



Australian Government
Cotton Research and
Development Corporation

Annual Operational Plan 2016–17

Cotton Research & Development Corporation

Annual Operational Plan 2016-17

Responsible Minister

The Hon. Barnaby Joyce MP, Deputy Prime Minister,
Minister for Agriculture and Water Resources

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About CRDC

The Cotton Research and Development Corporation (CRDC) has been delivering outcomes in cotton research, development and extension (RD&E) on behalf of Australia's cotton growers and the Australian Government for 25 years.

Established in 1990 and operating under the *Primary Industries Research and Development (PIRD) Act 1989*, CRDC exists to enhance the performance of the Australian cotton industry through investment in, and delivery of, cotton RD&E.

Cotton is a major contributor to the economy, environment and social fabric of rural Australia. Grown in NSW and QLD, cotton is a major employer and contributor to the local, state and national economy. The industry's national exports are worth between \$1-3 billion per annum.

CRDC's role is to invest in RD&E on behalf of cotton growers and the government, with the outcomes boosting the productivity and profitability of our industry. RD&E, and its resulting innovations, are a key driving force behind the cotton industry's continued success.

In 2016-17, CRDC will invest \$20.4 million in RD&E, including approximately 200 research and development projects in collaboration with 60 research partners, across five key program areas: farmers, industry, customers, people and performance.

We will extend the findings from this research through a range of methods, including the industry's joint extension program, CottonInfo; and encourage the adoption of best management practices via the industry program, myBMP. CRDC is a founding partner of both programs.

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Introduction

In 2016-17, CRDC will invest \$20.4 million in RD&E on behalf of the Australian cotton industry and the Government into five key investment areas – farmers, industry, customers, people and performance.

These five priority areas are reflected in CRDC's five year Strategic R&D Plan 2013-18; the overarching framework guiding CRDC's investments. The Plan sets ambitious targets around the cotton industry's capacity to innovate, adapt and adopt the results of R&D, while also seeking outcomes that can transform the resilience and the prosperity of the industry longer term.

A key focus of the Strategic Plan is to ensure a strong, sustainable and profitable future for the industry. This involves connecting insights about changes in societal expectations and consumer demands regarding the industry's performance and its products, with the evolving cotton sector issues. It identifies that innovation, knowledge sharing and stronger relationships between cotton farmers, the wider industry and the end consumer are paramount to the industry's ongoing success.

Research and development, led by CRDC, is at the heart of this. Investment in R&D outcomes across all five program areas – farmers, industry, customers, people and performance – is fundamental for the industry.

Our R&D investment priorities: the 2013-18 CRDC Strategic R&D Plan

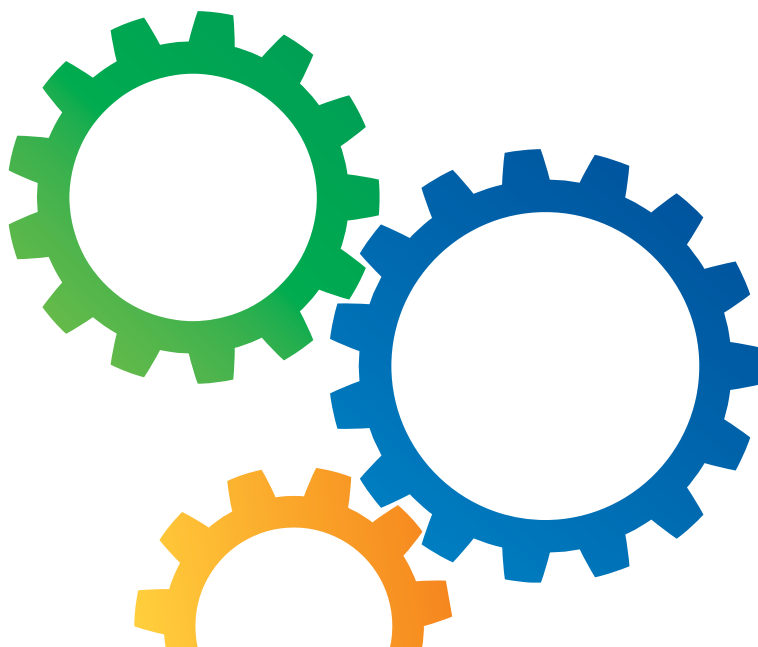
VISION <i>A globally competitive and responsible cotton industry</i>				
MISSION <i>To invest in RD&E for the world leading Australian cotton industry</i>				
OUTCOMES				
Farmers Cotton is profitable and consistently farmers' crop of choice	Industry The Australian cotton industry is the global leader in sustainable agriculture	Customers The Australian cotton industry captures the full value of its products	People Capable and connected people driving the cotton industry	Performance Measured performance of the Australian cotton industry and its RD&E drives continuous improvement
STRATEGIES				
Successful Crop Protection Cotton crops protected from pest, weed and disease threats	Respected Stewardship Industry protects its production technologies and its biosecurity	Assured Cotton The integrity and qualities of Australian cotton set global benchmarks for customers	Workforce Capacity A skilled, educated and progressive industry workforce	Best Practice World's best practice underpins the performance of the cotton industry
Productive Resource Efficiencies Inputs for cotton production are optimised	Responsible Landscape Management Industry leads in managing natural assets	Differentiated Products Customers recognise the differentiated value of Australian cotton products	Networks An industry connected by dynamic networks	Monitoring & Evaluation Industry and RD&E performance is captured
Profitable Futures Innovation in cotton production	Sustainable Futures An industry achieving its vision	Competitive Futures The demand for Australian cotton products is positively transformed	Communication Stakeholder information needs are met	Reviews Continuous improvement in industry and RD&E performance

CRDC has established five strategic outcomes to be achieved under the 2013-18 Strategic R&D Plan, which in turn are the key focus areas for R&D investment under this 2016-17 Annual Operational Plan.

- **Farmers:** Cotton is profitable and consistently farmers' crop of choice.
- **Industry:** The Australian cotton industry is the global leader in sustainable agriculture.
- **Customers:** The Australian cotton industry captures the full value of its products.
- **People:** Capable and connected people driving the cotton industry.
- **Performance:** Measured performance of the Australian cotton industry and its RD&E drives continuous improvement.

Through focusing on these five strategic priorities, CRDC will achieve its outcome of *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.*

The CRDC will monitor, evaluate and report on the achievement of targets in its Annual Report and Portfolio Budget Statement. Achievement against the 2015-16 targets is noted in table 2.2 (in the *Our 2016-17 financial budget statements* section of this plan).



STRATEGIC PLAN GOALS	PERFORMANCE CRITERIA	2016-17 TARGETS
Farmers – cotton is profitable and consistently farmers crop of choice.	Cotton farmers increase productivity by three per cent per hectare per year.	Three per cent per hectare per year.
Industry – the Australian cotton industry is the global leader in sustainable agriculture.	Industry reports to customer needs for sustainability indicators.	Achieved through responses to the 2014 Australian Grown Cotton Sustainability Report and Third Environmental Assessment.
Customers – the Australian cotton industry captures the full value of its products.	Customers continue to demand Australian products.	Double the premium for Australian cotton.
People – capable and connected people driving the cotton industry.	Implementation of the Cotton Industry Workforce Strategy.	Measured improvement in the capacity of farmers to attract, retain and develop people.
Performance – measured performance of the Australian cotton industry and its RD&E drives continuous improvement.	Coverage of Best Management Practice Systems across the Australian cotton industry.	80 per cent of cotton farms participating.

Our five key investment priorities

Farmers

Our investment in research to benefit growers focuses on protecting the crop from pests as well as enhancing crop management for quality and yield outcomes. Australian cotton farmers achieve exceptionally high yields - nearly three times the world average - but do so within an environment of rising input costs impacting on profitability. Farmers have relied upon annual productivity gains from improved varieties and management but the potential for ongoing gains is at risk as yields approach current genetic yield limits for cotton – hence our focus on crop management improvements in dryland and irrigated farming systems.

Our strategy also places an emphasis on driving optimal resource efficiency. In addition to our CRDC investments in this area, we are also leading two grant projects under the Australian Government's Rural R&D for Profit programme; *smarter irrigation for profit and more profit from nitrogen*. These projects are both cross-sectoral, involve many collaborative research partners, and are focused on optimising resource efficiency for on-farm productivity and profitability gains. Collectively, these projects involve almost \$10 million in funding from the Rural R&D for Profit programme.

Additionally, over the coming year, we will continue to test the feasibility of digital technology and other innovations to transform the future profitability of cotton production. Overall, our goal is to help cotton growers to increase their productivity by three per cent per hectare per year - thus far, since 2013, growers have achieved an average growth in yield of 3.1 per cent per hectare per year.

Industry

On an industry level, nationally, the Australian cotton industry generates significant wealth, with exports in excess of \$1-3 billion annually. It also provides an economic foundation to many regional and remote economies with employment of up to 14,000 people. Despite this, the industry faces ongoing challenges from competition for land, water and labour, climate variability, a reliance on key technologies and, like all industries, is subject to a growing social and environmental awareness and scrutiny.

These challenges are also opportunities for the Australian cotton industry given its acceptance of responsibilities for improved environmental performance and demonstrated capacity to act

collectively. In response, CRDC is investing in industry's biosecurity preparedness, stewardship of key production technologies and the responsible management of natural resources.

The CRDC's strategy also places an emphasis on landscape-scale management approaches and recognition of the inter-relationships with other industries. The strategy includes a commitment to proactively developing an understanding of emerging social and environmental issues, including changes in technology, so that the Australian cotton industry can be a global leader in sustainable agriculture into the future. Evidence of this being delivered was the development of the industry's first ever sustainability report in 2014, and a landmark study of industry resilience in 2015.

Overall, one of our key goals is to respond to customer needs for sustainability indicators, through our responses to the Australian Grown Cotton Sustainability Report and the industry's Third Environmental Assessment.

Customers

CRDC also invests in supply chain and customer research. As a result of our past investments, the industry has a greater understanding of the needs of customers in the markets for Australian cotton, and the value of our products. This knowledge has informed a new industry-led marketing initiative that seeks to secure access to preferred markets and increase demand along the supply chain for Australian cotton. This comes at a time where, globally, cotton's ongoing competitiveness as a fibre is subject to challenges from man-made fibres and the Australian cotton industry is critically exposed as one of the top five cotton exporters in the world.

In response, CRDC is investing in research to better inform customers of the qualities of Australian cotton and differentiate the value of its products. CRDC's strategy places an emphasis on ensuring customers can be assured of the fibre quality, sustainable practices and impact of Australian cotton production. The strategy includes a commitment to instigating R&D that can prepare industry for market changes, transform consumer demand and enable the Australian cotton industry to capture the full value of its products into the future.

In the coming year, we will continue to test the feasibility of new technologies in creating new competitive advantages for Australian cotton. Overall, our goal is to double the premium for Australian cotton.

People

CRDC recognises that people are the cotton industry's greatest resource. We continue to invest in the capacity and capability of people through many programs, designed to build a skilled, educated and progressive industry workforce and an industry connected by dynamic networks. We also invest in a range of people programs to build our leadership capacity.

Three of the current key focuses include CottonInfo, the industry's unique joint venture in extension, which is extending key research outcomes to growers; the collaborative implementation of the industry workforce development strategy, which will underpin future workforce programs; and communications, to ensure our stakeholder needs are met.

Overall, our goal is to improve the capacity of our growers and the wider industry to attract, retain and develop their people, and to support strong relationships and engagement in research through an interconnected network.

Performance

On an organisational level, CRDC recognises the importance of responding to stakeholder and corporate requirements for improvement to the efficiency and effectiveness of operations. In doing so, we are actively engaged with the national rural R&D effort to ensure our investments and activities are aligned and synergistic.

On an industry level, measuring the performance of the industry in order to drive continuous improvement underpins the collaborative best management practices program, *myBMP*. In the last year participation in *myBMP* reached 70 per cent of Australia's cotton farms; overall, our goal is to reach 80 per cent.



Setting the priorities

CRDC works 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 both the industry and Government to determine the Cotton Sector RD&E Strategy.

In turn, these priorities help to shape CRDC's strategic RD&E priorities, which are formalised under the 2013-18 Strategic R&D Plan.

Industry accountability

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

CRDC engages with Cotton Australia in a formal process of consultation in the development and implementation of the Strategic R&D Plan including R&D investments. This engagement ensures industry research priorities are regularly reviewed; emerging issues are actively considered; and facilitates the uptake of research in the form of best practices and the overall performance of the Australian industry.

Cotton industry priorities for R&D:

- 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.

Government accountability

CRDC is accountable to the Australian Government through the Minister for Agriculture and Water Resources. Government communicates its expectations of CRDC through Ministerial direction, enunciation of policy, administration of the PIRD Act, and priorities (Science and Research Priorities and R&D Priorities for Agriculture). CRDC responds to government expectations through regular communication; compliance with the Funding Agreement, policy and legislated requirements; and the development of Strategic R&D Plans, Annual Operational Plans and Annual Reports.

Government research priorities

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

- 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;
- achieving the sustainable use and sustainable management of natural resources;
- supporting the development of scientific and technical capacity;
- developing the adoptive capacity of primary producers; and
- improving accountability for expenditure upon research and development activities in relation to primary industries.

The Australian Government describes Science and Research Priorities and R&D Priorities for Agriculture.

The Science and Research Priorities are:

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

The Rural Research and Development Priorities are:

- Advanced technology
- Biosecurity
- Soil, water and managing natural resources
- Adoption of R&D

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

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

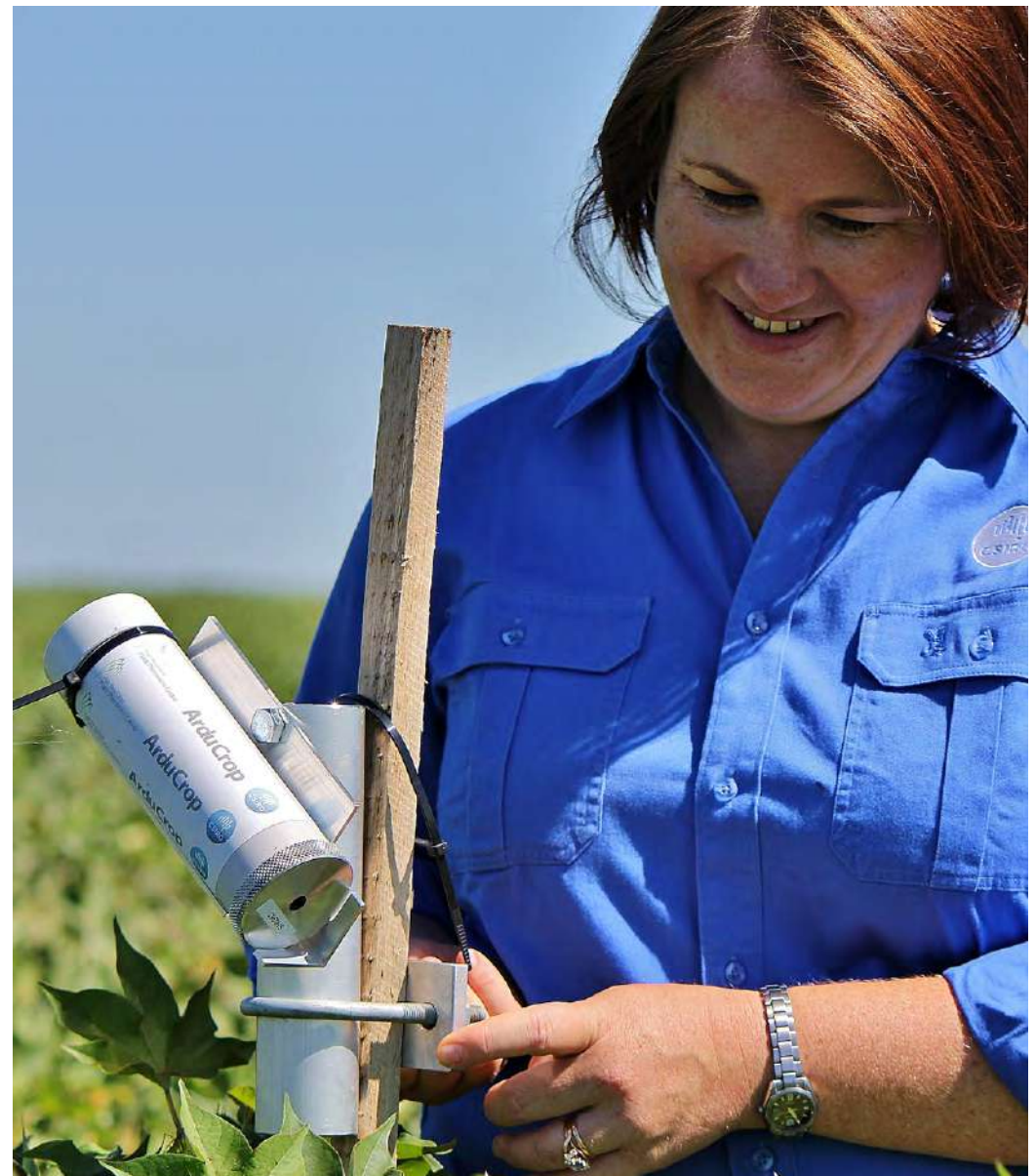
National RD&E strategies have been or are being developed for the following primary industry and cross industry sectors:

- cotton, beef, dairy, fisheries and aquaculture, forests, grains, horticulture, pork, poultry, sheep meat, sugar, wine, wool, and new and emerging industries;
- 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 & 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.



Our structure: CRDC governance

CRDC Board

CRDC is managed by a Board consisting of up to nine Directors. The Chair and five to seven non-executive directors are appointed by the Minister for Agriculture and Water Resources. The Executive Director is appointed by the Board. The CRDC Board sets the Corporation's strategic direction and delegates responsibility of day-to-day management to the Executive Director.

The Board is committed to high standards of corporate governance that ensure CRDC meets its obligations to government and industry stakeholders, and appropriately manages resources to achieve its outcome and strategic plan goals.

The Board has established a governance framework and systems that enhance performance and ensures that CRDC is operating according to accountability provisions of the PIRD Act and the *Public Governance, Performance and Accountability (PGPA) Act 2013*.

The Board's functions include:

- Establishing goals and setting strategic direction.
- Developing and approving a five year R&D Plan, Annual Operational Plan, Statements of Intent, and producing an Annual Report.
- Establishing policies and approving procedures for the operation of CRDC.
- Ensuring that risk assessment and management frameworks are in place to minimise business and financial risk.

Remuneration of Directors

The Chairperson and Non-Executive Directors are remunerated under the PIRD Act 1989 in accordance with such remuneration as is determined by the Remuneration Tribunal established under the *Remuneration Tribunal Act 1973*. The Remuneration Tribunal reviews and releases a determination each financial year under the "Remuneration and Allowances for Holders of Part-Time Public Office" determination in Schedule C, Table C1A Primary Industry Authorities.

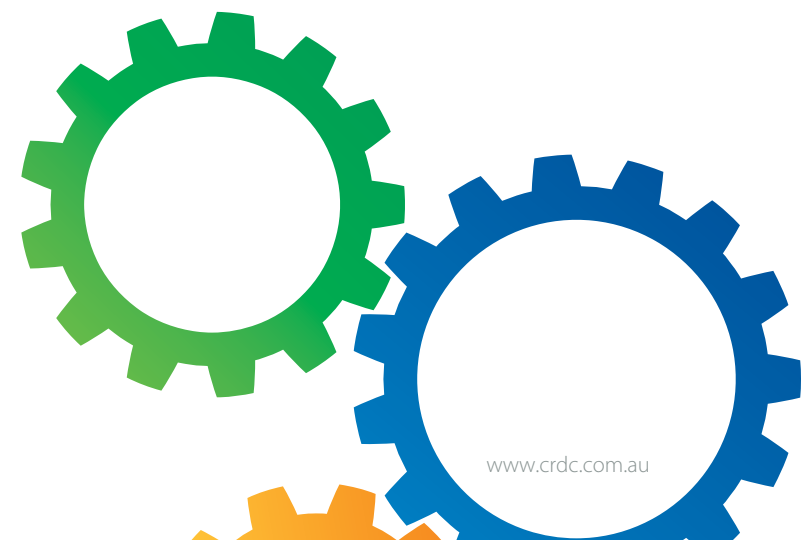
Under the PIRD Act 1989, the Executive Director's remuneration is determined by the Board through the recommendation of the Remuneration Committee. The total budgeted remuneration for all Directors in 2016-17, including superannuation, is \$449,382. CRDC committee members consist of directors and one external member for the Audit Committee.

Payment to representative bodies

The Corporation's industry representative body in 2016-17 is Cotton Australia. The role of the industry representative body involves:

- Participation in the development and review of the five-year Strategic R&D Plan. This ensures CRDC's strategic planning continues to address evolving industry R&D needs.
- A meeting to receive and discuss the CRDC Annual Report for the preceding year. This enables the industry representative body to assess whether CRDC's activities for that year have met its strategic objectives, and to question senior staff on many matters of interest and concern.
- Other R&D related activities which vary from year to year.

While CRDC does not pay a fee for service to the industry representative body it may fund discrete R&D projects and contribute to the expenses incurred as authorised under the PIRD Act. In 2016-17, CRDC has budgeted to pay Cotton Australia \$25,000 for the direct meeting costs incurred in consultation activities involving its R&D advisory panels which consist of voluntary members (farmers and ginners). The advice received from Cotton Australia's five R&D advisory panels is used by CRDC in considering changes to its research strategy, priorities and in making research investment decisions.



CRDC Corporate standards

In carrying out the functions of the Corporation, 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 contractual 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 revenue sources

CRDC revenue is drawn from two main sources:

- 1 Cotton farmers pay a levy of \$2.25 for each 227 kilogram bale of cotton. Cotton levy revenue is collected at the point of ginning, that is, when cotton has been picked and delivered to cotton gins. This occurs from March to September of each calendar year, so cotton levy revenue in any financial year is drawn from two consecutive cotton crops.
- 2 The Australian Government matches expenditure of levies on eligible R&D, capped at 0.5 per cent of the three year average gross value of production or the cumulative levy receipts, whichever is the lesser. The setting and collection of the industry levy is enabled by the *Primary Industries Levies and Charges Collection Act 1991* and the *Primary Industries (Excise) Levies Act 1999*.

The Australian Government general matching of industry contributions is expected to be limited by either the value of levies collected or 0.5 per cent of the cotton industry's three year average Gross Value of Production (GVP). Which trigger will apply depends on the price of cotton, timing of the harvest and ginning, and the variability of the crop size.

Royalties from the sale of domestic and international planting seed, interest on investments, external grant revenue and research project refunds make up the balance of CRDC's income.

Ensuring efficiency

Ensuring continuous improvement in organisational efficiency and productivity is a key focus for CRDC, to optimise our own input efficiency. CRDC is charged with investing in RD&E on behalf of cotton growers and the Government, so ensuring these funds are used to best effect is critically important. CRDC has invested in improved systems and infrastructure to ensure continuous improvement in the organisation's productivity.

Additionally, in order to achieve industry efficiency, CRDC works in collaboration with other cotton industry bodies and other rural research and development corporations (RDCs) to achieve strategic outcomes for the industry and to leverage higher returns for our investments. CRDC's collaborative approach underpins our investment strategy: we partner in approximately 80 per cent of RD&E projects conducted in the cotton sector. Almost 25 per cent of all CRDC investments are made in cross-sectoral RD&E.

The Australian Government's Rural R&D for Profit programme is one such collaboration: of the three grants that CRDC manages under this programme, two are focused on improving resource efficiencies and increasing on-farm profits. These grants all involve many partners, including other RDCs and research providers, and funding requires co-investment from all participants to ensure both organisational, and industry, efficiency.

The year ahead: 2016-17 industry and financial outlook

Industry

Following four consecutive above-average cotton crops, cotton production fell in 2014-15 and remained lower in 2015-16 due to a return to dry conditions, a resulting lack of water availability and a fall in global cotton prices.

Cotton production for the 2015-16 year is expected to reach 2.4 million bales – up slightly from the 2.2 million bales achieved in 2014-15. Pleasingly, an increase in yield has been achieved by cotton growers in 2015-16, with an average of 11.5 bales per hectare for irrigated cotton; up from 9.95 bales/hectare in 2014-15.

Assuming improved seasonal conditions leading up to cotton planting, the outlook for 2016-17 is for a slight increase in cotton production to 2.5 million bales.

Financial

As a result of lower levels of cotton production in the past two seasons, lower levels of revenue and the use of financial reserves are factored into CRDC's budget in order to sustain the commitment to increased investment in research activities under the five-year Strategic R&D Plan 2013–2018.

CRDC has budgeted for revenue of \$13.2 million in 2016-17 and expenditure of \$20.4 million, providing for a net loss of \$7.2 million funded from reserves. With this loss the reserves will decrease to \$28.9 million at 30 June 2017. Wherever possible, CRDC will aim to use its reserves to maintain research investment at a consistent level despite years where crop levels are below average due to climatic conditions. The use of CRDC's reserves complies with the organisation's Financial Reserves Policy which ensures the organisation maintains sufficient financial reserves to ensure the efficient and effective performance of its business, the achievement of its strategic R&D outcomes, and capacity to meet its fiduciary responsibilities.

CRDC expects to return to a balanced budget in 2018-19.



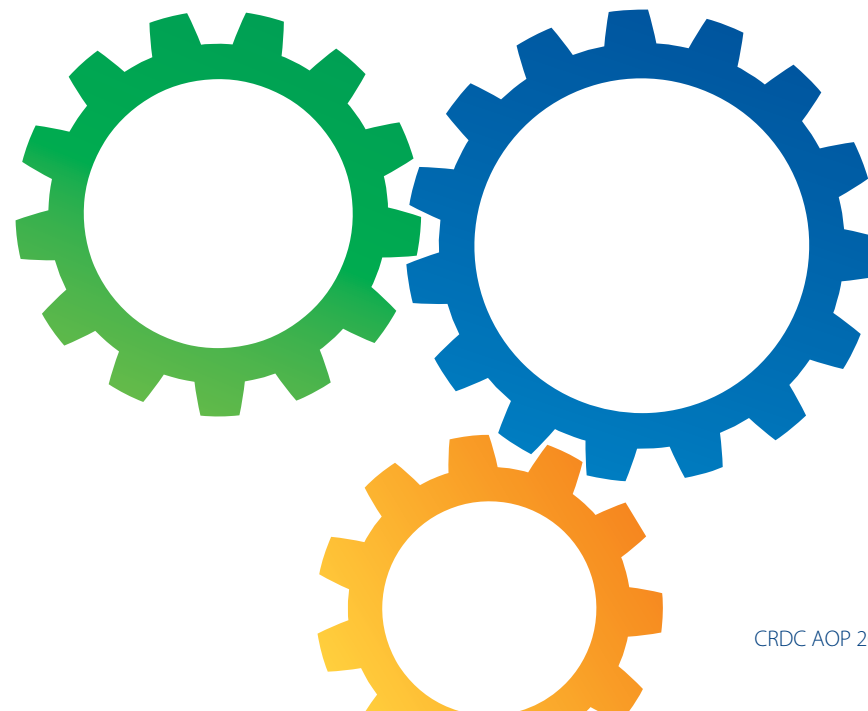


Our 2016-17 investment portfolio

CRDC's total planned investment in 2016-17 is \$20.4 million. This is aligned with the planned total expenditure of \$100 million over the five years of the CRDC 2013-18 R&D Plan and the objective to achieve a balanced RD&E portfolio that considers distribution of investment across:

- The RD&E strategies.
- The type of research including basic, applied, blue sky, development and delivery.
- In-project risks.
- Researcher experience and capacity.
- Research providers.
- Timeframe to outcomes.
- The likely return on investment for projects and programs.
- R&D management.

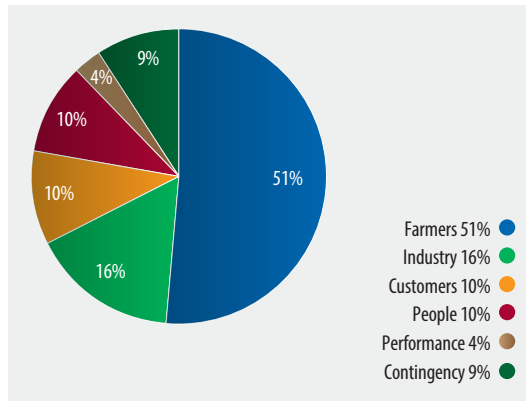
Of this expenditure, \$2.4 million is to be invested in new research as part of the total RD&E portfolio.



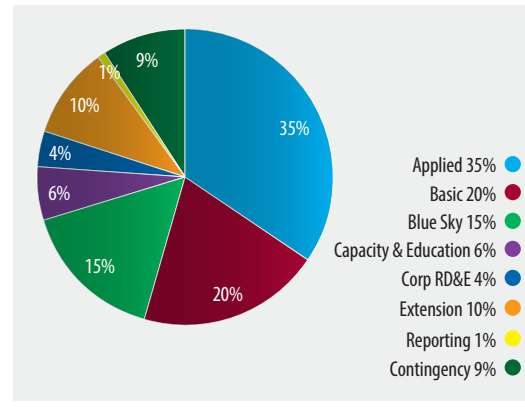
CRDC 2016-17 portfolio investment balance

Each year CRDC reviews the portfolio balance together with the measures of success for each program to inform decisions on any adjustments to research priorities and the allocation of resources.

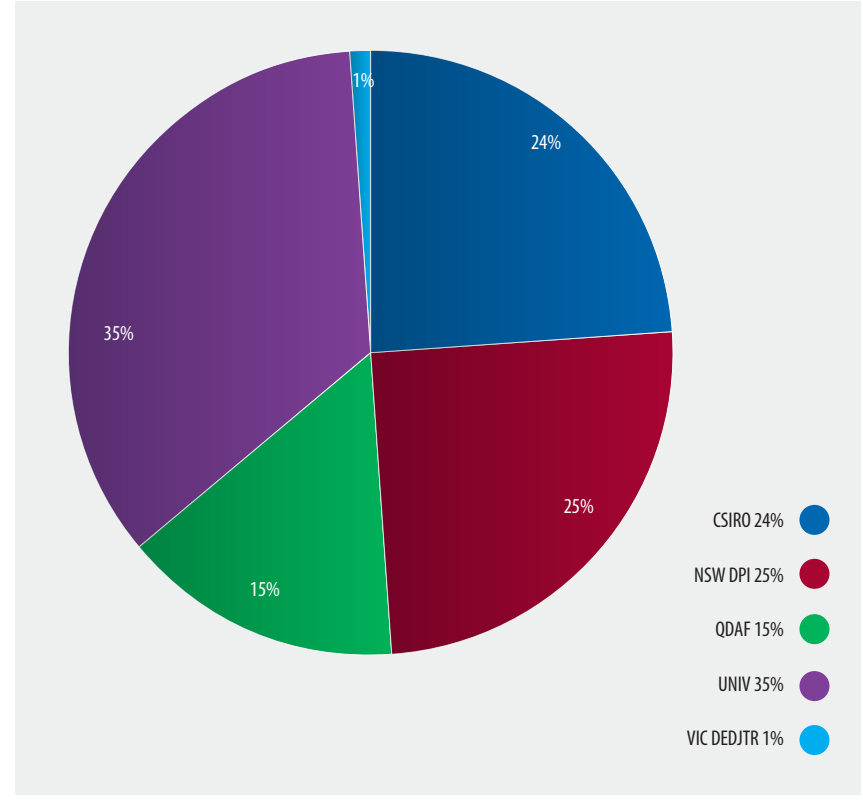
INVESTMENT BY THE FIVE CRDC PRIORITY AREAS:



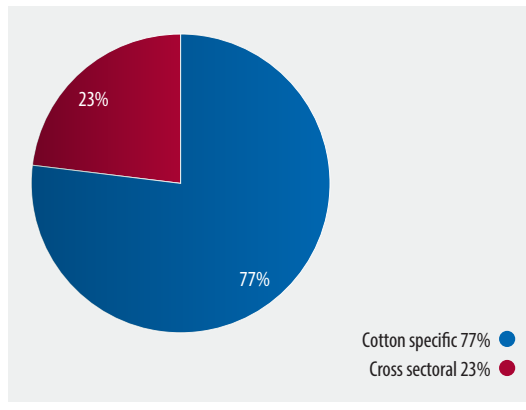
INVESTMENT BY RESEARCH TYPE:



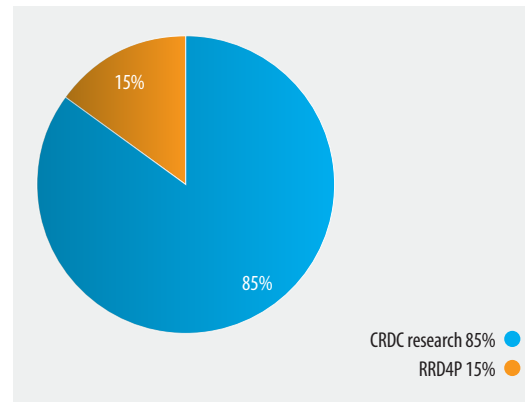
INVESTMENT BY CRDC IN THE RD&E PROJECTS LED BY KEY RESEARCH PARTNERS:



INVESTMENT BY SECTOR – COTTON SPECIFIC AND CROSS SECTORAL RD&E:



INVESTMENT FROM THE RURAL R&D FOR PROFIT PROGRAMME GRANTS:



Our investment process

The process of deciding where to invest CRDC's annual RD&E funding is a collaborative one, involving all major stakeholders.

CRDC works closely with the industry's peak representative body, Cotton Australia, and the Australian Government on an annual basis to identify and evaluate the cotton industry's requirements for RD&E. Cotton Australia provides ongoing advice to the CRDC on research projects and where research dollars should be invested, guided by the priorities established in the 2013-18 Strategic Plan.

In line with this Plan, CRDC holds an annual strategy forum, bringing together the Cotton Australia grower advisory panels to identify the gaps in the existing research portfolio and opportunities for new research. CRDC also holds a series of discipline forums with research partners, to identify any emerging research priorities.

From here, CRDC issues a targeted annual call for research proposals against these identified priorities. In determining which proposals are successful, CRDC again undertakes a process of consultation with growers, via the Cotton Australia panels. The final decision-making authority lies with the CRDC Board.

Successful proposals become contracted projects with CRDC, and are delivered by our research partners. Critically, CRDC's success in delivering RD&E outcomes to growers and the industry is contingent upon strong relationships with our research partners, who deliver projects on our behalf. The full list of research partners for 2016-17 can be found at Appendix A.

2016-17 priorities

The 2016-17 strategy forum, held in May 2015, identified key areas of focus for future RD&E investment. These key areas formed the basis of the targeted call, with 13 expressions of interest developed on these areas to guide researchers in developing their proposals. The 13 key areas of focus included:

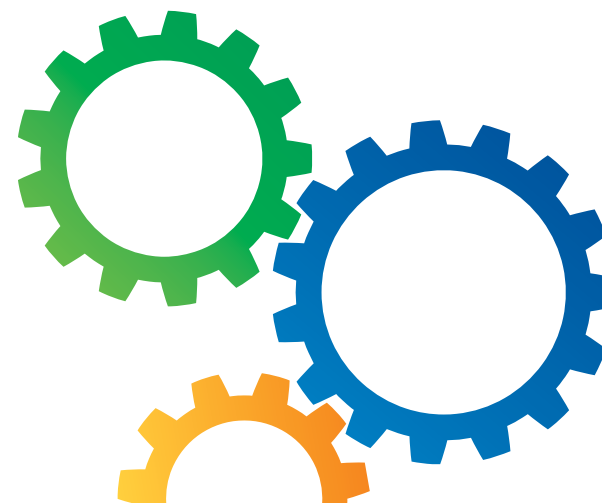
- Improving the management of cotton diseases;
- Optimising seedling emergence;
- Improving phosphorous management in cotton;
- New materials and options for reducing water losses from evaporation and seepage;
- Optimising nitrogen/water interactions for best practice production;

- Mitigating and managing soil compaction for improved production;
- Improving the ability of the industry to report its sustainability performance;
- Managing natural landscapes to increase the provision of ecosystem services;
- Monitoring silverleaf whitefly insecticide resistance;
- Quantifying the value of ecosystem services;
- Resistance research and monitoring to enhance stewardship of Bt cotton and management of *Helicoverpa* spp;
- Documenting the production of best practice Australian cotton;
- Measuring and reporting the value of capacity building on farms and in research to improve workforce capability.

Through the 2016-17 procurement process, CRDC has invested in projects to directly target these key needs.

Cotton Futures: blue sky research

In addition to immediate cotton industry priorities, CRDC also identifies and invests in longer-term priorities, specifically around ensuring a future for the industry that is profitable, sustainable and competitive. Investments are made into potentially transformational R&D projects – blue sky research – under the CRDC banner 'Cotton Futures'. In 2016-17, 15 per cent of CRDC's R&D investment is blue sky research.



Our 2016-17 investments by priority area

Farmers

Program outcome Cotton is profitable and consistently farmers' crop of choice
Measure of Success: Farmers increase productivity by three per cent per hectare per year

Outcome	Key tactics	R&D Investments 2016-17	Collaborative Partners	
SUCCESSFUL CROP PROTECTION				
Cotton crops protected from pest, weed and disease threats.	1.1.1	Monitoring and investigating the ecological behaviours and responses of cotton pest, weeds and diseases.	<ul style="list-style-type: none"> • New research to improve the management of diseases in cotton, wine and horticulture; including verticillium wilt in cotton in QLD and NSW, under the Rural R&D for Profit programme. • A new project addressing the threat of herbicide resistance in cotton and grain growing regions. • A continuing project to profile beneficial microorganisms and their manipulation in cotton growing soils to suppress cotton diseases and improve plant growth. • A continuing project to investigate the role of host- endosymbiont relationships in the regulation of silverleaf whitefly populations. • A continuing project investigating the predator-prey interactions for key cotton pests, including silverleaf whitefly, mealy bugs and green vegetable bug. • Continuing projects researching key attributes of weed ecology to inform the evaluation of tactics for their management in cotton farming systems, with a specific emphasis on glyphosate resistant weeds. 	<ul style="list-style-type: none"> • HIA, Wine Australia, CSIRO, NSW DPI, QDAF, Fraunhofer Institute for Factory Operation and Automation • ICAN, QDAF, NSW DPI • CSIRO • UQ, Greenwich University, UK – Gates Foundation • QDAF • CSIRO
	1.1.2	Testing practices that deliver improved management of insect pests, weeds and diseases.	<ul style="list-style-type: none"> • New research to improve management strategies for diseases in cotton, wine and horticulture, under the Rural R&D for Profit programme. • Continuing research projects to improve integrated management strategies for established insect pests and build management strategies for emerging insect pests in cotton including mealybug, mirids and apple dimpling bug. • Continuing project to develop weed management practices that lower the risks of crop damage, occurrence of weed resistance to key herbicides and the weediness of volunteer cotton on cotton farms. 	<ul style="list-style-type: none"> • HIA, Wine Australia, CSIRO, NSW DPI, QDAF, Fraunhofer Institute for Factory Operation and Automation • QDAF • NSW DPI
	1.1.3	Improving capacity, knowledge and adoption of techniques to successfully protect the cotton crop.	<ul style="list-style-type: none"> • New research to provide specialist agronomy, physiology and systems support for new and existing regions. • Continuing projects to package information about the management of pests, weeds and diseases in a range of hard copy and electronic formats for use by consultants working with cotton farmers to make in-crop decisions. • Continuing projects to establish integrated pest management support in southern farming systems and technical capacity in crop protection for extension. 	<ul style="list-style-type: none"> • CSIRO • CSIRO, NSW DPI, QDAF • NSW DPI

PRODUCTIVE RESOURCE EFFICIENCIES				
Inputs for cotton production are optimised.	1.2.1	Delivering benchmarks of on-farm resource use efficiencies.	<ul style="list-style-type: none"> • New research to identify options for reducing water loss from evaporation. • New research to manage and mitigate soil compaction for improved cotton production. • New research to increase profitability through improved nitrogen use efficiency and reduced losses of nitrogen in cotton, dairy, sugar and horticulture, under the Rural R&D for Profit programme. • Continuing research to improve irrigation practices in cotton, rice, sugar and dairy, under the Rural R&D for Profit programme. 	<ul style="list-style-type: none"> • NEOTOP Pty Ltd • CSIRO, USQ • CSIRO, DA, HIA, SRA, NSW DPI, USQ • DEDJTR, DA, USQ, NSW DPI, SRA, RIRDC, University of Melbourne
	1.2.2	Developing and proving decision systems and practices that deliver optimal resource efficiencies on cotton farms.	<ul style="list-style-type: none"> • New research to integrate data, agronomy, ecology and technology. • Continuing research to advance the availability of and ability to interpret real-time data sources for improving irrigation scheduling. • Continuing research to optimise the use and management of manures as a supplement to nitrogen fertiliser in southern NSW cotton growing regions. • Continuing research to increase capacity in soil biology research in cotton systems. • Continuing research to improve knowledge of nutrition management for high-yielding cotton varieties and improving nutrition via soil health. • A new project to develop and test strategies to improve dryland cotton production with Bollgard 3 cotton. 	<ul style="list-style-type: none"> • QUT • CSIRO, DA, RIRDC, SRA, SARDI, DEDJTR, GVIA, IREC, NSW DPI, CA • Deakin University • UNE • CSIRO • QDAF
	1.2.3	Developing new systems and tools to support farm decision-making processes.	<ul style="list-style-type: none"> • New research investigating novel plant growth regulators to develop resilient future cotton production systems. • Continuing research to investigate agronomy to support resilient cotton farming systems of the future. • Continuing PhD project evaluating autonomous drones for tracking irrigation. 	<ul style="list-style-type: none"> • CSIRO, USYD • CSIRO • USQ
	1.2.4	Improving capacity, knowledge and adoption of techniques to optimise resource uses.	<ul style="list-style-type: none"> • Continuing research to evaluate and demonstrate techniques and technologies cotton farmers can use to improve water use efficiencies and optimise the energy requirements for irrigation. • Continuing projects that package information about the optimisation of input efficiencies into a range of hard copy and electronic formats for use by cotton farmers in planning and decision making. 	<ul style="list-style-type: none"> • NSW DPI, USQ, CSIRO • CottonInfo, USQ, NSW DPI, CSIRO, QDAF
PROFITABLE FUTURES				
Innovations in cotton production.	1.3.1	Investigating the application of new technologies and different scientific approaches which have the potential to deliver significant improvements and economic returns to the cotton farming system.	<ul style="list-style-type: none"> • New research enabling new farming practices and the automation of routine decision and implementation processes for nutrition and water. • New research integrate data, agronomy, ecology and technology. • New research to develop a national regulatory framework for big data in primary production. • A continuing project to add value to primary products and by products through the development of higher value animal feeds, chemicals and fuels program. • Continuing projects to evaluate the application of sensor technology in insect and weed detection. • Continuing collaborative projects to discover and develop biopesticide and semiochemical compounds for controlling key insect pests of cotton. 	<ul style="list-style-type: none"> • GRDC, USYD, USQ, QUT, CSIRO, DEDJTR • QUT • UNE • AgFuels, Southern Oil, NSW DPI, FWPA, APL, QUT • USQ • UWS, UNE, NSW DPI

Industry

Program outcome: The Australian cotton industry is the global leader in sustainable agriculture

Measure of Success: Industry can report against recognised sustainability indicators

Outcome	Key tactics	R&D Investments 2016-17	Collaborative Partners	
RESPECTED STEWARDSHIP				
Industry protects its production technologies and its biosecurity.	2.1.1	Monitoring for and investigating changes in pest and weed susceptibility to biotechnologies and crop protection products used by the cotton industry.	<ul style="list-style-type: none"> • New research to monitor the evolution of resistance in silverleaf whitefly. • A new project to provide resistance monitoring of <i>Helicoverpa</i> spp. to Bt cotton. • Continuing research to map cotton production to provide awareness for apiarists. • Continuing research to manage Bt resistance and induced tolerance in Bollgard 3 cotton. • Continuing projects to provide mirid, aphid and two spotted mite insecticide resistance monitoring. • Continuing projects investigating molecular genetic methods to detect neonicotinoid resistance in cotton aphid. • Continuing research to predict the emergence of herbicide resistance in weed populations. 	<ul style="list-style-type: none"> • QDAF • CSIRO • CA, Nufarm, GRDC • CSIRO • QDAF, NSW DPI, CSIRO • NSW DPI • UQ
	2.1.2	Exploring tactics and strategies that lower the risks of pesticides to the environment and resistance evolution in populations of key insect pests and weeds.	<ul style="list-style-type: none"> • Continuing research and development of weed management practices that lower the risks of resistance developing to key herbicides used in the farming system. • A continuing project undertaking commercial scale evaluation of 'moth busting' as a new tactic for delaying the development of Bt resistance in <i>Helicoverpa</i> spp. • Continuing research to evaluate the efficacy of Bt resistance management tactics and optimise the deployment of refuge crops. 	<ul style="list-style-type: none"> • UQ, QDAF • UNE • CSIRO
	2.1.3	Developing and supporting the industry's capacity to effectively steward key technologies and products.	<ul style="list-style-type: none"> • Continuing project to ensure stewardship of biotechnology and crop protection products. • Continuing participation in the National Working Party for Pesticide Application. • Continuing projects that package information about the prevention of pesticide resistance and spray drift into a range of hard copy and electronic formats for use by the industry in planning and decision making. • A continuing project to develop industry recommendations for reducing the risk of aflatoxin contamination in Australian cotton seed. 	<ul style="list-style-type: none"> • Ceeney Agricultural Consultants • PHA • CottonInfo • NSW DPI
	2.1.4	Supporting the industry's preparedness and ability to deal with biosecurity threats.	<ul style="list-style-type: none"> • A new project to understand the potential for new biosecurity threats. • Continuing research providing surveillance and research for endemic and exotic virus diseases of cotton. • New projects providing industry wide surveillance for exotic disease threats. 	<ul style="list-style-type: none"> • QDAF • QDAF, NSW DPI • QDAF, NSW DPI

RESPONSIBLE LANDSCAPE MANAGEMENT

Industry leads in natural assets.	2.2.1	Defining the values and drivers relating to the management of natural landscapes and systems in cotton growing regions.	<ul style="list-style-type: none"> • New research enabling the cotton industry to report its sustainability. • A continuing research project to develop a groundwater health index for use as an industry wide monitoring tool. • Continuing research to understand the influence of climate variability and land use change on soil condition. 	<ul style="list-style-type: none"> • QUT, UQ • Macquarie University • USYD
	2.2.2	Recording and demonstrating improved environmental performance of the cotton industry.	<ul style="list-style-type: none"> • New research enabling the cotton industry to report its environmental performance. • Two continuing projects to investigate management strategies to sustain riparian areas, floodplain and wetland ecosystems on cotton farms. 	<ul style="list-style-type: none"> • UQ, QUT • UNE, Griffith University
	2.2.3	Identifying and proving integrated management strategies which deliver environmental and productivity gains.	<ul style="list-style-type: none"> • New research to better manage riparian corridors on cotton farms for multiple benefits. • A continuing project to connect farms and natural ecosystems to better manage cotton pests. 	<ul style="list-style-type: none"> • Griffith University • CSIRO
	2.2.4	Researching the connectivity between cotton farms and natural systems in the landscape.	<ul style="list-style-type: none"> • A new project to better manage natural landscapes on cotton farms to increase the provision of ecosystem services. • Continuing research to baseline the lower Namoi groundwater and evaluate Pilliga coal seam gas requirements. 	<ul style="list-style-type: none"> • Griffith University • UNSW
	2.2.5	Supporting initiatives and partnerships to improve the knowledge and capacity to manage natural landscapes and systems in cotton regions.	<ul style="list-style-type: none"> • A continuing project to support natural resource management technical capacity in industry extension. • A new RiverCare Champion project to facilitate best management practice of riparian zones with cotton growers. 	<ul style="list-style-type: none"> • Stacey Vogel Consulting • Capricorn North

SUSTAINABLE FUTURES

An industry achieving its vision.	2.3.1	Scoping and investigating critical threats and opportunities which may influence the long term sustainability of the Australian cotton industry.	<ul style="list-style-type: none"> • A continuing investigation to improve prediction of cotton growth and production in a changing climate. • A continuing project to assess the impact of potential future climates on cotton production and to identify potential management strategies. 	<ul style="list-style-type: none"> • CSIRO • CSIRO
	2.3.2	Supporting innovative approaches to solve traditional industry issues and drive future sustainability.	<ul style="list-style-type: none"> • A continuing project to assess the resilience of the Australian cotton industry at multiple scales. 	<ul style="list-style-type: none"> • Bel Tempo

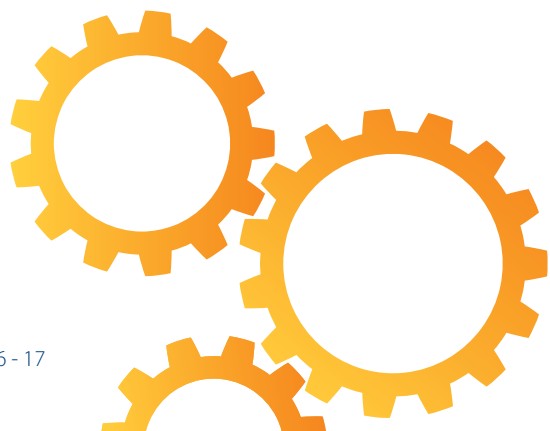


Customers

Program outcome: The Australian cotton industry captures the full value of its products

Measure of Success: Double the premium for Australian cotton

Outcome	Key tactics	R&D Investments 2016-17	Collaborative Partners
ASSURED COTTON			
The integrity and qualities of Australian cotton set global benchmarks for customers.	3.1.1	Improving Australian fibre quality testing standards and procedures and the capacity to measure and manage contamination.	<ul style="list-style-type: none"> • Previous investments in this area have delivered the sought outcomes, hence, no further research is planned under this tactic.
	3.1.2	Supporting the development and implementation of post farm gate BMPs.	<ul style="list-style-type: none"> • A continuing project aimed at improving the quality of Australian cotton through post-harvest initiatives. • A continuing project to assess the impact on cotton quality of using round modules.
	3.1.3	Developing and implementing a standardised reporting system for Australian cotton product quality and traceability.	<ul style="list-style-type: none"> • New research to map out and trace cotton through the supply chain. • Ongoing support for the adoption of best management practices for the classification of cotton.
	3.1.4	Benchmarking Australian cotton against key international programs for product stewardship and sustainability.	<ul style="list-style-type: none"> • New research to better manage colour grade for Australian cotton. • A continuing project to develop a carbon calculator for cotton.



DIFFERENTIATED PRODUCTS

Customers recognise the differentiated value of Australian cotton products	3.2.1	Identifying opportunities for improvement in fibre quality and cotton products.	<ul style="list-style-type: none"> • New research to develop an eco-friendly treatment that improves the look and feel of cotton. • A continuing PhD study to investigate improving length, strength and fineness of cotton. • A PhD study investigating the effects of cotton cellulose structure and interaction on dye uptake. 	<ul style="list-style-type: none"> • Deakin University • CSIRO • CSIRO
	3.2.2	Demonstrating the value of different fibre classes and defining fibre quality parameters that secure a premium market.	<ul style="list-style-type: none"> • Continuing research to understand fibre elongation characteristics of Australian cotton and its contribution to strength and fineness. 	<ul style="list-style-type: none"> • CSIRO
	3.2.3	Developing customer-based partnerships for the development of higher value and novel products, which differentiate Australian cotton.	<ul style="list-style-type: none"> • Continuing research to investigate development of compression athletic sportswear using improved functionality cotton treatments. • A continuing project to develop novel anti-wetting & self-sterilising cotton fabrics. • A continuing project to investigate the development of ever-dry, self-cooling cotton fabrics. • A PhD project to assess the potential to develop high value bio-extractives and bio ethanol from gin trash. • Further trial market developments with mills and brand owners to evaluate the competitive advantages of Australian cotton. Integrated promotion of technologies that help differentiated Australian cotton. 	<ul style="list-style-type: none"> • Deakin University • Deakin University • Deakin University • NSW DPI, QUT • CA, CottonInc, BCI, CottonLeads

COMPETITIVE FUTURES

The demand for Australian cotton products is positively transformed.	3.3.1	Investigating existing and future markets for Australian cotton and communicate these findings to the Australian cotton industry.	<ul style="list-style-type: none"> • New research to assess the potential of developing renewable fine chemicals from cotton biomass. • A new project to identify and optimise the cotton supply chain to drive efficiencies. 	<ul style="list-style-type: none"> • AgFuels, Southern Oil, NSW DPI, FWPA, APL, QUT • CSIRO
	3.3.2	Facilitating the development of new technologies and systems to improve the competitiveness of Australia cotton.	<ul style="list-style-type: none"> • Continuing feasibility studies to identify potential new products that would transform the cotton industry and its supply chains. • Continuing research to develop smart cotton/carbon fabric for electrical conductivity and reducing electromagnetic interference. 	<ul style="list-style-type: none"> • CSIRO • Deakin University

People

Program outcome: Capable and connected people driving the cotton industry

Outcome	Key tactics	R&D Investments 2016-17	Collaborative Partners	
WORKFORCE CAPACITY				
A skilled, educated and progressive industry workforce	4.1.1	Investigating effective strategies for attracting, developing and retaining people in the cotton industry.	<ul style="list-style-type: none"> • CSIRO • USQ • USQ, UQ • ARLF 	
	4.1.2	Supporting initiatives which lead to the continuous improvement of human resource management including on-farm Workplace Health and Safety	<ul style="list-style-type: none"> • USYD • DA, APL, GRDC, MLA • USYD • USYD 	
	4.1.3	Understanding opportunities for greater Aboriginal participation in cotton and partnering with organisations to support the development of a culturally aware cotton workforce.	<ul style="list-style-type: none"> • Investigate opportunities to build on previous research that enables the development of a longer term strategy for improved aboriginal participation in the workforce. 	<ul style="list-style-type: none"> • CA
	4.1.4	Supporting educational opportunities which increase the skills and knowledge of current workforces and will meet the needs of future workforces.	<ul style="list-style-type: none"> • A continuing project to investigate the development and value of recognition of prior learning for cotton growers and managers. • A continuing project to build capacity in cotton farm employer driven staff development. • Continuing support for the activities of the cotton education officer. • A continuing project to support the delivery of the Cotton Production Course. • Ongoing support for scholarships including summer scholars, undergraduate and PhDs. • A continuing project with Cotton Australia to maintain cotton industry membership of the Primary Industries Education Foundation. • Ongoing support for the ABARES Science & Innovation Awards for Young People in Agriculture. 	<ul style="list-style-type: none"> • USQ • UNE • CSIRO • USQ • CSIRO, NSW DPI, QDAF, UNE, USYD, CSU, USQ, UQ • CA • ABARES
	4.1.5	Creating opportunities for, and supporting the development of leadership skills.	<ul style="list-style-type: none"> • New and continuing projects which support specific industry and agricultural leadership development programs. 	<ul style="list-style-type: none"> • Nuffield, ARLF, RIRDC, Peter Cullen Trust

NETWORKS				
An industry connected by dynamic networks.	4.2.1	Establishing and empowering creative forums and initiatives which build relationships.	<ul style="list-style-type: none"> A continuation of the Grassroots Grants program to encourage capacity building projects with local cotton grower associations (CGAs). 	<ul style="list-style-type: none"> CA, CGAs
	4.2.2	Supporting and participating in collaborative cross sectoral RD&E initiatives.	<ul style="list-style-type: none"> Continued support for work under the Climate Change Research Strategy for Primary Industries (CCRSPI) and the water use in agriculture, soils and plant biosecurity cross sector RD&E plans. Ongoing support for the cooperative partnership for farming and fishing occupational health and safety. 	<ul style="list-style-type: none"> GRDC, MLA, DA, APL, HIA CSIRO, NSW DPI, FRDC, QDAF, USYD
	4.2.3	Creating and facilitating opportunities for national and international RD&E exchange.	<ul style="list-style-type: none"> Continued support for travel scholarships for research, capacity building and innovation focused purposes. The development of a scientific exchange program to build knowledge and networks. 	<ul style="list-style-type: none"> CSIRO, QDAF, NSW DPI, USYD CottonInc
	4.2.4	Facilitating engagement with stakeholders for prioritising and capturing advice on RD&E issues	<ul style="list-style-type: none"> Support for the skill and knowledge development of RD&E advisory panels. 	<ul style="list-style-type: none"> CA, CGAs
	4.2.5	Honing research expertise and the application of science from core research disciplines	<ul style="list-style-type: none"> Continuing support for the Managing Climate Variability IV program and a cotton grower participant in the Cotton Climate Champion Program. Continuing projects which support research and industry advisory panels. 	<ul style="list-style-type: none"> GRDC, MLA CA, CGAs
COMMUNICATION				
Stakeholder information needs are met.	4.3.1	Providing information for demand driven communication strategies and performance reporting.	<ul style="list-style-type: none"> CottonInfo joint venture partnership with commercial and industry partners. A new project to develop best management practice videos for the cotton industry. A continuing project to provide technical and extension support for cotton diseases and volunteer/ratoon management. A continuing project to support knowledge and extension for soil and nutrition. A continuing project to support delivery of natural resource management knowledge. 	<ul style="list-style-type: none"> CSD, CA QDAF QDAF UNE Stacey Vogel Consulting
	4.3.2	Applying innovative communication methods.	<ul style="list-style-type: none"> A continuing project to stimulate private sector extension in Australian agriculture to increase returns from R&D. 	<ul style="list-style-type: none"> MLA, SRA, APL, RIRDC, HIA, University of Melbourne, DEJTR, NSW DPI

Performance

Program outcome: Measured performance of the Australian cotton industry and its RD&E drives continuous improvement

Outcome	Key tactics	R&D Investments 2016-17	Collaborative Partners
BEST PRACTICE			
World's best practice underpins the performance of the cotton industry.	5.1.1	Supporting a best practice framework as the primary integrated planning, risk management, benchmarking, knowledge development and delivery system.	<ul style="list-style-type: none"> CA, Rachel Holloway Consulting CSIRO CA, CSIRO, NSW DPI, QDAF
	5.1.2	Promoting best practices through the CottonInfo Joint Venture.	<ul style="list-style-type: none"> CSD, CA, CSIRO, NSW DPI, QDAF CA, CSD
MONITORING AND EVALUATION			
Industry and RD&E performance is captured	5.2.1	Developing and implementing an internal M&E framework for evaluating portfolio balance and R&D performance.	<ul style="list-style-type: none"> A new project to assess the impact of research supported by CRDC for the Australian cotton industry. A continuing project developing a framework and benchmark for monitoring achievement of the CRDC's 2013-2018 Strategic Plan. Facilitation of linkages between research and development corporation's to incorporate prior learnings for monitoring and evaluation.
	5.2.2	Conducting annual industry surveys to capture practice change.	<ul style="list-style-type: none"> Agtrans Roth Rural MLA, GRDC, HIA, SRA, APL, FRDC, Wine Australia
	5.2.3	Establishing a framework through which industry performance can be nationally and internationally reported.	<ul style="list-style-type: none"> CCA Roth Rural BCA
		<ul style="list-style-type: none"> A new project to measure and report the value of capacity building on farms. myBMP as a system to record grower adoption of best management practices identified through R&D. 	<ul style="list-style-type: none"> Qualdata CA

REVIEWS				
Continuous improvements in industry and RD&E performance.	5.3.1	Undertaking scientific discipline reviews of the industry's RD&E.	<ul style="list-style-type: none"> New projects to review specific disciplines of the industry RD&E. 	<ul style="list-style-type: none"> Agtrans
	5.3.2	Commissioning and participating in independent reviews of CRDC's RD&E and organisational performance.	<ul style="list-style-type: none"> A new project to evaluate CRDC's people strategy. 	<ul style="list-style-type: none"> Qualdata
	5.3.3	Commissioning independent reviews of the social, environmental and economic performance of the industry.	<ul style="list-style-type: none"> New projects to review the social and economic performance of the industry. 	<ul style="list-style-type: none"> QUT
	5.3.4	Participating in cross-sectoral RD&E impact evaluations and reviews.	<ul style="list-style-type: none"> Participating in the Council of Rural Research and Development Corporation's (CRRDCs) project evaluations of RD&E. 	<ul style="list-style-type: none"> CRRDC, MLA, GRDC, HIA, SRA, APL, FRDC, Wine Australia



Our 2016-17 financial budget statements

Table 1.1 Resource Statement

Source	2015-16 estimated actual \$'000	2016-17 estimate \$'000
Opening balance/cash reserves at 1 July	36,666	29,275
FUNDS FROM GOVERNMENT		
Special appropriations ¹ <i>Primary Industries and Energy Research and Development Act 1989 s.30(3)</i> – Cotton R&D Corporation	11,113	10,782
Total special appropriations	11,113	10,782
Total funds from government	11,113	10,782
FUNDS FROM INDUSTRY SOURCES		
Levies ²	5,335	5,445
<i>less amounts paid to the CRF</i>	<i>(5,335)</i>	<i>(5,445)</i>
Total	-	-
FUNDS FROM INDUSTRY SOURCES		
Interest	1,182	700
Royalties	1,140	656
Other	5,396	1,207
Total funds from other sources	7,718	2,563
Total net resourcing for CRDC	55,497	42,620
	2015-16	2016-17
Average staffing level for CRDC (Number of staff)	13.4	13.8

1. CRDC is not directly appropriated as it is a corporate Commonwealth entity under the PGPA Act. Appropriations are made to the Department of Agriculture and Water Resources and then paid to CRDC and are considered departmental for all purposes.

2. Levies imposed and collected under the following legislation: Primary Industries Research and Development Act 1989 (PIRD Act), Primary Industries (Excise) Levies Act 1999, Primary Industries Levies and Charges Collection Act 1991 and associated legislation.

CRF – Consolidated Revenue Fund

Prepared on a resourcing (i.e. appropriations available) basis.

Please note: All figures shown above are GST exclusive – these may not match figures in the cash flow statement.

Table 2.1 Budgeted Expenses for Outcome 1

Outcome 1: 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.

	2015–16 Estimated actual \$'000	2016–17 Budget \$'000	2017–18 Forward estimate \$'000	2018–19 Forward estimate \$'000	2019–20 Forward estimate \$'000
PROGRAMME 1.1: COTTON RESEARCH AND DEVELOPMENT CORPORATION					
Revenue from Government					
Special appropriations <i>Primary Industries Research and Development Act 1989 s.30(3) – Cotton R&D Corporation</i>	5,200	5,308	5,891	6,564	6,562
Special appropriations – Industry Levies	5,335	5,445	6,030	6,705	6,705
Revenues from other independent sources	6,848	2,420	1,877	1,705	1,705
Reserves	5,497	7,228	4,118	-	-
Total expenses for programme 1.1	22,880	20,401	17,916	14,974	14,972
OUTCOME 1 TOTALS BY RESOURCE TYPE					
Revenue from Government					
Special appropriations	5,200	5,308	5,891	6,564	6,562
Special appropriations – Industry Levies	5,335	5,445	6,030	6,705	6,705
Revenues from other independent sources	6,848	2,420	1,877	1,705	1,705
Reserves	5,497	4,118	4,118	-	-
Total expenses for Outcome 1	22,880	20,401	17,916	14,974	14,972
	2015–16	2016–17			
Average Staffing Level (number)	13.4	13.8			

Table 2.2 Performance Criteria for Outcome 1

Outcome 1: 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.

PROGRAMME 1.1: COTTON RESEARCH AND DEVELOPMENT CORPORATION	
Objectives	<p>Farmers – cotton is profitable and consistently farmers’ crop of choice</p> <p>Deliver RD&E for cotton producers to increase productivity, successfully protect crops from threats, optimise resource efficiencies and innovate for improved profitability.</p>
	<p>Industry – the Australian cotton industry is the global leader in sustainable agriculture</p> <p>Deliver RD&E for the cotton industry for stewardship of its production technologies and its biosecurity, to lead in responsible landscape management and achieve its vision for a sustainable future.</p>
	<p>Customers – the Australian cotton industry captures the full value of its products</p> <p>Deliver RD&E for the cotton industry to set global benchmarks for cotton qualities and quality assurance, differentiate the value of Australian cotton products to customers and transform the competitive future for the Australian cotton industry.</p>
	<p>People – capable and connected people driving the cotton industry</p> <p>Deliver RD&E for the cotton industry to ensure workforce capacity, effective networks and communication.</p>
	<p>Performance – measured performance of the Australian cotton industry and its RD&E drives continuous improvement</p> <p>Deliver RD&E which supports a best practice framework for the cotton industry, captures and demonstrates performance and conduct reviews which enable continuous improvement by CRDC and the industry.</p>

PROGRAMME 1.1: COTTON RESEARCH AND DEVELOPMENT CORPORATION	
Delivery	<p>Farmers – cotton is profitable and consistently farmers’ crop of choice</p> <p>Strategically prioritise investment in basic, applied and blue-sky research collaboratively with research and cross-sectoral partners to develop new knowledge, practices and technologies for on-farm application by cotton farmers.</p>
	<p>Industry – the Australian cotton industry is the global leader in sustainable agriculture</p> <p>Strategically prioritise investment in basic, applied and blue-sky research collaboratively with research and cross-sectoral partners to develop new knowledge, practices and innovative approaches to solve industry issues.</p>
	<p>Customers – the Australian cotton industry captures the full value of its products</p> <p>Strategically prioritise investment in basic, applied and blue-sky research collaboratively with research partners to develop new knowledge, practices, processes, higher value and novel products for the Australian cotton industry and its customers.</p>
	<p>People – capable and connected people driving the cotton industry</p> <p>Strategically prioritise investment in research, development and extension collaboratively with research, industry and cross-sectoral partners to develop new knowledge, human capacity, support communication and adoption of R&D results.</p>
	<p>Performance – measured performance of the Australian cotton industry and its RD&E drives continuous improvement</p> <p>Strategically prioritise investment in research, development, data capture and analysis, reviews and extension with research, industry and cross- sectoral partners to drive performance outcomes.</p>

PERFORMANCE INFORMATION		
YEAR	PERFORMANCE CRITERIA ¹	TARGETS
2015–16	Farmers – cotton is profitable and consistently farmers’ crop of choice Industry productivity growth per hectare per annum.	3 per cent per hectare per annum. Estimated achievement of 3.1 per cent average growth in yield per hectare per annum since 2013.
	Industry – the Australian cotton industry is the global leader in sustainable agriculture Industry reports to customer needs for sustainability indicators.	Achieved through responses to the 2014 Australian Grown Cotton Sustainability Report and Third Environmental Assessment.
	People – capable and connected people driving the cotton industry National Primary Industries RD&E Framework cotton and cross-sectoral RD&E strategies supported.	Achieved through implementation of the cotton RD&E strategy and increasing collaborative co-investment in cross-sectoral RD&E.
	Performance – measured performance of the Australian cotton industry and its RD&E drives continuous improvement Coverage of Best Management Practice systems across Australian cotton industry.	75 per cent of cotton farms participating. Estimated achievement of 70 per cent participation.
2016–17	Farmers – cotton is profitable and consistently farmers’ crop of choice Cotton farmers increase productivity by 3 per cent per hectare per year.	3 per cent per hectare per year.
	Industry – the Australian cotton industry is the global leader in sustainable agriculture As per 2015–16.	As per 2015–16.
	Customers – the Australian cotton industry captures the full value of its products <i>Customers continue to demand Australian cotton products.</i>	<i>Double the premium for Australian cotton.</i>
	People – capable and connected people driving the cotton industry <i>Implementation of the Cotton Industry Workforce Strategy.</i>	<i>Measured improvement in the capacity of farmers to attract, retain and develop people.</i>
	Performance – measured performance of the Australian cotton industry and its RD&E drives continuous improvement As per 2015–16.	<i>80 per cent of cotton farms participating.</i>

2017-18 and beyond	Farmers – cotton is profitable and consistently farmers’ crop of choice As per 2016-17.	As per 2016-17.
	Industry – the Australian cotton industry is the global leader in sustainable agriculture As per 2016-17.	As per 2016-17.
	Customers – the Australian cotton industry captures the full value of its products As per 2016-17.	As per 2016-17.
	People – capable and connected people driving the cotton industry As per 2016-17.	As per 2016-17.
	Performance – measured performance of the Australian cotton industry and its RD&E drives continuous improvement As per 2016-17.	As per 2016-17.

1. New or modified performance criteria that reflect new or materially changed programmes are shown in *italics*.



Photo: Ruth Redfern

Table 3.2.1 Comprehensive Income Statement (Showing Net Cost of Services) *for the period ended 30 June*

	2015–16 Estimated actual \$'000	2016–17 Budget \$'000	2017–18 Forward estimate \$'000	2018–19 Forward estimate \$'000	2019–20 Forward estimate \$'000
EXPENSES					
Employee benefits	1,997	1,914	1,847	1,885	1,921
Supplier expenses	1,332	1,283	1,321	1,178	1,329
Grants	19,325	17,047	14,571	11,724	11,565
Depreciation and amortisation	226	157	177	187	157
Total expenses	22,880	20,401	17,916	14,974	14,972
LESS					
OWN-SOURCE INCOME Own-source revenue					
Interest	1,120	700	650	625	625
Rental income	5	5	5	5	5
Royalties	1,140	656	812	824	824
Other	4,583	1,059	410	251	251
Total own-source revenue	6,848	2,420	1,877	1,705	1,705
Net cost of (contribution by) services	16,032	17,981	16,039	13,269	13,267
Revenue from Government¹					
Commonwealth contribution	5,200	5,308	5,891	6,564	6,562
Industry contributions	5,335	5,445	6,030	6,705	6,705
Total revenue from Government	10,535	10,753	11,921	13,269	13,267
Surplus (Deficit) attributable to the Australian Government	(5,497)	(7,228)	(4,118)	–	–
Total comprehensive Income (Loss) attributable to the Australian Government	(5,497)	(7,228)	(4,118)	–	–

1. Revenue from Government includes a Commonwealth contribution under the PIRD Act and levies collected from industry by the Department of Agriculture and Water Resources for R&D activities.

Prepared on Australian Accounting Standards basis.

Table 3.2.2 Budgeted departmental balance sheet (as at 30 June)

	2015-16 Estimated actual \$'000	2016-17 Budget \$'000	2017-18 Forward estimate \$'000	2018-19 Forward estimate \$'000	2019-20 Forward estimate \$'000
ASSETS					
Financial assets					
Cash and cash equivalents	1,643	1,752	1,591	1,503	1,560
Trade and other receivables	2,900	2,900	2,900	2,900	2,900
Investments	35,023	27,523	23,523	23,523	23,523
Total financial assets	39,566	32,175	28,014	27,926	27,983
Non-financial assets					
Land and buildings	750	860	860	860	860
Property, plant and equipment	92	160	148	236	224
Intangibles	314	299	354	354	309
Other	10	10	10	10	10
Total non-financial assets	1,166	1,329	1,372	1,460	1,403
Total assets	40,732	33,504	29,386	29,386	29,386
LIABILITIES					
Payables					
Suppliers	200	200	200	200	200
Grants	4,000	4,000	4,000	4,000	4,000
Total payables	4,200	4,200	4,200	4,200	4,200
Provisions					
Employee provisions	384	384	384	384	384
Total provisions	384	384	384	384	384
Total liabilities	4,584	4,584	4,584	4,584	4,584
Net assets	36,148	28,920	24,802	24,802	24,802
EQUITY*					
Reserves	255	255	255	255	255
Retained surplus	35,893	28,665	24,547	24,547	24,547
Total equity	36,148	28,920	24,802	24,802	24,802

* Equity is the residual interest in assets after deduction of liabilities.

Prepared on Australian Accounting Standards basis.



Table 3.2.3 Departmental changes in equity

	Retained earnings \$'000	Revaluation Asset Reserve \$'000	Total equity \$'000
OPENING BALANCE AS AT 1 JULY 2016			
Balance carried forward from previous period	35,893	255	36,148
Adjusted opening balance	35,893	255	36,148
COMPREHENSIVE INCOME			
Surplus (deficit) for the period	(7,228)	-	(7,228)
Total comprehensive income	(7,228)	-	(7,228)
<i>Of which:</i>			
Attributable to the Australian Government	(7,228)	-	(7,228)
Estimated closing balance as at 30 June 2017	28,665	255	28,920
Closing balance attributable to the Australian Government	28,665	255	28,920

Prepared on Australian Accounting Standards basis.

Table 3.2.4 Budgeted departmental statement of cash flows (for the period ended 30 June)

	2015-16 Estimated actual \$'000	2016-17 Budget \$'000	2017-18 Forward estimate \$'000	2018-19 Forward estimate \$'000	2019-20 Forward estimate \$'000
OPERATING ACTIVITIES					
Cash received					
Industry contributions	5,511	5,445	6,030	6,705	6,705
Revenue from Government	5,602	5,337	5,921	6,596	6,595
Interest	1,182	700	650	625	625
Net GST received	1,478	1,693	1,490	1,210	1,191
Other	6,536	1,863	1,320	1,156	1,155
Total cash received	20,309	15,038	15,411	16,292	16,271
Cash used					
Employees	1,956	1,914	1,847	1,884	1,922
Suppliers	1,516	1,413	1,447	1,295	1,440
Grants	21,022	18,752	16,028	12,896	12,722
Other	30	30	30	30	30
Total cash used	24,524	22,109	19,352	16,105	16,114
Net cash from (used by) operating activities	(4,215)	(7,071)	(3,941)	187	157
INVESTING ACTIVITIES					
Cash received					
Investments	-	7,500	4,000	-	-
Total cash received	-	7,500	4,000	-	-
Cash used					
Purchase of property, plant and equipment	400	320	220	275	100
Total cash used	400	320	220	275	100
Net cash from (used by) investing activities	(400)	7,180	3,780	(275)	(100)
Net increase (decrease) in cash held	(4,615)	109	(161)	(88)	57
Cash and cash equivalents at the beginning of the reporting period	6,258	1,643	1,752	1,591	1,503
Cash and cash equivalents at the end of the reporting period	1,643	1,752	1,591	1,503	1,560

Prepared on Australian Accounting Standards basis.

Table 3.2.5 Departmental Capital Budget Statement

	2015-16 Estimated actual \$'000	2016-17 Budget \$'000	2017-18 Forward estimate \$'000	2018-19 Forward estimate \$'000	2019-20 Forward estimate \$'000
PURCHASE OF NON-FINANCIAL ASSETS					
Funded internally from departmental resources ¹	400	320	220	275	100
Total	400	320	220	275	100
RECONCILIATION OF CASH USED TO ACQUIRE ASSETS TO ASSET MOVEMENT TABLE					
Total purchases	400	320	220	275	100
Total cash used to acquire assets	400	320	220	275	100

¹ Includes the following sources of funding: internally developed assets.

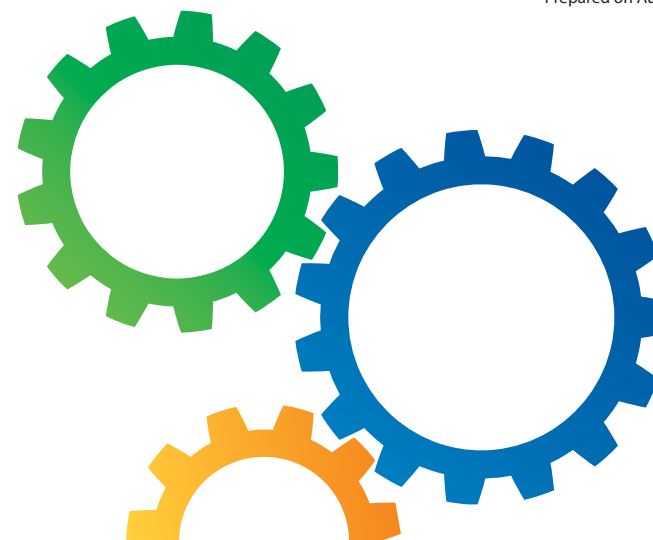
Consistent with information contained in the Statement of Asset Movements and the Budgeted Statement of Cash Flows.



Table 3.2.6 Statement of Asset Movements (Budget year 2016-17)

	Land \$'000	Buildings \$'000	Other property, plant and equipment \$'000	Computer software and intangibles \$'000	Total \$'000
AS AT 1 JULY 2016					
Gross book value	190	580	269	557	1,596
Accumulated depreciation/amortisation and impairment	-	(20)	(177)	(243)	(440)
Opening net book balance	190	560	92	314	1,156
CAPITAL ASSET ADDITIONS <i>Estimated expenditure on new or replacement assets</i>					
By purchase – other	-	130	105	85	320
Total additions	-	130	105	85	320
OTHER MOVEMENTS					
Depreciation/amortisation expense	-	(20)	(37)	(100)	(157)
Total other movements	-	(20)	(37)	(100)	(157)
AS AT 30 JUNE 2017					
Gross book value	190	710	374	642	1,916
Accumulated depreciation/amortisation and impairment	-	(40)	(214)	(343)	(597)
Closing net book balance	190	670	160	299	1,319

Prepared on Australian Accounting Standards basis.



Attachment A:

CRDC 2016-17 Investments listing

Note: List current as at 30 June 2016. Additional projects will be funded throughout the year, bringing the total number of projects invested in by CRDC during 2016-17 to approximately 200.

Project title	Project code	Researcher	Organisation	Start & Finish Dates	
Program one: Farmers					
1. SUCCESSFUL CROP PROTECTION					
A predictive diagnostic test for black root rot in cotton soils	CRDC1624	Maria Manjarrez	Microbiology Laboratories Australia	Apr-16	Oct-16
A productive diagnostic test for Verticillium		Karen Kirkby	NSW DPI	Jul-16	Jun-19
Centre for Biopesticides & Semiochemicals: Development of new tools & strategies for Integrated Pest Management (IPM)	DAN1404	Robert Mensah	NSW DPI	Jul-13	Jun-18
Centre for Biopesticides & Semiochemicals: Novel insecticides and synergists from endemic and exotic flora	UWS1401	Robert Spooner-Hart	UWS	Oct-13	Jun-18
Centre for Biopesticides & Semiochemicals: Semiochemical management for occasional pests of cotton and grains	UNE1404	Peter Gregg	UNE	Oct-13	Jun-18
Commercial development and evaluation of a machine vision-based weed spot sprayer	NEC1402	Stephen Rees	NCEA	Jul-13	Jun-18
Cotton industry disease survey		Linda Smith	QDAF	Jul-16	Jun-19
Crop protection development specialist (CottonInfo technical specialist)	DAQ1502	Sharna Holman	QDAF	Jul-14	Jun-17
Enhancing Integrated Pest Management (IPM) in cotton systems	CSP1401	Lewis Wilson	CSIRO	Jul-13	Jun-18
Establishing southern cotton Integrated Pest Management (IPM)	DAN1501	Sandra McDougall	NSW DPI	Jul-14	Jun-17
Management of Solenopsis mealybug in Bollgard cotton	DAQ1501	Richard Sequeira	QDAF	Jul-14	Jun-17
Northern Australia Cotton Development & Coordination Leader	CSP1602	Steve Yeates	CSIRO	Oct-15	Jun-18
PhD: Centre for Biopesticides & Semiochemicals: Electrophysiological and molecular identification of novel biopesticides	UWS1601	Michelle Mak	UWS	Jul-15	Jun-18
PhD: Developing the weed control threshold	DAN1601	Graham Charles	NSW DPI	Nov-15	Jun-17
PhD: Host plant relationships of green mirids - is alternative control possible?	UQ1402	Justin Cappadonna	UQ	Nov-13	Nov-16
PhD: Multiple host use and gene-flow in green vegetable bug relative to cotton crop	UQ1403	Dean Brookes	UQ	Mar-13	Oct-16
PhD: Quantifying and mapping the impacts of herbicide drift on cotton (non-target crop)	USQ1404	Luz Cadavid	USQ	Nov-13	Jun-17
Post doc: Hard to control weeds in northern farming systems - understanding key processes to improve control methods	DAN1402	Joe Moore	NSW DPI	Jul-13	Jun-17
Regional weed management workshops for growers and advisors	CRDC1621	John Cameron	ICAN	Mar-16	Jun-17
Review of technologies that can be enabled by robotics to improve weed control in Australian cotton farming systems	CRDC1615	Andrew Bate	SwarmFarm Robotics	Oct-15	Jul-16
Staying ahead of weed evolution in changing cotton systems	UQ1501	Jeff Werth & Bhagirath Chauhan	QAAFI	Jul-14	Jun-19
Travel: Attending the 49th Annual Society for invertebrate Pathology Conference	QUT1604	Christopher Nouné	QUT	May-16	Jul-16
Viruses, vectors and endosymbionts: Exploring interactions for control	UQ1305	Sharon van Brunschot	UQ	Apr-13	Jan-17

2. PRODUCTIVE RESOURCE EFFICIENCIES

Agronomy for resilient future cotton systems	CSP1601	Michael Bange	CSIRO	Jul-15	Jun-18
Benchmarking water use efficiency and crop productivity in the Australian cotton industry (CottonInfo technical specialist; <i>myBMP</i> water management module lead)	DAN1505	Janelle Montgomery	NSW DPI	Jul-14	Jun-19
Carbon farming in the Australian cotton industry - Grant support	CFEO1501	Rachel Bowman	Seed Media Pty Ltd	Oct-14	Jan-17
Carbon farming in the Australian cotton industry (CottonInfo technical specialist; <i>myBMP</i> energy and input efficiency module lead)	CFEO1401	Jon Welsh	CSD	Jul-13	Jun-17
Determining optimum nitrogen strategies for abatement of emissions for different irrigated cotton systems	AOTG1401	Graeme Schwenke	NSW DPI	Jul-13	Jun-17
Improving cotton productivity with crop nutrition	CSP1403	Michael Bange	CSIRO	Jun-13	Sep-16
Increasing profitability through improved nitrogen use efficiency and reducing gaseous losses of nitrogen	AOTG1601	Peter Grace	QUT	Jul-15	Jun-18
Mitigating and managing soil compaction for improved sustainable cotton production		Michael Braunack	CSIRO	Jul-16	Jun-19
Monitoring greenhouse gas emissions from irrigated cropping systems	CLW1401	Ben Macdonald	CSIRO	Jul-13	Jun-17
More Profit from Nitrogen: enhancing the nutrient use efficiency of intensive cropping and pasture systems			UQ and NSW DPI	Jul-16	Jun-20
New materials and options for reducing water losses from evaporation and seepage		Andrew Hamilton	NeoTop Water Systems	Jul-16	Jun-19
Opportunities for dryland cotton with Bollgard 3		Paul Grundy	QDAF	Jul-16	Jun-19
Optimising management of manure in southern NSW cotton production	DU1603	Wendy Quayle	CSIRO	Jul-15	Jun-18
Optimising seedling emergence	DAN1701	Deb Slinger	NSW DPI	Jul-16	Jun-19
PhD: Improving precision agriculture and environmental performance for the Australian cotton industry through fertiliser optimisation	ANU1602	James Latimer	ANU	Feb-16	Jun-19
PhD: Self-guided drones for tracking irrigation in a cotton field	USQ1402	Derek Long	USQ	Mar-14	Mar-17
PhD: Soil-specific strategic irrigation: identifying saline-sodic water as a resource	NEC1403	Aaditi Dang	NCEA	Mar-14	Jan-17
PhD: The impact of irrigation methods and management strategies on nitrogen fertiliser recovery in cotton	UQ1502	John Smith	UQ	Jul-14	Dec-18
PhD: Utilising novel plant growth regulators to develop resilient future cotton systems	CSP1604	Claire Welsh	CSIRO	Jan-16	Dec-18
Post doc: Cotton production in a future climate	CSP1501	Katie Broughton	CSIRO	Jul-14	Jan-18
Post doc: Professor of soil biology	UNE1403	Oliver Knox	UNE	Jan-14	Dec-18
Resilient cotton-farming systems in irrigated vertosols: soil quality, carbon and nutrient losses, cotton growth & yield in long-term studies	DAN1503	Guna Nachimuthu	NSW DPI	Jul-14	Jun-17
Smarter Irrigation for Profit: Develop precise and automated control systems for a range of irrigation systems	RRDP1603	Joseph Foley	NCEA	Jul-15	Apr-18
Smarter Irrigation for Profit: Evaluation of scheduling tools for the sugar industry	RRDP1609	Peter Samson	SRA	May-16	Apr-18
Smarter Irrigation for Profit: Grower led irrigation system comparison in the Gwydir Valley	RRDP1606	Louise Gall	GVIA	Jul-15	Apr-18
Smarter Irrigation for Profit: Increasing farm profit through efficient use of irrigation for dairy farms	RRDP1604	James Hills	UTAS	Jul-15	Apr-18
Smarter Irrigation for Profit: Irrigation agronomy for tailored and responsive management with limited water	RRDP1602	Hizbullah Jamali	CSIRO	Jul-15	Jun-18

Smarter Irrigation for Profit: Maximising on-farm irrigation profitability – southern connected systems	RRDP1605	Peter Regan	NSW DPI	Jul-15	Apr-18
Smarter Irrigation for Profit: Optimised dairy irrigation farms	RRDP1607	Monique White	Dairy Australia	Jul-15	Apr-18
Smarter Irrigation for Profit: Project leadership and coordination	RRDP1501	Guy Roth	Roth Rural	Jul-15	May-18
Smarter Irrigation for Profit: when and how much	RRDP1601	Mike Morris	DEDJTR	Jul-15	Apr-18
Soil System Research – physical, chemical and biological processes for plant growth and nutrient cycling down the whole soil profile	UNE1601	Oliver Knox	UNE	Jul-15	Jun-18
Southern Connected Systems - Trial Picker	DAN1603	John Smith	NSW DPI	Apr-16	Jun-17
Strengthening the Central Highlands Cotton Production System	DAQ1401	Paul Grundy	QDAF	Jul-13	Jun-17

3. PROFITABLE FUTURES

Agri-intelligence			QUT	Jul-15	Jun-19
Future farm automation and robotics management	GRDC1601		USQ	Apr-15	Jun-18
PhD: A National Regulatory Framework Governing Big Data in Primary Production	UNE1606	Gina Wood	UNE	Feb-16	Jan-19
PhD: Characterisation of brassinosteroid effects and brassinosteroid - responsive genes in cotton for growth and stress tolerance enhancement	UNE1605	Anahid A Essa Al-Amery	UNE	May-14	Apr-17
Precision to decision agriculture		Tristan Perez	QUT	Jul-16	Jun-19

Program two: Industry

1. RESPECTED STEWARDSHIP

Biosecurity: understanding the potential for new threats				Jul-16	Jun-17
Conventional insecticide resistance in Helicoverpa - monitoring, management and novel mitigation strategies in Bollgard III	DAN1506	Lisa Bird	NSW DPI	Jul-14	Jun-19
Cotton Map		Nicola Cottee	CA	Jul-16	Jun-17
Helicoverpa punctigera in inland Australia – what has changed?	UNE1502	Peter Gregg	UNE	Jul-14	Jun-17
Investigating the on-farm risks of aflatoxin contamination of cottonseed	DAN1406	Kathy Schneebeli	NSW DPI	Jan-14	Dec-16
Managing Bt resistance and induced tolerance in Bollgard III using refuge crops	CSE1601	Mary Whitehouse	CSIRO	Jul-15	Jun-18
Monitoring Silverleaf Whitefly (SLW) insecticide resistance	DAQ1701	Jamie Hopkinson	QDAF	Jul-16	Jun-19
NCEDD - Stewardship of biotechnologies and crop protection (CottonInfo technical specialist)	SC1601	Sally Ceeney	Consultant	Jul-15	Jun-18
PhD: Evolution of viral diversity and virus ecology in the management of resistance to biopesticides	QUT1402	Chris Nouné	QUT	Jan-14	Jun-17
Resistance research and monitoring to enhance stewardship of Bt cotton and management of Helicoverpa		Sharon Downes	CSIRO	Jul-16	Jun-19
Surveillance and studies for endemic and exotic virus diseases of cotton	DAQ1601	Murray Sharman	QDAF	Jul-15	Jun-19
The sustainable chemical control and resistance management of aphids, mites and mirids in Australian cotton: 2014-2019	DAN1507	Grant Herron	NSW DPI	Jul-14	Jun-19

2. RESPONSIBLE LANDSCAPE MANAGEMENT

Baselining Lower Namoi groundwater and evaluating Pilliga coal seam gas (CSG) developments	UNSW1601	Bryce Kelly & Charlotte Iverach	UNSW	Jul-15	Jun-18
Cotton Rivercare Champion	CRDC1602	Mark Palfreyman	Capricorn North Pty Ltd	Sep-15	Jun-18
Developing the groundwater health index (GHI) as an industry-wide monitoring tool	MQ1501	Grant Hose	Macquarie University	Jul-14	Jun-17
Improving the ability of the Australian cotton industry to report its sustainability performance		Erin Peterson	QUT	Jul-16	Jun-19
Improving the ability of the Australian cotton industry to report its sustainability performance		Francois Visser	UQ	Jul-16	Jun-19
Keeping pest populations lower for longer: Connecting farms and natural systems	CSE1501	Vesna Gagic	CSIRO	Jul-14	Jun-18
Managing climate variability program	GRDC1401	Beverley Henry	GRDC	Jul-13	Jun-17
Managing natural landscapes on Australian cotton farms to increase the provision of ecosystem services		Samantha Capon	Griffith University	Jul-16	Jun-19
Managing riparian corridors on cotton farms for multiple benefits	UNE1602	Rhiannon Smith	UNE	Jul-15	Jun-18
National cotton NRM technical specialist (CottonInfo technical specialist; myBMP natural assets module lead)	CRDC1501	Stacey Vogel	Stacey Vogel Consulting	Jul-14	Jun-17
National facility for cotton climate change research	CSP1402	Michael Bange	CSIRO	Jul-13	Dec-16
PhD: Effects of climatic fluctuation and landuse change on soil condition in the lower Lachlan	US1403	Patrick Filippi	USYD	Mar-14	Mar-17
PhD: Spatial & temporal importance of diffuse & stream recharge in semiarid environments: Implications for integrated water management	UNSW1403	Calvin Li	UNSW	Mar-14	Feb-17
PhD: Sustainable water extractions: Low flow refugia and critical flow thresholds	UNE1406	Marita Pearson	UNE	Jan-14	Dec-19
The impact of improved water use efficiency on paddock and catchment health	DNRM1401	Mark Silburn	DNRM	Jul-13	Dec-16

3. SUSTAINABLE FUTURES

Resilience assessment of the Australian cotton industry at multiple scales	CRDC1502	Francesca Andreoni	Bel Tempo	Jul-14	Dec-16
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Program three: Customers

1. ASSURED COTTON

Determining the shelf life of round modules and impact on cotton quality	CMSE1501	Menghe Miao	CSIRO	Jul-14	Sep-16
Enhancing and testing the Cotton Carbon Management Tool	UQ1503	Francois Visser	UQ	Jul-14	Jun-17
Managing colour grade		Simone Heimona	CSIRO	Jul-16	Jun-19
Raising the quality of Australian cotton through post harvest initiatives (CottonInfo technical specialist; myBMP fibre quality module lead)	CMSE1503	Rene van der Sluijs	CSIRO	Jul-14	Jun-17
Sustainable Apparel Coalition: 2015 membership	CRDC1608	Scott Miller	SAC	Aug-15	Aug-16
A review of emission methodologies for the Australian cotton industry & development of a detailed study for NW NSW	DAN1508	Pip Brock	NSW DPI	Jun-14	Sep-16

2. DIFFERENTIATED PRODUCTS

An eco friendly treatment to improve the look and handle of cotton fabric			Rangam Rajkhowa	Deakin University	Jul-16	Jun-18
Bio-degradation of dyed cotton fabrics			Nelson Vinueza			
Breathable cotton for compression athletic wear	DU1601	Maryam Naebe	Deakin University	Jul-15	Jun-17	
Measuring and managing fibre elongation for the Australian cotton industry	CMSE1504	Shouren Yang	CSIRO	Jul-14	Dec-16	
Novel anti-wetting & self-sterilising cotton fabrics	DU1501	Xin Liu and Yun Zhou	Deakin University	Jul-14	Jun-17	
Novel spinning technologies for fine and high quality Australian cotton yarns	DU1502	Xungai Wang	Deakin University	Jul-14	Jun-17	
PhD: Effects of cotton cellulose structure & interactions on dye uptake	CMSE1308	Genevieve Crowle	CSIRO	Jul-12	Dec-16	
PhD: High value bio-extractives and bioethanol from cotton gin trash	DAN1504	Shane McIntosh	NSW DPI	Jul-14	Aug-17	
PhD: Improving length, strength and fineness of cotton fibre	DU1401	Rangam Rajkhowa	Deakin University	Jan-13	Dec-16	
PhD: Low wax Australian cotton - reducing the scouring requirements of cotton fabric	CMSE1403	Katherine Birrer	CSIRO	Apr-14	Mar-17	
Smart cotton/carbon fabrics for electromagnetic interference shielding	DU1602	Jin Zhang	Deakin University	Jul-15	Jun-18	

3. COMPETITIVE FUTURES

Developing renewable fine chemicals from cotton biomass	SRA1601	William Doherty	QUT	Jul-15	Jun-18	
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Program four: People

1. WORKFORCE CAPACITY

ABARES Science and Innovation Award sponsorship		Various	ABARES	Jul-16	Jun-17	
Aboriginal Employment Strategy student scholarships	CRDC1613	Natalie Tighe	AES Ltd	Dec-14	Nov-16	
Aboriginal Employment Strategy student scholarships - Montana Jones	AES1601	Montana Jones	Merced Farming	Feb-16	Dec-17	
Co-investment in PIEF Membership for the cotton industry	CA1503	Adam Kay	CA/PIEF	Jul-16	Jun-17	
Cotton industry leadership development: Australian Rural Leadership Program		Various	ARLF	Jul-16	Jun-17	
CRDC Summer and Honours Scholarships		Various	CRDC	Jul-16	Jun-17	
CRDC Summer and Honours Scholarships: Determining emission factors for cotton residue-induced N2O emissions using 15N isotope tracers	QUT1603	Stephen Leo	QUT	Feb-16	Nov-16	
CRDC Summer and Honours Scholarships: Efficacy of robotic methods for the detection and treatment of herbicide resistance cotton weeds	QUT1602	Simon Thomas	QUT	Feb-16	Nov-16	
CRDC Summer and Honours Scholarships: Identifying and testing commercial root endophytes in cotton	QUT1601	Nathaniel Crane	QUT	Feb-16	Nov-16	
Developing education capacity for the Australian cotton industry (CottonInfo technical specialist)	CSE1602	Trudy Staines	CSIRO	Jul-15	Jun-18	
Horizon Scholarships	RIRDC1602	Various	RIRDC	Apr-13	Jun-17	

Horizon Scholarships 2013 - Jessica Kirkpatrick	RIRDC1302	Jessica Kirkpatrick	RIRDC	Apr-13	Dec-16
Horizon Scholarships 2013 - Paul Sanderson	RIRDC1304	Paul Sanderson	RIRDC	Apr-13	Dec-16
Horizon Scholarships 2014 - Alana Martin	RIRDC1404	Alana Martin	RIRDC	Mar-14	Dec-17
Horizon Scholarships 2014 - Felicity Taylor	RIRDC1401	Felicity Taylor	RIRDC	Mar-14	Dec-17
Horizon Scholarships 2014 - Grace Scott	RIRDC1402	Grace Scott	RIRDC	Mar-14	Dec-17
Horizon Scholarships 2014 - Michael Wellington	RIRDC1405	Michael Wellington	RIRDC	Mar-14	Dec-17
Horizon Scholarships 2014 - Sam Johnston	RIRDC1403	Sam Johnston	RIRDC	Mar-14	Dec-17
Horizon scholarships 2015 - Camilla a'Beckett	RIRDC1504	Camilla a'Beckett	RIRDC	Jul-15	Jun-17
Horizon scholarships 2015 - Scott Nevison	RIRDC1503	Scott Nevison	RIRDC	Jul-15	Jun-17
Nuffield Australia Farming Scholarships		Various	Nuffield Australia	Jul-16	Jun-17
People in farming - employment starter kit (EKSi)	DA1502	Shane Hellwege	Dairy Australia	Jul-14	Jun-17
Peter Cullen Trust scholarship		Various	Peter Cullen Trust	Jul-16	Jun-17
PhD: Career motivational factors of cotton growers' (attraction and retention)	USQ1401	Geraldine Wunsch	USQ	Jul-13	Dec-16
PhD: Investigating cotton farm workers' experiences of job satisfaction using social cognitive career theory	USQ1403	Nicole McDonald	USQ	Jan-14	Jan-17
Scholarship: Explore Leadership Development Capacity	CRDC1614	Eric Perez	FRDC	Sep-15	Sep-16
Skills profile and labour supply structure on cotton farms	UNE1402	Bernice Kotey	UNE	Jul-13	Aug-17
UNE Cotton Production Course	UNE1604	Brendan Griffiths	UNE	Jul-15	Jun-18

2. NETWORKS

18th Australian Cotton Conference foundation sponsorship	CA1601	Stuart Armitage	CA	Jul-15	Sep-16
AgVet collaboration		Rohan Rainbow	RIRDC	Jul-16	Jun-17
CCRSPI			RIRDC	Jul-16	Jun-17
CottonInfo on-farm trials		Warwick Waters	CRDC	Jul-16	Jun-17
CRDC Grassroots Grants		Various	CGAs	Jul-16	Jun-17
CRDC Grassroots Grants: Binnia Valley in-field trials to address local barriers to cotton growing and exposure to the cotton industry	CGA1605	Jon Welsh	Upper Namoi CGA	Oct-15	Jan-17
CRDC Grassroots Grants: Gwydir Valley dryland planting date row configuration trial	CGA1602	Ben Dawson	Gwydir Valley CGA	Jul-15	Dec-16
CRDC Grassroots Grants: Upgrade to Darling Downs weather station network and chemical application days	CGA1606	Chris Barry	Darling Downs CGA	Jan-16	Sep-16
Grower RD&E advisory panels - meeting travel, capacity building, Board Portal		Nicola Cottee	CA	Jul-16	Jun-17
IREC field station upgrade (jointly funded with CSD)	IREC1501	Rob Houghton	IREC	Jul-14	Jun-17
Plant Health Australia membership		TBA	PHA	Jul-16	Jun-17

Plant Health Australia secretariat support		TBA	PHA	Jul-16	Jun-17
Primary Industries Health and Safety Partnership	RIRDC1301	Simon Winter	Joint Partnership RIRDC	Aug-12	Jun-17
RIRDC Rural Womens Award sponsorship		Allanards Williams	RIRDC	Jul-16	Jun-17
Soils cross-sectoral strategy & National Soil RD&E Implementation Committee membership	DAFF1401	Mike Grundy	CSIRO	Jun-14	Jun-17
Travel: Attend International Congress of Entomology, Florida	CSP1603	Lewis Wilson & Simone Heimoana	CSIRO	Jan-14	Oct-16
Travel: Attend International Congress of Entomology, Florida	DAN1602	Robert Mensah	NSW DPI	Dec-15	Oct-16

3. COMMUNICATION

CRDC 25th Anniversary publication	CRDC1625	Robbie Sefton	Sefton & Associates	May-16	Jul-16
CRDC Annual Report		Ruth Redfern	CRDC	Jul-16	Jun-17
Documenting the production of best practice Australian cotton through videos		Paul Grundy	QDAF	Jul-16	Jun-18
Stimulating private sector extension in Australian agriculture to increase returns from R&D	DA1601	Ruth Nettle	Dairy Australia	Jul-15	Jun-18

Program five: Performance

1. BEST PRACTICE

'Science into best practice,' linking research with CottonInfo (CottonInfo technical specialist; myBMP IPM module lead)	CSP1504	Sandra Williams	CSIRO	Jul-14	Jun-17
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2. MONITORING AND EVALUATION

Annual Cotton Grower Practices Surveys: 2014, 2015 & 2016	RRR1501	Ingrid Roth	Roth Rural	Jul-14	May-17
Annual qualitative and quantitative surveys for the Australian cotton industry	CCA1601	Liz Todd	CCA	Jul-15	Jun-18
Boyce Cotton Comparative Analysis		Phil Alchin	BCA	Jul-16	Jun-17
Longitudinal Evaluation - Australian Rural Leadership Foundation's programs	RIR1602	Matt Linnegar	ARLF	Jun-16	Jun-17
Measuring and reporting the value of capacity building on farms and in research	CRDC1701	Gordon Stone	QualData	Jul-16	Jun-19

3. REVIEWS

Impact assessment of selected clusters of projects	CRDC1623	Peter Chudleigh	Agtrans Research and Consulting	May-16	Sep-16
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Table A

Research and development expenditure estimates 2016-17 across the Science and Research Priorities

Food (\$'000)						Soil and Water (\$'000)			Transport (\$'000)			Cybersecurity (\$'000)			
1.1.	1.2	1.3.1	1.3.2	1.3.3	1.3.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4
\$1,265	\$979	\$1,511	\$998	\$3,588	\$347	\$364	\$1,858	\$1,360	-	-	-	-	-	-	-

Energy (\$'000)			Resources (\$'000)				Advanced Manufacturing (\$'000)			Environmental Change (\$'000)			Health (\$'000)				Total (\$'000)
5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	8.1	8.2	8.3	9.1	9.2	9.3	9.4	
-	-	-	-	\$256	-	\$473	\$143	-	\$143	\$223	\$151	\$494	-	\$15	\$12	\$25	\$14,205

Science and Research Priorities:

PRIORITY 1: Food

- 1.1 Knowledge of global and domestic demand, supply chains and the identification of country specific preferences for food (and fibre).
- 1.2 Knowledge of the social, economic and other barriers to achieving access to healthy Australian food (and fibre).
- 1.3 Enhanced food production through:
 - 1.3.1 novel technologies, such as sensors, robotics, real-time data systems and traceability, all integrated into the production chain.
 - 1.3.2 enhanced food production through better management and use of waste and water; increased food (and fibre) quality, safety, stability and shelf life.
 - 1.3.3 enhanced food production through protection of food (and fibre) sources through enhanced biosecurity.
 - 1.3.4 enhanced food production through genetic composition of food (and fibre) sources appropriate for present and emerging Australian conditions.

PRIORITY 2: Soil and Water

- 2.1 New and integrated national observing systems, technologies and modelling frameworks across the soil-atmosphere-water-marine systems.
- 2.2 Better understanding of sustainable limits for productive use of soil, freshwater, river flows and water rights, terrestrial and marine ecosystems.
- 2.3 Minimising damage to, and developing solutions for restoration and remediation of, soil, fresh and potable water, urban catchments and marine systems.

PRIORITY 3: Transport

- 3.1 Low emission fuels and technologies for domestic and global markets.
- 3.2 Improved logistics, modelling and regulation: urban design, autonomous vehicles, electrified transport, sensor technologies, real time data and spatial analysis.
- 3.3 Effective pricing, operation, and resource allocation.

PRIORITY 4: Cybersecurity

- 4.1 Highly-secure and resilient communications and data acquisition, storage, retention and analysis for government, defence, business, transport systems, emergency and health services.
- 4.2 Secure, trustworthy and fault-tolerant technologies for software applications, mobile devices, cloud computing and critical infrastructure.
- 4.3 New technologies and approaches to support the nation's cybersecurity: discovery and understanding of vulnerabilities, threats and their impacts, enabling improved risk-based decision making, resilience and effective responses to cyber intrusions and attacks.
- 4.4 Understanding the scale of the cyber security challenge for Australia, including the social factors informing individual, organisational, and national attitudes towards cyber security.

PRIORITY 5: Energy

- 5.1 Low emission energy production from fossil fuels and other sources.
- 5.2 New clean energy sources and storage technologies that are efficient, cost-effective and reliable.
- 5.3 Australian electricity grids that can readily integrate and more efficiently transmit energy from all sources including low- and zero-carbon sources.

PRIORITY 6: Resources

- 6.1 A fundamental understanding of the physical state of the Australian crust, its resource endowment and recovery.
- 6.2 Knowledge of environmental issues associated with resource extraction.
- 6.3 Lowering the risk to sedimentary basins and marine environments due to resource extraction.
- 6.4 Technologies to optimise yield through effective and efficient resource extraction, processing and waste management.

PRIORITY 7: Advanced Manufacturing

- 7.1 Knowledge of Australia's comparative advantages, constraints and capacity to meet current and emerging global and domestic demand.
- 7.2 Cross-cutting technologies that will de-risk, scale up, and add value to Australian manufactured products.
- 7.3 Specialised, high value-add areas such as high-performance materials, composites, alloys and polymers.

PRIORITY 8: Environmental Change

- 8.1 Improved accuracy and precision in predicting and measuring the impact of environmental changes caused by climate and local factors.
- 8.2 Resilient urban, rural and regional infrastructure.
- 8.3 Options for responding and adapting to the impacts of environmental change on biological systems, urban and rural communities and industry.

PRIORITY 9: Health

- 9.1 Better models of health care and services that improve outcomes, reduce disparities for disadvantaged and vulnerable groups, increase efficiency and provide greater value for a given expenditure.
- 9.2 Improved prediction, identification, tracking, prevention and management of emerging local and regional health threats.
- 9.3 Better health outcomes for Indigenous people, with strategies for both urban and regional communities.
- 9.4 Effective technologies for individuals to manage their own health care, for example, using mobile apps, remote monitoring and online access to therapies.

Table B

Research and development expenditure estimates 2016-17 across the R&D Priorities for Agriculture.

	ADVANCED TECHNOLOGY (\$'000)	BIOSECURITY (\$'000)	SOIL, WATER AND MANAGING NATURAL RESOURCES (\$'000)	ADOPTION OF R&D (\$'000)	TOTAL (\$'000)
EXPENDITURE	\$3,800	\$4,130	\$3,828	\$2,447	\$14,205
PERCENTAGE OF TOTAL	27%	29%	27%	17%	100%



Attachment C:

Research partner acronyms

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
AES Ltd	Aboriginal Employment Strategy Ltd
ANU	Australian National University
APL	Australian Pork Limited
ARLF	Australian Rural Leadership Foundation
ARLP	Australian Rural Leadership Program
BCA	Boyce Chartered Accountants
BCI	Better Cotton Initiative
CA	Cotton Australia
CA/PIEF	Cotton Australia/Primary Industries Education Foundation
CCA	Crop Consultants Australia
CGAs	Cotton Grower Associations
CRDC	Cotton Research and Development Corporation
CRRDC	Council of Rural Research and Development Corporations
CSD	Cotton Seed Distributors Ltd
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSU	Charles Sturt University
DA	Dairy Australia
DEDJTR	Victorian Department of Economic Development, Jobs, Transport, and Resources
DNRM	Queensland Department of Natural Resources and Mines
FRDC	Fisheries Research and Development Corporation
FWPA	Forest and Wood Products Australia
GRDC	Grains Research and Development Corporation

GVIA	Gwydir Valley Irrigators Association
HIA	Horticulture Innovation Australia
ICAN	Independent Consultants Australia Network
IREC	Irrigation Research and Extension Committee
MLA	Meat & Livestock Australia
NCEA	National Centre for Engineering in Agriculture
NSW DPI	NSW Department of Primary Industries
PHA	Plant Health Australia
QAAFI	Queensland Alliance for Agricultural and Food Innovation
QDAF	Queensland Department of Agriculture and Fisheries
QUT	Queensland University of Technology
RIRDC	Rural Industries Research and Development Corporation
SAC	Sustainable Apparel Coalition
SARDI	South Australian Research and Development Institute
SRA	Sugar Research Australia
UNE	University of New England
UNSW	University of New South Wales
UQ	University of Queensland
USQ	University of Southern Queensland
USYD	University of Sydney
UTAS	University of Tasmania
UWS	University of Western Sydney





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