CRDC

STRATEGIC RD&E PLAN
2023-2028

CLEVER COTTON

Our strategy for a sophisticated,
prosperous Australian cotton industry
connected through its value chain,
delivering sustainable cotton.

CRDC

Acknowledgement of Country

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

Introduction

It is our great pleasure to introduce the CRDC Strategic RD&E Plan 2023-2028. Anchored to a vision of a sophisticated, prosperous cotton industry, connected through its value chain and committed to holistic sustainability, the plan embodies the breadth and depth of thinking and the courage of aspirations of our stakeholders.

From the CRDC Chair

Built on the foundations of Paddock, People and Planet, this plan has a significantly different look and feel to previous plans as we move from a project-centric approach to a five-year plan based around larger programs of work. In part, this shift helps us remain focused on delivering solutions to big challenges, such as ensuring system sustainability while stretching the limits of its performance, utilising the burgeoning capability that the data and digital world is throwing at us to close the immense physical gap between our producers and our customers, and ensuring that our wonderful industry built on a relentless pursuit of continuous improvement remains nimble and agile in the face of a dynamic external environment. But this shift also aims to ensure, as an organisation, we remain focused on maximising our impact by optimising the output of the human and capital resources we intend to invest across the life of this plan.

However, while this plan may look different in many ways to its predecessors, it also unashamedly retains those elements that have proven so successful in delivering sustained industry excellence over such an extended period of time. Those attributes of authentic collaboration driven by curiosity, a deep-seated respect for disciplined adoption and a generous willingness to share our learnings have created an ecosystem of excellence that is admired both here and abroad, and they remain vital to the delivery of the ambitious goals enunciated herein.

Richard Haire
CRDC Chair

From the CRDC Executive Director

The challenges facing the Australian cotton industry have arguably never been as great or as complex as they are today. Climate change and extremes in both temperature and water availability are impacting our farms, global trade instability is impacting our supply chains, and concerns globally about the way agricultural products are produced and the need to provide confidence and evidence relating to farming practices are impacting our markets.

The greatest challenges, though, offer the greatest opportunities for change, innovation, and decisive leadership: three character traits synonymous with the Australian cotton industry. Clever Cotton, CRDC's new Strategic RD&E Plan, provides a pathway for the cotton industry to address these and other complex systems issues. Our vision for the future is to create a sophisticated and prosperous cotton industry: one that seizes opportunities through advances in science and technology, harnesses the creativity of people, and reimagines our farming practices to deliver more sustainable cotton.

CRDC's purpose is to grow the sustainable future of cotton through innovation with impact. Through Clever Cotton, we will be working closely with growers, researchers and innovators to deliver real results. Our plan is bold and ambitious, and will address complex problems using innovation and co-design. It's a comprehensive roadmap to ensure the future success of Australian cotton through world-leading RD&E.

Dr Ian Taylor
CRDC Executive Director

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Clever Cotton

Our vision

Clever Cotton, CRDC's Strategic Research, Development and Extension (RD&E) Plan for 2023-2028, sets out our vision for a sophisticated, prosperous and sustainable Australian cotton industry that is strongly connected to its value chain.

This bold plan defines what CRDC aims to achieve over the next five years and what we will do to get there. The strategy recognises that our industry operates in uncertain times and needs 21st-century approaches to overcome 21st-century challenges.

Clever Cotton commits CRDC to invest in RD&E to address and capitalise on challenges and opportunities for the benefit of levy payers, the cotton industry and the wider community.

The strategy is aligned to the Australian cotton industry's sustainability framework, which recognises sustainability is integral to the industry's future success and provides a pathway for the entire industry.

Clever Cotton charts an ambitious new course through three pillars of investment – PADDOCK, PEOPLE, PLANET – drawn from the sustainability framework. Each pillar contains three themes, creating nine key investment areas. By adopting this model, our RD&E will focus on industry priorities – be they emerging issues or long-term challenges – to leverage higher investment returns and champion solutions to deliver the greatest impact.

We will deliver the plan by putting our values at the centre – to be bold, collaborative, future focused, and trusted.

Through this plan, our industry will thrive by:

+ increasing its productivity and profitability
+ sustainably addressing the impacts of climate change
+ improving decision making using data and digital technologies.

Our goal is to add an additional $1 billion in economic value to the Australian cotton industry over the next five to ten years.

CRDC will collaborate with current and new partners to achieve Clever Cotton's substantial aspirations and our strategic goals.

Clever Cotton was developed with and endorsed by the cotton industry to strengthen Australian cotton's position as a global leader and to secure our industry's future.

Clever Cotton

A sophisticated, prosperous cotton industry, connected through its value chain delivering sustainable cotton.

PURPOSE

Grow the sustainable future of cotton through innovation with impact.

VALUES

Bold, collaborative, future-focused and trusted.

MISSION

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

PLAN

Paddock:
Our future fields

+ Data-driven decisions
+ Adaptive systems
+ Connected market intelligence

People:
Central to our success

+ Design and innovation
+ Leadership and capacity
+ Adoption and impact

Planet:
Our shared future

+ Natural capital
+ Carbon
+ Circular economy

Clever Cotton

CRDC's role

CRDC exists to grow the sustainable future of cotton through innovation with impact (our purpose). We deliver world-class RD&E outcomes for the cotton industry through thought leadership, innovation, and adoption through collaboration and partnership (our mission).

Cotton growers are at the heart of what we do: they determine our RD&E priorities and co-fund our research through a grower levy, matched by Commonwealth contributions.

In many ways, the Australian cotton industry has never been stronger. Built on the foundations of CRDC's RD&E and a culture of innovation, adoption and collaboration, our industry is more resilient, diverse, sustainable, and profitable than ever.

Cotton is a major contributor to the nation's economic, environmental, and social fabric. According to the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), from 2022-23 the value of exported cotton is expected to be close to $7 billion, making cotton the third-ranking agricultural export commodity. Australia's cotton is among the best and most sustainable in the world, thanks in part to the RD&E that underpins it. Compared to 1992, Australian cotton growers use 97 per cent less insecticides,

52 per cent less water, and 34 per cent less land to grow a bale of cotton.

Cotton employs more than 12,000 people across 150 rural and regional communities, many of which rely heavily on cotton for their economic prosperity and viability. Each year, Australia grows enough of this high-quality natural fibre to clothe 500 million people. Australian cotton production is increasing and expanding into new regions.

Innovative and adaptive growers, supported by RD&E and world-leading researchers, have driven Australian cotton's success. However, the world is changing rapidly, and our industry faces serious, complex challenges – locally and globally.

Major strategic forces will profoundly affect our industry in the decades ahead. These pressures will test the industry's continued resilience and success: a changing climate, demographic shifts, digital disruption, evolving consumer expectations, automation, geopolitical unrest, urbanisation, and the rising demand for resources.

CRDC's role – investing in RD&E as a catalyst for progress, innovation and adoption – will become increasingly important as Australian cotton works to meet these strategic challenges.

To achieve this, CRDC must evolve our investment approach to become more agile and better support the industry as the rate and breadth of change increase. To facilitate greater adaptability, CRDC will become a broker of research investment and partner in developing innovative industry practices. We will work closely with Cotton Australia, our representative organisation, from whom we seek advice on industry research priorities.

Collaboration and partnerships

CRDC developed Clever Cotton in collaboration with the cotton industry – and collaboration will underpin the strategy's delivery.

To achieve our vision, CRDC will work closely with the following:

Cotton growers and the Cotton Australia research advisory panels to identify RD&E priorities (guided by CRDC's stakeholder engagement plan), co-design research, and implement and adopt research outcomes

National and international researchers and research organisations to deliver RD&E projects

Cotton Australia on the industry's research priorities, the best practice program (*my*BMP), national sustainability initiatives, and the Cotton to Market program

Cotton Seed Distributors (CSD) and Cotton Australia, on the industry's extension program, CottonInfo

Agriculture Innovation Australia and our fellow **rural research and development corporations (RDCs)** on cross-sectoral projects

And **new partners and investors** to deliver solutions faster.

Industry-defining challenges confront Australian agriculture, and they demand novel approaches to collaborative innovation. Incremental cotton-focused strategies are still important; however, to achieve real change and meet the expectation of a $100 billion agricultural sector, RD&E needs to deliver transformational changes to respond to shifting community expectations around production, sustainability, and the environment.

Consequently, Clever Cotton does things differently and will involve different partners. New industry and commercial partnerships will help CRDC deliver Clever Cotton to address complex problems facing agriculture, including climate change, sustainability, digital disruption and biosecurity. CRDC will broker research investment and work with external investors to deliver better solutions more rapidly for Australia's cotton growers.

Clever Cotton

Challenges and opportunities

The Australian cotton industry and strategic thinkers from diverse fields helped CRDC to create Clever Cotton. In developing this strategy, the CRDC team, our partners and collaborators explored our context and identified the forces Australian cotton must understand and overcome to prosper and remain sustainable.
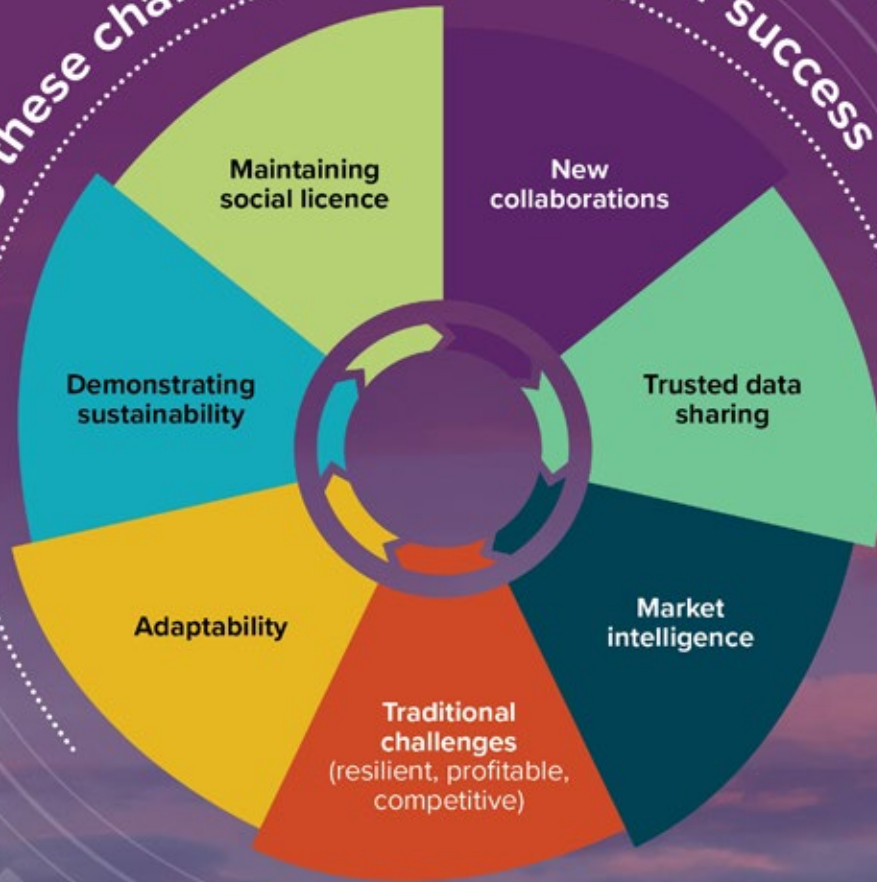
Scenario planning challenged us to think differently about the future. Participants imagined alternative realities in a changing world. In the scenario planning workshop, participants identified that growing and succeeding will become more difficult because of increasing challenges for Australian cotton. Traditional obstacles to improving productivity and profitability through managing cotton quality, pests and other environmental threats remain. But at the same time, participants identified new challenges and pathways to success and strongly agreed on critical success factors — adaptability, demonstrating sustainability, new collaborations, data, and community and stakeholder trust.

The CRDC team used **horizon scanning** to examine industry trends, risks, customer needs, competitors, our marketplace, and DNA. That helped us determine key actions towards future-proofing the strategy.

We also explored the **megatrends** identified by the CSIRO, Australia's national science agency, that point to the major challenges and opportunities for the next 20 years.

Clever Cotton responds directly to these challenges and opportunities.

Solving these challenges is critical to our success

Maintaining social licence

New collaborations

Demonstrating sustainability

Trusted data sharing

Adaptability

Market intelligence

Traditional challenges
(resilient, profitable, competitive)

common to all scenarios

Clever Cotton

Our environment in context

The challenges and opportunities for Australian cotton identified through extensive consultation.

SCENARIO PLANNING

+ Adaptability
+ Attracting talent
+ Competitiveness
+ Maintaining social licence
+ Data
+ Demonstrating sustainability
+ New collaborations
+ Novel uses for cotton
+ Profitability
+ Resilience
+ Self-sufficiency
+ Trust

HORIZON SCAN

+ Biosecurity
+ Carbon-neutral agriculture
+ Climate and water
+ Farm: Labour, automation, research gaps, resilience, capability, research
+ Making the cotton supply chain more competitive
+ New tools and technology
+ Partnering for success
+ The product (*my*BMP, traceability, data)

2028
and beyond

PROFITABLE AND SUSTAINABLE

CONSULTATION

+ Australian cotton growers
+ Cotton Australia
+ Cotton Australia grower advisory panels
+ Cotton Grower Associations
+ The Department of Agriculture, Fisheries and Forestry
+ The Minister for Agriculture, Fisheries and Forestry
+ The Cotton Innovation Network
+ The Australian Cotton Industry Forum

Cotton research partners, including:

+ CSIRO
+ NSW Department of Primary Industries
+ Queensland Department of Agriculture and Fisheries
+ Universities
+ The private sector

Other industry bodies and partners, including:

+ CSD
+ CottonInfo
+ Crop Consultants Australia
+ Australian Cotton Shippers Association
+ Grains Research and Development Corporation

MEGATRENDS

Leaner, cleaner and greener

Adapting to climate change

The escalating health imperative

Geopolitical shifts

Diving into digital

Increasingly autonomous

Unlocking the human dimension

CRDC

Clever Cotton:

Our plan to deliver $1 billion in additional value to the Australian cotton industry

Clever Cotton

Snapshot: CRDC's Strategic RD&E Plan 2023-2028

Paddock
Our future fields

People
Central to our success

Planet
Our shared future

Data-driven decisions

Objective
Improve productivity, profitability, and sustainability by accurately monitoring and measuring every field on every cotton farm.

Impact
In 2028, a transparent and trusted data platform will deliver increased profitability and productivity through better decision-making, facilitating innovative research, and building trusted engagement.

Design and innovation

Objective
Embed collaboration in RD&E prioritisation, design, development, and adoption.

Impact
In 2028, growers can see RD&E addressing their problems and creating practical solutions to be adapted and adopted into their production systems.

Natural capital

Objective
Implement resilient natural capital practices that support productivity, help maintain biodiverse ecosystems, strengthen capacity for adaptation to climate change, and progressively improve regional water, land and soil quality.

Impact
In 2028, cotton farms have maintained and enhanced natural capital and are more resilient to shocks.

Adaptive systems

Objective
Grow the profitability and resilience of Australian cotton-farming systems through innovative solutions, technologies and practices.

Impact
In 2028, Australian cotton-farming systems are resilient, biosecure, and able to thrive in an increasingly variable climate with enhanced resource efficiency.

Leadership and capacity

Objective
Develop people and skills to support industry RD&E.

Impact
In 2028, the development of world-class research capability supports industry goals.

Carbon

Objective
Establish a sustainable low-carbon cotton production system for a changing future.

Impact
In 2028, the cotton industry meets market, community and government expectations for carbon.

Connected market intelligence

Objective
Enhance the sustainability, market access and diversity, and value of Australian cotton.

Impact
In 2028, Australian cotton growers are preferred suppliers of sustainable cotton.

Adoption and impact

Objective
Adopt knowledge and technology through dedicated development and delivery pathways.

Impact
In 2028, adoption has increased its rate, reach and effectiveness.

Circular economy

Objective
Develop the circular economy for Australian cotton.

Impact
In 2028, the cotton industry can participate in the circular economy, providing lasting end-of-life solutions for cotton textiles.

Clever Cotton: Our plan

Clever Cotton commits CRDC to investing across nine themes to achieve our vision and to deliver the greatest impact and best outcomes for growers (levy payers), our industry and the wider community. The three pillars and nine themes are distinct and interconnected. Each supports the other while directly targeting bold strategic priorities and outcomes to meet the ambitions of the cotton industry and our communities.

Our industry's sustainability framework PLANET. PEOPLE. PADDOCK unites the plan, reaffirming Australian cotton's commitment to being a global leader in sustainable production. The critical importance of addressing sustainability to maintain the community's trust in the industry and in ensuring market access was a recurring theme during scenario planning and horizon scanning. Overseas jurisdictions – ultimately, Australian cotton's markets – are starting to regulate the environmental and social impacts of textile production all the way back to raw material production.

Because producing more sustainable cotton is a shared responsibility, PLANET. PEOPLE. PADDOCK provides a collaborative framework for the industry.

While sustainable production is critical for the industry's future, CRDC recognises its core role as supporting the productivity and profitability of the cotton industry, ensuring that we address the key production risks, and ensuring that Australian cotton is highly sought after in the global market. This is why the Paddock pillar is the leading pillar in our plan.

Clever Cotton will use a new program framework for RD&E investments. Until now, CRDC's RD&E investments have been largely component based, and our industry has prospered. However, the increasing complexity of 21st-century challenges and the growing competitiveness to find solutions demand a more sophisticated approach to ensure ongoing success.

Programs enable CRDC to focus on delivering large-scale desired outcomes that provide better solutions for complex problems and have a greater impact for the industry.

CRDC recognises that not every project will necessarily be part of a program; however, using a program approach to deliver big-picture outcomes will result in more effective RD&E. Greater emphasis and support will be given to ensure that researchers within a program can collaborate and share their results with each other and the broader industry. Similarly, more formal connections will be made between programs.

CRDC's framework will help our industry to look ahead across boundaries through to the longer term and act with more agility, integration, and innovation. **The Design and innovation** theme's founding principle is that collaboration drives prioritisation, development, and adoption.

It will support Australian cotton to understand and leverage links and dependencies between complex systems and their components. Our industry will be able to innovate faster and unlock solutions to difficult, long-term problems.

The plan will enhance cotton's adoption pathways and capacity to identify and leverage commercial opportunities for the benefit of the industry. We will look beyond 2028 to tackle more complex challenges.

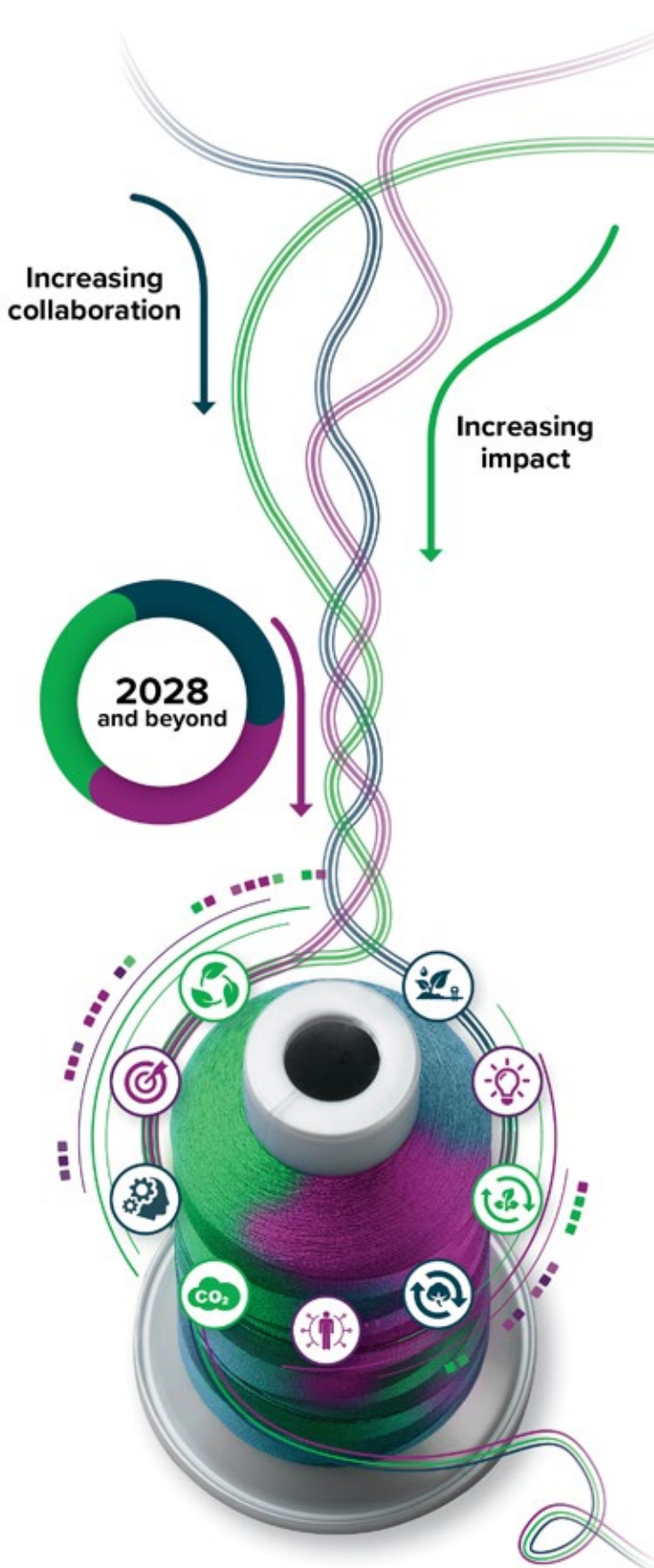Crucially, stakeholder reference groups will inform our progress to 2028.

Paddock

+ Data-driven decisions
+ Adaptive systems
+ Connected market intelligence

People

+ Design and innovation
+ Leadership and capacity
+ Adoption and impact

Planet

+ Natural capital
+ Carbon
+ Circular economy

Increasing collaboration

Increasing impact

2028 and beyond

Glossary

+ **Pillar:** Paddock, People, and Planet are the three pillars of Clever Cotton, drawn from PLANET. PEOPLE. PADDOCK, the three pillars of Australian cotton's sustainability framework.

+ **Theme:** The title and objective of the investment area. Each of Clever Cotton's pillars has three themes.

+ **Impact statement:** A short description of the impact CRDC will deliver through investing in the theme.

+ **Outcomes:** A short description of the outcomes that CRDC will achieve, resulting in the desired impact.

+ **Initiatives:** A broad description of the potential areas of investment and resulting activities.

+ **Program:** An RD&E investment framework that links investments and researchers to achieve a common goal under the Clever Cotton themes.

Alignment with UN Sustainable Development Goals

2 ZERO HUNGER

6 CLEAN WATER AND SANITATION

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

15 LIFE ON LAND

17 PARTNERSHIPS FOR THE GOALS

Paddock:
Our future fields

'Paddock' is the first pillar under Clever Cotton. It focuses on the on-farm cotton system. The themes of the Paddock pillar – **Data-driven decisions; Adaptive systems; and Connected market intelligence** – unite data and insights to support thriving cotton farms producing a premium product being demanded by the market.

CRDC will measure its success in this pillar by the economic value the three themes add to the industry over the next five to ten years. CRDC's 2028 target for added value is $1 billion.

Data-driven decisions

In 2028, a transparent and trusted data platform will deliver increased profitability and productivity through better decision-making, facilitating innovative research, and building trusted engagement.

Adaptive systems

In 2028, Australian cotton-farming systems are resilient, biosecure, and able to thrive in an increasingly variable climate with enhanced resource efficiency.

Connected market intelligence

In 2028, Australian cotton growers are preferred suppliers of sustainable cotton.

Paddock

Data-driven decisions

Objective
Improve productivity, profitability, and sustainability by accurately monitoring and measuring every field on every cotton farm.

Impact
In 2028, a transparent and trusted data platform will deliver increased profitability and productivity through better decision-making, facilitating innovative research, and building trusted engagement.

Measures

+ Yield per hectare
+ The value of data analysis and insights created from the management and production data captured in the industry data platform

Across agriculture and its supply chains, the demand for and value of data to describe, measure and monitor the production and processing of commodities is growing rapidly. Agriculture is on the cusp of a new digital wave, with the vast majority of digital transformation still to come.

A substantial amount of data are already collected and stored on farms and through the supply chain. However, the cotton industry needs more comprehensive, consistent, trustworthy, and reliable data that is centralised and linked to take full advantage of these opportunities.

Within the **Data-driven decisions** theme, CRDC will significantly increase its investment in data collection, management and analysis to help lead the industry's digital transformation. CRDC will develop a transparent and trusted industry-owned data platform of management and production data. CRDC has already invested in data collection and automation through pilot programs, and the industry trusts us in this role.

By collecting, sharing, managing and analysing the data, CRDC aims to find solutions to complex industry problems. More innovative research and greater trust and engagement across the farm and the supply chain will result. Australian cotton growers will be able to increase their productivity and profitability through improved data collection and data-driven insights.

In developing the new data platform, CRDC will also focus on the data layers and digitised farm data required to support the transition from equipment automation to intelligent autonomous farm operations. This process may identify important gaps in data and automation. Therefore, this theme will also focus on producing and deploying novel and existing surveillance and diagnostic tools to address data gaps. This theme will also establish and implement a digital strategy for Australian cotton in partnership with industry stakeholders. It will provide the industry with clear and cohesive management guidelines to encourage participation and sharing, and to position Australian cotton as the leader in data best practice. It will also greatly benefit growers by reducing demands on their time.

As well as delivering these outcomes, the data and insights generated by this theme will play a crucial role in the planning, progression and achievement of all themes of Clever Cotton.

Outcomes

+ By 2023, a digital strategy for the Australian cotton industry is established

+ By 2025, a transparent and trusted industry-owned data platform of management and production data to support decision-making across the value chain is available

+ By 2026, management and production data are captured for 50 per cent of fields in the cotton industry

+ By 2027, new and existing surveillance and diagnostic tools that allow for more timely identification of threats and constraints are developed and deployed

+ By 2028:
  - Data are collected, shared, managed and analysed to solve industry problems at both a farm scale and a regional scale
  - Growers obtain greater productivity through improved analysis and insights of management and production data
  - Input costs and resource constraints are reduced through improved understanding and more timely decision-making
  - Yield improvement is maintained at 3 per cent year on year

Example initiatives

+ Delivery of better solutions to growers through the establishment of an industry data platform that harmonises data and facilitates new research approaches and insights

+ Deployment of best practice data sharing and privacy agreements for industry use

+ Leadership of industry data standardisation and sharing initiatives

+ Automated solutions for on-farm data collection through strategic partnerships and the creation of shared value

Paddock

Adaptive systems

Measures

+ The value of the systems solutions created to address the challenges of disease, sustainable industry expansion, adaptation to climate change, biosecurity threats and reduced availability of inputs

The **Adaptive systems** theme aims to equip Australian cotton growers with production solutions to thrive in an increasingly complex future.

RD&E has been a key driver to expansion, boosting yields, cutting production costs, and improving sustainability.

Our industry faces escalating threats and pressures that will affect how, where, and how much cotton we produce. Among these challenges is the need to adapt to a changing climate, grow more cotton with fewer inputs, remain resilient to changing and new disease, pest and weed challenges, and respond to and meet market and community expectations on sustainability.

To ensure the long-term profitability and resilience of our cotton farms, the industry needs to develop adaptive farming systems and support faster adoption of new solutions, technologies, and practices.

By looking at farms as true systems and not isolated aspects of farming, CRDC will target RD&E across four integral sub-themes: **Solving farming systems constraints** (water, agronomy, climate change); **Disease**; **Biosecurity**; and **Northern Australia**. The sub-themes will prioritise investments for the greatest impact to help:

+ Growers respond to a future requiring enhanced resource efficiency with better adapted cotton plants and systems > **Solving farming systems constraints (water, agronomy, climate change)**

+ Reduce the economic impacts of current and emerging diseases of cotton > **Disease**

+ Build biosecure, pest-suppressive farming systems to cope with challenges (exotics, resistance, species shift) > **Biosecurity**

+ Support establishing a sustainable and profitable cotton-farming system in Northern Australia > **Northern Australia.**

The **Adaptive systems** theme will help ensure our cotton-farming systems continue to be profitable and resilient. This theme will build on and influence other Clever Cotton themes, especially **Data-driven decisions** and **Connected market intelligence**.

Outcomes

+ By 2028, economic impacts of current and emerging cotton diseases are cut to less than 5 per cent of the cost of production through practice change underpinned by efficient and collaborative RD&E

+ By 2028, a pest-suppressive farming system is established that is better able to cope with challenges (exotics, resistance, species shift) while meeting community expectations about less relience on pesticides

+ By 2028, a sustainable and profitable cotton-farming system is established in Northern Australia

+ By 2028, on-farm profitability is supported, and key challenges addressed while also enabling the achievement of sustainability metrics

+ By 2033, cotton-farming systems are better adapted to the future – limited water, more variable and extreme climate, and input constraints

Example initiatives

+ Technologies and systems to enhance resource efficiency under future climates, such as cover cropping, soil polymers, plant hormones, and synthetic biology

+ Novel integrated farming system solutions for more precise management to optimise inputs within the field

+ A comprehensive national disease program based on strong partnerships to deliver improved understanding of the impact of disease, foundational pathology resources and capability, tactical management, and a pipeline of technology solutions

+ Pest and weed management strategies and technologies that enable industry to meet sustainability objectives, respond to emerging crop protection issues, and prepare for new biosecurity threats

+ Development of a sustainable cotton, grain, and cattle farming system program for Northern Australia

Paddock

Connected market intelligence

Objective

Enhance the sustainability, market access and diversity, and value of Australian cotton.

Impact

In 2028, Australian cotton growers are preferred suppliers of sustainable cotton.

Measures

+ Percentage of Australian cotton sold as more sustainable (as defined by the market)

Retailer, brand, community and investor expectations are evolving. As well as high-quality products, they are demanding better organisational transparency, the adoption and independent certification of more sustainable and ethical practices, and evidence of reductions in environmental impact. Some jurisdictions have already regulated aspects of the textile supply chain. This move to greater regulation and supply chain due diligence will continue and reach back to raw material production, including cotton farming.

As Australia exports 99.9 per cent of its cotton, it will be directly affected by these changing expectations. While Australia's high-quality product has a sound reputation and earns a price premium maintaining and growing market access and diversity will require understanding and adapting to a more regulated and transparent commodity value chain.

It will also require the ability to understand and respond to market definitions of what is considered 'more sustainable' cotton. The current approach focuses on distinguishing between so-called conventional cotton, and more sustainable cotton produced and certified according to a defined standard, such as *my*BMP.

To meet future market needs, the Australian cotton industry must anticipate and respond to future expectations about the definition of sustainable cotton production, and be able to provide accurate and representative data about Australian production practices. The industry will need to provide impact and production data from the farm to the port. The **Connected market intelligence** theme aims to address this need and ensure the industry prepares and profits through preferred market access.

Under this theme, CRDC will work with Cotton Australia to establish a system to improve two-way information flows between the Australian cotton industry and the value chain. Such a system will help the industry monitor, identify, understand and respond to value chain needs. This greater knowledge will prepare the Australian cotton industry to meet emerging market expectations and regulations. It will also identify potential market barriers and improve the industry's capacity to influence, mitigate and overcome them.

Transparent information will enhance trust in the industry and help it to confidently respond to retailer, brand, community, and investor needs and demands. Cotton growers will benefit from better intelligence around production practice expectations, and CRDC will invest in the research needed to support growers as they adapt to these expectations.

CRDC will work with the Cotton to Market program to provide the evidence for Australian cotton as a world-leading sustainable material choice. Consumers will be able to make more informed choices, and the Australian cotton industry will be able to maximise the value of its high-quality, sustainable cotton.

This theme will build on and influence other Clever Cotton themes, including **Data-driven decisions, Adaptive systems, Natural capital, Carbon**, and **Circular economy**. It will also be closely connected to the industry's PLANET. PEOPLE. PADDOCK. Sustainability Framework. It will engage with other agricultural industries (especially grains) to ensure a consistent approach to collecting and reporting sustainability metrics across the many commodities that cotton growers produce.

Outcomes

+ Ongoing: the industry understands and can respond to the information needs of its value chain

+ By 2024, the industry is prepared for changing market needs and market diversification opportunities

+ By 2025, the value chain understands and considers the unique attributes of agriculture when determining what is meant by 'sustainable cotton'

+ By 2028, Australian cotton exceeds the expectations of retailers and brands that source sustainable cotton

+ By 2030, 80 per cent of Australian cotton is sold as more sustainable (as defined by the market)

Example initiatives

+ Engagement with global forums to influence the definition of sustainable cotton production

+ *my*BMP meets the needs of growers, retailers, brands, community and investors

+ Position Australian cotton to meet emerging market needs, e.g. recyclability and durability

+ Business models to support equitable sharing of the value created by more sustainable cotton production

+ Incorporation of supply chain information needs into the industry's data collection systems

+ Trusted sharing of industry information along the value chain

People:
Central to our success

'People' is the second pillar under Clever Cotton. It recognises that people are central to cotton's success. The themes of the People pillar – **Design and innovation; Leadership and capacity;** and **Adoption and impact** – ensure that in developing our world-class research capability, we are providing practical RD&E solutions and increasing the reach and impact of adoption.

We will measure our success in this pillar by the level of satisfaction in CRDC by growers and research partners.

Design and innovation

In 2028, growers can see RD&E addressing their problems and creating practical solutions to be adapted and adopted into their production systems.

Leadership and capacity

In 2028, the development of world-class research capability supports industry goals.

Adoption and impact

In 2028, adoption has increased its rate, reach and effectiveness.

People

Design and innovation

> **Objective**
>
> Embed collaboration in RD&E prioritisation, design, development, and adoption.
>
> **Impact**
>
> In 2028, growers can see RD&E addressing their problems and creating practical solutions to be adapted and adopted into their production systems.

Measures

+ Growers acknowledge the utility of solutions and technologies developed through CRDC investment

+ Progression of innovations through Technology Readiness Levels (TRLs) tracked

In every sector, it is the people who generate innovation. As industries tackle more complex and competing forces in coming years, people will be called upon to problem-solve, innovate and respond faster to challenges. Performance and success will be affected by two factors – the way organisations are structured and the extent to which their processes nurture innovation. Under Clever Cotton, the shift to a program approach aims to fuel innovation and deliver transformative change.

The **Design and innovation** theme underpins Clever Cotton's new strategic direction. It seeks to embed design methodologies and innovative approaches within processes, and to set collaboration as the foundation for the prioritisation, design, development, and adoption to progress change.

It incorporates a more intentional selection of science-led, grower-led or co-design approaches for progressing and delivering solutions. This shift will help the industry better understand the nature of changes needed across systems in all theme areas.

This theme will support processes that enable growers, researchers and industry stakeholders to develop pathways to change. Each theme will have a multi-stakeholder program reference group to provide diversity and a systems perspective. Program Managers (CRDC's Innovation Brokers), researchers and growers will contribute to the program's objectives and consider the environment to support change. They will pilot and test ideas and have more knowledge about the implications of systems.

The framework will enable solutions to be co-designed, tested and integrated within programs. It will focus investment decisions and help researchers better understand end-user needs and how the design and function of solutions would be used in the real world.

It will also support the setup, data collection, analysis and interpretation of on-farm RD&E and production data. Integrating data from growers and on-farm trials will improve gap analysis and the adaptation and impact of technology solutions. It will also enhance the ability to identify linkages between and across all programs.

The theme will use a systems approach to acknowledge the commercial environment where any changes are needed. It will enable Australian cotton to be more agile, work across silos, enhance partnerships, and support cross-industry action to address complex problems more effectively.

Outcomes

+ By 2024, processes that enable growers, researchers and industry stakeholders to develop pathways to change are supported and encouraged

+ By 2025, innovations are delivered through clear pathways to impact

+ By 2026, ideas are co-designed, tested and integrated within programs

+ By 2026, on-farm RD&E is supported and production data shared

Example initiatives

+ Capability building for program teams to apply design and development-led innovation methodologies

+ Linkage of on-farm experimentation and applied projects

+ Protocols to enable agile responses to design-led approaches

People

Leadership and capacity

Objective

Develop people and skills to support industry RD&E.

Impact

In 2028, the development of world-class research capability supports industry goals.

Measures

+ Research capacity is assessed and integrated into CRDC's new research programs

+ Industry capacity to lead change and contribute to the future of cotton and Australia's rural industries

Delivering world-class RD&E for the benefit of Australian cotton is the core business of CRDC via Clever Cotton. To achieve the plan, we must effectively build and maintain a diverse, world-class RD&E workforce, plus build leadership capability. The **Leadership and capacity** theme aims to do that.

This theme will help ensure the industry has access to the right skills and capacity to support research and development. Through the research capacity program, CRDC will provide clear signals to our research partners of the research and innovation capacity needs to address cotton research skills gaps and priorities. Continued collaboration across cotton and with Australia's rural industries will make it easier to quantify, understand and respond to current and future research needs.

It will also help ensure the industry has more diverse leaders with the skills and knowledge to lead change and drive sustainable prosperity. It will support future cotton leaders in priority areas: natural capital; WHS; diversity and inclusion; and cultural change. Investments in this theme will help the industry address barriers to diversity and engage on important issues, including cultural change.

By strengthening the capacity of our RD&E workforce and supporting future leaders, Australian cotton will be able to solve complex challenges for thriving and resilient cotton communities.

CRDC has previously invested in research to explore workforce needs, future skills and best practice, the outputs of which are implemented through Cotton Australia. While not explicit in this plan, CRDC will consider further research in workforce should additional research questions remain that will deliver impact for the industry.

Outcomes

+ By 2028, the industry has access to the right skills and capacity to support research and development

+ By 2028, CRDC partners to invest in leadership programs to support more diverse leaders with the skills and knowledge to lead change and drive sustainable prosperity

Example initiatives

+ Mapping of current and future RD&E capability requirements in collaboration with partners

+ Research capacity-building programs, including programs to support early career researchers (PhD and undergraduate scholarships), travel scholarships and scientific exchanges

+ Research career development support through better awareness of the potential cotton industry career pipelines

+ A framework to support the learning and development of career researchers and technical staff

+ Engagement and participation of Indigenous and diverse Australians in cotton RD&E and leadership

People

Adoption and impact

<div>

Objective

Adopt knowledge and technology through dedicated development and delivery pathways.

Impact

In 2028, adoption has increased its rate, reach and effectiveness.

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Measures

+ Percentage of growers actively contributing to RD&E adaptation through regional trials and data collection

+ Percentage of growers actively engaged with RD&E programs

+ Percentage of growers recognise that CRDC and CottonInfo have contributed to improving their productivity and sustainability

Moving innovations from their source to widespread practice change on cotton farms is critical to delivering a prosperous and sustainable future. To meet the challenges ahead, cotton growers will benefit from the effective extension, adoption and, where applicable, commercialisation of beneficial outcomes of CRDC's research and development investments.

Australian cotton is uniquely placed within agriculture to connect research and best practice information with growers through the industry's joint venture extension program, CottonInfo. CRDC invests in CottonInfo in partnership with Cotton Seed Distributors and Cotton Australia.

CottonInfo is pivotal in building relationships between innovation stakeholders, including researchers, growers and commercial providers.

The **Adoption and impact** theme aims to build on that success and increase research adoption rate, reach and effectiveness.

Under this theme, we will continue collaborating to deliver a dynamic learning environment through the CottonInfo joint venture. Clever Cotton will see CottonInfo contributing to collaborative design through the new program structure, a greater emphasis on supporting solutions progress through technology readiness levels (TRLs) and the development of on-farm experimentation (OFE) to increase the utility of research outputs. When researchers and growers work together, we will improve research adoption pathways and ensure developments add value and meet the needs of growers.

This theme will connect industry extension capacity and support development activities and materials via dedicated technical leads. CottonInfo's technical leads are a valued conduit connecting researchers and cotton growers in regions.

It will also support capacity building and skills development to implement technology and innovation. It will help to ensure growers can adopt and apply research innovations and collaborate to benefit from co-design.

Outcomes

+ By 2026, research outcomes are integrated into on-farm practice change at a faster rate

+ By 2028, uptake of technology is maximised through a diverse range of adoption pathways and commercialisation processes

Example initiatives

+ Strategic partnerships with service providers to support large-scale on-farm experimentation

+ Mechanisms to communicate project progress to growers and stakeholders, e.g. grower-targeted videos of progress

Planet:
Our shared future

'Planet' is the third pillar under Clever Cotton. It recognises the importance of environmental sustainability in ensuring a successful future for the cotton industry. The themes of the Planet pillar – **Natural capital; Carbon;** and **Circular economy** – ensure that the cotton industry contributes positively to the environment, meeting community, government and market expectations.

CRDC will measure its success in this pillar by the level of trust the industry has from the community, the market and government about how it manages and reports on its environmental and social impacts.

Natural capital

In 2028, cotton farms have maintained and enhanced natural capital and are more resilient to shocks.

Carbon

In 2028, the cotton industry meets market, community and government expectations for carbon.

Circular economy

In 2028, the cotton industry can participate in the circular economy, providing lasting end-of-life solutions for cotton textiles.

Planet
Natural capital

Objective

Implement resilient natural capital practices that support productivity, help maintain biodiverse ecosystems, strengthen capacity for adaptation to climate change, and progressively improve regional water, land and soil quality.

Impact

In 2028, cotton farms have maintained and enhanced natural capital and are more resilient to shocks.

Measures

+ Condition and value of natural capital on cotton farms as measured by sustainability framework metrics

+ Higher community and stakeholder trust in the cotton industry as a responsible steward of natural capital

Research consistently shows that the Australian community's trust in agriculture is driven primarily by perceived environmental impacts and responsiveness to community concerns. As the pressures of climate change and habitat loss intensify, the Australian cotton industry must provide evidence of responsible management of its natural capital to avoid the risk of declining community trust, and to capture the benefits of increasing community acceptance. There is also a need for the Australian cotton industry to consider the cultural values and wisdom of Australia's Traditional Owners in the use and management of natural resources.

At the same time, Australian cotton-farming systems and their catchments benefit from the ecosystem services provided by natural capital. Good soil health, strong biodiversity, and clean air and water deliver significant tangible and intangible value, including boosting farm yields and reducing farm inputs.

The interactions between farming systems and the provision of ecosystem services are complex, and often involve trade-offs. It is critical there is a clear understanding of the costs, practicality and benefits (including the potential for payment) of enhancing natural capital.

The **Natural capital** theme aims to help cotton farms benefit from enhanced natural capital conditions and demonstrate their coordinated contribution to the resilience of regional communities and ecosystems.

To achieve this, CRDC will invest across three sub-themes: **Biodiversity and soils; Water;** and **Pesticides and nitrogen**. These sub-themes will target RD&E action to:

+ Protect and enhance ecosystems > **Biodiversity and soils**

+ Improve water-resource efficiency > **Water**

+ Minimise the environmental impacts of farming practices > **Pesticides and nitrogen.**

The Natural capital theme will help the industry identify risks and motivate the adoption of best management practices to strengthen natural capital conditions. It will also help Australian cotton capture and quantify condition changes to demonstrate benefits.

Through the delivery of this theme, Australian cotton will be stronger, with enhanced natural capital and the capacity to confirm and communicate its contributions to the resilience of

regional communities and ecosystems. As well as delivering these benefits, the outcomes of the Natural capital theme will play a crucial role in Clever Cotton overall.

Outcomes

+ By 2025, biodiversity and soils are benchmarked and industry has consistent supporting metrics and methodologies for reporting

+ By 2026, the industry has agreed strategies for:

  1. supporting growers to enhance and maintain biodiversity and soil condition and to be more resilient to impacts
  2. managing pesticide and nitrogen movement risks
  3. delivering co-benefits of regional water management for multiple water holders

+ By 2028, growers are quantifying changes in condition in natural capital on farm

+ By 2028, industry has improved management of pesticides and nitrogen movement

+ By 2028, losses in the water delivery system are reduced

+ By 2030, growers are enhancing and maintaining biodiversity and soil condition, and are more resilient to impacts

Example initiatives

+ Better data to improve decision-making and show how cotton farms create, preserve or erode natural capital value over time

+ Collaborate with natural resource management (NRM) bodies so that industry sustainability targets and indicators for natural capital reporting are established and aligned with regional NRM plans

+ Understand cultural values and climatic impacts on future regional water management

+ Reducing evaporative and conveyance losses of water, on and off-farm

+ Partner on knowledge and technology gaps needed for informed decision-making and solutions for better regional water management

+ Identify strategies for assessing pesticide and nitrogen movement and pathways to mitigate their impact

Planet

Carbon

Objective

Establish a sustainable low-carbon cotton production system for a changing future.

Impact

In 2028, the cotton industry meets market, community and government expectations for carbon.

Measures

+ Development of a clear pathway to carbon neutrality available to support industry targets
+ Improvement in nitrogen (N)-use efficiency, with N inputs matching plant demand across the rotation cycle
+ Development of regionally specific guidelines for on-farm carbon sequestration in soils or native vegetation

In response to climate change, more and more countries and industries are committing to transitioning towards carbon neutrality. In June 2022, the Australian Government affirmed Australia's commitment to net zero emissions by 2050, with a more ambitious interim target to reduce greenhouse gas (GHG) emissions by 43 per cent below 2005 levels by 2030.

Cotton production creates GHGs; Australian cotton is estimated to emit about 0.2 per cent of the country's annual GHG emissions. In the Australian Cotton Sustainability Framework, the cotton industry aspires to contribute to the Paris Agreement's aim for a climate-neutral world. To achieve this, growers need to reduce cotton production emissions — especially those associated with nitrogen (N) — and sequester carbon on-farm in the soil and vegetation. Through this **Carbon** theme, CRDC's RD&E investments will play a major role in helping growers meet this challenge.

The theme aims to help the cotton industry meet market, community and government expectations for carbon by helping to establish a sustainable low-carbon cotton production system.

It will help set baseline levels for the carbon content of soils, carbon potential, and soil health across cotton-farming systems. It will map potential pathways to carbon neutrality, and model the benefits of the practices and technologies available to achieve climate neutrality, which aligns with the PLANET. PEOPLE. PADDOCK ambitions to contribute to the Paris Agreement's aim for a climate-neutral world.

To enable long-term sustainable market access for Australian cotton, we need to understand and meet the demands of the supply chain and customers.

There is a need for significant innovation and research to contribute to the broad 2030 GHG emission reductions targets being set by the textile value chain.

Under this theme, CRDC will do three other things:

+ establish ways to reduce GHG emissions on cotton farms
+ define and describe pathways for carbon sequestration and capture on farms

+ improve understanding about managing soils for organic carbon and supporting soil health.

This theme will also help improve industry N-use efficiency by reducing fertiliser rates to match plant demand.

Through this theme, Australian cotton growers will have clarity on how to reduce their GHG emissions and have options to respond to a changing climate and market demands.

Outcomes

+ By 2023, CRDC has established partnerships to investigate options for reducing GHG emissions from broadacre agriculture production systems

+ By 2024, CRDC collaborates to collectively inform community expectations of broadacre agriculture's contribution to a sustainable and healthy production environment

+ By 2025, cotton growers have clarity on how to reduce their GHG emissions and have options to respond to a changing climate and market demands

Example initiatives

+ Establish industry GHG emissions and sequestration potential baselines in line with other agricultural industries

+ Low carbon footprint cotton farming systems

+ Develop novel solutions for N application and supply

Planet
Circular economy

Objective

Develop the circular economy for Australian cotton.

Impact

In 2028, the cotton industry can participate in the circular economy, providing lasting end-of-life solutions for cotton textiles.

Measures

+ The 'added value' developed through interventions to create a circular economy for cotton

There is increasing momentum for consumers, fashion and textile businesses and industries to play their role in a circular economy. The change comes from the need to cut carbon emissions, do more with less, decrease waste and pollution, and enhance biodiversity. For many people, a circular economy is the way of the future.

Cotton sits naturally in a circular economy. It is a natural, biodegradable, renewable, and recyclable fibre that can be returned to the earth. It also breaks down quickly in water and soil. The Australian cotton industry is already investing in and working with partners and brands on end-of-life processing solutions for textiles on cotton farms by turning textile waste into compost.

Cotton can also be recycled and reused through the deconstruction of waste textiles and re-spinning of the fibres. There is a need to explore how all cotton-based products can be reused and repurposed as many times as possible before they reach their product end-of-life and can be returned to the soil.

To capitalise on circularity's social, economic, and environmental opportunities, the industry must accelerate this action. Making the **Circular economy** theme a core activity in Clever Cotton is evidence of the cotton industry's commitment to this exciting research area.

This theme aims to support the cotton industry's participation in the circular economy, with an initial focus on providing lasting end-of-life solutions for cotton-rich textiles. The ultimate ambition is to work towards developing a circular economy for Australian cotton.

The theme will develop a viable business plan for returning textile waste to cotton farms. Collaborating with partners will help close the loop on cotton waste back to the cotton farm.

To understand the benefits of providing end-of-life solutions to cotton textile waste, this theme seeks to identify and quantify the GHG emissions from textile degradation in landfill and the many forms of waste processing options. It will look at creating a pathway for the composting and agricultural use of pure cotton textile waste. To create value across cotton-growing regions, it will also evaluate the potential to process this waste in cotton communities.

Via this theme, CRDC will also scope opportunities to add value to the cotton circular economy.

Australian cotton has significant potential to contribute positively and constructively to the circular economy. This theme will help the industry take a leading role in understanding and seizing those opportunities.

Outcomes

+ By 2028, the cotton waste loop is closed through collaboration with partners

+ By 2028, logistic and economic opportunities to add value to the cotton circular economy are identified, quantified, and implemented where appropriate

Example initiatives

+ Define and develop pathways and business cases for collecting and processing textile waste to close the loop back to cotton farms

+ Understand the unique properties of Australian cotton and how this provides opportunities for additional repurposing, recycling, and reuse

+ Compare the GHG emissions from various ways of processing textile waste

Delivering the plan

Corporate governance

CRDC is committed to best practice and recognises the value of corporate governance principles.

The governing body of the CRDC, the Board, provides oversight within the following legislation:

+ *Primary Industries Research and Development Act 1989* (PIRD Act).

+ *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

The Board's objectives are to add value by ensuring that appropriate governance is in place by:

+ Setting the strategic direction of the CRDC

+ Developing policy to help implement this direction

+ Monitoring and supervising systems that deliver the results of CRDC

+ Ensuring accountability (including engaging with and reporting to stakeholders)

+ Ensuring legal compliance.

Team skills

CRDC will invest in the professional development of its people to ensure they have the necessary innovation and brokering skills to support the industry.

Financials

CRDC's investment portfolio is primarily funded through a grower levy and matching Commonwealth contributions. This is supported by co-investment from the Australian and state governments, and strategically leverages collaborative investments and minor income from other sources, such as interest and royalties.
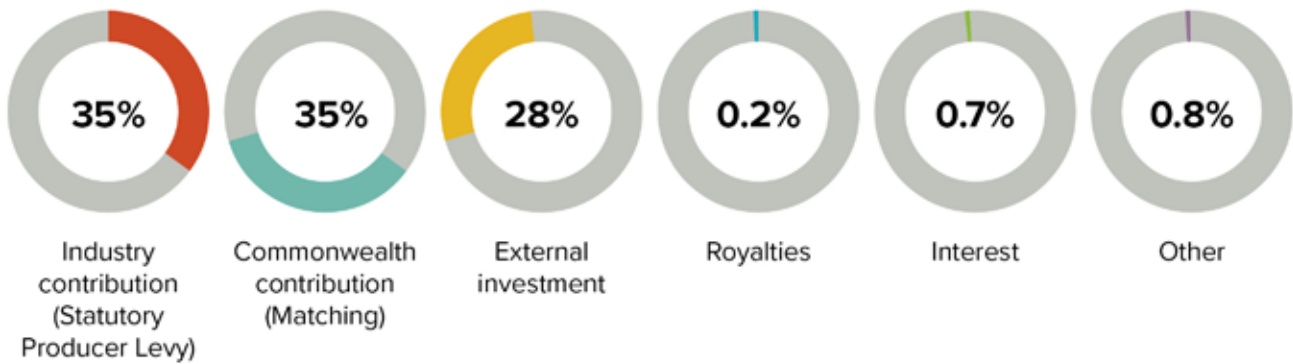
Resource allocation

In implementing this plan, CRDC intends to commit a total expenditure of $125 million over five years. This represents a 15 per cent increase on the 2013-18 Strategic Plan total expenditure target.
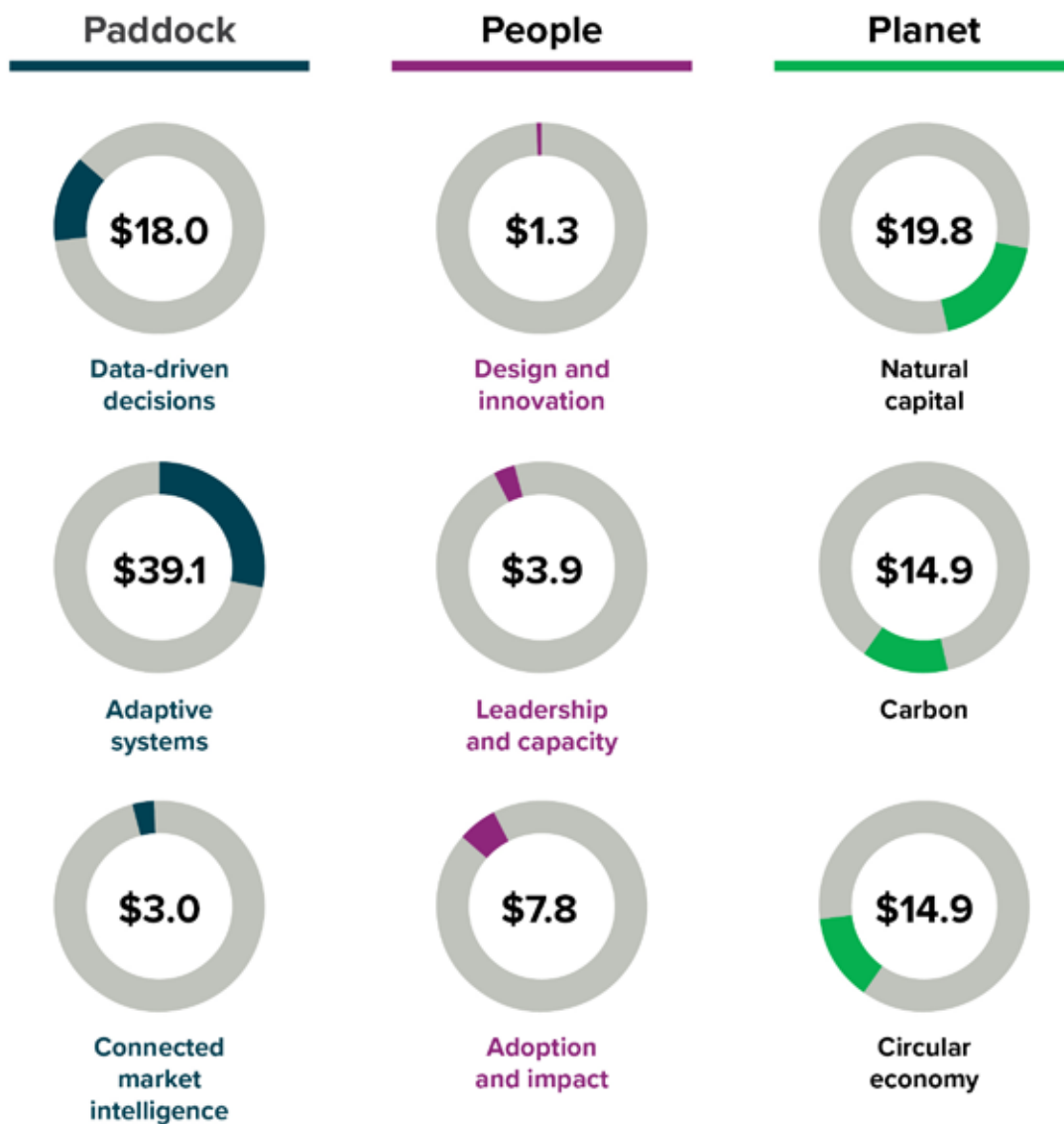
It is based on five key assumptions:

+ Revenue – annual average cotton production increasing from 3.5 to 3.9 million bales over the five years.

+ Attracting an additional $42 million over five years through external revenue.

+ Equity – financial reserves accumulated during above-average production years to be used to sustain RD&E investment and capacity over the five years.

+ Annual RD&E investments to average $26 million, which is 87 per cent of total expenditure, and RD&E management costs of $4 million, which is 13 per cent of total expenditure.

+ The ability to utilise reserves to maintain research investment at a consistent level in years when crop levels are below average due to climatic conditions.

CRDC financial resource allocation	Average annual	5-year total
Operating income	**$'000**	**$'000**
Industry contribution (Statutory Producer Levy)	10,699	53,495
Commonwealth contribution (Matching)	10,699	53,495
External investment	8,460	42,300
Royalties	50	250
Interest	200	1,000
Other	250	1,250
Operating income total	**30,158**	**150,790**
Operating expenditure		
RD&E investments		
Paddock	12,020	60,099
People	2,601	13,006
Planet	9,910	49,550
Total	**24,531**	**122,655**
RD&E management costs		
Employees	3,169	15,845
Corporate	1,739	8,695
Total	**4,908**	**24,540**
Operating expenditure total	**29,439**	**147,195**
Operating result – surplus (deficit)	719	3,595

Equity & Reserves		
	At 30June 2023	On 30 June 2028
Equity & Reserves at end of 5 years	28,400	32,000

Income sources five-year total

35%	35%	28%	0.2%	0.7%	0.8%
Industry contribution (Statutory Producer Levy)	Commonwealth contribution (Matching)	External investment	Royalties	Interest	Other

RD&E investments five-year total

Paddock	People	Planet
$18.0	$1.3	$19.8
Data-driven decisions	Design and innovation	Natural capital
$39.1	$3.9	$14.9
Adaptive systems	Leadership and capacity	Carbon
$3.0	$7.8	$14.9
Connected market intelligence	Adoption and impact	Circular economy

Strategic alignment with priorities

CRDC's Strategic RD&E Plan aligns with Australian Government and industry priorities. It supports the Australian Government's Science and Research Priorities and National Agricultural Innovation Priorities, and addresses the Cotton Sector RD&E Strategy Priorities, the Australian Cotton Sustainability Framework, and the UN's Sustainable Development Goals (SDGs).

Alignment of pillars and themes against Government priorities

	National Agricultural Innovation Priorities	Science and Research Priorities
Paddock		
Data-driven decisions	Priority 4	
Adaptive systems	Priorities 1, 2 and 3	Soil and water (2.2) Environmental change (8.1, 8.3)
Connected market intelligence	Priorities 1, 2 and 4	
People		
Design and innovation	All priorities	
Leadership and capacity	All priorities	
Adoption and impact	All priorities	
Planet		
Natural capital	Priorities 1 and 2	Environmental change (8.1, 8.3)
Carbon	Priorities 1 and 2	Environmental change (8.1, 8.3)
Circular economy	Priorities 1 and 2	Advanced manufacturing

National Agricultural Innovation PRIORITIES

Priority 1: Trusted exporter of premium food and agricultural products

Priority 2: Champion of climate resilience to increase the productivity, profitability, and sustainability of the agricultural sector

Priority 3: World leader in preventing and rapidly responding to significant pests and diseases through future-proofing our biosecurity system

Priority 4: Mature adopter, developer, and exporter of digital agriculture

Science and Research PRIORITIES

+ Food
+ Soil and Water
+ Transport
+ Cybersecurity
+ Energy
+ Resources
+ Advanced Manufacturing
+ Environmental Change
+ Health