 years).

All software assets were assessed for indications of impairment as at 30 June 2023.

2.3 PAYABLES

	2023 $	2022 $
2.3A: SUPPLIERS		
Trade creditors and accruals	**46,715**	109,935
Contract liabilities	**47,022**	85,791
Total suppliers	**93,737**	195,726

Settlement is usually made within 30 days.

The contract liabilities are associated with recognition of *AASB 15 Revenue from contracts with customers* for revenue received for future performance obligations under grant agreements.

2.3B: GRANTS		
Grants		
Public sector		
Australian Government entities	**150,384**	299,080
State and Territory Governments	**789,392**	922,981
Universities and Colleges	**979,462**	1,119,246
Other research organisations	**-**	41,000
Private sector		
RD&E service providers	**1,385,777**	1,392,839
Total grants	**3,305,015**	3,775,146

All grants payable are expected to be settled within 12 months.
Settlement is usually within 30 days of completion of milestones and receipt of a tax invoice. Grants are accrued based on the research grants annual budget in recognition of the project activities being undertaken by the grantee. The grantee is paid on receipt of regular progress reports and approval by CRDC.

2.3C: OTHER PAYABLES		
PAYG & FBT payable	**74,422**	62,254
Other	**-**	451
Total other payables	**74,422**	62,705

3. PEOPLE AND RELATIONSHIPS

This section describes a range of employment and post-employment benefits provided to our people and our relationships with other key people.

3.1 EMPLOYEE PROVISIONS

	2023 $	2022 $
3.1A: EMPLOYEE PROVISIONS		
Leave	**661,785**	582,979
Total employee provisions	**661,785**	582,979

Accounting Policy

Liabilities for short-term employee benefits and termination benefits expected within 12 months of the end of the reporting period are measured at their nominal amounts.

Leave

The liability for employee benefits includes provision for annual leave and long service leave.

The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that will be applied at the time the leave is taken, including the Corporation's employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability for long service leave has been determined by reference to the Department of Finance standard parameters for the Long Service Leave Shorthand Method set out in the Financial Reporting Rule. The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Superannuation

Staff of the Corporation are members of Public Superannuation Funds, Self Managed Superannuation Funds, the Public Sector Superannuation Scheme (PSS) or the PSS accumulation plan (PSSap).

The PSS is a defined benefit scheme for the Australian Government. The PSSap is a defined contribution scheme.

The liability for defined benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported in the Department of Finance's administered schedules and notes.

The Corporation makes employer contributions to the employees' defined benefit superannuation scheme at rates determined by an actuary sufficient to meet the current cost to the Government. The Corporation accounts for the contributions as if they were contributions to defined contribution plans.

3.2 KEY MANAGEMENT PERSONNEL REMUNERATION

Key management personnel are those persons having authority and responsibility for planning, directing and controlling the activities of the Corporation, directly or indirectly, including any director (whether executive or otherwise) of the Corporation. The Corporation has determined the key management personnel to be the Directors, Executive Director and General Managers.

Key management personnel remuneration is reported in the table below:

	2023 $	2022 $
Short-term employee benefits	**897,142**	843,794
Post-employment benefits	**90,933**	72,119
Other long-term employee benefits	**39,561**	17,953
Total key management personnel remuneration expenses	**1,027,636**	933,866

Notes: The total number of key management personnel that are included in the above table is 10 (2022: 10).

3.3 RELATED PARTY DISCLOSURES

The Corporation is an Australian Government controlled entity. Key management personnel include the directors and executive management.

Given the breadth of Government activities, related parties may transact with the government sector in the same capacity as ordinary citizens. These transactions have not been separately disclosed in this note.

Certain key management personnel related entities have transactions with the Corporation that occur within normal customer or supplier relationships on terms and conditions no more favourable than those which it is reasonable to expect the Corporation would have adopted if dealing with the director-related entity at arm's length in similar circumstances. Section 15 of the PGPA Rule 2014 is applied by the Board when a Director gives notice of a material personal interest in a matter. These transactions include the following entities and have been described below where the transactions are considered likely to be of interest to users of these financial statements:

	2023 $	2022 $
TRANSACTIONS WITH RELATED PARTIES		
None	**-**	-
Total transactions with related parties	**-**	-

4. MANAGING UNCERTAINTIES

This section analyses how the Corporation manages financial risks within its operating environment.

4.1 FINANCIAL INSTRUMENTS

	2023 $	2022 $
4.1A: CATEGORIES OF FINANCIAL INSTRUMENTS		
Financial Assets		
Financial assets at amortised cost		
Cash and cash equivalents	**5,549,414**	15,403,644
Term deposits	**27,000,000**	8,000,000
Trade and other receivables	**790,969**	194,432
Total financial assets at amortised cost	**33,340,383**	23,598,076
Financial assets at fair value through other comprehensive income (investments in equity instruments)		
Shares in unlisted companies	**1,097,000**	92,976
Total financial assets at fair value through other comprehensive income (investments in equity instruments)	**1,097,000**	92,976
Total financial assets	**34,437,383**	23,691,052
Financial Liabilities		
Financial liabilities measured at amortised cost		
Grants payable	**3,305,015**	3,775,146
Suppliers payable	**93,737**	195,726
Total financial liabilities measured at amortised cost	**3,398,752**	3,970,872

Available-for-sale financial assets have been valued under the following fair value hierarchy:	2023 $	2022 $
Level 3: inputs that are not observable and involve significant judgement.		
Movements in available-for-sale financial assets		
Opening balance	**92,976**	213,412
Fair value gains/(losses) through other comprehensive income	**1,004,024**	(120,436)
Closing balance of available-for-sale financial assets	**1,097,000**	92,976

Accounting Policy

Financial assets

In accordance with AASB 9 *Financial Instruments*, the Corporation classifies its financial assets in the following categories:

a) financial assets at fair value through other comprehensive income; and

b) financial assets measured at amortised cost.

The classification depends on both the entity's business model for managing the financial assets and contractual cash flow characteristics at the time of initial recognition. Financial assets are recognised when the Corporation becomes a party to the contract and, as a consequence, has a legal right to receive or a legal obligation to pay cash and derecognised when the contractual rights to the cash flows from the financial asset expire or are transferred upon trade date.

4.1 FINANCIAL INSTRUMENTS (CONTINUED)

Financial Assets at Amortised Cost

Financial assets included in this category need to meet two criteria:

1. the financial asset is held in order to collect the contractual cash flows; and
2. the cash flows are solely payments of principal and interest (SPPI) on the principal outstanding amount.

Amortised cost is determined using the effective interest method.

Effective Interest Method

Income is recognised on an effective interest rate basis for financial assets that are recognised at amortised cost.

Financial Assets at Fair Value Through Other Comprehensive Income (FVOCI)

Financial assets measured at fair value through other comprehensive income are held with the objective of both collecting contractual cash flows and selling the financial assets and the cash flows meet the SPPI test.

Any gains or losses as a result of fair value measurement or the recognition of an impairment loss allowance is recognised in other comprehensive income.

Significant accounting judgements and estimates for unlisted companies:

The shares in the unlisted company are valued based on the best information available (level 3 inputs) due to the start-up phase nature and that future cash flows are uncertain. In 2022-23 the valuation method was changed to be based on a price that is observable with an unobservable discount. In 2021-22 the valuation was based on an earnings before interest and tax (EBIT) basis of management's view of potential cash flow outcomes.

Financial liabilities

Financial liabilities are classified as either financial liabilities 'at fair value through profit or loss' or other financial liabilities. Financial liabilities are recognised and derecognised upon 'trade date'.

Financial Liabilities at Amortised Cost

Financial liabilities, including borrowings, are initially measured at fair value, net of transaction costs. These liabilities are subsequently measured at amortised cost using the effective interest method, with interest expense recognised on an effective interest basis.

Grants and Suppliers payable are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

4.1C: NET GAINS OR LOSSES ON FINANCIAL ASSETS

	2023 $	2022 $
Financial assets at amortised costs		
Interest revenue	**837,340**	90,735
Net gain on financial assets at amortised cost	**837,340**	90,735
Investments in equity instruments at fair value through other comprehensive income		
Gain/(Losses) recognised in equity	**1,004,024**	(120,436)
Net gains/(losses) on investments in equity instruments at fair value through other comprehensive income	**1,004,024**	(120,436)
Net gain from financial assets	**1,841,364**	(29,701)

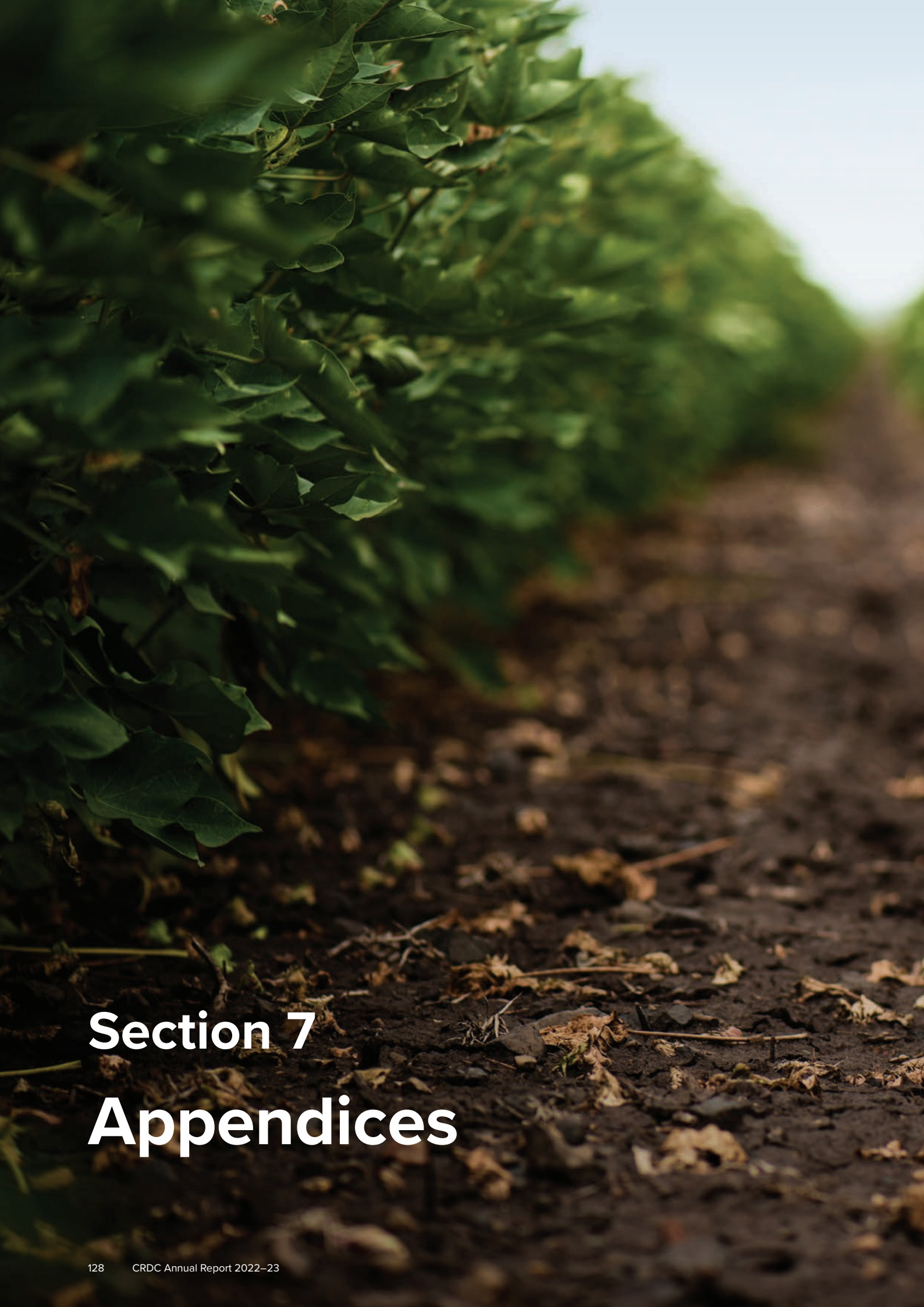
5. OTHER INFORMATION

5.1 CURRENT/NON-CURRENT DISTINCTION FOR ASSETS AND LIABILITIES

5.1A: CURRENT/NON-CURRENT DISTINCTION FOR ASSETS AND LIABILITIES

	2023 $	2022 $
Assets expected to be recovered in:		
No more than 12 months		
Cash and cash equivalents	**5,549,414**	15,403,644
Term deposits	**27,000,000**	8,000,000
Trade and other receivables	**4,215,659**	2,584,766
Other investments	**1,097,000**	-
Total no more than 12 months	**37,862,073**	25,988,410
More than 12 months		
Other investments	**-**	92,976
Land and buildings	**756,418**	764,719
Plant and equipment	**402,695**	204,330
Computer software	**12,460**	26,492
Total more than 12 months	**1,171,573**	1,088,517
Total assets	**39,033,646**	27,076,927
Liabilities expected to be settled in:		
No more than 12 months		
Suppliers	**93,737**	195,726
Grants	**3,305,015**	3,775,146
Other payables	**74,422**	62,705
Employee provisions	**531,173**	341,664
Total no more than 12 months	**4,004,347**	4,375,241
More than 12 months		
Employee provisions	**130,612**	241,315
Total more than 12 months	**130,612**	241,315
Total liabilities	**4,134,959**	4,616,556

SECTION 6 Financials



Section 7
Appendices

SECTION 7 Appendices

Appendix 1: Australian Government Priorities

CRDC's investments in RD&E during 2022–23 supported the achievement of the Australian Government's Science and Research Priorities and National Agricultural Innovation Priorities, as outlined below.

National Agricultural Innovation Priorities	Science and Research Priorities	CRDC RD&E outputs and outcomes 2022–23
Australia is a trusted exporter of premium food and agricultural products	• Food • Soil and Water • Advanced Manufacturing	To ensure Australia remains a trusted exporter of premium cotton, CRDC invested in a number of projects in 2022–23, including: • Ensuring an understanding of the implications of European Life Cycle Assessment (LCA)-based labelling legislation in partnership with GRDC, MLA and AWI. • Maintaining *my*BMP, the industry's best management practices and environmental assurance program, keeping it up to date with the latest research information. • Collecting and reporting on the key sustainability metrics desired by the market through the Australian Cotton Sustainability Framework, including the publication of the *Australian Cotton Sustainability Update 2022* in collaboration with Cotton Australia, and investing in the industry's Fourth Environmental Assessment. • Collaborating with Cotton Australia and the Australian Cotton Shippers Association (ACSA) to develop a strategic roadmap for the Australian cotton industry that will help the industry remain competitive in a changing fashion and textiles market. Five key topic areas are being addressed via broad consultation with growers and the industry: traceability; industry data; sustainably certified cotton/ *my*BMP program; human rights; and Australian cotton marketing. • Continued support for a dedicated fibre quality technical lead as part of the CottonInfo team of extension specialists, helping to maintain Australian cotton's reputation for high quality.

National Agricultural Innovation Priorities	Science and Research Priorities	CRDC RD&E outputs and outcomes 2022–23
Australia will champion climate resilience to increase the productivity, profitability and sustainability of the agricultural sector	• Food • Soil and water • Environmental change • Transport • Resources • Energy • Health	CRDC continued to invest in projects seeking to improve the environmental footprint of Australian cotton, with a particular focus on soil health, nitrogen use and water efficiency. These included: • Collecting and reporting on the key sustainability metrics through the Australian Cotton Sustainability Framework. The *Australian Cotton Sustainability Update 2022* highlighted that the water productivity of Australian cotton production continues to improve, with the long-term trend of 2.5 per cent per annum increase in water-use efficiency being maintained. The greenhouse gas emissions per bale of cotton rose in 2022, while the five-year rolling average carbon footprint per bale of cotton remained stable. • A PhD looking at combining synthetic biology solutions to improve cotton productivity under future water-limited and heatwave conditions. • Continued support for a dedicated climate extension officer as part of the CottonInfo team, and a post-doctoral study looking at climate-proofing the Australian cotton industry through improving crop water use and photosynthetic carbon assimilation.
Australia is a world leader in preventing and rapidly responding to significant pests and diseases through future-proofing our biosecurity system	• Food • Soil and water • Transport • Environmental change	Biosecurity is a key focus for CRDC. Investments focusing on significant pests, disease and biosecurity in 2022-23 included: • A continued partnership with other plant-based RDCs in the Plant Biosecurity Research Initiative (PBRI). PBRI coordinates funding for biosecurity RD&E and attracts further co-investment. It focuses on biosecurity threats to plant-based industries and developing better preparedness, diagnostics, surveillance and management capabilities in addition to improving industry resilience. • The finalisation of a review of the cotton industry's biosecurity plan with Plant Health Australia. • Two Rural Research and Development for Profit strategic biosecurity projects: Boosting National Diagnostics, which ensures we can diagnose high-priority threats across all plant sectors; and iMapPESTS, a collaboration of government, industry and researchers developing a mobile plant pest surveillance network that monitors and reports the presence of high-priority pests and diseases. • Continued investment to support bringing the BioClay™ technology to growers. BioClay™ is a novel biological crop protection approach that is non-genetically modified, safe and environmentally sensitive. Early research targets include insects, viruses and fungal disease in several crops, including cotton. • Continued support for crop protection and biosecurity research in Northern Australia.

National Agricultural Innovation Priorities	Science and Research Priorities	CRDC RD&E outputs and outcomes 2022–23
Australia is a mature adopter, developer and exporter of digital agriculture	• Food • Soil and water • Environmental change • Energy	Investments focusing on digital agriculture in 2022-23 included: • A new algorithm to enhance existing CRDC-supported technology for irrigation management based on the temperature of the crop canopy. This technology will be further tested in the United States by commercial partner Goanna Ag. • The continued development of the Weather and Networked Data (WAND) spray drift hazard warning system, in partnership with GRDC and Goanna Ag, providing real-time weather data and alerts to growers and spray operators about the presence of temperature inversions. Being able to accurately identify the presence of hazardous temperature inversions will reduce the spray drift risk for growers and spray contractors.

Science and Research Priorities per CRDC RD&E program 2022–23 ($'000)

Science and Research Priorities	Food	Soil and Water	Transport	Cyber security	Energy	Resources	Advanced Manufacturing	Environmental Change	Health	Total
Goal 1	$6,107	$949	$0	$0	$0	$0	$0	$185	$0	**$7,241**
Goal 2	$427	$270	$0	$0	$0	$0	$0	$531	$0	**$1,228**
Goal 3	$958	$55	$0	$0	$0	$0	$0	$20	$0	**$1,033**
Enabling Strategy 1	$2,562	$317	$0	$0	$59	$0	$0	$59	$0	**$2,997**
Enabling Strategy 2	$355	$0	$0	$0	$0	$0	$0	$0	$0	**$355**
TOTAL*	$10,409	$1,591	$0	$0	$59	$0	$0	$795	$0	**$12,854**

* Refer to Note 1.1C in the financial statements.

National Agricultural Innovation Priorities per CRDC RD&E Program 2022–23 ($'000)

National Agricultural Innovation Priorities	Australia is a trusted exporter of premium food and agricultural products	Australia will champion climate resilience to increase the productivity, profitability and sustainability of the agricultural sector	Australia is a world leader in preventing and rapidly responding to significant pests and diseases through future-proofing our biosecurity system	Australia is a mature adopter, developer and exporter of digital agriculture	Total
Goal 1	$258	$2,686	$3,350	$948	**$7,241**
Goal 2	$658	$570	$0	$0	**$1,228**
Goal 3	$419	$178	$172	$265	**$1,033**
Enabling Strategy 1	$478	$246	$988	$1,285	**$2,997**
Enabling Strategy 2	$264	$43	$23	$25	**$355**
TOTAL*	$2,077	$3,723	$4,532	$2,522	**$12,854**

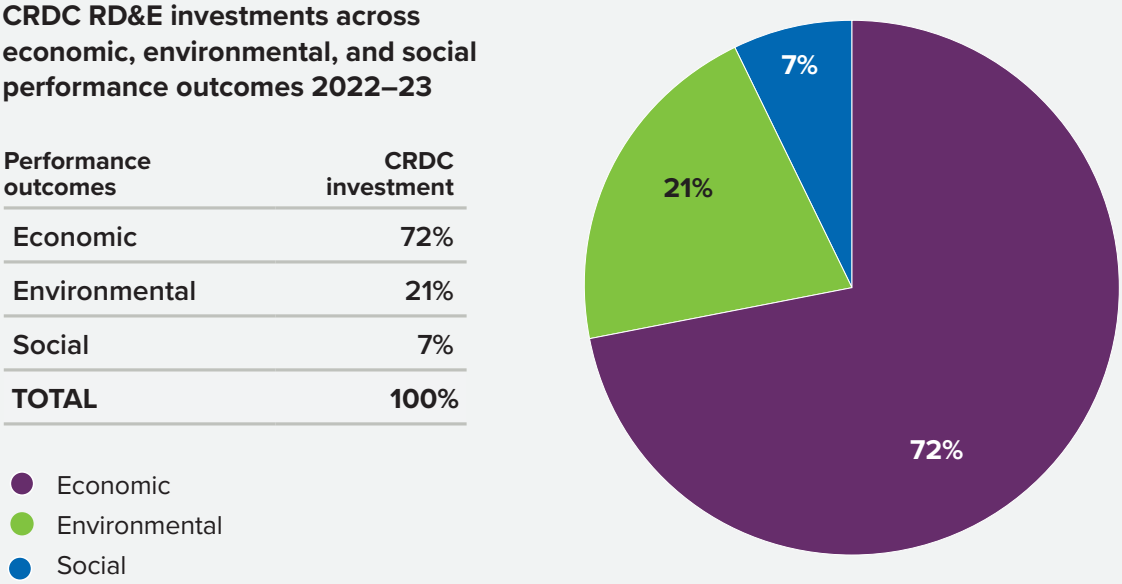
* Refer to Note 1.1C in the financial statements.

Appendix 2: Environmental performance

CRDC has integrated the principles of ecologically sustainable development under section 516A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) into its planning framework. As such, each of the measures of success within the CRDC program areas (outlined in the Strategic RD&E Plan) consider triple bottom line outputs. In line with this, the Annual Operational Plan 2022–23 was designed to ensure RD&E investments provide measurable economic, environmental, and social benefits to the cotton industry and the wider community.

CRDC RD&E investments across economic, environmental, and social performance outcomes 2022–23

Performance outcomes	CRDC investment
Economic	72%
Environmental	21%
Social	7%
TOTAL	**100%**



CRDC program contribution to economic, environmental, and social outcomes 2022–23 ($'000)

Contributions CRDC programs	Economic Investment total	Environmental Investment total	Social Investment total	Investment total
Goal 1	$6,453	$647	$141	**$7,241**
Goal 2	$289	$891	$48	**$1,228**
Goal 3	$317	$47	$669	**$1,033**
Enabling Strategy 1	$1,934	$1,051	$12	**$2,997**
Enabling Strategy 2	$289	$0	$65	**$355**
TOTAL*	$9,282	$2,636	$936	**$12,854**

* Refer to Note 1.1C in the financial statements.

APS Net Zero 2030 policy

As part of the Australian Public Service (APS) Net Zero 2030 policy, greenhouse gas emissions reporting has been developed with methodology consistent with the whole-of-Australian Government approach. CRDC has used the location-based approach to calculate electricity emissions during 2022–23.

Greenhouse gas emission inventory 2022–2023

Emission source	Scope 1 kg CO_2-e	Scope 2 kg CO_2-e	Scope 3 kg CO_2-e	Total kg CO_2-e
Electricity	0	30,632	2,518	33,150
Natural Gas	0	0	0	0
Fleet vehicles	30,859	0	7,739	38,598
Domestic flights	0	0	38,479	38,479
Other energy	0	0	0	0
Total kg CO_2-e	30,859	30,632	48,736	110,227

*CO_2-e = Carbon dioxide equivalent

Appendix 3: RD&E portfolio

CRDC 2022–23 Project List (as at 30 June 2023)

GOAL 1: INCREASED PRODUCTIVITY AND PROFITABILITY ON COTTON FARMS

Project title	Project code	Researcher	Organisation	Start date	Cease date
1.1 Optimised farming systems					
1.1.1 Improved yield and quality					
PhD: Assessing yield and fibre quality variability in cotton systems through data science for improved management	US2104	Mikaela Tilse	USYD	Mar-21	Feb-24
1.1.2 Improved input efficiencies					
Assessing the critical nitrogen (N) and phosphorus (P) values of cotton cultivars for improved yield and fertiliser efficiency	UQ2301	Tim McLaren	UQ	Jul-22	Jun-25
Identifying the trends and drivers of water productivity in Australian cotton through benchmarking (includes CottonInfo technical lead)	DAN2002	Malem McLeod	NSW DPI	Jul-19	Jul-22
Optimising irrigation performance in bankless channel cotton layouts to improve water management and nitrogen-use efficiency	DU2301	Wendy Quayle	DU	Jul-22	Jun-25
PhD: Sub-paddock scale prediction of soil-water characteristic: Need for localised calibration	USQ2101	Ned Skehan	USQ	Feb-21	Feb-23
Postdoc: Measuring evapotranspiration from canopy temperature (CTET)	USQ2302	Simon Kelderman	USQ	Jul-22	Jun-25
Professor of Soil Biology (includes CottonInfo technical lead and *my*BMP module lead)	UNE2001	Oliver Knox	UNE	Jul-19	Jun-24
Water productivity benchmarking in the Australian cotton industry	DAN2303	Malem McLeod	NSW DPI	Jul-22	Jun-25
1.1.3 On-farm sustainable development is supported					
Cotton production and research at 'L'Lara' Narrabri 2021-22	US2201	Stephen Cattle	USYD	Oct-21	Sep-22
Cotton production and research at 'L'Lara' Narrabri 2022-23	US10571	Stephen Cattle	USYD	Oct-20	Sep-23
Cotton production and research at 'Nowley' Spring Ridge 2021-22	US2202	Stephen Cattle	USYD	Oct-21	Sep-22
Limited water decision support	DAN2203	Sarah Dadd	NSW DPI	Jul-21	Jun-24
On-farm experimentation workshop	CRDC10361	Meredith Conaty	CRDC	Jan-23	Jun-23
PhD: Classifying the suitability of Murrumbidgee Valley soils for cotton production	US2002	Jonathon Moore	USYD	Mar-20	Sep-23
Science leadership for cotton development in Northern Australia	CSP1903	Steve Yeates	CSIRO	Oct-18	Sep-22
Supporting a sustainable northern Australia cotton, grain & cattle system (Northern program)	CRCNA2301	Carla Keith	CRCNA	Jul-22	Oct-26
Supporting farming system adaptation to climate and biological threats (including CottonInfo technical leads Paul Grundy and Sharna Holman)	DAQ2201	Paul Grundy	QDAF	Jul-21	Jun-24
1.1.4 Improved reliability of cotton production					
Benchmarking soil carbon, soil properties and management between long term experimental sites and on-farm cotton industry sites	DAN2305	Guna Nachimuthu	NSW DPI	Jul-22	Jun-25
Panels over channels and floating solar for evaporation mitigation	USQ10068	Michael Scobie	USQ	Feb-23	Jun-23
Smart application system for evaporation suppressants	USQ10063	Michael Scobie	USQ	Feb-23	Jun-23
Supporting Southern cotton production systems: Southern cotton agronomy and fibre quality	DAN2306	Beth Shakeshaft	NSW DPI	Jul-22	Jun-25

1.2 Transformative technologies					
1.2.1 New technologies are adapted for use in cotton					
Identifying sensors for better Integrated Pest Management in cotton	NEC1901	Alison McCarthy	USQ	Jul-18	Sep-22
Production of material for biopesticide commercialisation activities	WSU10312	Robert Spooner-Hart	WSU	Sep-22	Jun-23
Smarter Irrigation 2: Dairy case studies	RRDP2211	Lee-Ann Monk	Lee-Ann Monk	Jun-22	Aug-22
Smarter Irrigation 2: Development of information resources	RRDP2210	Annette McCaffery	Annette McCaffery	Jun-22	Jul-22
Smarter Irrigation 2: Graphic Design Services II	RRDP2301	Cathy Phelps	C&J Phelps Consulting	Jul-22	Aug-22
Smarter Irrigation 2: Monitoring and evaluation final report	RRDP2206	Lyndal Hasselman	Earth Up Consulting	Apr-22	Jul-22
Smarter Irrigation 2: Project leadership and coordination	RRDP2001	Cathy Phelps	C&J Phelps Consulting	Jul-19	Oct-22
Smarter Irrigation 2: Updating the Irrigation Scheduling Tools and Technologies booklet	RRDP2209	Lou Gall	Ace Regional Marketing	May-22	Jul-22
1.2.2 Cotton farms are digitally enabled					
Advanced field sensing for improved cotton management	USQ2303	Alison McCarthy	USQ	Sep-22	Jun-25
Annual consultant qualitative and quantitative surveys 2022-24	CCA2202	Doug McCollum	CCA	Apr-22	Mar-25
Central Qld Smart Cropping Centre co-design day sponsorship	CRDA2301	Peter Dowling	CHDC	Nov-22	Nov-22
Developing canopy temperature sensors with new multipixel technology	USQ2304	Alison McCarthy	USQ	Sep-22	Jun-24
Digital strategy for the Australian cotton industry: phase 2	CRDC2216	Simon Jenkins	DataGene	Dec-21	Oct-22
Economic assessment of Australian cotton systems: What are the key drivers of profitability?	CSD10438	Michael Bange	CSD	Mar-23	Dec-23
Silverleaf whitefly app commercialisation and development	CRDC2206	Brendan McDonald	Clevvi	Jul-21	Nov-22
Whole of farm water management digital dashboard	CSD2302	Michael Bange/ John Pattison	CSD/Goanna Ag	Oct-22	Jun-25

1.3 Protection from biotic threats and environmental stresses					
1.3.1 Increased understanding of the impact of pests, diseases and weeds, and environmental stresses					
Agricultural Innovation Australia: agri-climate outlooks	AIA2301	Alison Laing	AIA	Jul-22	Dec-26
Disease management in cotton farming systems: a participatory action research approach to deliver solutions	CSD2303	Michael Bange	CSD	Oct-22	Sep-26
Postdoc: Climate proofing Australia's cotton industry through improving crop water use and photosynthetic carbon assimilation (Climate-proof cotton)	UWS2201	Demi Sargent	WSU	Jul-21	Jun-24
Regional demonstration of integrated weed tactics across farming systems	DAN2304	Eric Koetz	NSW DPI	Jul-22	Dec-24
Using DNA diagnostics to monitor disease suppressive cotton farming systems	CAS2101	Rob Long	Crown Analytical	Jul-20	Jun-23
1.3.2 Improved identification, surveillance and management systems for pests, diseases and weeds and environmental stresses					
ARC Research Hub for Sustainable Crop Protection	UQ2001	Neena Mitter	HIA/UQ	Jul-19	Aug-25
Area wide management for cropping systems weeds, investigating the weed management, social and economic opportunity	GRDC2002	Rick Llewellyn	GRDC	Aug-19	Jun-23
Biological based products for improved cotton production	UWS1901	Brajesh Singh	WSU	Jul-18	Aug-22
Characterisation and management of Alternaria leaf spot and black root rot pathogens of cotton in NSW	DAN2307	Duy Le	NSW DPI	Jul-22	Jun-24
Characteristics of disease suppressive cotton farming systems and soils understood	DAQ2002	Linda Smith	QDAF	Sep-19	Oct-22
CRDC R&D Manager (disease portfolio)	CRDC2105	Elle Storrier	Macpherson Agronomy Services	Oct-20	Oct-22
Developing proactive approaches to IPM in cotton production systems	CSP2203	Simone Heimoana	CSIRO	Sep-21	Aug-24
Improved insecticide resistance monitoring for key pests to support sustainable insect management	DAN2301	Lisa Bird	NSW DPI	Jul-22	Jun-25
Improved insecticide resistance monitoring for SLW to support sustainable insect management	DAQ2301	Jamie Hopkinson	QDAF	Jul-22	Jun-25
Improved management of weeds in cotton and grains farming systems (including CottonInfo technical lead Eric Koetz)	DAN2004	Graham Charles	NSW DPI	Nov-19	Jun-23
Modern systems agronomy for resilient cotton production	CSP2001	Katie Broughton	CSIRO	Jan-20	Sep-23
Novel options and strategies for integrated pest management in Australian cotton	CCA2201	Doug McCollum	CCA	Jul-21	Sep-22
Plant Biosecurity Research Initiative (PBRI) Phase 2	HIA2101	Jo Luck	HIA	Jul-20	Jun-23
Plant Health Australia membership subscription 2020-23	PHA2001	Stuart Kearns	PHA	Jul-20	Jun-23
Review of the Cotton Industry Biosecurity Plan	PHA2201	Stuart Kearns	PHA	Jul-21	Jun-24
Tactical management and surveillance of, Verticillium, Fusarium and reoccurring wilts	DAQ2302	Linda Smith	QDAF	Jul-22	Jun-24
Tools for assessing and achieving pesticide sustainability targets for the Australian cotton industry	DAN2201	Mick Rose	NSW DPI	Jul-21	Oct-23
Validation and implementation of new molecular tools for Bt resistance monitoring	CSP2204	Sharon Downes	CSIRO	Sep-21	Aug-24
What is the best fit for electric weed control in Australia?	WAAA10493	Catherine Borger	WAAA	Jul-22	Jun-24
1.3.3 Industry is prepared for a biosecurity incursion					
Boosting diagnostic capacity for plant production industries	GRDC2001	K'trie Coster	GRDC	Jul-19	Jun-23
Hemiptera identification training	CRDC10526	Michael Elias	Michael Elias	May-23	Jun-23
GOAL 1 TOTAL: $7.24 MILLION					

GOAL 2: IMPROVE COTTON FARMING SUSTAINABILITY AND VALUE CHAIN COMPETITIVENESS

Project title	Project code	Researcher	Organisation	Start date	Cease date
2.1 Sustainability of cotton farming					
2.1.1 Improved environmental footprint for cotton farms					
Agricultural Innovation Australia: Know and show your carbon footprint (discovery)	AIA2302	Alison Laing	AIA	Dec-22	Apr-23
Building profitable farming systems for the future through increasing Soil Organic Carbon (SOC) and optimising Water Use Efficiency (WUE) in a changing climate	CRDC2202	Annette McCaffery	DCRA	Jul-21	Jun-23
Carbon and biodiversity benchmarking in native vegetation on cotton farms	UNE2301	Rhiannon Smith	UNE	Jan-23	Dec-25
Climate Research Strategy for Primary Industries (CRSPI): Developing a common methodology	AIA2102	Alison Laing	AIA	Jun-21	Feb-23
Closing the loop: textile waste composting for improved carbon footprint and sustainability	UON2301	Thava Palanisami	UoN	Jul-22	Jun-25
Cotton Landcare Tech Innovations: Biodiversity field days	NLP2303	Stacey Vogel	CRDC	Mar-23	Mar-23
Cotton Landcare Tech Innovations: Communications support	NLP1903	Bernadette Pilling	HOC	Nov-18	Jun-23
Cotton Landcare Tech Innovations: Contract with Landcare Australia to replant 6.5 ha of trial site	NLP2301	Rob Porter	Landcare Aust	Oct-22	Jun-24
Cotton Landcare Tech Innovations: Florabank workshops	NLP2102	Stacey Vogel	CRDC	Jul-19	Aug-23
Cotton Landcare Tech Innovations: Innovation Alley at the 2022 Australian Cotton Conference	NLP2201	Stacey Vogel	CRDC	Jun-22	Jul-22
Cotton Landcare Tech Innovations: Revegetation guide	NLP2302	Stacey Vogel	CRDC	Jun-22	Jul-22
Cotton Landcare Tech Innovations: Updating *Birds on Cotton Farms* publication	NLP2202	Stacey Vogel	CRDC	Jun-22	Jul-22
Evaluating the economic and environmental return on investment of modern fish screens	DAN2308	Fiona Scott	NSW DPI / Ozfish	Jul-22	Jun-25
Greenhouse gas baseline and mitigation for cotton - phases 1 and 2	CSP2102	Hizbullah Jamali	CSIRO	May-21	Jun-25
Impacts and solutions: A scoping study on relative impacts of irrigation infrastructure on fish	DAQ2101	Michael Hutchison	QDAF	Jul-20	Sep-22
PhD: Farm-wide microgrid decision support system for the Australian cotton industry	UTS1901	Yunfeng (Forrest) Lin	UTS	Aug-18	Dec-22
Secretariat support for Australian Fish Screen Advisory Panel	CRDC2104	Craig Copeland	Ozfish Unlimited	Aug-20	Aug-22
Seeking regionally specific guidelines for cover crops through cotton-farmer-led best practice and soil security	US2301	Alex McBratney	USYD	Feb-23	Jan-26
Understanding the environmental co-benefits of irrigation water in the northern Murray-Darling Basin	GU2201	Rebekah Grieger	GU	Jul-21	Jun-24
2.2 Create higher value uses for cotton					
2.2.2 Increased understanding of market requirements and opportunities throughout the value chain					
Community Trust in Agriculture (Joint RDC trust monitoring project, phase 2)	RIRDC10461	Georgina Toose	AgriFutures	Mar-23	Jun-25
Community Trust in Cotton (Cotton specific trust monitoring project)	REFL10444	Rolf Fandrich	Voconiq	Mar-23	Mar-24
Strategies for improving labour conditions within the Australian cotton value chain	QUT1903	Alice Payne	QUT	Jun-19	Nov-22

2.3 Measurement and reporting throughout the value chain					
2.3.1 CRDC collaborates in global leadership for sustainability initiatives					
Australian participation in the European Union product environmental footprint technical advisory board	CRDC2008	Angus Ireland	AWI	Sep-19	Dec-22
Cotton industry social and wellbeing sustainability indicators	UC1901	Jacki Schirmer	UC	Jun-19	Nov-22
Membership of the Better Cotton Initiative	CRDC2309	Vinay Kumar	BCI	Sep-22	Sep-23
Membership of the Sustainable Agriculture Initiative (SAI) platform - Australian chapter	CRDC2303	Selwyn Heilbron	SAI	Jul-18	Jun-24
Membership of the Sustainable Apparel Coalition	CRDC2205	Glenn Robinson	SAC	Jul-21	Jun-24
2.3.2 The value chain is transparent and understood by participants					
Australian cotton industry strategic roadmap (ATMAC Grant Phase 2)	CA2301	Brooke Summers	Cotton Australia	Jul-22	Sep-23
PhD: Quantifying the temporary climate mitigation impacts of biogenic carbon	NCSU2301	Stephen Pires	NCSU	Aug-22	Aug-24
The economic benefits of composting textile waste: process mapping and optimal location	RMIT10072	Rajkishore Nayak	RMIT	May-23	Oct-23
Undertaking the Fourth Environmental Assessment of the Australian cotton industry	CRDC2210	Susan Madden	GHD	Sep-21	Oct-22
GOAL 2 TOTAL: $1.23 MILLION					

GOAL 3: BUILD ADAPTIVE CAPACITY OF THE COTTON INDUSTRY

Project title	Project code	Researcher	Organisation	Start date	Cease date
3.1 Science and innovation capability, and new knowledge					
3.1.1 Science and innovation capacity is strengthened and strategically fit for a digital future					
Australian Cotton Industry Awards 2023: CRDC Chris Lehmann Young Cotton Achiever of the Year Award sponsorship	CA10491	Adam Kay	Cotton Australia	Mar-23	Dec-23
Australian Rural Leadership Program: Course 26, Course 27, Course 28, TRAIL 2020 and 2021	RIR1903	Tristan Richmond	ARLF	May-19	Dec-22
Australian Rural Leadership Program: Course 29, 30 & 31, TRAIL 2022, 2023, 2024	RIR2201	Tristan Richmond	ARLF	Jul-21	Dec-25
Cotton Production Course	UNE2002	Oliver Knox	UNE	Jan-20	Dec-23
CRDC R&D Manager (People and Capacity)	CRDC2106	Rachel Holloway	Rachel Holloway	Jul-20	Jun-23
CSIRO student vacation scholarship program 2022-23	CSP2301	Hazel Parry	CSIRO	Jul-22	Jun-23
Future Cotton Leaders Program 2022 and 2024	CA2201	Paul Sloman	Cotton Australia	Oct-21	Oct-24
Graduate tour: Careers in the cotton industry 2023	CRDC 10562	Rachel Holloway	CRDC	Jun-23	Sep-23
Horizon Scholarship 2022: Alya Christophers	RIRDC2203	Abbey O'Callaghan	AgriFutures	Apr-22	Jan-24
Horizon Scholarship 2023: Georgie Oldham	RIRDC10499	Abbey O'Callaghan	AgriFutures	Mar-23	Jan-24
Horizon Scholarship 2023: Niamh Mason	RIRDC10500	Abbey O'Callaghan	AgriFutures	Mar-23	Jan-24
Nuffield Australia Farming Scholarship 2023: Tim Houston	CRDC2301	Jodie Redcliffe	Nuffield Australia	Oct-22	Oct-24
PhD: Drought resilient cotton: Combining synthetic biology solutions to improve cotton productivity under future water limited and heatwave conditions	UWS2202	Garima Dubey	WSU	Mar-22	Mar-25
PhD: Integrating deep learning AI software with hardware for next generation acoustic biodiversity monitoring	QUT2301	Tim Chant	QUT	Jul-22	Nov-25
Postdoc: Improving grower decision in complex systems: A targeted tool to assist cotton growers in appropriate technology adoption	QUT2001	Geraldine Wunsch	QUT	Jul-19	Nov-22
Science and Innovation Awards for Young People in Agriculture: 2021 & 2022 – Demi Sargent & Xiaoqing Li	ABA2101	Camina Gorham	ABARES	Jul-20	Jun-23
Science and Innovation Awards for Young People in Agriculture: 2023 & 2024 – Cong Vu & TBA	ABA2301	Camina Gorham	ABARES	Jul-22	Jun-24
Summer Scholarship: Low-cost satellite technologies that remove need for cellular or radio coverage in smart broadacre irrigation	USQ10154	Simon Kelderman	USQ	Dec-22	Nov-23
Travel: Attend and present at the 12th International Congress of Plant Pathology, France	DAQ10367	Linda Smith	QDAF	May-23	Sep-23
Travel: Attend and present at the XXI international N workshop at the School of Agricultural, Food and Biosystems Engineering, Universidad Politecnica de Madrid	CSP2302	Tim Weaver	CSIRO	Oct-22	Sep-23
Travel: Attend the 2022 Australian Cotton Conference – Dianna Somerville	CRDA2210	Dianna Somerville	RDA Riverina	Jun-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Elizabeth Czislowki	UQ2202	Elizabeth Czislowki	UQ	Jun-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Garima Dubey	UWS2203	Garima Dubey	WSU	Jun-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Kaylie Simpfendorfer	CRDA2206	Kaylie Simpfendorfer	DPIRD	Jun-22	Aug-22

Travel: Attend the 2022 Australian Cotton Conference – King Yin Lui	CRDA2207	King Yin Lui	DPIRD	Jun-22	Aug-22
Travel: Attend the 2022 Australian cotton conference – Mikaela Tilse	US2302	Mikaela Tilse	USYD	Aug-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Ruth Nettle	UM2201	Ruth Nettle	UMELB	Jun-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Thomas O'Donoghue	US2205	Thomas O'Donoghue	USYD	Jun-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Chris Schelfhout	CRDA2205	Chris Schelfhout	DPIRD	Jun-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Jack Daniel	CRDA2211	Jack Daniel	Northern Australian Crop Alliance	Jun-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Peter Shotton	CRDA2212	Peter Shotton	NT DITT	Jun-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Rhys Flynn	CRDA2208	Rhys Flynn	DPIRD	Jun-22	Aug-22
Travel: Attend the 2022 Australian Cotton Conference – Sarah Nolan	CRDA2209	Sarah Nolan	DPIRD	Jun-22	Aug-22
Travel: Attend the 8th International Weed Science Congress, Bangkok	DAQ2303	Jeff Werth	QDAF	Sep-22	Dec-22
3.1.2 Increased understanding of the diverse human capital in regional communities					
AgriFutures Rural Women's Award 2023 gala dinner	RIRDC2301	Abbey O'Callaghan	AgriFutures	Jul-22	Oct-22
AgriFutures Rural Women's Award 2023 gala dinner – Supporting cotton industry attendees	CRDC2310	Ruth Redfern	CRDC	Jul-21	Oct-22
Association of Australian Cotton Scientists (AACS) 2023 Australian Cotton Research Conference – Sponsorship	AACS10490	Joseph Foley	AACS	May-23	Oct-23
Australian cotton industry socio-economic study	CRDC2012	JP Van Moort	ACIL Allen Consulting	Feb-20	Sep-23
Delivering best practice to manage future workforce skills	CQU2201	Nicole McDonald	CQU	Oct-21	Sep-24
Exploring a cotton and grains agricultural traineeship model	CQU2303	Amy Cosby	CQU	Jul-22	Sep-23
How to attract and retain young people on cotton farms	CQU2301	Amy Cosby	CQU	Oct-22	Sep-24
Opportunities for greater diversity in the cotton workforce	CQU2302	Nicole McDonald	CQU	Sep-22	Sep-23
3.1.3 Increased opportunities for innovation skills development					
11th Australian National Soil Judging Competition – Sponsorship	SSA10537	Michael Walker	Australian Society of Soil Science	May-23	Jun-23
Designing the integration of extension into research projects	HIA2201	Anthony Kachenko	HIA	Jan-22	Jul-22

3.2 Futures thinking					
3.2.1 Australian cotton growers are able to adapt to change					
CSIRO AgCatalyst 2022 – Sponsorship	CSP2004	Michiel van Lookeren Campagne	CSIRO	May-20	Nov-22
Grassroots Grant: Ord & Northern Territory crop development tour	CGA2105	Hollie Gall	Macintyre Valley CGA	Jan-21	May-23
Grassroots Grants: Assist with Coleambally community demo farm, improve their current soil issues on farm, to facilitate longevity in their charity farming operations	CGA2204	James Kanaley	Southern Valley CGA	Dec-21	Dec-22
Grassroots Grants: Far North Qld Sustainable Cropping Group Grower Study Tour May 2023	FNQS10534	Sarah Stevens	FNQ Sustainable Cropping Group	May-23	Jun-23
Grassroots Grants: The connectivity challenge	CGA2203	Amanda Thomas	Macquarie CGA	Dec-21	Dec-22
Grassroots Grants: Young Cotton Grower Tour	NUAG10440	Jacob Thuijs	Nutrien Ag	Mar-23	Mar-23
Nuffield Australia Farming Scholarship 2020: Richard Quigley	CRDC2009	Jodie Redcliffe	Nuffield Australia	Apr-19	Dec-22
Rural Safety and Health Alliance collaboration 2021-24	RIRDC2201	Georgina Toose	AgriFutures	Jul-21	Jun-24
3.2.2 Increased opportunities for strategic foresight					
CRDC Strategic Plan 2023-28: Governance framework	CRDC2307	Steve Thomas	ST Strategic Services	Aug-22	Aug-22
CRDC Strategic Plan 2023-28: Governance principles and processes	STST10558	Steve Thomas	ST Strategic Services	Jun-23	Jun-23
Grower RD&E advisory panels and industry committees 2019-23	CA2002	Jennifer Brown	Cotton Australia	Jul-19	Jun-23
GOAL 3 TOTAL: $1.03 MILLION					

GOAL 4 (ENABLING STRATEGY 1): STRENGTHENING PARTNERSHIPS AND ADOPTION

Project title	Project code	Researcher	Organisation	Start date	Cease date
4.1. Partnerships and collaboration					
4.1.1 Growers/consultants value CRDC farming systems research outcomes					
20th Australian Cotton Conference Foundation - Sponsorship	CA2004	Tracey Byrne-Morrison	Cotton Australia	Dec-19	Nov-22
Capital: Module scale and trailer	CSD10305	Peter White	CSD	Jan-23	Jun-23
4.1.2 CottonInfo partnership is maintained and practice change improved					
Climate, energy and business analysis for cotton growers (including CottonInfo technical lead)	AE2101	Jon Welsh	AgEcon	Jul-20	Jun-23
Cotton industry database management	CRDC2101	Lee Armson	Making Data Easy	Jul-20	Jun-23
CottonInfo Activity and Trial Project	CSD10445	Janelle Montgomery	CottonInfo	Oct-22	Nov-23
CottonInfo field demonstration trial: Optimisation of application in tailwater backup system	CSD10485	Andrew McKay	CSD	Oct-22	Jul-23
CottonInfo field demonstration trial: Optimisation of application in tailwater backup systems	CSD2201	Andrew McKay	CSD	Oct-21	Aug-22
CottonInfo multimedia content development	DAQ2202	Tonia Grundy	QDAF	Jul-21	Jun-24
CottonInfo technical lead for irrigation (includes *my*BMP module lead)	GVIA2301	Lou Gall	GVIA	Jul-22	Jun-25
CottonInfo technical lead for nutrition (includes *my*BMP module lead)	DAN2202	Jon Baird	NSW DPI	Jul-21	Jun-24
CottonInfo technical lead for weeds (includes *my*BMP module lead)	DAN2302	Graham Charles & Eric Koetz	NSW DPI	Jul-22	Jun-25
CRDC NRM R&D Manager and Technical Lead	CRDC2102	Stacey Vogel	Stacey Vogel Consulting	Jul-20	Jun-23
Identifying key issues to maintain and improve Australian cotton fibre quality (includes CottonInfo Technical Lead and *my*BMP module lead)	CRDC2103	Rene van der Sluijs	TTS	Oct-20	Jun-23
Proofreading *Cotton Pest Management Guide 2022* (CPMG)	CRDC2304	Helen Dugdale	Helen Wheels HR	Jul-22	Jul-22
4.1.3 Partnerships are strengthened to engage multi-disciplinary and multi-institutional resources					
Agricultural Innovation Australia membership	AIA2101	Alison Laing	AIA	Jul-20	Jun-23
SOS Group communication support: spray drift and WAND	IREC10488	Iva Quarisa	IREC	Mar-23	Dec-23
4.2 Best practice (*my*BMP)					
4.2.1 Best practice is based on science and measured impact					
Farm performance – rate of return data for cotton sustainability report	CRDC2208	Simon Fritsch	Agripath	Nov-21	Mar-24
*my*BMP WHS module review	CRDC2306	Wayne Baker	Safe Systems Engineering	Aug-22	Sep-22
Support for the sustainability working group, industry sustainability reporting and integration of research into *my*BMP	CRDC2113	Chris Cosgrove	Sustenance Asia	Apr-21	Jun-24

4.3 Innovation and commercialisation					
4.3.1 Improved R&D innovation and commercialisation					
Commercialisation management tasks	CRDC2203	Jarrod Ward	Ahurei	Jul-21	Jun-24
Commercialisation process coordination and support for WSU plant extract pesticides	CRDC2218	Doug McCollum	AGK Services	Apr-22	Sep-22
Demonstrating and integrating irrigation technology for cotton	USQ2301	Joseph Foley	USQ	Jul-22	Jun-25
Investigating options for protection of multiarray thermal sensor IP	IP2202	Jarrod Ward	Ahurei	May-22	Sep-22
Patent for DAT511	IP10607	Allan Williams	CRDC	Jun-23	Jun-23
Pesticide patent costs WSU	IP10589	Susan Maas	Ahurei	May-23	Jun-23
Spray drift hazard alert and warning systems	DISA2201	Alicia Garden	Goanna Ag	Jan-22	Jun-28
GOAL 4 TOTAL: $3.00 MILLION					

GOAL 5 (ENABLING STRATEGY 2): DRIVING RD&E IMPACT

Project title	Project code	Researcher	Organisation	Start date	Cease date
5.1 Impact and effectiveness					
5.1.1 CRDC investments meet grower, industry and government needs					
CRDC Strategic RD&E Plan 2023-28: Project management	CRDC2112	Bernadette Pilling	HOC	Mar-21	Jun-23
5.1.2 CRDC monitors and evaluates RD&E impact					
CRDC and CottonInfo monitoring and evaluation technical support	CRDC2302	Ben Coutts	J&R Coutts	Jul-22	Jun-23
CRDC Cotton Grower Survey 2020-22	CRDC2014	Michael Sparks	Intuitive Solutions	Jul-20	Mar-23
CRDC Cotton Grower Survey 2023-25	INTS10342	Michael Sparks	Intuitive Solutions	Jan-23	Nov-25
CRDC Partner Relationship Review (Stakeholder Survey) 2022	CRDC2215	Michael Sparks	Intuitive Solutions	Mar-22	Nov-22
Regional Australia Institute (RAI) assessment of CRDC RD&E investment on the socio-economic resilience of rural and regional communities	RAI10501	Katherine Bassett	RAI / GRDC	Apr-23	Jun-24
Research for impact	HIA10594	Jane Wightman	HIA	Jun-23	Jun-26
5.1.3 CRDC-funded projects demonstrate value and return on investment					
CRDC economic impact assessment	AE2202	George Revell	AgEcon	Jun-22	Oct-22
5.1.4 Growers, the cotton industry and government are informed and aware of RD&E outcomes					
20th Australian Cotton Conference 2022: Innovation Alley	CA2202	Tracey Byrne-Morrison	Cotton Australia	May-22	Nov-22
CRDC and CottonInfo communications support	CRDC2305	Bernadette Pilling	HOC	Jul-22	Oct-22
Media monitoring - CRDC and CA	CA10599	Darrin Davies	Cotton Australia	Jul-22	Jul-23
Public Relations support	REGP10561	Georgie Robertson	Regional PR Co	Jun-23	Mar-24
Research summaries	HOUC10573	Bernadette Pilling	HOC	Jun-23	Nov-23
Strategic Plan video project	CUSM10578	David Cussons	Cussons Media	Jun-23	Jun-24
GOAL 5 TOTAL: $0.35 MILLION					

TOTAL INVESTMENT IN RD&E: $12.85 MILLION

Appendix 4: Glossary and acronyms

Term	Description
AACS	Association of Australian Cotton Scientists
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ACRI	Australian Cotton Research Institute
AFI	Australian Farm Institute
AgriFutures	AgriFutures Australia Ltd
AIA	Agricultural Innovation Australia
ARLF	Australian Rural Leadership Foundation
ARLP	Australian Rural Leadership Program
AWI	Australian Wool Innovation
BCI	Better Cotton Initiative
CA	Cotton Australia
CCA	Crop Consultants Australia Inc.
CGA	Cotton Grower Association
CHDC	Central Highlands Development Corporation
CO_2-e	Carbon dioxide equivalent
CottonInfo	Joint venture between CRDC, Cotton Australia and CSD to deliver cotton extension activities
CQU	Central Queensland University
CRC	Cooperative Research Centre
CRCNA	Cooperative Research Centre for Developing Northern Australia
CRDC	Cotton Research and Development Corporation
CRRDC	Council of Rural Research and Development Corporations
CRSPI	Climate Research Strategy for Primary Industries
CSD	Cotton Seed Distributors Ltd (a grower-owned cooperative)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Department of Agriculture, Fisheries and Forestry
DCRA	Dryland Cotton Research Association
DPIRD	Department of Primary Industries and Regional Development (Western Australia)
GM	Genetically modified
GMO	Genetically modified organism
GRDC	Grains Research and Development Corporation
GVIA	Gwydir Valley Irrigators Association
ha	hectare
HOC	House of Communications
IOT	Internet of Things
IP	Intellectual Property
IPM	Integrated Pest Management

kg	kilogram
LCA	Life Cycle Assessment
ML	megalitre
MLA	Meat & Livestock Australia
*my*BMP	The cotton industry's Best Management Practice program
NCSU	North Carolina State University
NRM	Natural Resource Management
NSW DPI	NSW Department of Primary Industries
NQ	North Queensland
NT DITT	Northern Territory Department of Industry, Trade and Tourism
PBRI	Plant Biosecurity Research Initiative
PGPA Act	*Public Governance, Performance and Accountability Act 2013*
PHA	Plant Health Australia
PhD	Doctor of Philosophy
PIRD Act	*Primary Industries Research and Development Act 1989*
QDAF	Queensland Department of Agriculture and Fisheries
QUT	Queensland University of Technology
R&D	Research and development
RAI	Regional Australia Institute
RDA	Regional Development Australia
RD&E	Research, development and extension
RDC	Rural Research and Development Corporation
REO	Regional Extension Officers
RMIT	Royal Melbourne Institute of Technology
RRDP	Rural R&D for Profit grants
SAC	Sustainable Apparel Coalition
SAI	Sustainable Agriculture Initiative
TIMS	Transgenic and Insect Management Strategy Committee
TTS	Textile Technical Services
UC	University of Canberra
UMELB	University of Melbourne
UNE	University of New England
UoN	University of Newcastle
UQ	University of Queensland
USQ	University of Southern Queensland
USYD	University of Sydney
UTS	University of Technology, Sydney
WAAA	Western Australia Agriculture Authority
WHS	Work Health and Safety
WSU	Western Sydney University

Appendix 5: Annual reporting requirements

The following table details the contents of the CRDC Annual Report and the associated requirements under the PIRD Act, the PGPA Act, the PGPA Rule, and the CRDC Funding Agreement.

Annual Report item	PIRD Act	PGPA Act / PGPA Rule	Funding Agreement
SECTION 1: EXECUTIVE SUMMARY			
About CRDC and the Australian cotton industry	s28(a)(vii)	s17BE (k) & (l) (and s17BE (s)) 17BE (b) (ii) (g)	Clause 8.1-8.5
Report from Chair & Executive Director	s28(a)(iii)	s17BE (p) 17BE(j)	
Progress against Strategic RD&E Plan 2018–23: Our Annual Performance Statement	s28(a)(i) s28(a)(iii) s28(a)(iib) s28(b)	s39(1) (b) s17BE (a) & (b) s17BE (g)	Clause 9.2(a-d) Clause 9.4(a-b)
2022-2023 investment & impact		s39(1) (b) s17BE (g)	Clause 9.2(a-d)
Year in review: RD&E highlights	s28(a)(i) s28(a)(iv)	s39(1) (b) s17BE (g)	Clause 9.2(a-d)
Letter of transmittal		s17BB	
SECTION 2: CRDC BUSINESS			
CRDC role	s28(a)(vii)	s17BE (k) & (l) (and s17BE (s))	Clause 8.1-8.5
CRDC operations		s17BE (n), (o) & (ii)	Clause 14.1
Setting the research priorities	s28(d)	s17BE (n) & (o)	Clause 9.2(a-d)
Collaboration & co-investment	s28(a)(iv) s28(a)(vi)	s17BE (n) & (o) s39(1) (b)	Clause 9.2(a-d) Clause 11
SECTION 3: CORPORATE OPERATIONS			
Business financials	s28(a)(ii) s28(d)	s17BE(b)	Clause 14.1
Investments in RD&E	s28(d) s28(a)(iib)		Clause 9.2(a-d) Clause 14.1
Investments against Government Priorities	s28(a)(iib)		Clause 9.2(a-d)
SECTION 4: RD&E PORTFOLIO			
Investments, innovations & impacts: Goals 1-3, Enabling Strategies 1&2	s28(a)(i)	s39(1)(b) s17BE(b)	Clause 9.2(a-d)

SECTION 5: CRDC PEOPLE AND GOVERNANCE			
CRDC Board		s17BB s17BE (j) s17BE (m)	
CRDC Employees		s17BE (k) & (l) (and s17BE (s)) and s17BE (k) and (ka)	
Governance & accountability	s28(a)(i) s28(a)(ii) s28(a)(iv) s28(a)(v) s28(a)(vi) s28(c) s143(2)	s17BB s17BE (a), (b), (b)(i), (c), (d), (e,) (f), (h) (i), (j), (m), (n), (o), (p), (q), (r), (s), (t), (ta), (taa)	Clause 2.6 (a-b) Clause 7.1 Clause 9.7 Clause 12
Selection Committee Report	s141(1A)		
SECTION 6: FINANCIALS			
Independent Auditor's Report		s17BB s43(4) s17BE (r)	
Statement by the Accountable Authority, ED & Finance Officer		s17BB 17BE(j)	
Financial statements	s28(a)(ii) s28(a)(viii) s28(d)	s17BE(b) s43(4) RMG 138/139	Clause 14.1 Clause 12
Notes to the financial statements	s28(a)(viii) s28(d)	s43(4)	
SECTION 7: APPENDICES			
Appendix 1: Australian Government priorities	s28(a)(i) s28(a)(ii)	s17BB s17BE(b)	Clause 9.2(a-d)
Appendix 2: Environmental performance	s28(a)(i) s28(a)(ii)		Clause 9.2(a-d)
Appendix 3: RD&E Portfolio	s28(a)(i) s28(a)(ii)		
Appendix 4: Glossary & acronyms		s17BD	
Appendix 5: Annual reporting requirements		S46(3) s17BD s17BE (u)	Clause 9.2(a-d)

NB: Section 28(a)(ia) of the PIRD Act is not applicable to CRDC.

The following table is required under Schedule 2A of the PGPA Rule, Section 17BE(u), outlining where mandatory requirements are found in the CRDC Annual Report.

PGPA RULE REFERENCE	PART OF REPORT	DESCRIPTION	REQUIREMENT
17BE	Contents	Contents of annual report.	
17BE(a)	**Section 5:** People and governance, PIRD Act / PGPA Act.	Details of the legislation establishing the body.	Mandatory
17BE(b)(i)	**Section 5:** People and governance, Objects / Functions. **Section 7:** Appendices / Appendix 1 Australian Government priorities.	A summary of the objects and functions of the entity as set out in legislation.	Mandatory
17BE(b)(ii)	**Section 1:** Executive summary / Purpose. **Section 2:** CRDC business / Our operations.	The purposes of the entity as included in the entity's corporate plan for the reporting period.	Mandatory
17BE(c)	**Section 5:** Governance and accountability / Minister.	The names of the persons holding the position of responsible Minister or responsible Ministers during the reporting period, and the titles of those responsible Ministers.	Mandatory
17BE(d)	**Section 5:** Governance and accountability / Ministerial directions.	Directions given to the entity by the Minister under an Act or instrument during the reporting period.	None to report
17BE(e)	**Section 2:** CRDC business / Government and accountability. **Section 5:** Governance and accountability / Policies, procedures and charters.	Any government policy order that applied in relation to the entity during the reporting period under section 22 of the Act.	None to report
17BE(f)	**Section 5:** Governance and accountability.	Particulars of non-compliance with: a direction given to the entity by the Minister under an Act or instrument during the reporting period; or a government policy order that applied in relation to the entity during the reporting period under section 22 of the Act.	None to report
17BE(g)	**Section 1:** Executive Summary / Progress against CRDC Strategic R&D plan 2022-2023: Our Performance Statement.	Annual performance statements in accordance with paragraph 39(1)(b) of the Act and section 16F of the rule.	Mandatory

17BE(h), 17BE(i)	**Section 5:** Governance and accountability / significant events & Significant changes in the state of affairs.	A statement of significant issues reported to the Minister under paragraph 19(1)(e) of the Act that relates to non-compliance with finance law and action taken to remedy non-compliance.	None to report
17BE(j)	**Section 1:** Report from the Chair and Executive Director / Certification by the Executive Director. **Section 5:** Governance and accountability. Statement by the accountable authority, Executive Director and Chief Financial Officer.	Information on the accountable authority, or each member of the accountable authority, of the entity during the reporting period.	Mandatory
17BE(k)	**Section 5:** Governance and accountability / CRDC Employees.	Outline of the organisational structure of the entity (including any subsidiaries of the entity).	Mandatory
17BE(ka)	**Section 5:** Governance and accountability / CRDC Employees.	Statistics on the entity's employees on an ongoing and non-ongoing basis, including the following: • statistics on full-time employees; • statistics on part-time employees; • statistics on gender; • statistics on staff location (i.e. location, of staff on the State or Territory of employment).	Mandatory
17BE(l)	**Section 1**: About CRDC, Our Role.	Outline of the location (whether or not in Australia) of major activities or facilities of the entity.	Mandatory
17BE(m)	**Section 5:** Governance and accountability.	Information relating to the main corporate governance practices used by the entity during the reporting period.	Mandatory
17BE(n), 17BE(o)	**Section 5:** Governance and accountability / Contractors and consultants / Payment to a Representative Body. **Section 6:** Financial Statements.	For transactions with a related Commonwealth entity or related company where the value of the transaction, or if there is more than one transaction, the aggregate of those transactions, is more than $10,000 (inclusive of GST): the decision-making process undertaken by the accountable authority to approve the entity paying for a good or service from, or providing a grant to, the related Commonwealth entity or related company; and the value of the transaction, or if there is more than one transaction, the number of transactions and the aggregate of value of the transactions.	If applicable, mandatory

17BE(p)	**Section 5:** Governance and accountability / Significant events / Significant changes in the State of Affairs.	Any significant activities and changes that affected the operation or structure of the entity during the reporting period.	None to report
17BE(q)	**Section 5:** Governance and accountability / Judicial decisions.	Particulars of judicial decisions or decisions of administrative tribunals that may have a significant effect on the operations of the entity.	None to report
17BE(r)	**Section 5:** Governance and accountability.	Particulars of any reports on the entity given by: the Auditor-General (other than a report under section 43 of the Act); or a Parliamentary Committee; or the Commonwealth Ombudsman; or the Office of the Australian Information Commissioner.	None to report
17BE(s)	**Section 5:** Governance and accountability.	An explanation of information not obtained from a subsidiary of the entity and the effect of not having the information on the annual report.	None to report
17BE(t)	**Section 5:** Governance and accountability/Indemnities and insurance premiums for Directors and officers.	Details of any indemnity that applied during the reporting period to the accountable authority, any member of the accountable authority or officer of the entity against a liability (including premiums paid, or agreed to be paid, for insurance against the authority, member or officer's liability for legal costs).	None to report
17BE(taa)	**Section 5:** Governance and accountability / Audit Committee.	The following information about the audit committee for the entity: • a direct electronic address of the charter determining the functions of the audit committee; • the name of each member of the audit committee; • the qualifications, knowledge, skills or experience of each member of the audit committee; • information about each member's attendance at meetings of the audit committee; • the remuneration of each member of the audit committee.	Mandatory
17BE(ta)	**Section 5:** Governance and accountability / Key Management Personnel	Information about executive remuneration.	Mandatory

NB: Section 17BF of the PGPA Rule is not applicable to CRDC.

CRDC

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