CRDC ANNUAL REPORT 2013–2014

Investing in RD&E for the world leading Australian cotton industry

Australian Government

Cotton Research and Development Corporation

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If you are interested in learning more about CRDC and funded projects visit the CRDC website **www.crdc.com.au** or subscribe to our free magazine Spotlight.

Front cover photo: *CRDC-supported mechatronic research fellow, Dr Cheryl McCarthy of the National Centre for Engineering in Agriculture (NCEA), is investigating the commercial development and evaluation of a machine vision-based weed spot sprayer. Photo courtesy NCEA.*

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LETTER OF TRANSMITTAL

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15 October 2014

The Hon. Barnaby Joyce MP
Minister for Agriculture
Parliament House
Canberra ACT 2600

Dear Minister

It is with great pleasure that I submit the Corporation's Annual Report for 2013–14, prepared in accordance with the provisions of the *Primary Industries Research and Development Act 1989*, the *Commonwealth Authorities and Companies Act 1997* and section 46 of the *Public Governance, Performance and Accountability Act 2013.*

The activities of the Corporation are reported against the objectives, strategies, outputs and outcomes of the CRDC Strategic Research and Development Plan 2013–18 and are consistent with CRDC's 2013–14 Annual Operating Plan and Portfolio Budget Statement.

Under Section 9 of the *Commonwealth Authorities and Companies Act 1997,* CRDC Directors are responsible for the preparation and content of the Annual Report being made in accordance with the Finance Minister's orders. The report of operations was approved by a resolution of the Directors on 18 August 2014.

Yours sincerely

Dr Mary Corbett
Chair
Cotton Research and Development Corporation

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CRDC-supported postdoctoral research fellow, Dr Sharon van Brunschot of the University of Queensland, is investigating the control of silverleaf whitefly using similar science to that used to successfully control dengue fever in mosquitoes.

REPORT FROM THE CHAIR AND EXECUTIVE DIRECTOR

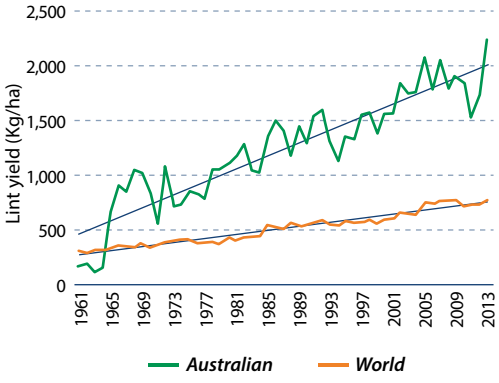
The Cotton Research and Development Corporation's (CRDC's) 2013–14 investment in research, development and extension (RD&E) continues our long standing commitment to deliver beneficial outcomes for our cotton growers and enhance industry's performance.

Cotton RD&E – led by CRDC over the past 24 years – has delivered and continues to deliver real outcomes for growers, the industry and the wider community.

Our focus is on improving the productivity and importantly, the profitability, of our growers and ensuring the industry is sustainable into the future – for this generation and the next. Our investments focus on all aspects by the supply chain: from growers to the wider industry to our customers, as well as our people and our performance.

A culture of RD&E innovation and the adoption of R&D findings have led to many of the industry's success stories. Thanks to cotton RD&E, led by CRDC and delivered in partnership with our research partners, Australian cotton growers are world leaders in resource efficiency, while reducing their environmental footprint. Our growers achieve the highest yields in the world, increase productivity of around four per cent per annum and have increased their water productivity by 40 per cent and reduced their insecticide use by 95 per cent over the past 10–15 years.

The Australian cotton industry's yield increases from 1961 to 2013, compared with the global cotton industry.



Today, cotton is Australia's third most valuable agricultural export commodity. Our focus is on delivering a triple bottom line approach: outcomes that benefit the cotton industry and its communities via economic, environmental and social means. Importantly, as our investments in this year demonstrate, work continues on our future success stories.

In 2013–14, despite challenging seasonal conditions, Australia's cotton production remained strong, with cotton growers weathering unseasonably dry conditions during planting and, in some areas flooding rains during picking, to generate an estimated four million bales – a benchmark achieved over each of the past three seasons. Cotton production during this season was particularly strong in the emerging southern New South Wales (NSW) areas and, for the first time, cotton was also grown on a commercial scale in northern Victoria during the 2013–14 season.

Weather was but one of a number of challenges faced by the industry during the year, with fluctuating cotton prices and international market changes providing external pressure. But this was also a year of major advances for the cotton industry, underpinned by the industry's investment in RD&E – from resistance management preparation for the impending release of Bollgard III® technology to major initiatives in the marketing of Australian cotton.

The 2013–14 year also marked the first year of investment under the CRDC's new Strategic R&D Plan 2013–18, which has a strong focus on improving the industry's profitability, sustainability and competitiveness. With 99 per cent of Australian cotton being exported, we are not just a domestic industry. We are playing on the world stage and as the challenges get bigger, Australian cotton must get bolder.

That's why the CRDC Strategic R&D Plan 2013–18 sets ambitious targets for the industry: ensuring cotton is profitable and farmers' crop of choice; that the industry is the global leader in sustainable agriculture; that the industry is capturing the full value of its products for customers; that it has capable and connected people driving the industry; and that the measurement of its performance drives continuous improvements.

The Plan is about ensuring the industry is prepared to overcome the challenges, and capitalise on the opportunities, ahead. In accordance with this Plan, during the 2013–14 year, CRDC invested a total of $21.9 million on behalf of cotton growers and the Australian Government in RD&E with more than 200 projects across five key program areas: farmers, industry, customers, people and performance.

The Strategic R&D Plan 2013–18 has a long-term focus on the future. The Australian cotton industry is already internationally recognised as innovative, dynamic and hugely successful – due in part to its willingness to invest in world-class RD&E results and rapidly adopt emerging science, innovations and technology.

However, the environment in which our industry operates is rapidly changing. Increased volatility in production, prices and climate, combined with rising input costs, staff shortages, and cotton's declining share of the global fibre market all suggest that the future for the industry is going to be increasingly complex and uncertain.

The challenge for the industry is to continue adapting to these changes and remain profitable, sustainable and competitive in 20 years' time, and beyond. It's an ambitious goal given that the future is unpredictable. The challenge for CRDC is how and where to focus RD&E investments. As such, the Plan contains three futures themes which CRDC worked with the industry to develop in 2013–14 and will continue to develop over the coming year: profitable futures, sustainable futures and competitive futures.

In addition to a long-term strategic view for the future of the sector, ensuring RD&E continues to underpin the current success of the cotton industry is the major focus of CRDC. We believe there are strong benefits in the Australian Government continuing its co-investment in rural RD&E, working hand in hand with the Australian agricultural sector – which is why in April 2014 CRDC submitted a response to the Agricultural Competitiveness White Paper Issues Paper.

We also believe that RD&E outcomes are not truly valuable unless they reach their intended audience, which is why ensuring the outcomes of CRDC's RD&E projects are delivered to growers has been a key focus for CRDC during 2013–14, with extension forming a critical component of CRDC's industry involvement.

The industry's extension program, CottonInfo, completed its second season during 2013–14, with support from joint venture partners CRDC, Cotton Australia and Cotton Seed Distributors Ltd.

During this time, CRDC also progressed with work on the response to the Australian cotton industry's Third Environmental Assessment. Since 1991, the industry has proactively sought independent appraisal of its environmental management and performance, ensuring it continuously recognises and responds to environmental concerns. This 23 year commitment to independent environmental reviews is unique among agricultural industries, marking the industry's dedication to continuously improving its environmental management.

The Third Environmental Assessment, conducted in 2012, identified future environmental priorities for the industry and made six specific recommendations for the industry to continue to reduce its environmental footprint. One of these, 'deliver evidence based reporting of environmental performance', has resulted in the development of the first Australian Grown Cotton Sustainability Report, which CRDC and Cotton Australia are currently finalising.

These achievements, combined with CRDC's ongoing investments in RD&E on behalf of the industry, hold the industry in good stead in the lead up to the 2014–15 season, which is expected to again be a challenging one for growers, due to water shortages. Whatever the seasonal conditions, CRDC will be standing side by side with the cotton industry over the coming year, ensuring that growers and the Australian Government's valuable investment in RD&E is delivered where it is needed most.

Finally, we will have a new Board of Directors in October 2014. Our thanks go to the current Board, who have soundly governed and guided CRDC to new levels of strategic ambition for RD&E outcomes.

Mary Corbett,
CRDC Chair

Bruce Finney,
CRDC Executive Director

Executive Summary

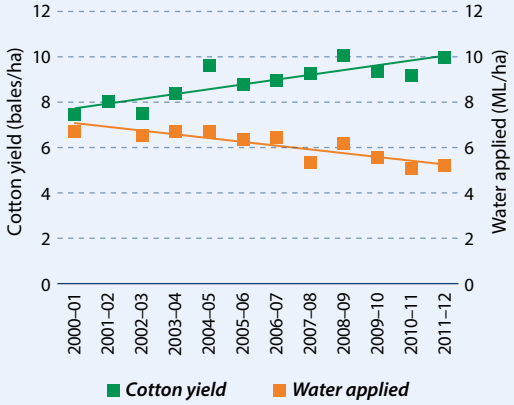
MAJOR CRDC RD&E ACHIEVEMENTS 2013–14

Three of the major achievements from CRDC's investment in RD&E over the 2013–14 period are:

1. Continued improvements in water use efficiency

Water use efficiency has long been a great success story for the Australian cotton industry, with significant gains made over time. Importantly, this work has continued in 2013–14, with RD&E investments into optimising crop water use and promoting water smart infrastructure, ensuring the industry's efficiency gains continued their positive trend.

Irrigated cotton yields and irrigation water applied in Australia 2001–12.



Source: Roth 2013

2. Development of the Bollgard III® Resistance Management Plan (RMP)

Science underpinning the development of the Bollgard III® RMP is another major achievement for cotton industry RD&E during 2013–14. Preserving the efficacy of *Bt* cotton to control insect pests is vital to the survival of the industry, and this has been achieved through CRDC's investment since *Bt* cotton was first introduced in 1996. With the latest *Bt* technology, Bollgard III®, set to be released in the 2015–16 season, the development of a pre-emptive RMP based on sound science has been a major focus during 2013–14.

3. Research underpinning the Cotton to Market strategy

Working with industry partners to improve cotton's market access has been a major achievement for CRDC during 2013–14. CRDC's investment in understanding the current markets and potential opportunities for the Australian cotton industry provided sophisticated market intelligence, which in turn underpinned the development of a new industry marketing strategy by Cotton Australia with the assistance of the Australian Cotton Shippers Association (ACSA) and CRDC. The resulting Cotton to Market international program was launched in 2014, incorporating CottonLEADS™ and the Better Cotton Initiative.

Executive summary

OVERVIEW OF THE AUSTRALIAN COTTON INDUSTRY

The Australian cotton industry is one of the success stories of Australian agriculture. A culture of innovation within the industry, supported by and embracing a well-organised RD&E framework, has been a major contributor to this success.

From small beginnings in the 1970s, Australia's cotton industry is now the third most valuable agricultural export commodity. Cotton is now the major agricultural crop grown in many rural and remote regions of Queensland (Qld) and New South Wales (NSW).

Australian cotton is the highest-yielding, finest, cleanest and greenest cotton in the world. On a global scale, Australia is not a large cotton producer – only around three per cent of the global crop is grown within Australia, by some 1,300 cotton growers in Qld and NSW, and for the first time, Victoria (Vic).

However Australia is one of the largest exporters of cotton, with nearly 100 per cent of the national crop exported, generating in excess of $2 billion in export revenue annually. The industry generates significant wealth and provides an economic foundation to many regional and remote rural economies, employing up to 14,000 people.

Improved practices over the past 15 years have seen insecticide use reduced by 95 per cent and water use efficiency improved by 40 per cent, while improvements in fertiliser and energy use are driving an ongoing reduction in greenhouse gas emissions. The best cotton producers now achieve more than two bales of cotton per megalitre (ML) of water – almost double the industry average of just a decade ago. The industry is at the forefront of environmental management systems, and climate change mitigation and adaptation.

Importantly, cotton is an industry taking responsibility for itself by undertaking practice changes to meet societal expectations. The introduction of the industry's best management practice program *my*BMP, the uptake of biotechnology to help reduce pesticide use, and the implementation of the industry's environmental assessment and resulting actions, are all examples of the cotton industry recognising the need for change, and working with the RD&E system to enact it.

In recent years, new cotton varieties, and favourable weather and market conditions, have seen an expansion in southern NSW cotton growing regions, reaching as far south as the Victorian border. At the same time, CRDC research projects are exploring the viability of growing cotton in the Burdekin region in tropical Qld.

Dr Onoriode Coast is a crop physiologist based at the Australian Cotton Research Institute near Narrabri. Dr Coast's CRDC-supported project is applying plant-based measurements for irrigation in water limited environments in the Australian cotton industry.

Section 2
CRDC Business

Namoi cotton grower Matt Norrie talks with cotton researchers on farm at 'Mollee', Narrabri during dryland cotton picking. Photo courtesy Ruth Redfern.

The Cotton Research and Development Corporation (CRDC) was established in 1990 under the *Primary Industries and Research and Development Act 1989* (PIRD Act). This Act outlines the accountability of CRDC to the Australian Government and to the cotton industry, through its representative body Cotton Australia.

CRDC is based in Narrabri, NSW, the heart of one of Australia's major cotton growing regions and home to the Australian Cotton Research Institute. CRDC invests in and manages a portfolio of research, development and extension (RD&E) programs that seek to enhance the environmental, social and economic values associated with cotton production systems, for the benefit of cotton industry participants, regional communities and the Australian people.

The CRDC is co-funded through an industry levy and matching Government contributions. The cotton industry R&D levy (excluding GST) is $2.25 per 227 kilogram bale of cotton. The Australian Government contributes matching funds up to a limit of 0.5 per cent of industry Gross Value of Production.

Vision

A globally competitive and responsible cotton industry.

Mission

To invest in RD&E for the world leading Australian cotton industry.

Purpose

Enhancing the performance of the Australian cotton industry and community through investing in research and development, and its application.

Corporate outcome

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.

CRDC stakeholders

- Australian Government through the Minister for Agriculture
- Department of Agriculture
- Cotton Australia
- Cotton growers including Cotton Grower Associations

CRDC research partners

- NSW Department of Primary Industries
- Queensland Department of Agriculture, Fisheries and Forestry
- Other State Government Departments
- Rural Research and Development Corporations
- CSIRO
- Universities
- Cooperative Research Centres (CRCs)
- Cotton Seed Distributors Limited
- Crop Consultants Australia
- Agribusinesses

CRDC Business
CRDC OPERATIONS

CRDC Strategic R&D Plan 2013–18

CRDC, and its investment in R&D on behalf of the Australian cotton industry, is guided by a five year Strategic Plan (2013–18). The Plan sets the direction for the organisation and its investment and is designed to help the industry achieve its long-term vision, and the Government its rural R&D priorities.

The Plan for investment in R&D responds to the challenges arising for the Australian cotton industry's profitability, sustainability and competitiveness. The Plan has a sharper focus, increased commitment of resources and greater ambition for future outcomes.

The Plan connects insights of changes in society with those of the cotton sector. It identifies the critical importance of responding with better knowledge sharing and even stronger relationships between farmers, industry and customers.

Core programs

The importance of industry stakeholders has been recognised in the design of the plan, which consists of three RD&E programs – *Farmers, Industry and Customers.* Complementing these programs are two integrating programs – *People and Performance,* which recognise the interdependencies of issues within the RD&E programs, as well as responding to stakeholder and corporate requirements for improvement to the efficiency and effectiveness of operations.

- **Farmers** – including successful crop protection, on-farm resource use efficiency, innovations in cotton production.
- **Industry** – including stewardship, natural resource management, identifying and responding to threats.
- **Customers** – including cotton quality, the recognised value of Australian cotton, ensuring future demand for our cotton.
- **People** – including skilling and educating our industry workforce, creating networks and communication.
- **Performance** – including measuring and reporting on our industry's performance, and continuous improvement under best management practices.

Cotton futures

Within the CRDC Strategic R&D Plan 2013–18, CRDC has included three futures themes – profitable futures, sustainable futures and competitive futures. These themes provide a clear framework through which CRDC can invest in long-term innovations to address the industry's goal to remain profitable, sustainable and competitive in 20 years' time. During 2013–14, CRDC commenced planning the implementation of the three themes.

The scope of research in which CRDC could invest in the future is extremely broad, so to assist the industry narrow this focus, a Futures Forum was held in November 2013 with 80 delegates from across the industry gathered to help identify the areas of priority. The forum challenged assumptions about the way Australian cotton is currently produced and used, identified new ways in which cotton could be produced and used into the future, and identified the points along the supply chain where CRDC could focus its investment.

A broad range of priority areas were established as a result of the forum and outlined in a Futures Forum Delegate Report. This report gave CRDC some clear guidance on where potential investments should be directed in the future.

In 2014–15, CRDC will draft a Cotton Futures paper, outlining the priority areas, key outcomes, proposed partners and the planned procurement process for each area. This paper will be provided to the industry for consideration. From there, CRDC will start the process of calling for and investing in, specifically targeted futures research.

Communicating research outcomes

CRDC is actively involved in the dissemination of research results, working through a range of mechanisms to promote research outcomes – principally supported by the industry's joint extension program, CottonInfo.

CottonInfo aims to ensure the effective communication of, and support for, the adoption of research results. CRDC created the CottonInfo joint venture with Cotton Australia and Cotton Seed Distributors Ltd in 2012. Within this venture, CRDC is responsible for resourcing the program management, communication and technical specialists.

This collaboration has also seen the recruitment of new regional development officers in Qld and NSW. Their roles are aligned with technical specialists and the industry *my*BMP program in conducting extension campaigns to improve research communication, practice change and industry preparedness for biosecurity threats or natural disasters.

Measuring performance

One of CRDC's formal principles of operation is to strive to maximise return on industry and public funds, invested through our Corporation. The performance program includes a variety of monitoring and evaluation projects designed to ensure CRDC and industry can capture and demonstrate the impact of investment in RD&E. More information about performance projects are explained in the RD&E project summary section of this report.

CRDC analysis of a study by the Cotton Innovation Network in 2013, showed the CRDC accounted for 32 per cent of total cotton RD&E investments and was involved in over 80 per cent of all cotton RD&E undertaken in Australia.

It was estimated in a recent review that the minimum return on investment for the 2003–08 period was 7:1 for growers (a $7 benefit to growers for every $1 invested) and 14:1 for society at large (i.e. a $14 benefit to society for every $1 invested).

Overall, the CRDC estimates that public and private RD&E investment in the cotton sector is in the order of $60 million annually – supporting an industry that typically generates in excess of $2 billion in export revenue annually and contributes to broader economic, environmental and social benefits.

Cotton RD&E industry representative body

Cotton Australia is the gazetted cotton industry representative organisation under the PIRD Act. Established in 1972 (as the Australian Cotton Foundation), Cotton Australia merged with the Australian Cotton Growers Research Association in 2008 to provide a united voice for cotton growers across research, stewardship, natural resource management and cotton production issues.

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

CRDC Business
SETTING THE RESEARCH PRIORITIES

Cotton Sector RD&E Strategy

The Cotton Sector RD&E Strategy is one of 14 sectorial strategies within a national framework led by the Research and Innovation Committee (formerly the Primary Industries Standing Committee RD&E Committee). The Committee facilitates coordination among Australian and State Governments, CSIRO, Rural Research and Development Corporations, agriculture industries and universities to better harmonise roles in RD&E related to primary industries and assure that they work together effectively to maximise net benefits to Australia.

The Cotton Sector RD&E Strategy was formally approved in 2011. This strategy was a key resource for CRDC during the formation of the CRDC Strategic R&D Plan 2013–18. Progress of this plan is on-going and CRDC continues to facilitate a lead role in its implementation. The Cotton Sector RD&E Strategy sets out priorities for the cotton industry sector's RD&E organisations to cooperate on a national basis to address the national needs of the industry.

Strategic needs of the cotton industry:

- **Better cotton plant varieties** – lifts on-farm performance and product value.
- **Improved farming systems** – sustainable production delivers quality cotton.
- **People, businesses and communities** – proudly developing cotton and sustaining regional communities and environments.
- **Product and market development** – competitive advantage through differentiation.
- **Development and delivery** – maximising the potential of research through extension.

Cotton Innovation Network

Responsibility for the implementation of the Cotton Sector RD&E Strategy rests with the Cotton Innovation Network, while responsibility and authority for RD&E investment and provision of capability rests with the member organisations.

This network is independently chaired and comprises senior representatives from CRDC, the Department of Agriculture, Cotton Australia, Cotton Seed Distributors Ltd, CSIRO, NSW Department of Primary Industries, Qld Department of Agriculture, Fisheries and Forestry and the Australian Council of the Deans of Agriculture. CRDC provides the secretariat and funds the services of an independent consultant to support the work of the network.

The Cotton Sector RD&E Strategy outlines how the key RD&E organisations will work together, through the Cotton Innovation Network, to improve the quality and efficiency of RD&E over the next 10 years by coordinating:

- **Strategy and investment across cotton and with other sectors** – to maximise focus and leverage.
- **Research pathways** – to define what RD&E is needed and ensure it is sound and aligned.
- **Development and delivery** – to ensure adoption of research is optimised.
- **Capability** – to ensure capacity is maintained and developed.

The network has focused on developing a deeper and shared understanding of how these functions occur and opportunities for improvement. It has mapped what RD&E is needed currently and in the future.

CRDC's involvement extends to greater than 80 per cent of the effort, with all the major RD&E organisations playing a significant role in at least two priorities. This highlights the integrated nature of cotton RD&E and its critical reliance on the continued commitment and involvement of all parties.

The Strategy is working effectively to ensure cotton RD&E remains well focused and organised with a strengthening ability to collaboratively solve problems and sharpen RD&E in areas where the industry can do better.

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

In 2009, the Australian cotton industry developed a 20 year vision for the future that encompassed improved industry performance, collaboration and capacity, using a 20-year time frame to ensure a longer-term focus.

CRDC analysed ways in which it could advance the Vision 2029 elements and these were central during the formation of the CRDC Strategic R&D Plan 2013–18. CRDC meets with the Australia Cotton Industry Council annually to review progress towards achieving Vision 2029.

Element	Goal	CRDC invested in the following during 2013–14
Differentiated	World leading supplier of an elite quality cotton highly sought in premium markets.	■ Market and supply chain intelligence. ■ Product, processing and supply chain innovation and improvements.
Responsible	Producer and supplier of the most environmentally and socially responsible cotton on the globe.	■ Solutions to production constraints, optimising inputs, processes and improving environmental performance. ■ Supporting a best-practice framework.
Tough	Resilient and equipped for future challenges.	■ Solutions to production constraints. ■ The capacity to adapt to climate impacts. ■ Protection from biosecurity threats.
Successful	Exciting new levels of performance that transform productivity and profitability of every sector of industry.	■ Improving product, production and people.
Respected	An industry recognised and valued by the wider community for its contribution to fibre and food needs of the world.	■ Measuring and communicating performance.
Capable	An industry that retains, attracts and develops highly capable people.	■ Determining future capacity needs. ■ Skills and leadership. ■ The industry CottonInfo team.

Source: Cotton Innovation Network.

CRDC Business
CRDC COLLABORATION AND COOPERATION

CRDC works in collaboration with other cotton industry bodies and other Research and Development Corporations (RDCs) to achieve strategic outcomes for the industry and to leverage higher returns for its investments.

CRDC was highly effective in partnering in over 80 per cent of the RD&E projects conducted in the cotton sector in 2013–14. Cooperation extended from participation in national cross sectorial collaborations, the industry extension joint venture CottonInfo, and at the local level, the continuation of an Aboriginal school based traineeship program (with assistance from the Aboriginal Employment Strategy).

Best Management Practices (*my*BMP)

*my*BMP is the Australian cotton industry's commitment to best practice in cotton production.

It is a voluntary farm management system that provides self-assessment mechanisms, practical tools and resources allowing growers to both comply with regulation and to ensure that cotton is produced with best practice across a range of focus areas.

It is also the mechanism that combines science and agribusiness management to lift the industry's performance standards, address threats and anticipate future challenges and opportunities.

The Best Management Practices (BMP) program was launched in 1997 and redeveloped into the web-based program *my*BMP in 2010. CRDC and Cotton Australia are partners in *my*BMP and continue to develop the program to benefit the industry. Over time, BMP has extended from its focus as an environmental management system into a tool comprising 11 modules that touch on many areas of production and farm business. *my*BMP contains strong linkages with the industry's joint extension program, CottonInfo.

Council of Rural Research and Development Corporations (CRRDC)

A great deal of collaboration and cooperation takes place through the CRRDC: a forum for supporting the Rural R&D Corporations (RDCs) in collectively maximising their ongoing contribution to a sustainable and profitable Australian agricultural sector.

This collaboration extends well beyond co-investment. Cooperation, coordination and communication are equally important to avoiding duplication in research and maximising the impact of research outcomes. The scale of this collaboration extends from large national research programs to small local projects and administration, to bring a national focus in dealing with climate change, soil health, irrigation, crop protection, farm safety and human capacity.

CRDC continues to work with the CRRDC to investigate administrative efficiency gains within the RDCs and the rural R&D system as a whole.

The following table summarises CRDC collaboration with other RDCs. Many of these initiatives are covered in more detail in the RD&E project summary section of this report.

Collaboration with Rural Research and Development Corporations (RDCs) 2013–14

Program or group	Nature of collaboration
Council of Rural Research and Development Corporations (CRRDC)	The Council is made up of leaders from all 15 RDCs. The Council meets regularly throughout the year, to discuss ways to collaborate with joint RD&E projects, communication activities, business operations, and coordinate other joint RDCs activities at the broadest level. The 15 RDCs include a mix of both Statutory Authorities and industry owned companies. 1. Cotton Research and Development Corporation (CRDC) 2. Fisheries Research and Development Corporation (FRDC) 3. Grains Research and Development Corporation (GRDC) 4. Rural Industries Research and Development Corporation (RIRDC) 5. Australian Egg Corporation Limited (AECL) 6. Australian Grape and Wine Authority (AGWA) 7. Australian Meat Processing Council Limited (AMPC) 8. Australian Wool Innovation Limited (AWI) 9. Australian Pork Limited (APL) 10. Dairy Australia Limited (DA) 11. Forest and Wood Products Australia Limited (FWPA) 12. Horticulture Australia Limited (HAL) 13. Australian Livestock Export Corporation Limited (Livecorp) 14. Meat and Livestock Australia Limited (MLA) 15. Sugar Research Australia Limited (SRA) More information about RDC collaborative projects are available from **www.ruralrdc.com.au**
Communications Managers group	Using cross RDCs communication opportunities to promote rural industries and RD&E achievements. Each RDC nominates their Communication Manager or representative to attend up to three group meetings each year to plan and provide input into collaborative RDC projects requiring communications support. In 2013–14, the RDC Communications Managers jointly hosted a dinner for the Agricultural Chief Scientists, a precursor event to the G20, to be held in Brisbane in late 2014.
Business Managers group	Cooperation with all RDCs to improve administration, contracts, program management systems and IP management is in alignment with the Council of RDCs harmonisation project. CRDC and GRDC continue to cooperate on best practices and innovation in IT, finance and administration. CRDC, AGWA and RIRDC continue co-hosting arrangements for Clarity program management systems.
Information Systems Managers group	Cooperation between all RDCs to share Information and Communication Technology (ICT) knowledge and experiences with the various systems and software used by the RDCs.
R&D Managers Group	Cooperation between all RDCs to share program, extension and R&D procurement management experiences, best practices and ICT systems.
Climate Change Research Strategy for Primary Industries	During 2013–14, CRDC worked collaboratively with other RDCs and partners of Climate Change Research Strategy for Primary Industries (CCRSPI) to review CCRSPI's key strategic themes.

Program or group	Nature of collaboration
Development of a Life Cycle Inventory for Australian Agriculture (AusAgLCI)	CRDC contributed to a joint program managed by RIRDC to establish a Life Cycle Inventory for Australian Agriculture. Other partners in the project include FWPA, DA, GRDC, HAL, MLA and SRA.
Primary Industries Health and Safety Partnership	CRDC renewed its co-investment in the Primary Industries Health and Safety Partnership with RIRDC, GRDC, SRA and FRDC. The five year partnership (2012–17) aims to improve the physical and mental health of farming and fishing workers, and their families, and the safety of the environment and work practices in these.
Spray drift minimisation	As the areas under conservation farming practices and GM herbicide-tolerant crop technology increase in cotton/grain producing regions, so too does the potential for spray drift damage to susceptible crops. CRDC and GRDC continue to co-invest in this program to map the location of farms where cotton is grown and invested in parallel to deliver spray application management training workshops to growers and agronomic advisors in the respective industries.
Insecticide resistance monitoring and management	CRDC and GRDC continued to co-invest in research to monitor resistance in *Helicoverpa armigera* and *Helicoverpa punctigera* to a range of pesticides commonly used on both crops.
Shared weed management issues	CRDC continued to collaborate directly with GRDC on the important issue of glyphosate resistance management. A joint development and delivery focused project initiated in 2011–12 continued into 2012–13 with an emphasis on fallow management of weeds in particular in 2013–14.
Education	CRDC is collaborating broadly with rural RDCs and universities through the national Primary Industry Centre for Science Education (PICSE). This program is building on a decade of success in attracting high school students into science education and, beyond that, to careers in science that support agriculture. Other rural RDCs co-investing in PICSE are GRDC, FRDC, DA, RIRDC and HAL. The universities involved are the University of Tasmania, University of Western Australia, University of Southern Queensland, and University of the Sunshine Coast and Flinders University. During the year CRDC continued a partnership with RIRDC, GRDC, HAL, SRA, AGWA, APL and AECL to invest in an undergraduate scholarship program, now known as Horizon Scholarships. The program is managed by RIRDC. CRDC currently supports eight Horizon undergraduate scholars.
Evaluating R&D return on investment	With significant taxpayer dollars invested in industry RD&E through the 15 RDCs, the CRRDC developed a rigorous external review process in 2006 to determine the value of these RD&E investments to the industries involved and to the Australian taxpayers. The CRRDC commissioned an external review of randomly selected research projects from RDCs every three years. The next review will occur in 2015.

CRDC partnerships with Australian Government

CRDC was successful in gaining funding from four Australian Government grant programs. Since 1 July 2013 these projects have been managed by CRDC in partnership with government and industry and generate around $3.3 million for RD&E investment.

1. Improving energy efficiency on irrigated Australian cotton farms *(Funded 2013–15; $500,411 from Department of Agriculture)*

CRDC received an Energy Efficiency Information grant to deliver a two year project focused on 'Improving energy efficiency on irrigated Australian cotton farms'.

This project aims to improve energy efficiency on irrigated Australian cotton farms and reduce their energy costs, through developing and extending a cost-effective process for irrigated cotton farmers to assess their overall energy use.

Energy audits show that a 30 per cent saving of energy on irrigated cotton farms is achievable. The National Centre for Engineering in Agriculture is coordinating industry-wide energy use benchmarking – developing and refining tools and products for cotton growers to reduce their energy consumption (including the cotton industry's *my*BMP energy module and training Regional Development Officers (RDO's) consultants and cotton farmers on tools and techniques to reduce energy consumption).

2. Carbon Farming in the Australian Cotton Industry *(Funded 2013–18; $1,374,700 from Department of Agriculture)*

CRDC received a Carbon Farming Futures Extension and Outreach grant, to deliver a project, focused on 'Carbon Farming in the Australian Cotton Industry'.

The cotton industry has invested in nitrous oxide and other greenhouse gas emissions research for more than a decade, and has a a strong commitment to improvement through the industry's Best Management Practices program *my*BMP and the dedicated CottonInfo team. Despite this, reducing emissions and optimising carbon sequestration on farm has been hampered by a lack of technical capacity in the integration of the various sciences, practical farm management, the policy context and economics. Through economic analysis and technical forums, a Carbon Technical Specialist, will integrate new and emerging carbon farming information into trusted cotton industry extension, BMPs and adviser training.

The appointment of this Carbon Technical Specialist within the CottonInfo team in 2013–14 is a significant step for this project. The Specialist is leading the industry effort to interpret carbon farming concepts into practical, farmer relevant practices.

3. Indirect emissions of nitrous oxide from broad acre irrigated agriculture *(Funded 2013–16; $677,884 from Department of Agriculture)*

CRDC received a Carbon Farming Futures Filling the Research Gap grant to deliver a three year project, focused on 'Indirect emissions of nitrous oxide from broad acre irrigated agriculture'.

Irrigation water can contain significant concentrations of nitrate and dissolved nitrous oxide. As a result, the irrigation water itself, as well as the sediments deposited in the channels and canals of the irrigation system, may be significant sources of nitrous oxide emissions. This project seeks to identify the extent of nitrous oxide emissions from the irrigation water to determine whether it is significant, and what the appropriate management responses could be to mitigate those emissions.

4. Determining optimum N strategies for abatement of emissions for different irrigated cotton systems *(Funded 2013–16; $769,535 from Department of Agriculture)*

CRDC received a Carbon Farming Futures Action on the Ground grant to deliver a three year project, focused on 'Determining optimum N strategies for abatement of emissions for different irrigated cotton systems'.

This project is trialling to demonstrate nitrogen fertiliser management strategies – including variable rate fertiliser applications, rotational cropping with legumes and matching fertiliser rates to crop demands on irrigated cotton farms, in three climatic zones in NSW and Qld. The aim is to determine their influence on improving nitrogen use efficiency, reducing nitrogen oxide emissions and enhancing carbon sequestration.

CRDC-funded researcher, Dr Rhiannon Smith of UNE, is helping growers to take advantage of future ecosystem service markets. Rhiannon's research has found that old growth River Red Gums can store as much as 396.4 tonnes of carbon per hectare per year the same amount of carbon as 290 Holden Commodores emit in one year. Photo courtesy of Melanie Jenson.

Section 3
Corporate Operations

Business Financials

RD&E Investment Priorities

CRDC-funded research field trial is viewed by local cotton growers.

CRDC's investment in RD&E is funded through an industry levy and matching Government contributions. In 2013–14, the CRDC invested $22 million in cotton RD&E throughout the industry supply chain. In 2014–15, this figure is likely to equal $24 million.

Revenue

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.

The Australian Government provides a matching contribution to levy revenue. The contribution is based on the lesser of 0.5 per cent of a three-year rolling average of gross value of production, or equal to the cumulative levy receipts or up to 50 per cent of the cumulative total eligible expenditure on RD&E.

The setting and collection of the industry levy is enabled by the *Primary Industries (Excise) Levies Act 1999* and the *Primary Industries Levies and Charges Collection Act 1991*. The Australian Government contributions in 2013–14 were capped at the value of levies collected, as it was lower than the 0.5 per cent of the three year average gross value of production.

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 income.

Revenue	2013–14 (actuals by $m)
Industry levies	10.977
Australian Government	11.239
Royalties	1.830
Interest	1.779
Grants	1.243
Other	0.411
TOTAL	**27.479**

Total revenue for 2013–14 was $27.479 million. Revenue was $5.852 million (27 per cent) above budget of $21.627 million.

The above average crops in 2012–13 and 2013–14 combined to boost revenue from levies, Australian Government contributions and royalties. From the 2012–13 crop of 4.499m bales, 75 per cent of the levies were received in 2013–14.

ABARES *Agricultural Commodities June 2014* estimated lint production for the 2013–14 season to be 910,000 tonnes (4.01 million bales), which is 0.51 million bales higher than the CRDC 2013–14 budget of 3.5 million bales.

Total revenue of $27.479 million for 2013–14 comprised:

- Industry levy revenue of $10.977 million, which includes $7.736 million (75 per cent) of the 2012–13 crop and $3.226 million (36 per cent) of the 2013–14 estimated crop.
- Australian Government contribution of $11.239 million. Australian Government matching of expenditure was capped at the value of levies collected.
- $1.830 million in royalties from the sale of CRDC funded CSIRO seed varieties, which was $0.620m below budget due to delayed receipt.
- Interest revenue of $1.779 million was 69 per cent above budget, due to additional revenue under CRDC management.
- Other revenue of $1.654 million, which includes external grant revenue and project refunds. External grants included Carbon Farming Initiative $0.261 million, Action on the Ground $0.279 million, Filling the Research Gap $0.351 million, Energy Efficiency Information $0.240 million, third party project contributions of $0.112 million and projects refunds of $0.395 million.

Expenditure and investment

Actual expenditure for 2013–14 was $21.923 million, an increase of $1.526 million over the budgeted expenditure of $20.397 million. CRDC's increased capacity to invest in RD&E continues to attract research and scholarship funding applications.

In the previous three years CRDC worked closely with research organisations to rebuild the cotton industry's research capacity which had been reduced during the drought period.

Actual ($m)	2009–10	2010–11	2011–12	2012–13	2013–14
Cotton Crop Size (millions of bales)	1.71	3.96	5.28	4.49	**4.01***
Total Revenue	11.736	14.824	25.353	30.915	**27.479**
Industry levies	3.433	4.576	9.532	11.801	**10.977**
Australian Government	2.997	5.677	9.529	11.523	**11.239**
Royalties	1.897	2.789	3.145	3.971	**1.830**
Interest	0.568	0.805	1.401	1.726	**1.779**
National Program for Sustainable Irrigation**	1.980	0.399	1.293	–	–
Other (grants)***	0.856	0.587	0.453	1.894	**1.654**
Expenditure total	11.501	9.812	13.717	19.301	**21.923**
Cotton RD&E activities	7.855	8.063	10.682	15.632	**18.203**
Equity position at 30 June	10.530	15.54	27.317	38.931	**44.488**

* *ABARES estimate, Agricultural Commodities June 2014.*

** *The National Program for Sustainable Irrigation (NPSI) concluded 30 June 2012.*

*** *Includes grant income.*

Portfolio Budget Statement

The CRDC Portfolio Budget Statement released in May 2014 provided an estimate of CRDC's outcomes, outputs, performance and financial position for 2014–15 to 2017–18. The statement was consistent with the CRDC Strategic R&D Plan 2013–18 and the Annual Operational Plan 2014–15.

Outcomes and outputs 2013–14

CRDC has one Government outcome: 'Adoption of innovation that leads to increased productivity, competitiveness and environmental sustainability through investment in research and development that benefits the Australian cotton industry and the wider community.'

Outcome	2013–14
TOTAL Budgeted Revenue	$21,627,000
TOTAL Actual Revenue	$27,479,372
TOTAL Budgeted Cost of Outputs	$20,397,000
TOTAL Actual Cost of Outputs*	$21,922,966

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

Forecast revenue

Water availability and commodity prices are the significant factors in forthcoming cropping decisions. The average storage level of public irrigation dams serving the Australian cotton growing region was 48 per cent of capacity in May 2014, down from 95 per cent at the same time in 2012 but well above the 10 year average of 29 per cent. These changes in circumstances reflect the volatility in cotton industry production and CRDC's revenue. CRDC mitigates these impacts through accumulating financial reserves in good years to sustain expenditure through drought periods.

Seasonal inflows into the main cotton irrigation dams can be expected between now and the end of the cotton planting window (September to mid-November 2014). Similarly, soil moisture profiles can be expected to improve, which could enable recovery of planting in dry land areas. (Source: ABARES Agricultural Commodities Report for March–June 2014).

CRDC has budgeted for a $3.734 million operating deficit for 2014–15. This reflects revenue of $20.444 million and expenditure of $24.178 million. Industry levy revenue and Commonwealth contributions will continue to be drawn from two crop seasons, 2013–14 and 2014–15.

The size of industry levies and Commonwealth contributions is heavily reliant upon crop production, which is budgeted to be 3.0 million bales for 2014–15. However, early estimates indicate that the crop may decline to 2.0 million bales unless there is a significant increase in water availability. CRDC expects that the Australian Government contributions will be based on matching industry levy revenue in 2014–15.

Forecast expenditure

Budgeted expenditure for 2014–15 is $24.178 million, an increase of $2.255 million over the 2013–14 actual expenditure. CRDC's increased capacity to invest in RD&E continues to attract research and scholarship funding applications. The forecast expenditure for the next two years for RD&E is budgeted at approximately $20 million each year.

Corporate Operations
RD&E INVESTMENT PRIORITIES

The CRDC portfolio is a balance between five key areas: farmers, industry, customers, people, and performance.

It includes: RD&E that seeks to 'protect and defend' the production base from pest threats; productivity RD&E focused on maintaining a positive rate of increase while ensuring resource use efficiency; enhancing product value through the supply chain; building a capable industry; and an element of research discovery.

The CRDC invests in applied RD&E that improves productivity, biosecurity, natural resource management and manages climate variability concurrently given the interrelationships between the issues.

CRDC program breakdown*	Farmers	Industry	Customers	People	Performance	TOTAL
Number of projects	70	49	20	71	14	224
Program expenditure	$8.415m	$5.412m	$1.787m	$2.019m	$0.570m	$18.203m
Per cent	46%	29%	10%	11%	4%	100%

* *Excludes Cotton CRC projects and corporate research activities supporting RD&E planning and adoption. Some percentages have been rounded up or down.*

CRDC projects	2009–10	2010–11	2011–12	2012–13	2013–14
Number of new projects	57	66	128	201	**142**
Number of continuing projects	50	42	50	61	**118**
Projects finalised	58	45	117	142	**85**
TOTAL number of projects**	107	108	178	262	**260***

* *Includes 36 Cotton CRC projects being managed to completion after the cessation of the CRC in 2012.*

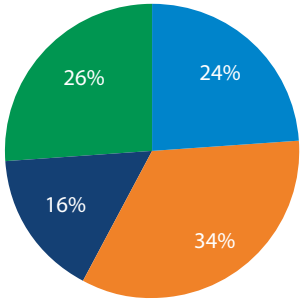
** *Total is the sum of new and continuing projects in the same year.*

The CRDC used the Strategic R&D Plan 2013–18 to guide its program investments in 2013–14. The Plan was developed with extensive industry, government and stakeholder consultation and was evaluated as part of the production of the Annual Operational Plan 2013–14 approved by the Minister in June 2013.

CRDC's investments addressed the National Research Priorities, the Rural R&D Priorities of the Australian Government, industry priorities and the Cotton Sector RD&E Strategy.

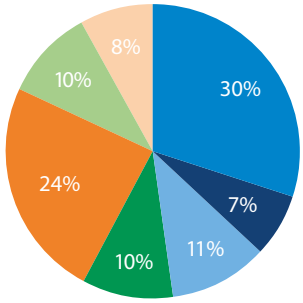
The investments against the National Research Priority (NRP) and Rural Research and Development Priorities (RRDP) attributed to each CRDC program in 2013–14 can be viewed in appendix 2 of this report.

CRDC funded RD&E projects by National Research Priority (NRP) in 2013–14



Priority	
NRP 1 – Environmentally Sustainable	24%
NRP 2 – Promoting and Maintaining Good Health	34%
NRP 3 – Frontier Technologies	16%
NRP 4 – Safeguarding Australia	26%
TOTAL	**100%**

CRDC funded RD&E projects by Rural R&D Priority (RRDP) 2013–14



Priority	
RRDP 1 – Productivity and Adding Value	30%
RRDP 2 – Supply Chain and Markets	7%
RRDP 3 – Natural Resource Management	11%
RRDP 4 – Climate Variability and Climate Change	10%
RRDP 5 – Biosecurity	24%
RRDP 6 – Innovation skills (supporting priority)	10%
RRDP 7 – Technology (supporting priority)	8%
TOTAL	**100%**

Section 4
RD&E Portfolio

Dr Janelle Montgomery of NSW DPI was awarded the 2013 Cotton Seed Distributors' Researcher of the Year award for her outstanding contribution to improving cotton's water use efficiency. Janelle is the NSW water use efficiency technical specialist for the industry's extension program, CottonInfo, and her CRDC funded project is focused on water smart infrastructure investment. Photo courtesy Melanie Jenson.

GOVERNMENT AND INDUSTRY PRIORITIES

Primary Industries Research and Development (PIRD) Act 1989 – No.17, 1990 as amended by the *Rural Research and Development Legislation Amendment Act 2013.* Compilation start date: 13 December 2013, Includes amendments up to: Act No.146, 2013. The objects of this Act are to:

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

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

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

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

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

v) developing the adoptive capacity of primary producers; and

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

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

Australian Government		Industry
National Research Priorities	***Rural R&D Priorities***	***Cotton Industry Priorities***
An Environmentally Sustainable Australia Transforming the way we utilise our land, water, mineral and energy resources through a better understanding of human and environmental systems and the use of new technologies. **Promoting and Maintaining Good Health** Promoting good health and wellbeing for all Australians. **Frontier Technologies for Building and Transforming Australian Industries** Stimulating the growth of world-class Australian industries using innovative technologies developed from cutting-edge research. **Safeguarding Australia** Safeguarding Australia from terrorism, crime, invasive diseases and pests, strengthening our understanding of Australia's place in the region and the world, and securing our infrastructure, particularly with respect to our digital systems.	**Productivity and Adding Value** Improve the productivity and profitability of existing industries and support the development of viable new industries. **Supply Chain and Markets** Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the whole supply chain, including to consumers. **Natural Resource Management** Support effective management of Australia's natural resources to ensure primary industries are both economically and environmentally sustainable. **Climate Variability and Climate Change** Build resilience to climate variability and adapt to and mitigate the effects of climate change. **Biosecurity** Protect Australia's community, primary industries and environment from biosecurity threats. **Supporting priorities:** ■ Innovation skills ■ Technology.	■ 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.

Cotton Sector RD&E Strategy five priorities: 1. Better plant varieties, 2. Improved farming systems, 3. People, business and community, 4. Product and market development and 5. Development and delivery. Cross sectoral strategies include: climate change, soils, plant biosecurity and water use.

CRDC Strategic R&D Plan five programs: Farmers, Industry, Customers, People and Performance.

RD&E Portfolio
PROGRAM 1: FARMERS

Outlined below are a selection of the key projects funded by CRDC under the five RD&E program areas: farmers, industry, customers, people and performance during 2013–14.

Program 1: Farmers			
Program	**Farmers**		
Outcome	Cotton is profitable and consistently farmers' crop of choice.		
Measure	Farmers increase productivity by 3 per cent per hectare per year		
Theme	**1.1 Successful Crop Protection**	**1.2 Productive Resource Efficiencies**	**1.3 Profitable Futures**
Strategy Outcomes	Cotton crops protected from pest, weed and disease threats.	Inputs for cotton production are optimised.	Innovations in cotton production.
Will be achieved by	1.1.1 Monitoring and investigating the ecological behaviours and responses of cotton pest, weeds and diseases. 1.1.2 Testing practices that deliver improved management of insect pests, weeds and diseases. 1.1.3 Improving capacity, knowledge and adoption of techniques to successfully protect the cotton crop.	1.2.1 Delivering benchmarks of on-farm resource use efficiencies. 1.2.2 Developing and proving decision systems and practices that deliver optimal resource efficiencies on cotton farms. 1.2.3 Developing new systems and tools to support farm decision making processes. 1.2.4 Improving capacity, knowledge and adoption of techniques to optimise resource uses.	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.
Measures of success	Farmers are able to improve their crop management practices based on sound science. ■ 85 per cent of farmers adopting improved practices that reduce the reliance on pesticide inputs. ■ 50 per cent of farmers adopting improved practices that reduce the incidence of insect pests, weeds and diseases affecting cotton on their farm. ■ World class science foundations for managing ecological adaptations in cotton insect pests, weeds and diseases.	Farmers are able to increase their productivity: ■ per hectare of land. ■ per unit of nitrogen (N) fertiliser. ■ per ML water. ■ per unit of CO_2 equivalent emitted.	Farmers are profitable: ■ Improving gross margins for Australian cotton production systems. ■ On-farm innovations and partnerships established to drive profitability.

CRDC Program: Farmers	
Theme:	1.1 Successful Crop Protection
Strategy:	1.1.1 Monitoring and investigating the ecological behaviours and responses of cotton pest, weeds and diseases
Measure of success:	World class science foundations for managing ecological adaptations in cotton insect pests, weeds and diseases

Monitoring and managing for disease threats

New and existing disease threats continue to challenge the Australian cotton industry. The RD&E focus is on understanding the ecology of these threats and developing strategies and management tactics to address these issues. Queensland (QLD) and New South Wales (NSW) pathology projects completed early and late season disease surveys, across 79 farms, during the 2013–14 season. These surveys, which have been conducted for 31 years in NSW and 12 years in Qld, inform research and extension, and also provide 'proof of absence' for high priority exotic diseases.

Analysis of trends from these surveys, coupled with data from experiments and observational studies, has provided valuable strategies for integrated disease management aimed at decreasing the spread and severity of diseases. CRDC are also investing in research to understand and enhance microbial functions in the soil and improve the resilience of these soils to disease.

DAQ1402 – Fusarium wilt management in cotton *(Funded July 2013 – June 2016)*

This project provides pathology diagnostic services, disease management research capacity (Fusarium wilt, Boll rot) and maintains biosecurity preparedness and surveillance capacity. Diversity of Verticillium dahliae research has isolated a new strain from a farm in NSW, where severe symptoms (40 per cent yield reduction) had been reported. Research on genetic diversity of this pathogen, including pathogenicity, morphology and Vegetative Compatibility Group (VCG), is ongoing. This project has also confirmed an overall trend of increasing reniform nematode populations commonly associated with back to back cotton. Growers have reported up to 40 per cent yield loss from reniform nematodes in these back to back situations. Ongoing research is investigating the impact of growing non-host crops, such as wheat.

DAN1403 – Diseases of Cotton XI *(Funded July 2013 – June 2016)*

The Diseases of Cotton XI project, led by the NSW DPI, commenced in July 2013. The project builds on previous projects providing pathology research capacity for disease management (such as black root rot, Verticillium and seedling disease), as well as maintaining biosecurity preparedness and pathology capacity for surveillance and diagnostics. During 2013–14 research investigated novel disease management approaches such as biofumigation and new seed treatments.

CSE1401 – Management options enhancing beneficial microbial functions in cotton soils *(Funded July 2013 – June 2016)*

This project adds to a number of existing research projects and long term experiments, by investigating how microbial communities are impacted by management practices. Working in collaboration with research teams led by Dr. Linda Smith (DAQ1402) and Dr. Karen Kirkby (DAN1403), this research aims to link the observations on soil fungal community with disease incidence and yield.

During 2013–14, preliminary results indicated a difference in soil fungal community diversity under different rotations, with the lowest diversity in the continuous cotton rotation. This research also looked for differences in microbial activity and diversity in long term nutrition/farming systems experiments at Australian Cotton Research Institute (ACRI), which will help with understanding differences between these trials, as well as the impact of management (stubble management and fertiliser application) on microbial activity important for plant growth.

CRDC Program: Farmers	
Theme:	1.1 Successful Crop Protection
Strategy:	1.1.1 Monitoring and investigating the ecological behaviours and responses of cotton pest, weeds and diseases
Measure of success:	85 per cent of farmers adopting improved practices that reduce the reliance on pesticide inputs

Lower reliance on insecticides (secondary pests)

While total insecticide use in cotton has reduced by over 90 per cent in the last decade, within Integrated Pest Management (IPM) programs there is still very strong reliance on a few key products when pest issues arise. The future challenge for the industry will be to maintain low total insecticide use as pest threats and product availabilities continue to change. New pest threats will periodically emerge and may require the introduction/reintroduction of insecticide products to aid their control. This season's emergence of mealy bug in new locations exemplifies a changing pest threat.

Understanding pest and beneficial ecology, availability of insect sampling techniques and damage thresholds, assists crop advisors and growers to implement practices that suppress pests and use appropriate insecticides at times when insect pest populations threaten the yield of the crop. Without thresholds, pest threats would be managed prophylactically. Insecticide applications that are triggered by thresholds represent their optimised use, therefore the greater the adoption of thresholds the lower the 'reliance' on insecticides. CRDC investment is aimed at refining existing thresholds, and developing thresholds and management tactics for emerging pests, such as Solenopsis mealybug. Grower and consultant survey data indicates moderate to high adoption of industry's recommended thresholds for their management, as well as strong adoption of IPM.

CSE1403 – Automated insect monitoring for pest management *(Funded July 2013 – June 2015)*

This project is researching the feasibility of using a Commonwealth Scientific and Industrial Research Organisation (CSIRO) developed automated insect monitoring device to improve pest management and to better understand insect movement and habitat use. Early trials have been generally successful, and have provided interesting insights into differences in insect activity at different times of the day.

CSP1401 – Enhancing IPM in cotton systems *(Funded July 2013 – June 2018)*

This project provides considerable IPM responsiveness capacity to industry, including in-season advice on symphyla in conjunction with Queensland Department of Agriculture, Fisheries and Forestry (QDAFF), silverleaf whitefly, and late season thrips. The project team has also provided technical support to CottonInfo, including industry training in pest sampling and identification. Research has also been conducted on the impact of new insecticides on predators, parasitoids and bees.

This builds on previous work and is presented to industry through the Cotton Pest Management Guide, ensuring that industry has the capacity to make informed decisions when selecting an insecticide as part of an overall IPM program.

Honeydew, residue from silverleaf whitefly and aphids, has the potential to damage the Australian cotton industry's reputation for quality cotton. While management generally prevents this problem, this research is looking at the environmental degradation of these sugars if honeydew contamination does occur. A strong relationship between rainfall and reduction in honeydew concentration has been determined.

DAQ1204 – Management of mirids, stinkbugs and Solenopsis mealybug *(Funded July 2011 – June 2014)*

In recent years, Solenopsis mealybug has emerged as a challenging pest. This project has characterised the extent of damage at different crop stages, with heavy infestations (>500 mealybug in top 8 nodes at cut out) found to have an 80 per cent reduction in harvestable bolls.

While preliminary damage thresholds have been developed, there are currently no insecticides registered for control of this pest and insecticides are not expected to be the main means of control. Natural enemies have been proven to be effective at reducing populations. Integrated pest management that supports these natural enemies, including avoiding early season use of broad spectrum insecticides, considering increasing thresholds for other pests and good farm hygiene, have been identified as key components of mealybug management. Evaluation of insecticide options for Solenopsis mealybug are continuing, and based on research to date the Australian Pesticides and Veterinary Medicines Authority (APVMA) has recently approved a permit for field trials with buprofezen.

UQ1305 – Viruses, vectors and endosymbionts: Exploring interactions for control *(Funded April 2013 – June 2016)*

This project is focused on examining the symbiotic relationship that silverleaf whitefly (SLW) shares with bacteria (endosymbionts) that are harboured in the insects' body and cells. Clarifying the influence that these endosymbionts have on the biology of SLW may reveal opportunities for new pest management approaches. Significant progress has been achieved in the development of diagnostic assays that underpin the surveillance efforts for virus and whitefly species identification and detection.

CRDC Program: Farmers	
Theme:	1.2 Productive Resource Efficiencies
Strategy:	1.2.1 Delivering benchmarks of on-farm resource use efficiencies 1.2.3 Developing new systems and tools to support farm decision making processes 1.2.4 Improving capacity, knowledge and adoption of techniques to optimise resource uses
Measure of success:	Farmers are able to increase their productivity per hectare of land, per unit of N fertiliser and per unit of CO_2 equivalent emitted

Nitrogen management

The yields of Australian cotton growers continue to increase, and are on average, the highest in the world. High yields however result in high rates of nutrient removal, and the subsequent need for fertiliser to replace those nutrients, especially nitrogen.

Fertiliser costs continue to increase and nitrogen is the major component of these costs. As well as the direct costs associated with applying nitrogen, the losses (inefficiency) of nitrogen fertilisers can be significant. Most of the losses occur via the nitrogen returning as a gas to the atmosphere, as either nitrogen (N_2) or nitrous oxide (N_2O).

Nitrous oxide is an important greenhouse gas, with a global warming potential 300 times that of carbon dioxide. It is therefore a significant contributor to cotton's carbon footprint. CRDC continues to invest in research aimed at better understanding how nitrogen requirements can be optimised, to reduce overall nitrogen requirements and improve nitrogen use efficiency. Optimising nitrogen use will both improve overall farm profitability and reduce greenhouse gas emissions.

The research portfolio investigating nitrogen use has a number of aims, including to:

- Ensure that there is a comprehensive understanding of the nutrition requirements of high-yielding cotton crops and of the associated management requirements.
- Develop a comprehensive understanding of the nitrogen losses from each component of the cotton-farming system and to identify management practices to minimise those losses.

Tools to help growers manage their nitrogen requirements are also being developed and enhanced, including NutriLOGIC, the Cotton Carbon Management Tool, and a new system for assessing the nitrogen content of leaves in a cotton plant.

CSP1403 – Improving cotton productivity with crop nutrition *(Funded July 2013 – June 2016)*

This long-term rotation and nutrition trial project began in 1994 and continues to be supported. In 2013–14 the focus of the research shifted from the impact of various rotation crops, such as vetch and faba beans on nitrogen fertiliser requirements, to investigating whether the new, significantly higher yielding varieties have different crop nutrition requirements. The project is also investigating the benefits of different crop stubble management options on nutrition needs and soil carbon levels.

CLW1401 – Monitoring greenhouse gas emissions from irrigated cropping systems *(Funded July 2013 – June 2016)*

The cotton industry has been investigating the losses of nitrous oxide from cotton fields since 2002 and continues to invest in developing a good understanding of the drivers for nitrous oxide emissions, which can be highly variable. This research is being conducted on the same site as the long-term rotation and nutrition trial (CSP1403). By using the different nitrogen rate treatments which that project is testing and comparing to determine optimum rates, this project is developing a clearer picture of the nitrous oxide emissions from the soil (losses) associated with different rates of fertiliser application nitrogen use (the emissions factor). The highly variable nature of the emissions requires an extensive data set to provide a clear picture.

FTRG1401 – Indirect emissions of nitrous oxide from broad acre irrigated agriculture
(Funded July 2013 – June 2016)

In 2013–14 research commenced to investigate the losses of nitrous oxide associated with the irrigation system. This research is supported by the federal government's Filling the Research Gap grant program. The research is investigating nitrogen losses from the water surface of the various components of the irrigation system including supply channels, return drains, furrows and water storages (an area not previously studied). Preliminary results have highlighted that the losses of nitrogen from an irrigated cotton farm via the irrigation system can be significant and options to mitigate these losses will be investigated in the coming season.

UTS1202 – Image processing method to estimate cotton requirements for nitrogen fertiliser (PhD)
(Funded May 2012 – June 2015)

One of the challenges to improve nitrogen use efficiency is the ability to quickly and easily identify the current nitrogen status of the crop, so that management responses are timely. This PhD project has laid the groundwork for developing a handheld device to provide critical information about a crop's nutrient status 'in the field' and filed a provisional patent for its new system for assessing nitrogen leaf content in December 2013.

DAN1306 – Cotton Gin Trash to bioethanol
(Funded January 2012 – October 2014)

This project, led by NSW DPI, aimed to add value to cotton gin trash (CGT), a waste product from seed cotton processing at the gin. Current use of CGT is limited to composting the trash to use as a soil conditioner. The project evaluated higher value options than composting alone to provide ginners with an alternative source of income, and thereby improving the sustainability of the industry.

The project had a particular focus on processing methods for CGT for the production of bio-fuels. It also assessed the production of other bioproducts that may be developed from CGT.

In assessing CGT it was found that the trash contains a relatively high holocellulose content of 54 per cent (by weight), with the major component being glucans. The high proportion of available glucans and moderate lignin contents (~27 per cent) suggests CGT is an ideal feedstock for bioprocessing into sugars and subsequently into ethanol via fermentation.

During 2013–14, results identified a number of other compounds that may provide the opportunity for further value adding of the existing waste product from ginning.

CRDC Program: Farmers	
Theme:	1.2 Productive Resource Efficiencies
Strategy:	1.2.1 Delivering benchmarks of on-farm resource use efficiencies 1.2.2 Developing and proving decision systems and practices that deliver optimal resource efficiencies on cotton farms 1.2.3 Developing new systems and tools to support farm decision making processes 1.2.4 Improving capacity, knowledge and adoption of techniques to optimise resource uses
Measure of success:	Farmers are able to increase their productivity per ML of water

DAN1205 – Promoting Water Smart Infrastructure Investment in NSW
(Funded December 2011 to June 2014)

The Australian cotton industry has used values of Gross Production Water Use Index (GPWUIfarm) to benchmark water use efficiency since 1988–89. This project has compared the GPWUIfarm for 2012–13 to previous years. GPWUIfarm for 2006–07 and 2008–09 were 1.17 and 1.14 bales/ML, and both seasons had reduced plantings, low water availability and cotton prices.

In contrast, for 2012–13, which saw record planting and full production, the GPWUIfarm was 1.12 bales/ML. There was no significant difference in GPWUIfarm between the three seasons, indicating the cotton industry is performing as water efficient in years of full production. Variation in GPWUIfarm between farms indicates the scope for further efficiency gains on individual farms.

GVIA1302 – Grower led research in irrigation system comparisons in the Gwydir Valley
(Funded July 2012 to August 2014)

The comparison of irrigation systems on 'Keytah' farm in the Gwydir Valley in NSW continues to engage many growers and industry personnel. This year's field day attracted 130 attendees and media interest. The project results illustrate:

- The highest yielding system was the lateral move.
- The most water use efficient was drip irrigation.
- Furrow had by far the greatest labour input (hrs/p.a).
- Laterals and drip had the highest operating energy cost.
- Bankless had the lowest total operating cost ($/ha/pa).

CSP1104 – Applying plant based measurements for irrigation in water limited environments
(Funded July 2012 to June 2016)

In a world first under this project, irrigations were scheduled from Narrabri for a field in Emerald, based on data received from plant canopy temperature sensors, and without ever seeing the crop. Yields comparisons showed no difference between canopy temperature and traditional, with averages of 10.1 and 10.5 bales/ha respectively. This yield is consistent with highest yielding fields across different farms in the 2013–14 season in Emerald.

NEC1401 – Advancing VARIwise with autonomous irrigation and a grower's guide
(Funded July 2013 to June 2016)

This project is exploring ways to improve crop productivity through real time adaptive (spatial and temporal) control of irrigation application. The project researcher, Dr Alison McCarthy, received the CRDC sponsored, Federal Department of Agriculture's Science and Innovation Awards for Young People in Agriculture (Cotton) in 2014, as well as the highly coveted Minister for Agriculture's Award.

CRDC Program: Farmers	
Theme:	1.2 Productive Resource Efficiencies
Strategy:	1.2.2 Developing and proving decision systems and practices that deliver optimal resource efficiencies on cotton farms
Measure of success:	Farmers are able to increase their productivity per hectare of land

UQ1302 – Developing soil testing and fertiliser response guidelines to manage P, K and S fertility for irrigated and dryland cropping systems
(Funded July 2012 – June 2017)

This three year project led by the Queensland Alliance for Agriculture and Food Innovation (QAAFI) has been conducting soil tests and fertiliser response guidelines to monitor phosphorus (P), potassium (K) and sulphur (S) fertility levels for irrigated and dryland cropping systems.

Soil reserves of P, K and S are declining due to removal rates exceeding replacement in fertilisers or soil amendments. Even in the situations where inputs exceed removal rates, the lack of mobility of some of these nutrients in soil (especially P and K), and the limited amount of deep tillage or soil inversion, means that these nutrients are becoming increasingly concentrated in the topsoil (0–10 cm), where they may be less available to cotton roots. Declining soil nutrient reserves will require more frequent applications of P, K and S and more targeted placement of fertiliser to ensure that the on-going high productivity of cotton farms can be maintained.

Therefore there is a need to develop improved soil and plant tissue testing guidelines to more precisely determine P, K and S fertiliser needs. While soil test and sampling strategies exist for P and K, work is still required to better enable growers and advisors to predict likely crop responsiveness, based on soil test results, and accordingly apply the optimum amount of fertiliser. Research is also required to better understand where in the soil profile cotton roots are accessing P and K, so that fertilisers can be applied in the right place and in the right form, to ensure they are most effectively accessed by the crop roots.

Findings from the project so far have suggested that while early in the season the crop is able to utilise the P and K available in the top 30 cm, as the crop ages and the roots expand deeper into the soil profile, it becomes dependent on the deeper/subsoil nutrient reserves for P and K requirements. If confirmed, this may require a revision of the current fertiliser application placement strategies for P and K to ensure that replenishment is being provided to the soil region from which the nutrients are being extracted.

CRDC Program: Farmers	
Theme:	1.2 Productive Resource Efficiencies
Strategy:	1.2.2 Developing and proving decision systems and practices that deliver optimal resource efficiencies on cotton farms
Measure of success:	Farmers are able to increase their productivity per hectare of land and per unit of CO_2 equivalent emitted

DAN1202 – Managing carbon in a cotton-based farming system *(Funded July 2011 – June 2014)*

While the benefits of soil carbon are well understood, measuring soil carbon as part of a commercial farming operation is time-consuming and costly. It is also difficult to monitor changes in a regular and comprehensive manner across an entire farm.

This project aimed to develop a relationship between soil carbon levels, the management practices being deployed on the farm, and prevailing temperature and rainfall conditions. It was anticipated that qualitative indicators, such as rotation frequency, stubble retention levels and tillage intensity, could be used as surrogate indices for soil carbon sequestration.

Increasing soil carbon storage, as well as improving the water holding capacity of the soil and reducing greenhouse gas emissions, can also increase the resilience and long-term productivity of the soil. This increased resilience, or soil health, is achieved through improved water conservation, soil structure, nutrient storage, and reduced salinity and sodicity.

Irrigated corn was identified as a potential candidate to effectively increase soil carbon levels in a cotton-based farming system. The rotations compared were a cotton-corn-cotton sequence, and a back-to-back cotton sequence, under both a conventional and a minimum tillage (permanent bed) approach.

The preliminary results have been impressive, with a range of benefits being seen in the corn rotation. These have included increased yield of cotton in the crop following corn, higher levels of soil carbon (especially at depth; i.e. 60–120 cm), increased cotton root densities and rooting depth, and a decrease in black root rot infestation.

More broadly, the project suggested that legumes, although contributing large amounts of carbon (C) to the soil, were unable to retain it because their low C/N ratio facilitates rapid microbial decomposition. Further, C inputs of C4 crops such as sorghum and corn were much larger than those of C3 crops such as wheat, with a major proportion coming from the root systems.

CRDC Program: Farmers	
Theme:	1.2 Productive Resource Efficiencies
Strategy:	1.2.3. Developing new systems and tools to support farm decision making processes
Measure of success:	Farmers are able to increase their productivity per ML of water

NEC1302 – Commercial prototype smart automation system for furrow irrigation of cotton *(Funded January 2013 – March 2015)*

Cotton growers are under constant pressure to produce more cotton with less, including less water and less labour. Smart automated furrow irrigation potentially provides a solution for these very real constraints on irrigated cotton farms. This project aims to develop a commercial prototype system which sees the integration of the National Centre for Engineering in Agriculture (NCEA) real-time optimisation software with the Rubicon Water FarmConnect® surface irrigation automation system.

This year, performance evaluations have been undertaken on a real-time optimisation system for furrow irrigation (AutoFurrow). Trials for the system were undertaken on commercial furrow-irrigated cotton properties.

A new approach to selecting the optimal time to cut-off has been developed and tested, which will have application to both automated and manually controlled systems. For automated systems this will have the effect of making the system more robust and less susceptible to errors in the data.

Preliminary analysis of the results from the Moree trial site show that application efficiencies above 85 per cent can be achieved consistently by all methods trialled this season.

The trials proposed for this coming season (the last season of the project) provide the opportunity to demonstrate the final configurations for the commercial prototype systems.

The output from this project will be a fully tested, commercial prototype adaptive real-time system for the automation and control of furrow irrigation. The outcome for the industry will be the commercial availability of a furrow irrigation system, able to compete with the pressurised alternative of centre pivot or lateral move machines on capital cost, water and labour savings, but without the massive energy costs.

CRDC Program : Farmers	
Theme:	1.2 Productive Resource Efficiencies
Strategy:	1.2.3 Developing new systems and tools to support farm decision making processes
Measure of success:	Farmers are able to increase their productivity per hectare of land

CSP1308 – Agronomic Management for Better Fibre and Textile Quality *(July 2012 – June 2015)*

This research is assessing the impact of different agronomic inputs and production management strategies, harvesting, and ginning, on fibre quality. The aims of this project are to develop crop and post-harvest management strategies that optimise crop fibre quality and yield, and assess the effects of changes in management and crop production conditions on fibre quality and subsequent yarn quality and spinnability.

In assessing agronomic impacts on fibre quality, different varieties were grown under two management regimes 'Standard' and 'Wise' management. The 'Wise' management treatment involved targeted irrigations at flowering, a later defoliation (thereby avoiding the application of boll openers), and using late season mepiquat chloride to mature the crop in time to avoid inclement weather. Standard treatments use normal irrigation practice, including the use of a boll opener at 60 per cent open bolls, and have no mepiquat chloride applied at cutout.

The results show, as expected, early defoliation had an impact on the maturity and High Volume Instrument (HVI) micronaire values of the top bolls, but limited impact of the quality of the bottom bolls. The relationship of fibre fineness, maturity and ribbon width on packing density of fibres in yarn has also been assessed. Consistently the variety with the lower inherent fibre fineness produced the cotton with lower micronaire and maturity.

Analysing the boll development period aims to support a more accurate assessment of the last effective flower. This will allow growers to improve the management of crops during the last one third of the crop production cycle. This project has produced improvements in the CottASSIST online tool by adding a micronaire predictor, which will allow growers to better predict crop quality.

To improve crop management the project is assessing the use of portable hand held technology to determine the micronaire of unopened cotton bolls to enable researchers and growers to better predict the micronaire of ginned cotton lint. This would allow better management of defoliation timing to maximise yield and avoid penalties for cotton micronaire outside of the preferred quality range (3.5–4.9).

Research also developed a new concept of fibre measurement called fibre ellipticity. It describes the shape of the fibre cross-section and will help the understanding of how fibres pack together and interact together in a yarn structure. This may have important outcomes for fibre processing and selection of fibre types to be used in processing.

RD&E Portfolio
PROGRAM 2: INDUSTRY

Program 2: Industry			
Program	**Industry**		
Outcome	The Australian cotton industry is the global leader in sustainable agriculture.		
Measure	Industry can report against recognised sustainability indicators.		
Theme	**2.1 Respected Stewardship**	**2.2 Responsible Landscape Management**	**2.3 Sustainable Futures**
Strategy Outcomes	Industry protects its production technologies and its biosecurity.	Industry leads in managing natural assets.	An industry achieving its vision.
Will be achieved by	2.1.1 Monitoring for and investigating changes in pest and weed susceptibility to biotechnologies and crop protection products used by the cotton industry. 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. 2.1.3 Developing and supporting the industry's capacity to effectively steward key technologies and products. 2.1.4 Supporting the industry's preparedness and ability to deal with biosecurity threats.	2.2.1 Defining the values and drivers relating to the management of natural landscapes and systems in cotton growing regions. 2.2.2 Recording and demonstrating improved environmental performance of the cotton industry. 2.2.3 Identifying and proving integrated management strategies which deliver environmental and productivity gains. 2.2.4 Researching the connectivity between cotton farms and natural systems in the landscape. 2.2.5 Supporting initiatives and partnerships to improve the knowledge and capacity to manage natural landscapes and systems in cotton regions.	2.3.1 Scoping and investigating critical threats and opportunities which may influence the long term sustainability of the Australian cotton industry. 2.3.2 Supporting innovative approaches to solve traditional industry issues and drive future sustainability.

Program 2: Industry

Program	Industry		
Outcome	The Australian cotton industry is the global leader in sustainable agriculture.		
Measure	Industry can report against recognised sustainability indicators.		
Theme	**2.1 Respected Stewardship**	**2.2 Responsible Landscape Management**	**2.3 Sustainable Futures**
Measures of success	Industry is able to maintain its access to, and the effectiveness of, biotechnologies and crop protection products. ■ 100 per cent of cotton farmers are aware of the underlying risks of trait and agricultural chemical resistance. ■ 100 per cent of insecticide use decisions are consistent with the Insecticide Resistance Management Strategy (IRMS). ■ The cotton industry has the necessary science to provide informed input into the development of resistance management plans for biotech traits. ■ The cotton industry demonstrates pesticide management practices that lower the risks posed to the environment and the evolution of resistance in target insect pest and weed populations. Industry is capable of managing its biosecurity responsibilities: ■ The cotton industry is able to meets its biosecurity obligations. ■ The cotton industry is prepared to effectively respond to biosecurity incursions.	Industry participation in the collective management of natural landscapes ■ Regional delivery partnerships for every major cotton growing region. Industry recognised for its leadership in environmental performance ■ Recognition by national and global initiatives for biodiversity management. ■ 1000km of riparian lands managed under best practice. ■ One million hectares of floodplain vegetation managed under best practice. Industry contributes to the improvement of landscape systems knowledge and science. ■ A comprehensive database documenting the extent and condition of the natural assets the industry utilises and manages. ■ Two national science based collaborations for the industry to inform surface and groundwater management.	Industry is capable of leading and adapting to change ■ Innovations and partnerships established to drive cotton industry sustainability.

CRDC Program: Industry	
Theme:	2.1 Respected Stewardship
Strategy:	2.1.1 Monitoring for and investigating changes in pest and weed susceptibility to biotechnologies and crop protection products used by the cotton industry 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 2.1.3 Developing and supporting the industry's capacity to effectively steward key technologies and products
Measure of success:	Industry is able to maintain its access to and the effectiveness of, biotechnologies and crop protection products

Bt technology

The *Bt* genes in Bollgard II® cotton that provide resistance to cotton's greatest pest, *Helicoverpa*, have helped the industry to reduce its use of insecticides by 90 per cent in recent years. In the lead up to the commercial release of third generation *Bt* technology, it is critical that the industry gets the Resistance Management Plan (RMP) for Bollgard III® right to ensure the longevity of *Bt* technologies. Throughout 2013–14 there has been a significant effort by the Transgenic and Insect Management Strategy (TIMS) *Bt* Technical Panel on reviewing research relevant to the third generation *Bt* cotton RMP for Bollgard III®. This involves reviewing the current Bollgard II® RMP and its effectiveness and incorporating new research specific to the efficacy and expression of new Bollgard III® cultivars.

The science of resistance management is complex and a major priority for CRDC's research investment. Along with the current investment into Bollgard II® resistance monitoring, CRDC has also been investing in research critical to determining an effective RMP for third generation transgenic cotton.

The range of research is complex and includes:

- Efficacy and expression characteristics of the toxins contained in Bollgard III®.
- Determining baseline frequencies to Vip3A, the additional toxin contained in Bollgard III®.
- Effectiveness of key tactics in the current RMP, such as planting windows and refuges.
- Alternatives to pupae busting and trap crops.
- *Helicoverpa* spp ecology including flight capacity, host preference and landscape influences on behavior.
- Continued resistance monitoring in Bollgard II®, including identifying resistance characteristics and potential cross resistance between different *Bt* toxins and conventional insecticides.

CSE1402 – Monitoring to manage resistance to *Bt* toxins *(Funded July 2013–June 2016)*

This research continues a program initiated in 1994 to monitor resistance in field populations of *H. armigera* and *H. punctigera* to the *Bt* toxins produced in transgenic cotton. In 2013 CSIRO shifted to performing only F1 screens to focus on the frequencies of the known resistances. In addition to screening F1 families against the toxin of interest (e.g. Cry2Ab), they introduced screens against all classes of *Bt* toxins (e.g. Cry1Ac and Vip3A) in an effort to detect any novel forms of resistance that carry dominance. The project has conducted extensive screening for the 2013–14 season, with early indication that there is no increases in the frequencies of resistance.

CSE1201 – The characterisation of Vip3A resistance in *Helicoverpa* spp. *(Funded July 2011 – June 2014)*

Monitoring for resistance to the Vip3A protein has revealed that genes allowing survival against this toxin already exist in *H. punctigera* and *H. armigera*, and as with Cry2Ab, the early data indicates that there is an unexpectedly high frequency of individuals in field populations that carry a gene conferring resistance to Vip3A protein. Understanding this resistance, and any associated fitness cost is an important element in development of the Bollgard III® RMP.

CSE1302 – Area-wide pest suppression in transgenic landscapes: Implications for IRM *(Funded July 2012 – June 2015)*

Data generated from Cotton CRC projects has been combined with data generated from this project (2012–13 and 2013–14), providing a comprehensive space and time data set of *Helicoverpa* spp in cotton (5 years), sorghum (3 years) and pigeon pea (2 years). This final data set will be used for statistical analysis and simulation modelling. A general model for each *Helicoverpa* spp has been developed and includes the incorporation of real-landscape data, such as the amount of crops, and mandated and unmandated refuge, and an evaluation of the role of planting windows, in the development and delay of resistance.

CSE1304 – Managing *Bt* resistance and induced tolerance with effective refuge crops in preparation for Bollgard III® *(Funded July 2012 – June 2015)*

To better understand how well refuges work in practice relative to theory, this research developed the use of field cages to replace pupae digging. Comparisons between moth emergence from *Bt* cotton, with its unsprayed cotton refuge and its unsprayed pigeon pea refuge, has highlighted the importance of managing *Bt* cotton as well as refuge.

While most resistance work focuses on genetic resistance, this research has also investigated whether *Helicoverpa* spp can become tolerant of *Bt*, as a consequence of successive generations being exposed to low doses – survive without having resistance genes. To date, the idea that *Helicoverpa* can become tolerant to *Bt* toxins through successive generations being exposed to low doses has been demonstrated, with one toxin at a time under laboratory conditions (toxin incorporated diet). This research is now expanding to try to demonstrate this phenomenon on Bollgard II® plants.

CSE1306 – Managing *Bt* resistance, *H.punctigera* movements and cotton planting windows *(Funded July 2012 – June 2015)*

This project has provided key data and analysis to the *Bt* tech panel, including analysis of the long term pheromone trapping data and the Monsanto dataset of current (and recent) industry wide planting and defoliation dates to clarify the likely effectiveness of 'planting windows' with the *Bt* Resistance Management Plan (RMP). In addition to informing Bollgard III® discussions, this information was used to support an application to APVMA to change planting window requirements for the 2014–15 season and is being prepared for publication.

This project is also evaluating how effectively moths from different plant host origins, move and mix within cotton production landscapes of different complexity, thus providing further evidence of the effectiveness of this critical component of the *Bt* RMP.

SC1301 – National Cotton Extension Development & Delivery – Stewardship of biotechnologies *(Funded July 2012 – June 2015)*

CRDC has invested in a Cotton Info Team Stewardship Technical Specialist, to coordinate the activities of the TIMS *Bt* Tech Panel and Insecticide Tech Panel. The Specialist is working with industry researchers to distil communication messages from this research to ensure the industry is aware of the importance of resistance management.

During 2014, regional meetings discussing the development of the RMP for Monsanto's Bollgard III® technology have been delivered through the CottonInfo team, with collaboration between CRDC, Cotton Australia & Monsanto. These meetings have focused heavily on promoting the research outputs from CRDC's stewardship theme, and have strongly demonstrated the need for locally generated research on Australian pests and the Australian environment in developing a robust RMP. A recent grower survey found that over three quarters of growers recognised the value of the elements of the RMP.

UNE1301 – Substitutes for pupae busting – commercial scale trials of moth busting *(Funded July 2012 – June 2015)*

Pupae busting is an effective, non-chemical method of preventing resistance carryover from one season to the next. However it can be costly, reduces soil water and carbon, and restricts farming systems. This project builds on previous work through the Cotton CRC to look at commercial area-wide trials of the novel moth attract-and-kill technology, Magnet®. This project targets moths emerging from late season cotton, and/or overwintering moths from spring wheat, as a potential way of reducing or eliminating the need for pupae busting. Field trials to date generally support the feasibility of moth busting as a tool for resistance management, with ongoing work addressing challenges of rain and timing.

CRDC Program : Industry	
Theme:	2.1 Respected Stewardship
Strategy:	2.1.3 Developing and supporting the industry's capacity to effectively steward key technologies and products
Measure of success:	The cotton industry demonstrates pesticide management practices that lower the risk posed to the environment and the evolution of resistance in target insect pest and weed populations

Supporting industry capacity to manage herbicide resistance risk

Herbicide resistance in cotton farming systems is a serious industry issue. Increased reliance on glyphosate in the cotton system has increased the risk of resistance developing to this herbicide. Seven weed species have confirmed glyphosate resistance. Ninety per cent of dryland area, as reported in the Crop Consultants Australia (CCA) survey, contains resistant weeds, and herbicide resistance is costing growers up to $60 per hectare per season in increased weed control.

CRDC1411 – Developing an industry-agreed strategy for managing herbicide resistance in cotton *(Funded November 2013 – August 2014)*
CRDC commissioned Annabelle Guest to facilitate the development of a Herbicide Resistance Management Strategy (HRMS) for cotton. This strategy has been developed with guidance from Cotton Australia's TIMS technical panel (herbicides) and the HRMS will be released in August 2014.

This strategy consolidates a large volume of weed ecology and herbicide resistance modelling conducted by project UQ1203, into a format that growers and consultants can employ in both irrigated and dryland systems. The strategy indicates the combinations of practices that offer greatest effect in delaying glyphosate resistance in herbicide tolerant cotton systems. The same practices apply to managing situations where resistant populations are already present. The future availability of multi-trait herbicide tolerant varieties has also been considered in the design of the strategy.

CRDC Program: Industry	
Theme:	2.1 Respected Stewardship
Strategy	2.1.4 Supporting the industry's preparedness and ability to deal with biosecurity threats
Measure of success:	Industry is capable of managing its biosecurity responsibilities

Biosecurity

CRDC has a number of investments aimed at supporting the industry's capacity to deal with biosecurity threats through surveillance and development of diagnostic protocols and contingency plans. Investment into raising awareness and training is also ensuring that the industry has the capacity to adequately respond.

DAQ1405: Surveillance for exotic cotton viruses – Multiple targets in and nearby Australia *(Funded July 2013 – June 2016)*

This project has delivered better connectivity between the cotton industry and surveillance activities in northern Australia by other government agencies. This means that the cotton industry can access relevant information earlier and be more prepared to respond to changing threats. Virus research has assisted the industry to negotiate modification to import requirements for high risk plants.

Cotton leafroll dwarf virus (CLRDV), also known as Cotton blue disease and Chickpea stunt disease, was detected in an asymptomatic Sea Island cotton plant (*Gossypium barbardense*) in Laivai, Timor Leste in May 2013. The sample was collected by Northern Australia Quarantine Strategy (NAQS) and sent to QDAFF for screening, as part of this project. Cotton blue disease is generally regarded as the second most damaging virus disease to commercial cotton (second to Cotton leaf curl virus) and is a significant threat to the Australian cotton industry. The vector (cotton aphid – Aphis gossypii) is widespread in all Australian growing regions. This disease is a Plant Health Australia (PHA) high priority pest, and a national diagnostic protocol is currently being developed by QDAFF as part of the CRDC funded project (DAQ1201), 'Surveillance and monitoring for endemic and exotic virus diseases of cotton'.

DAQ1201: Surveillance and monitoring for endemic and exotic virus diseases of cotton *(Funded July 2011 – June 2015)*

Cotton blue disease is in the same family (poleroviruses) as the endemic Cotton Bunchy Top Virus. This research has identified that there are two genetically distinct strains of Cotton Bunchy Top Virus (CBTV-A and CBTV-B) found in almost all Australian cotton growing regions.

As CBTV-A and CBTV-B were found to be as different to each other as they are to Cotton blue disease, and both strains have been found in native cotton (*G.sturtianum* and *G. australe*) which occurs in scattered populations across Northern Australia, there is a likelihood these hosts may be capable of hosting other polero viruses (such as the exotic Cotton blue disease). As such they could act as a pathway for incursion from South East-Asia into Northern Australia. This research has provided important input into the industry's Cotton blue disease contingency plan.

CRDC Program: Industry	
Theme:	2.2 Responsible Landscape Management
Strategy:	2.2.3 Identifying and proving integrated management strategies which deliver environmental and productivity gains
Measure of success:	Industry contributes to the improvement of landscape systems knowledge and science.

CRDC1403 – Natural Resource Management (NRM) Technical Specialist (*Funded October 2013 – June 2014)*

This project translates research into action to support the cotton industry to continue to improve its environmental performance and aims to identify and improve integrated management strategies which deliver environmental and productivity gains on cotton farms.

Cotton NRM research underway is improving our understanding of how managing riparian land can promote the recruitment of trees and shrubs, the role of trees in arresting the lateral flow of groundwater in salty landscapes, the connectivity of groundwater aquifers and the value of ecosystem services provided by natural vegetated areas like erosion control, carbon storage and keeping pest thresholds lower for longer.

This project involves working closely with researchers to help define best management practices, and provide support and advice to growers to implement best management practice of natural resources on cotton farms. In 2013–14 the project undertook a major review of the *my*BMP Natural Assets module to ensure management of natural areas on cotton farms is guided by the latest research. This project will be extended and funded for another three years.

CRDC Program: Industry	
Theme:	2.3 Sustainable Futures
Strategy:	2.3.1 Scoping and investigating critical threats and opportunities which may influence the long term sustainability of the Australian cotton industry
Measure of success:	Industry is capable of leading and adapting to change

Managing Climate Change

Medium term climate change models forecast an increase in average daily temperature, the concentration of carbon dioxide and the frequency of extreme weather events (especially periods of drought), as well as an increase in the intensity of rain fall events. All of these forecast changes have the potential to significantly affect the growth of cotton and how cotton should be best managed.

These projects are all interested in developing a better understanding of the implications of any changes to the climate for cotton growing and the identification of appropriate management responses (adaptation). There is a focus on temperature (extent of extremes and seasonal averages), carbon dioxide concentration, waterlogging and flooding. The research provides a broad investment in understanding the effects of a changed climate (through modelling, glass house experiments and small scale field trials) and in identifying potential adaptation options.

UTS1301 – Assessing climate change impacts and adaptation options in the cotton industry *(Funded July 2012 – June 2015)*

This project aims to model the likely climate (including changes to the mean climate and to climate variability) in 2030 across nine cotton growing regions. The effect of climate on the key growth phases of the cotton crop, and on water use efficiency, yield and fibre quality is also being modelled. The costs and benefits of adaptation options are also being investigated.

The modelling results suggest that planting later than is current practice may be the best option to mitigate the impact of a hotter growing season on a key fibre quality parameter (micronaire). Project CSP1402, that supports large (4m x 4m) climate controlled facilities for use in the field, will be used to test and validate these modelled findings over the coming years.

CRC1101 – Improving prediction of cotton growth and production in a changing climate *(Funded July 2010 – March 2014) and* CSP1402 – National facility for climate change research *(Funded July 2013 – December 2016)*

These two projects, (CRC1101 and CSP1402), aim to investigate the interactive effects of increases in temperature and carbon dioxide levels on crop growth and development, and to evaluate the effectiveness of adaptation strategies such as choice of variety, planting date, and nutrition and irrigation management.

The PhD project CRC1101, using glass house experiments and small-scale field chambers has found that while elevated carbon dioxide levels may have a beneficial impact on crop growth and crop water use efficiency at current (ambient) temperatures, these impacts are not maintained under higher temperatures. For example, the beneficial effects of elevated carbon dioxide on crop growth and crop water use efficiency is not able to mitigate the negative impacts of higher temperatures on crop growth.

These findings will be tested in small-scale field trials utilising the climate controlled facilities supported in project CSP1402.

UWS1301 – Cotton industry adaptation to extreme weather and climate change *(Funded July 2012 – December 2015)*

This project aims to understand the effect of extended wet and dry periods on soil fertility and to identify potential remediation options. Project UWS1301, utilising glass houses, confirmed the small field chamber findings of CRC1101, that there is no additive effect of elevated temperature and carbon dioxide on crop growth. While each independently can enhance crop growth, there is no additional benefit when the two treatments are combined.

US1301 – The physiology of cotton crop nutrition, shade and waterlogging *(Funded March 2012 – March 2015)*

This PhD funded project aims to investigate the effectiveness of ethylene inhibitors to mitigate the impacts of waterlogging on crop growth and yield. This project has shown that pre-waterlogging application of the ethylene inhibitor aminoethoxyvinylglcine (AVG) not only enhanced the ability of cotton plants to recover from waterlogging, but also improved the yield of plants not subjected to waterlogging, when compared to a non-treated control.

Higher fruit abscission (loss) is a common response of cotton to many stresses, which is accelerated by higher ethylene synthesis. For waterlogging affected plants, those treated with AVG yielded 11–13 per cent higher than those not treated with AVG. While for plants not subjected to waterlogging at all, AVG treated plants yielded 7–9 per cent higher than the untreated controls.

Program 3: Customers

Program	Customers		
Outcome	The Australian cotton industry captures the full value of its products.		
Measure	Double the premium for Australian cotton.		
Theme	**3.1 Assured Cotton**	**3.2 Differentiated Products**	**3.3 Competitive Futures**
Strategy Outcomes	The integrity and qualities of Australian cotton set global benchmarks for customers.	Customers recognise the differentiated value of Australian cotton products.	The demand for Australian cotton products is positively transformed.
Will Be Achieved By	3.1.1 Improving Australian fibre quality testing standards and procedures and the capacity to measure and manage contamination. 3.1.2 Supporting the development and implementation of post farm gate BMPs. 3.1.3 Developing and implementing a standardised reporting system for Australian cotton product quality and traceability. 3.1.4 Benchmarking Australian cotton against key international programs for product stewardship and sustainability.	3.2.1 Identifying opportunities for improvements in fibre quality and cotton products. 3.2.2 Demonstrating the value of different fibre classes and defining fibre quality parameters that secure a premium market. 3.2.3 Developing customer-based partnerships for the development of higher value and novel products, which differentiate Australian cotton.	3.3.1 Investigating existing and future markets for Australian cotton and communicate these findings to the Australian Cotton Industry. 3.3.2 Facilitating the development of new technologies and systems to improve the competitiveness of Australia cotton.
Measures of success	Customers have confidence in the integrity of Australian cotton: ■ Australia has the best ranking for non-contamination in The International Textile Manufacturers Federation (ITMF) survey. ■ Customers recognise and use Australia's BMP standards as their guarantee of quality assurance. ■ Australia uses standardised reporting systems for product quality and traceability for farmers, industry and customers. ■ Australia can respond to customer needs for reporting sustainability indicators.	Customers value the qualities of Australian cotton: ■ New fibre classification systems established. ■ Partnerships established to demonstrate the potential for differentiating Australian cotton.	Customers continue to demand Australian cotton products: ■ Provide the Australian Cotton Industry with knowledge of fabric innovations and future market opportunities. ■ Development of alternative and high value cotton products.

CRDC Program: Customers	
Theme:	3.2 Differentiated Products
Strategy:	3.2.1 Identifying opportunities for improvements in fibre quality and cotton products
Measure of success:	Customers value the qualities of Australian cotton

CMSE1305 – Commercial Ready Cottonspec *(Funded July 2012 – October 2014)*

This project, led by CSIRO, supports the use of high quality Australian cotton by mills. The software uses objective fibre quality data to predict yarn quality outcomes for a mill. The software system can be used to improve cotton ordering systems so mill managers can order appropriate cotton quality types to meet their end product objectives.

The current core aim is to refine the software system to be at a commercial ready stage. The project will focus on completing a commercial evaluation of the technology and initiate a process for its commercialisation.

During 2013–14, the second stage trials using the upgraded Cottonspec software version 1.1.4 (upgraded prediction models and inclusion of a Mill Correction Factor interface) commenced in four partner mills: Chongqing Sanxia, Luthai (Shandong), Demian (Shandong) and Xinjiang Esquel. Preliminary results have shown the upgraded models work very well for Chongqing Sanxia and reasonably well for Luthai and Xinjiang Esquel.

Mill Correction Factor (MCF) calculation has been refined and tested at the partner mills. The outcomes have allowed the prediction accuracy of the Cottonspec models to be significantly improved. Specific trials were completed with Australian Long Staple (ALS) cotton at Luthai Mill in China. This included blending ALS with Pima cotton.

To progress commercialisation of the technology, CSIRO engaged with and extended expression of interest (EOI) information to more than 12 potential Cottonspec licensees (companies and organisations in the cotton trading and spinning sectors) in China and Australia.

The technology offers a number of opportunities for the industry to promote the use of Australian cotton to high quality mills. Commercial scale trials, conducted over the last 3 years, have continued to demonstrate the value of the technology to mills over any existing software technologies.

CRDC Program: Customers	
Theme:	3.2 Differentiated Products
Strategy:	3.2.1 Identifying opportunities for improvements in fibre quality and cotton products
Measure of success:	Customers value the qualities of Australian cotton

CMSE1201 – Identifying the glass transition temperature behaviour of Australian cotton (Funded July 2011 – March 2015)

The cotton fibre may be damaged during processing at the gin and spinning mill. The physical state of the fibre can have an influence on the level of damage that may occur to the fibre during processing. The assessment of the transition behaviour, or glass transition (Tg), of the fibre may be used to manage the environmental conditions during processing and thereby improve the management of fibre processing. Tg for cotton has not been reported before.

This PhD project will assist to train a new Fibre Scientist. The project aims to measure Tg for cotton for the first time, and assess different fibres and the effects of moisture and temperature on Tg for cotton.

During 2013–14, a range of cellulose samples (cotton, viscose and Tencel fibre, cellulose filter paper and microcrystalline cellulose powder) have been assessed. Techniques used in assessing Tg include differential scanning calorimeter (DSC), dynamic mechanical analysis (DMA) and pycnometry and atomic force microscopy (AFM).

A number of fibre tests have been conducted and results are beginning to emerge in the area of glass transition (Tg). It has been noted that management of relative humidity (RH) may play a greater role in determining Tg than temperature. For example, Tg at 97 per cent RH may be -50 degrees Celsius while at 85 per cent it may be 10 degrees Celsius. This result is encouraging for assessing future management of Tg within cotton ginning and processing.

Future experiments will focus on determining whether there is any difference in the Tg of (developmentally) immature cotton compared to mature cotton fibres. This work will aim to identify the Tg, crystallinity and density of cotton of different varieties at varying developmental maturity, and relate these findings to their possible impact on post-harvest processing.

CMSE1312 – Cotton contamination detection sensors *(Funded July 2012 – June 2014)*

Australian cotton has very low levels of contaminant and as such is able to command premiums on the basis of this property. The use of new harvesters that produce modules wrapped in plastic on the harvester has reduced harvest costs. However, the plastic that encases these modules may present a contamination risk. Anecdotal evidence indicates that not all plastic is removed in the module feed area by operators or by the mechanised systems used to remove the wraps. A consequence is that if fragments of plastic were be to found in bales, the contamination free impression that mills have of Australian cotton will be damaged.

The project involved working in collaboration with Australian Ginners and the commercial company Loptex Italia (a manufacturer of sensors for detecting contamination in textile mills), to develop high speed contamination detectors and removal systems for use by Australian cotton gins.

Outcomes of the project have included the development of low cost camera base sensors to be used at the module hood feeding point of the gin. These sensors are able to provide gin operators a view of the feed rollers or beaters, and to determine if they become contaminated with any plastic wrap from the modules. The cameras proved very successful in providing the first stage of detection and have been adopted across a number of gins. The project aims to refine the software used in detection of the plastic by the cameras to provide an automated warming system for ginners.

Commercial interest for the CSIRO module hood sensor system is high. The system's contaminant recognition factor was above 80 per cent, which justifies it as a useful tool able to improve and perfect Australia's reputation in the international markets, as a producer of quality contaminant free cotton. In addition the system provides valuable data to gin operators about day-to-day contamination management while a gin is in operation.

The development of more advanced inline contamination sensor systems has progressed with a number of prototypes tested within commercial gins. The project continues to refine these sensors in collaboration with Loptex Italia. Commercial development of inline detection and removal systems will be assessed by Loptex Italia.

CMSE1402 – Automated gin seed fingers *(Funded July 2013 – June 2015)*

This project evolved from earlier research that assessed the impact of gin seed fingers on cotton fibre quality. Evidence emerged that the position of the seed fingers can have positive influences on fibre quality and yield during ginning. The concept was that the development of an automated gin seed finger system may be instrumental in the production of more and higher quality bales from the same gin input, resulting in a better return for growers.

The aim for the current project is to develop an automated gin seed finger system that is able to self-adjust according to the density of the seed roll to provide improvement in the efficiency of Australian saw gins. It is predicted that improvements would be achieved through higher lint turn-out and reduced residual lint on the seed, as well as possible changes in total energy requirements for ginning through improved management of the total load on the seed roll.

The project has progressed to develop and test a prototype automated gin seed finger system within commercial gins. Initial data indicated that small but significant improvements in gin turnout may be achieved to provide direct benefits for growers. A patent has been developed to protect the technology.

CRDC Program: Customers	
Theme:	3.2 Differentiated Products
Strategy:	3.2.2 Demonstrating the value of different fibre classes and defining fibre quality parameters that secure a premium market
Measure of success:	Customers value the properties of Australian cotton

CMSE1308 – Effects of cotton cellulose structure and fibre surface substrate interactions on dye uptake *(Funded July 2012 – June 2016)*

Dyeing of cotton is a major cost in garment production. It may be influenced by the quality of cotton, however limited information is known about the key factors of the cotton fibre that may affect dye uptake and dyeing efficacy. This PhD project focuses on the assessment of the physical and chemical properties of cotton fibre and their influence on dye uptake.

Following the completion of a literature review, dyeing trials have commenced with structural differences between two cotton sets predicted based on dyeing behaviour. Analysis of the structure and surface chemistry of cotton will be conducted to better understand the impact of these properties on dye uptake. Further work will also include the use of different dyes and pretreatments.

In the future it is hoped that any properties considered to be potential factors of differential dye uptake can be identified to enable future differentiation of cotton based on dyeability. It is anticipated that this will also include a comparative study of dyeing behaviour of Australian and internationally grown cotton samples.

CRDC Program: Customers	
Theme:	3.2 Differentiated Products
Strategy:	3.2.3 Developing customer-based partnerships for the development of higher value and novel products which differentiate Australian cotton
Measure of success:	Partnerships established to demonstrate the potential for differentiating Australian cotton

DU1102 – Development of low twist fine count yarns and fabrics from Australian Long Staple (ALS) upland cotton

(Funded September 2011 – September 2014)

This project is a collaboration between CSIRO, Deakin University and Hong Kong Polytechnic University. The aim is to assess the use of Australian cotton in the production of low twist yarns, using innovative Nu-Torque technology. The development of Nu-Torque technology is new to spinning, which may not only reduce spinning costs, but also produce a higher quality fabric. New partnerships with mills and brand owners are also an aim for this project.

During 2013–14, spinning trials were completed with 100 per cent Pima Extra Long Staple (ELS), 80/20 ELS and Australian Long Staple (ALS) – LS cotton; 70/30 ELS and Australian LS cotton; and 100 per cent Australian LS cotton. Low-twist Nu-Torque yarns were produced with the optimised spinning parameters, using the cotton roving of 80 per cent ELS (Pima) and 20 per cent Australian cotton. The ply yarns have been knitted into garments and samples of the knitwear have been produced.

Twist level of Nu-Torque ply yarns were reduced by around 29 per cent. Under such conditions, Nu-Torque knitted fabrics still show very good bursting strength, air permeability and pilling resistance. Results showed that yarns produced with the new modified spinning system had reduced imperfections. At low twist levels, fine modified yarns and resultant fabrics also showed improved quality over conventional fabrics.

Trial results have been analysed, and an algorithm relating fibre to yarn properties has been developed. The research has shown that the 100 per cent roving Australian LS performed as well as ELS blends. This finding will assist the industry in the promotion of ALS cotton to mills that use the new spinning technology.

CRDC Program: Customers	
Theme:	3.2 Differentiated Products
Strategy:	3.2.3 Developing customer-based partnerships for the development of higher value and novel products which differentiate Australian cotton
Measure of success:	Partnerships established to demonstrate the potential for differentiating Australian cotton

DU1301 – Design of thermal cotton/wool fabrics made from Australian fibre *(Funded July 2012 – June 2015)*

Cotton wool blends provide a number of advantages in terms of the thermal properties of finished garments. The majority of cotton/wool blends are knitted garments and the market opportunity is to develop a new range of woven garments.

This project involves collaboration with leading researchers in Australia and a premium shirt producer in China (Esquel Ltd). The project aim is to develop a new range of thermal woven fabrics made from cotton and wool.

During 2013–14, the initial objectives were to design a range of fabrics with increased thermal resistance for cooler seasons. This began with assessing different cotton wool blends, including cotton:wool ratios of 90:10, 80:20, 70:30, 60:40 and 100 per cent cotton. The research also assessed a range of fabric treatments and fabric designs.

In achieving fabrics with different thermal ratings, the project progressed to design cooler fabrics to provide a range that could be used across different seasons. The target garments are dress and casual shirts.

Through collaboration with Esquel Ltd, the project has a very commercial focus and drive to develop fabrics that major international brands will find attractive. The overall goal is to have a range of thermal fabrics made from Australian natural fibres.

CRDC Program: Customers	
Theme:	3.3 Competitive Futures
Strategy:	3.3.1 Investigating existing and future markets for Australian cotton and communicate these findings to the Australian cotton industry
Measure of success:	Provide the Australian cotton industry with knowledge of fabric innovations and future market opportunities

DU1302 – New developments and opportunities for cotton yarns and fabrics *(Funded February 2013 – June 2014)*

Cotton is losing its market share in all sectors of apparel. This project was commissioned to assess future trends for fibre use and identify key opportunities for cotton. The study focused on technology requirements, as well as trends, in garment production.

The project identified a number of short and medium term opportunities for advancing the use of cotton, including:

- Reducing the environmental impacts associated with the processing of denim. Denim, an iconic cotton fabric, is increasingly being produced utilising other fibres that claimed a lower environmental impact.
- Improving the functionality of cotton fabrics to enable them to better compete with fabrics made from man-made fibres. For example, heat and moisture management, anti-bacterial properties, and stain repellency.
- Investigating novel blends of cotton with other natural fibres, such as cashmere or ultra-fine wool, targeting fabrics for the luxury market.

CRDC Program: Customers	
Theme:	3.3 Competitive Futures
Strategy:	3.3.2 Facilitating the development of new technologies and systems to improve the competitiveness of Australian cotton
Measure of success:	Development of alternative and high value cotton products

DU1401 – Improving length, strength and fineness of cotton fibre *(Funded January 2013 – January 2016)*

Developing innovation in how cotton can be improved for selected markets includes new post farm processing techniques and technologies. Fibre length, strength and fineness are key aspects of premium fibres. Improvements in these properties, without affecting other quality traits of cotton, would allow cotton to secure higher value markets.

This PhD project aims to draw a cotton fibre and stabilise its new structure to make it longer, finer and stronger. The specific objectives of this project include:

- Softening of the cotton fibre by using suitable chemical reagents without degrading or dissolving the fibre.
- Retaining the stretched fibre permanently even after removing the chemical load.
- Improving the mechanical properties of the cotton fibre.
- Understanding the structural changes during the fibre drawing process.

The initial results from the project have been encouraging, successfully stretching individual cotton fibres following a chemical treatment. The tensile properties of the modified fibres are now being tested.

CRDC Program: Customers	
Theme:	3.3 Competitive Futures
Strategy:	3.3.2 Facilitating the development of new technologies and systems to improve the competitiveness of Australian cotton
Measure of success:	Development of alternative and high value cotton products

DU1402 – Ever-dry, self-cooling cotton fabrics *(January 2014 – December 2015)*

The main goal of this project is to develop new functional fabrics that have ever-dry, self-cooling properties. This includes developing an effective technique to make single layer cotton fabrics with an apparent directional water-transport effect – a functionality that currently requires double-layered (and thus bulkier) fabrics.

Key outcomes to date for this project include:

- Development of cotton fabric treatments that show directional water-transport, that are durable enough to withstand 50 cycles of laundering, and that have only a small influence on air permeability.
- Coating systems have been developed successfully for producing superhydrophobic patterns on cotton fabrics.

CRDC Program: Customers	
Theme:	3.3 Competitive Futures
Strategy:	3.3.2 Facilitating the development of new technologies and systems to improve the competitiveness of Australian cotton
Measure of success:	Development of alternative and high value cotton products

QUT1301 – The development of a web-based carbon footprint calculator for the Australian cotton industry

(Funded January 2013 – December 2013)

This project was a follow-on from a PhD that undertook a comparative analysis of different 'carbon footprint' calculators and developed an alternative method for calculating the carbon footprint of Australian cotton, that took into account local conditions.

This project developed a Crop Carbon Management Tool (CCMT) – a web-based version of the calculator that enables farmers to better understand the sources and extent of greenhouse gas emissions from their farming operations. The CCMT is the most scientifically advanced carbon footprint calculator available, especially for estimating nitrous oxide emissions associated with fertiliser use. The CCMT is fully aligned with the requirements of Life Cycle Assessment (LCA) methodology and the International Greenhouse Gas Protocol (IGGP) for product life cycle accounting.

RD&E Portfolio
PROGRAM 4: PEOPLE

Program 4: People			
Program	**People**		
Outcome	Capable and connected people driving the cotton industry.		
Theme	**4.1 Workforce Capacity**	**4.2 Networks**	**4.3 Communication**
Strategy Outcomes	A skilled, educated and progressive industry workforce.	An industry connected by dynamic networks.	Stakeholder information needs are met.
Will be achieved by	4.1.1 Investigating effective strategies for attracting, developing and retaining people in the cotton industry. 4.1.2 Supporting initiatives which lead to the continuous improvement of human resource management including on-farm Workplace Health and Safety. 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. 4.1.4 Supporting educational opportunities which increase the skills and knowledge of current workforces and will meet the needs of future workforces. 4.1.5 Creating opportunities for, and supporting the development of leadership skills.	4.2.1 Establishing and empowering creative forums and initiatives which build relationships. 4.2.2 Supporting and participating in collaborative cross sectoral RD&E initiatives. 4.2.3 Creating and facilitating opportunities for national and international RD&E exchange. 4.2.4 Facilitating engagement with stakeholders for prioritising and capturing advice on RD&E issues. 4.2.5 Honing research expertise and the application of science from core research disciplines.	4.3.1 Providing information for demand driven communication strategies and performance reporting. 4.3.2 Applying innovative communication methods.

Program 4: People

Program	People		
Outcome	Capable and connected people driving the cotton industry.		
Theme	**4.1 Workforce Capacity**	**4.2 Networks**	**4.3 Communication**
Strategy Outcomes	A skilled, educated and progressive industry workforce.	An industry connected by dynamic networks.	Stakeholder information needs are met.
Measures of success	Opportunities for learning are demanded by industry: ■ A 10 fold increase in school visits to promote careers in cotton by 2018. ■ A student gap year internship program. ■ 50 horizon students by 2018. ■ 30 completed summer scholarships by 2018. ■ 300 students having completed the UNE Cotton Course by 2018. Opportunities for workforce development are demanded by industry. ■ 60 Ginners trained. ■ 25 Industry representatives having completed the Field to Fabric Course. ■ 50 cotton farmers awarded a new Diploma in Human Resources by 2018. ■ A 10 per cent reduction in cotton farm related injuries by 2018. ■ On-farm skill development ■ Participation in leadership programs	People and industry are connected through effective networks: ■ 10 conferences and forums are coordinated which promote industry, cross sectoral and community knowledge sharing. ■ CRDC is an active member of key industry and government initiatives. ■ Agriculture Senior Officials Committee (AgSOC) cotton and cross sectoral RD&E strategies. ■ 50 travel scholarships are supported. ■ The cotton industry has effective collaborative structures for prioritising RD&E	People have ready access to industry information: ■ Communication systems for all CRDC stakeholders are meeting their communication needs. ■ The information and services derived from CRDC investments are in demand and the technologies are adopted.

CRDC Program: People	
Theme:	4.1 Workforce Capacity
Strategy:	4.1.1 Investigating effective strategies for attracting, developing and retaining people in the cotton industry
Measure of success:	On farm skill development and a 10 fold increase in school visits to promote careers in cotton by 2018

Investigating effective strategies for attracting, developing and retaining people in the cotton industry.

Research in workforce development has identified that improving the contribution of human capacity to a sectors' competitiveness requires a multi-dimensional response. That is, people need to be simultaneously deployed more effectively in the production system, developed to meet new challenges and provided with interesting work and careers. In addition, this is understood to only be possible with due consideration to the particularities of local communities and regional economies in designing effective support systems.

The issues of attracting, retaining and developing people in a sector is far from solved by generating knowledge about skill needs, clever marketing strategies to attract people or developing and delivering training products. What is required is effective workforce development across the supply chain, requiring both an understanding of the workforce development system and a capacity to improve it.

Currently there are innovative practices in human capacity in the cotton sector such as progressive employers, a strong skills and training focus, and a commitment to *my*BMP. Also as new local models for workforce development such as 'The Make it Work' program, are building interest as well as greater involvement in grower association and local-level initiatives.

However, what is missing is:

- A comprehensive understanding of the workforce development system including data and information about the system at a regional scale.
- An analysis of what is working well in the system and what could be improved or built on.
- A framework to link, engage and mobilise stakeholders, including farmers, in planning and acting at a business, sector and regional scale.

Without these elements, there is often limited impact from project investments. For example, training is delivered but people do not have positions to go to, or the impacts are very short-term and people are attracted into the sector but do not stay in the long-term.

UM1201 – Innovative Work: Cotton workforce development for sustained competitive advantage *(Funded July 2011 – December 2014)*

The aim of this project is to improve the effectiveness of cotton workforce development so that the sector has the people it needs to drive industry competitiveness.

The key objectives of this project are to assist the cotton sector to have access to:

- The data and information it needs (updateable through time and available regionally) about the demand and supply for people and skills and how people are attracted, developed and retained in the sector.
- An integrated workforce development strategy that better links projects, organisations and people in the workforce system.
- Appropriate processes, tools and resources to influence workforce development by an ability to prioritise, plan and act both regionally and nationally.
- The leadership and ownership of its workforce development to improve outcomes for producers.
- The ability to engage with key stakeholders at a regional level who are interested in and can partner effectively to improve the workforce development system and its outcomes.
- A network of employers and stakeholders in two to three regions to plan and pilot new action in skills and workforce development.

During 2013–14, a draft strategy for action on workforce development was developed through this project. The draft strategy focuses on four key areas:

1. Identifying a sustainable source of labour that has the capacity to acquire the necessary skills and which can accept the physical and social demands of working in the cotton industry.
2. Building a critical mass of 'good practice in employment relations' and establishing a culture of innovation and excellence in this area to improve job design, manage work across seasons and retention. As well as sharing good practice examples widely, within and outside the industry.
3. Over the longer term, developing skills and career pathways for workers within the industry that take account of technical improvements in cotton production and the ongoing trend toward capital deepening and automation.
4. Developing a national and regional capacity to coordinate and take action and link to government.

Importantly, the notion of strategic collaborative action needs to be considered in terms of strategies, and whether each strategy would best fit the short, medium or long-term.

- **Short term** – may include identifying a sustainable source of labour.
- **Medium term** – may encompass broader collaborations in recruitment and retention (such as with other primary industries and regional industries such as mining).
- **Longer term** – which could involve adding workforce planning to strategic management at the enterprise level and considering what would help the industry best ride out the external threats (such as drought).

CRDC Program: People	
Theme:	4.1 Workforce Capacity
Strategy:	4.1.2 Supporting initiatives which lead to the continuous improvement of human resource management including on farm Workplace Health and Safety
Measure of success:	A 10 per cent reduction in cotton farm related injuries by 2018

Supporting initiatives which lead to the continuous improvement of human resource management including on farm Workplace Health and Safety.

Health and safety continues to be a major concern for cotton growers and employees within the cotton industry. While there is compelling evidence that the cotton sector is a leading performer in terms of health and safety, there is a requirement to continue to improve to meet the aspirational levels articulated within *my*BMP.

US1401 – Cotton industry injury and safety profile *(Funded November 2013 – October 2014)*

Ensuring that the data upon which decisions are made is both current and accurate is an important factor in making genuinely evidence based decisions. The cotton industry recognised that there was a gap in the provision of data.

This project aims to ensure that the most current and complete data is made available so priorities and actions to improve cotton farm health and safety are based on comprehensive evidence.

In turn, this data can be used with confidence by growers to update/modify *my*BMP information, and enhance their health and safety systems/practices.

It is also important that data covers a range of severity issues when health and safety issues are concerned. While correctly the major concern is with the prevention of Class 1 injuries that result in death and/or permanent disability, growers also have a legislated responsibility to control as 'far as is reasonably practicable' all potentially hazardous actions.

Data from the National Coroners Information System (2001–13) has been accessed and analysed to classify incidents that were determined as definitely occurring within cotton production or possibly occurring in cotton production. Where it was clear the fatality involved another sector (e.g. cattle or grains), these cases were deleted from the analysis.

Cotton Related – Seven cases were identified involving the following mechanisms: aeroplane, cotton picker, dam drowning, farm ute, module builder and water pump. Further data on the costs associated with the cotton related fatal incidents is being completed and compiled.

Potentially Cotton Related – A further 28 possible cases, that may have involved properties where cotton was also grown, were identified. The mechanisms involved included dams, earth moving equipment, firearms, forklifts, fuel store, motorcycles, quads, tractors, utes and being hit by objects (trees, equipment, structures).

During 2013–14, a series of cotton Farm Safety workshops attracted over 80 growers to venues in Boggabri, Bourke, Brookstead, Carroll, Dalby, Gunnedah, Moree, Mungindi, Narromine, St George and Theodore.

CRDC Program: People	
Theme:	4.1 Workforce Capacity
Strategy:	4.1.4 Supporting educational opportunities which increase the skills and knowledge of current workforces and will meet the needs of future workforces
Measure of success:	■ 50 Horizon students by 2018, ■ 30 completed summer scholarships by 2018 ■ 300 students having completed the UNE Cotton Course by 2018

Supporting educational opportunities to increase the skills and knowledge of current workforces to meet the needs of future workforces.

The cotton industry recognises the need for passionate, skilled and innovative people to shape its future in a rapidly changing and growing world. To help ensure that the industry is able to attract talented young people, CRDC is investing in a number of initiatives focused at the school, undergraduate and post graduate levels.

UT1301 – Cotton Industry Young Professionals Program *(Funded January 2013 – December 2015)*

The Primary Industries Centre for Science Education (PICSE) has developed a cotton focused activity centre. Nineteen grade 10, 11 and 12 classes were introduced to cotton through this program. An additional 250 students (ranging from kindergarten through to grade 10) were involved in developing 90 projects for the Science and Engineering Investigation Awards, aimed toward engaging students in science based disciplines.

CA1403 – Primary Industries Education Foundation *(Funded July 2012 – June 2014)*

CRDC and Cotton Australia partner as members of the Primary Industries Education Foundation (PIEF). PIEF is the preferred provider of credible, relevant and factual information on all matters relating to agriculture for Australian teachers, students and the community.

CSE1305 – Developing education capacity in the Australian cotton industry *(Funded July 2012 – June 2015)*

CRDC has invested in funding a part time Education Officer, to be based at the Australian Cotton Research Institute, to implement a range of initiatives and activities in schools to boost knowledge of the industry and career options.

RIRDC1302 to RIRDC1306 and RIRDC 1401 to RIRDC 1405 – Horizon Scholarship *(Funded April 2013 – December 2016)*

The Horizon Scholarship has been developed to support the next generation of agricultural leaders, who will take up the challenge of farming for the future. The scholarship is for young people who are passionate about agriculture, with a keen interest in the future of the industries, and who are ready to expand their networks and learn new skills.

The Horizon Scholarship is an initiative of the Rural Industries Research and Development Corporation (RIRDC) that, in partnership with other RDCs and industry sponsors, supports undergraduates studying agriculture at university by providing a bursary, professional development workshop and work experience.

In 2013–14, CRDC supported five new Horizon Scholarships for undergraduate students; Jessica Kirkpatrick, Charlie French, Paul Sanderson, Alana Johnson and Emily Miller. Overall the CRDC has supported 12 Horizon scholars throughout the 2013–14 year.

CRDC Summer and Honours scholarships *(Funded November 2013– November 2014)*

Summer and Honours Scholarships are available to university students completing the senior years of an undergraduate degree or enrolled in an honours program. The scholarships provide them with the opportunity to work on real research, extension or industry projects in a working environment as part of their professional development.

In 2013–14, CRDC granted five summer scholarships for undergraduate students Andrew Dickson (QUT1401), Brendon Delroy (UWS1402), Richard Quigley (US1402), Brook McAlister (UNE1405) and Charlotte Iverach (UNSW1402) to work with existing researchers or research organisations.

CRDC1415 – PhD Program 2014 postgraduate tour *(Funded January 2014 – June 2017)*

In 2013–14 CRDC funded a record 14 new PhD scholarships and held the first PhD tour of the cotton industry in five years. A total of 18 PhD students participated in the tour which enabled students to connect with cotton industry researchers, cotton growers and commercial organisations involved in the ginning and marketing of cotton.

CRDC Program: People	
Theme:	4.1 Workforce Capacity
Strategy:	4.1.5 Creating opportunities for and supporting the development of leadership skills
Measure of success:	Participation in leadership programs

Creating opportunities for and supporting the development of leadership skills

The cotton industry, like many agricultural industries in Australia is facing complex change that challenges the social structural and environmental dynamic of rural communities and the industry. Faced with significant variability in climate, competition for skilled labour from the resources sector, changes in land use and access to water resources, the industry requires a network of informed and experienced leaders that can work together to develop resilient and sustainable farming systems and communities.

The industry requires leaders who are able to develop and broker solutions, as well as advocate for the industry in the public arena and in board rooms. CRDC supports a number of leadership development opportunities for the industry including Future Cotton Leaders program, Nuffield Scholarship program, Australian Rural Leadership Program and the Peter Cullen Trust Leadership program.

CA1404 – Australian Futures Cotton Leaders – Program 4 *(Funded February 2014 – December 2014)*

The Australian Future Cotton Leaders Program is an innovative program supporting individual commitment to creating and leading change in the Australian cotton industry. The program is designed to assist and work with participants to develop, implement and evaluate leadership development with the ongoing support of their own leadership facilitator and industry partner mentor. CRDC in conjunction with Cotton Australia has supported the development of 15 participants.

CRDC1412 – Nuffield Scholarship
(Funded July 2013 – September 2015)

The Nuffield Scholarship is the leading program for primary producers in Australia and connects to a global network of scholars. The Nuffield Farming Scholarship is generally a two year program for outstanding farmers, owners or managers, aged between 28 and 40, to pursue an area of agricultural study internationally and at home. Participants travel for up to four months overseas, meeting farmers and agriculture decision makers on other continents and learning about farming practices. CRDC supported Nigel Corish as the scholar in 2013–14.

RIR1401 – Cotton Industry leadership development strategy *(Funded July 2013 – June 2016)*

The Australian Rural Leadership Foundation (ARLF) is focused on producing a network of informed, capable and ethical leaders who can work collaboratively to advance the interests of their industries, communities and rural Australia. It includes challenge-based education, workshops and overseas field study.

CRDC funds participants from the cotton industry to attend the Australian Rural Leadership Program, Training Rural Australians in Leadership (TRAIL) course, and TRAIL Blazers course.

PCT1401 – Peter Cullen Trust – Science to Policy Leadership Program
(Funded September 2013 – November 2013)

The program behind the Peter Cullen Trust focuses on enhancing the role of science in policy development, by building leadership and communication skills of water scientists and irrigation's rising stars. The aim is to make a difference in water and catchment management in Australia. Cotton Australia and the CRDC sponsor one irrigator and/or industry person to participate in the Peter Cullen Science to Policy Leadership Program every year.

The program selection process aims to attract participants who can think strategically, understand the political process, have the capacity to influence policy, demonstrate evidence of change leadership through collaboration, and have future aspirations of leadership.

In November 2013, fifteen successful applicants actively involved in water systems management graduated from the program, including Tandou Ltd Water Manager, Brendan Barry. Upon completion, successful participants graduate as Fellows of the Peter Cullen Trust. The Australian cotton industry currently has four Fellows: Juanita Hamparsum, Susan Madden, Brendon Warnock and Brendan Barry.

Program 5: Performance

Program	Performance		
Outcome	Measured performance of the Australian cotton industry and its RD&E drives continuous improvement.		
Theme	**5.1 Best Practice**	**5.2 Monitoring and Evaluation**	**5.3 Reviews**
Strategy Outcomes	World's best practice underpins the performance of the cotton industry.	Industry and RD&E performance is captured.	Continuous improvement in industry and RD&E performance.
Will be achieved by	5.1.1 Supporting a best practice framework as the primary integrated planning, risk management, benchmarking, knowledge development and delivery system. 5.1.2 Promoting best practices through the development and delivery Joint Venture.	5.2.1 Developing and implementing an internal M&E framework for evaluating CRDC's investment portfolio balance and its RD&E performance. 5.2.2 Conducting annual industry surveys to capture practice change. 5.2.3 Establishing a framework through which industry performance can be nationally and internationally reported.	5.3.1 Undertaking scientific discipline reviews of the industry's RD&E. 5.3.2 Commissioning and participating in independent reviews of CRDC's RD&E and organisational performance. 5.3.3 Commissioning independent reviews of the social, environmental and economic performance of the industry. 5.3.4 Participating in cross-sectoral RD&E impact evaluations and reviews.
Measures of success	Industry is able to demonstrate best practice: ■ The cotton industry's *my*BMP program is the primary resource for farmers accessing best practice knowledge and tools. ■ The cotton industry's *my*BMP program is nationally recognised and integrated with other agricultural sector best management practice programs. ■ An 80 per cent coverage of Best Management Practice systems across the Australian cotton industry.	Industry and CRDC are able to capture and demonstrate performance: ■ A rigorous monitoring and evaluation platform which measures and reports on the performance of CRDC's research and development investments. ■ An industry performance monitoring and evaluation framework that is consistent with national and international standards. ■ Providing the industry with cotton sustainability indicators and supporting its capacity to report against these indicators.	Industry and CRDC are able to continually review and improve performance: ■ Independent reviews of the social, environmental and economic performance of the industry's performance. ■ Independent reviews of CRDC's research and development performance.

CRDC Program: Performance	
Theme:	5.1 Best Practice
Strategy:	5.1.1 Supporting a best practice framework as the primary integrated planning risk management, benchmarking, knowledge development and delivery system
Measure of success:	The cotton Industry's *my*BMP program is nationally recognised and integrated with other agricultural sector best management programs

CSP1201 – Linking research, extension and *my*BMP facilitation (Funded July 2011 – June 2014)

The cotton industry has a strong focus on its *my*BMP program and seeks to integrate research outcomes into industry best practice. This project, which is strongly linked to the industry's extension team (CottonInfo), provides a mechanism to capture develop, package and deliver research outcomes and foster their uptake by industry. The project integrates new research outcomes into *my*BMP as well as supporting delivery through a range of online decision support aids and publications.

The CottASSIST web tool offers a unique way to capture and integrate research outcomes to assist growers and consultants with complex tactical and strategic decisions. CottASSIST contains a number of specific tools to guide grower decision making, including NutriLOGIC, a nutrition tool to optimise input efficiency while minimising green house gas emissions, a crop development tool enabling growers to optimise crop management and yield in a variable climate, as well as a cotton day degree calculator.

The aims of this project are to develop research outcomes and apply industry knowledge and experience to:

- Ensure the CottonInfo team is linked and updated with new and existing research outcomes.
- Explore opportunities for the development of new customised user-friendly web tools (including smartphones/tablets) to support *my*BMP and improve research uptake.
- Integrate CottASSIST, the CottonInfo website, and *my*BMP systems together as an online system.
- Enhance existing CottASSIST web tools to ensure ongoing availability of these and other tools to industry, and to maintain industry's access to that capability and to external weather and climate information.
- Collate data to review the crop development tool so that it remains relevant to high yielding cotton crops.

CRDC Program: Performance	
Theme:	5.1 Best Practice
Strategy:	5.1.1 Supporting a best practice framework as the primary integrated planning risk management, benchmarking, knowledge development and delivery system
Measure of success:	The cotton industry's *my*BMP program is the primary resource for farmers accessing best practice knowledge and tools

RRR1402 – *my*BMP Lead Certification
(Funded July 2013 – June 2015)

The *my*BMP program is a voluntary farm and environmental management system which provides self-assessment mechanisms, practical tools and auditing processes to ensure that Australian cotton is produced according to best practice. *my*BMP is the industry's assurance mechanism – a best management practice system for growers to improve on-farm production. It attends to the industry's requirement for risk management and supports industry's social licence.

Through *my*BMP, all Australian cotton growers have a resource bank to access the industry's best practice standards, which are fully supported by scientific research and development, resources and technical support. By using *my*BMP's tools, growers can improve on-farm production performance by; better managing business and production risk, maximising potential market advantages, and demonstrating responsible and sustainable natural resource management to the community.

*my*BMP is the result of industry wide consultation with growers, researchers and industry bodies, taking into consideration the requirements of the cotton industry, now and into the future. Information is categorised into 11 key modules for growers including: biosecurity, biotechnology, energy and input efficiency, fibre quality, human resources and WHS, integrated pest management, natural assets, pesticide management, petrochemical storage and handling, soil health, and water management. During 2013–14 an additional module focused on ginning and classing was developed and reviewed for release in late 2014.

The *my*BMP Lead Certification project (RRR1402) provides auditing expertise for growers who wish to become *my*BMP accredited growers. During 2013–14 a total of 53 farms were certified as *my*BMP compliant.

CRDC Program: Performance	
Theme:	5.2 Monitoring and Evaluation
Strategy:	5.2.3 Establishing a framework through which industry performance can be nationally and internationally reported
Measure of success:	Industry and CRDC are able to capture and demonstrate performance

RRR1201 – Grower practices survey
(Funded May 2012 – October 2013)

CRDC's survey of growers gathers valuable information about cotton farming practices. Trends over time can be monitored when compared with similar surveys conducted in 2011, 2007, 2006 and earlier. This survey aimed to consolidate all CRDC funded surveys for 2013 into a single survey tool, to reduce the number of surveys growers are asked to complete for industry research. The information gathered feeds directly into research projects and is also used to evaluate research outcomes, plan new projects, identify priority issues and tell the industry's 'story'.

Survey responses covered 92,687 ha of irrigated cotton (23 per cent of the total irrigated crop) and 9,853 ha of dryland cotton production (27 per cent of the total dryland crop in 2012–13). 20 per cent (165) of the farms registered with CRDC who grew cotton in 2012–13 returned surveys. The survey was mailed to all 1,000 cotton growers registered with the CRDC in July 2013. While 352 replied, many had not grown cotton in 2012–13, reducing the population to 837. A total of 38 (23 per cent) of the responses included at least some dryland cotton production. At a regional level the rate of response ranged from 12 to 30 per cent. A total of 62 per cent of respondents have been involved with the cotton industry for 20 years or more.

Some of the key findings from this report included:

2012–13 season

- Irrigated cotton was grown on average on 16 per cent of the land area (on farms where it was grown) while dryland cotton accounted for 2 per cent.
- Dryland cotton exceeded target yields in most regions.
- The highest reported yield from an individual field was 16.2 bales/ha in the Upper Namoi.
- 43 per cent of irrigator respondents and 24 per cent of dryland respondents received quality discounts, ranging from 11c/bale to $75/bale with micronaire and colour being the most costly.

Nutrition

- Average rates of nutrient application per hectare of irrigated cotton were 243 kgN, 31kgP, 24 kgK, 3 kgZn and 14 kgS.
- Average rates of nutrient application per hectare of dryland cotton were 84 KgN, 13kgP, 10kgK, 1.8 kgZn and 5.5 kgS.
- On average 67 per cent of nitrogen was applied pre-season for irrigated cotton, which is similar to that reported for the 2010–11 season. There was a large variation between farms.
- 13 per cent of farms have a petiole nitrogen test conducted on every field every season on irrigated cotton.

Soils, crop rotations and other agronomy

- Almost all respondents (99 per cent) thought that soil health was generally increasing or steady.
- 75 per cent of respondents produced on average two or less cotton crops before breaking with an alternate crop or fallow. 49 per cent usually have at least one back-to-back cotton crop. 13 per cent grow five or more consecutive cotton crops.

Crop protection stewardship

- 76 per cent of respondents thought the long term value of complying with the BollgardII® resistance management plan (RMP) was worth the effort and cost; 11 per cent did not agree.
- Herbicide resistant weeds were reported by 37 farms in irrigation and 31 farms in dryland.

Energy

- Diesel accounted for 86 per cent of energy usage; Electricity for 11 per cent.
- 11 per cent of respondents had measured or benchmarked their total energy usage in the past 5 years, 16 per cent had done this for individual operations and 24 per cent of irrigator respondents had a pump efficiency investigation completed.

Harvesting

- Where round module pickers were used, 53 per cent of respondents used contract harvesters, 40 per cent purchased or leased their own and 7 per cent used a combination of both.
- The motivation for the decision to use a JD7760 was its ability to pick crops more quickly, a decrease in labour and decrease in workforce health and safety risks.

Human Resources

- 73 per cent of respondents indicated that they have a capable workforce.
- The average vacancy rate at January 2013 was 0.4 positions per farm.
- 65 per cent of casual staff employed at January 2013 were 417 visa holders.

Safety

- 62 per cent of respondents complete inductions for some or all new workers (51 per cent for all).
- 24 per cent complete inductions before each season with contractors.
- 28 per cent have a formal system for workers and contractors to report hazards.
- 26 per cent have a documented health and safety plan.

Information and research

- 73 per cent of respondents considered that cotton industry research and development was effectively communicated to them.
- The Australian Cottongrower, Cotton Pest Management Guide, CRDC's Spotlight and technical fact sheets rated highly as the preferred mechanisms to receive cotton RD&E information.
- 91 per cent considered that R&D drives continuous improvement of the Australian cotton industry.

Cotton productivity and profitability

- 86 per cent of respondents believed that cotton was profitable and consistently their crop of choice.
- 32 per cent indicated they would not be able to farm profitably into the future if recent trends in inputs costs and cotton prices continue.
- Water and weather were the most frequently identified limitations to productivity and profitability, followed by farm characteristics, labour, costs, finance and varieties.
- The most mentioned drivers of productivity and profitability were yield and price followed by water, costs and nutrition.

Aspirations

- Close to half of respondents intend to grow their farm assets and/or cotton enterprise.
- One third intend to transition the farm ownership to family members.
- 11 per cent will move out of farming to retire or for other reasons.

CRDC Program: Performance	
Theme:	5.2 Monitoring and Evaluation
Strategy:	5.2.3 Establishing a framework through which industry performance can be nationally and internationally reported
Measure of success:	Industry and CRDC are able to capture and demonstrate performance

RRR1401 – Developing a framework and benchmark for monitoring achievement of the CRDC's Strategic R&D Plan

(Funded October 2013 – June 2014)

CRDC commissioned the development of a Monitoring and Evaluation (M&E) framework for evaluating CRDC's investment portfolio balance and its RD&E performance. The aim of the M&E framework is to enable CRDC to rigorously capture, measure and report on performance, and to be able to assess and report upon the impact and performance of investments undertaken in the CRDC Strategic R&D Plan 2013–18.

Evaluation is based on a logic framework approach linking core metrics from the plan and key performance indicators and practices described in the CottonInfo plan to ensure alignment through the RD&E supply chain.

The key objectives of the project are to:

- Develop a framework.
- Review strategic requirements for monitoring.
- Distil a set of core metrics.
- Map existing data sources and identify ongoing needs and gaps.
- Prepare a benchmark snapshot of the cotton industry in 2013.
- Recommend a framework and process for benchmarking and gathering future data.

CRDC Program: Performance	
Theme:	5.3 Reviews
Strategy:	5.3.1 Undertaking scientific discipline reviews of the industry's RD&E
Measure of success:	Industry and CRDC are able to continually review and improve performance

CRDA1401 – Irricomm review – Tools for irrigating the field *(Funded July 2013 – June 2014).*

To increase productivity, cotton farmers need to optimise their use of resources, particularly water. Current irrigation projects have led to advances in the optimisation and automation of irrigation applications. Remote sensing and satellite imagery can now be used as indicators of crop stress and spatial variability, and the industry is close to fully understanding how weather forecasts and canopy temperature sensors can be used to refine scheduling decisions.

The development of a control system for variable rate irrigation application, and software that sequences irrigations and controls the communications between the system components, brings the industry tauntingly close to smart automated furrow irrigation.

The Australian cotton industry has an impressive record when it comes to optimising the use of water. Despite this, the tools that irrigators are using today to manage their irrigations have not changed dramatically over the last 20 years. The adoption of a system that automatically integrates soil, weather and plant data could achieve efficiency gains of over 20 per cent.

In March 2014, CRDC developed a workshop with the aim of bringing together irrigation researchers to identify current and future tools in the cotton irrigation toolbox, to optimise yield and water use efficiency.

Nearly thirty researchers gathered in Narrabri, NSW, for the two day workshop to learn about the RD&E projects underway and to develop a blueprint for an integrated, precise, automated irrigation framework that would fully service the future needs of cotton irrigation systems. All of the workshop participants agreed to a collaborative approach between organisations with the aspiration of developing a fully integrated system for irrigation scheduling.

Section 5
CRDC People and Governance

CRDC Board

CRDC Employees

Governance and Accountability

CRDC Program Manager Tracey Leven and National Centre for Engineering in Agriculture (NCEA) post-doctoral fellow Dr Alison McCarthy inspect one of the real-time adaptive control irrigation systems. Photo courtesy NCEA.

CRDC BOARD

Dr Mary Corbett *BSc PhD (FAICD, AFAIM)*

Chair CRDC Board of Directors (from 13 August 2013)

CRDC Chair, Dr Mary Corbett, has more than 17 years' experience as a Company Director in the scientific research and development area, and in education and training. She has significant board and corporate governance experience gained across a range of organisations. Dr Corbett is currently Chair of the West Moreton Hospital and Health Service and a Board member on the Wound Management Innovation CRC.

Dr Corbett was previously Deputy Chair of the Southbank Institute of Technology and Deputy Chair of the Australian Agriculture College Corporation. Dr Corbett also served on the Boards of Food Science Australia from 2004–09 and the Sugar Research and Development Corporation from 2002–08.

Dr Corbett has extensive experience as Chair and member of a number of board committees, including Audit and Risk Management, Intellectual Property and Remuneration and Nominations committees. She is Managing Director of Australian Business Class, an executive consulting organisation which specialises in providing senior executive training and facilitation.

Dr Corbett's expertise lies in the areas of strategy, governance and leadership. She has a PhD in Clinical Physiology from Dundee University, Scotland.

Appointed Chair: 12/08/2013 until 13/08/2016
Appointed Chair of the Remuneration Committee (from 13 August 2013).

Mike Logan *(GAICD)*

Chair CRDC Board of Directors (until 13 August 2013)

Mr Logan is a cotton farmer from Narrabri, NSW, and brought a wealth of practical industry experience and a strong vision to the position of CRDC Chair. He has long been a strong advocate of best practice use of natural resources in the Australian cotton industry. His cotton farm was the first in the world to gain International Organisation for Standardisation (ISO) certification for compliance with world's best practice principles for environmental management.

Mr Logan also spent six years on the Board of Land and Water Australia, where he played a leadership role in a number of key programs dealing with irrigation and climate variability. He was a Director of the Australian Rural Leadership Foundation, the CRC for Irrigation Futures and Cotton Australia (for four years). He is currently CEO of Dairy Connect NSW.

Appointed: 13/08/2007 until 13/08/2010
Reappointed: 13/08/2010 to 13/08/2013
Chair of the Remuneration Committee and a member of the Audit Committee (until 13 August 2013).

Mr Bruce Finney BSc Ag (MAICD)

CRDC Executive Director

Mr Finney has extensive experience in the agricultural sector. Prior to his appointment to CRDC he worked in corporate agriculture in various corporate, management and agronomy roles in Australia and in an advisory role in Argentina. He is a member of the Advisory Board QLD DAFF programme on Agricultural Robotics at QUT.

He is a past chair of the Australian Cotton Growers Research Association and a past director of the Cotton Catchment Communities CRC and Irrigation Association of Australia.

Mr Finney is a graduate of the Australian Rural Leadership Program and of the Company Directors Course of the Australian Institute of Company Directors.

Appointed: 01/08/2004 (by virtue of his appointment as Executive Director of CRDC)
Attends the Audit, Intellectual Property and Remuneration Committees as an observer.

Mr Hamish Millar – CRDC Deputy Chair (FAICD)

CRDC Deputy Chair, Mr Millar is the Managing Director of Cowal Agriculture, a large scale agribusiness based in Emerald, Central Queensland, producing predominately irrigated cotton and grain. He is a graduate of the Memphis Exchange International Cotton School, and has experience in classing and marketing. Mr Millar has extensive knowledge of production and agribusiness within the cotton industry, including roles requiring strategic planning, business management and trading commodities.

Mr Millar has had extensive experience in several cotton industry organisations, including the Chair of the Australian Cotton Growers Association, Director of Cotton Australia, Director of the Cotton Industry Council and Chair of Cotton Industry Development in Northern Australia.

Mr Millar is committed to the benefits of well-targeted research and development to underpin the overall performance of the Australian cotton industry.

Appointed: 01/10/2011 until 01/10/2014
Appointed member of Intellectual Property Committee and Remuneration Committee.

Dr Michael Robinson BSc (Hons), PhD (FAIMS, GAICD)

Dr Robinson is the CEO of Plant Biosecurity Cooperative Research Centre. Previously he was the CEO of FrOG Tech Pty Ltd (a private research company specialising in geological reconstructions and interpretations across a range of sectors, including oil and groundwater) and CEO of GeoSphere Ltd (a specialist geological consulting firm in New Zealand).

Dr Robinson has extensive experience in primary industries and natural resources research, development and extension.

He was the Executive Director of Land & Water Australia, Centre Director of the Primary Industries Climate Challenges Centre (a joint venture between DPI Victoria and University of Melbourne), Chair of the National Climate Change Research Strategy for Primary Industries, CEO of the CRC for Greenhouse Accounting, and a member of the National Primary Industries Standing Committee RD&E Extension Subcommittee.

Appointed: 01/10/2011 until 01/10/2014
Appointed member of the Audit Committee.

Mr Cleave Rogan *(MAICD)*

Mr Rogan has been farming and marketing cotton and grains for 30 years. He has acted in an advisory role to CRDC, working on research projects related to biosecurity, insects, weeds, diseases, cotton fibre processing and quality enhancement.

Mr Rogan was a Director of Cotton Australia and has been an industry representative on various other cotton industry associations and research advisory committees.

Appointed: 01/10/2011 until 01/10/2014
Chair of the Intellectual Property Committee.

Dr Lorraine Stephenson *BSc (Hons), MBA, PhD, (GAICD)*

Dr Stephenson is the Principal Consultant for Lightning Consulting Services, an independent energy and climate change strategic advisory business. She has over 30 years' experience in the energy sector and has a strategic focus on creating opportunities for Australian businesses and governments to respond to climate change challenges.

Dr Stephenson is the former Clean Energy Adviser to the Queensland Government and a former member of the Expert Panel on Emissions Intensive Trade Exposed Industries advising the Australian Government.

She is currently a member of the Expert Panel on Emissions Intensive Trade Exposed Industries, a member of the NSW Climate Change Council and a non-executive director of Good Environmental Choice Australia Ltd.

Appointed: 01/10/2011 until 01/10/2014
Appointed member of Intellectual Property Committee.

Richard Haire *(FAICD, FAIM)*

Mr Haire is the Australian and New Zealand Managing Director and regional head of Olam International, a global leader in the supply chain management of agricultural products and food ingredients. He was formerly the Chief Executive of Queensland Cotton Corporation Pty Ltd and has been Director of several organisations, including Cotton Australia, SunWater Limited, the Cooperative Research Centre for Sustainable Cotton Production and the CSIRO Advisory Board for Field Crops.

Mr Haire is currently a Director of the Bank of Queensland and the Australian Institute of Company Directors (Queensland Division).

Appointed: 01/10/2011 until 01/10/2014
Chair of the Audit Committee and appointed member of the Remuneration Committee.

Composition

CRDC's Board comprises a Chair (appointed by the Minister for Agriculture), the Executive Director (selected by the Board) and five to seven non-executive Directors nominated by an independent Selection Committee. Appointment of non-executive Directors is subject to Ministerial approval and Directors (other than the Executive Director) are appointed for three-year terms.

Board

1. Mary Corbett *(Chair appointed 13 August 2013) (Mike Logan was Chair until 12 August 2013)*
2. Hamish Millar *(Deputy Chair)*
3. Richard Haire
4. Michael Robinson
5. Cleave Rogan
6. Lorraine Stephenson
7. Bruce Finney *(Executive Director)*

Chair

On 13 August 2013, Dr Mary Corbett was appointed Chair of the CRDC Board for a three year term, ending on 13 August 2016. Dr Corbett has been a non-executive Director of CRDC since October 2008 and the Board's Vice-Chair since 2011. Dr Corbett has over 17 years' experience as a company Director, particularly in the fields of education and training, and rural, food and medical research.

Responsibilities of Executive Director

It is the Executive Director's responsibility to manage CRDC and the senior management team. Close links between the Board of Directors and management have assisted the development of a sense of mutual confidence, trust, teamwork and common purpose. Senior management participates in Board meetings, with other staff invited to contribute wherever appropriate.

Responsibilities of non-executive Directors

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

Call for non-executive Directors

Applications for five to seven CRDC non-executive Directors opened in May 2014 and closed 13 June 2014. Joe Robinson was appointed the Presiding member of a selection committee, which assessed all applications and made nominations for appointment to the Minister. The Minister is expected to announce appointments by 1 October 2014.

Expertise

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

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

Induction

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

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

Training

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

Functions

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

Conflicts of interest

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

The Board follows section 21 of the CAC Act regarding Directors' disclosures of interests. A Director who considers that he or she may have a direct or indirect pecuniary or non-pecuniary interest in a matter to be discussed by the Board must disclose the existence and nature of the interest before the discussion.

Depending on the nature and significance of the interest, Directors may be required to absent themselves from the Board's deliberations. The Board has a standing notice of Director's interests, which is an agenda item at each Board meeting and is updated as necessary.

The Board is very aware of its responsibilities regarding conflict of interest and duty of care and has adopted a very cautious approach. A Board Charter clearly outlines the roles and responsibilities of Directors in terms of potential conflicts of interest. This approach has been successful and no difficulties have been encountered.

Board Charter

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

Indemnities and insurance premiums for Directors and officers

The Board has taken the necessary steps to ensure professional indemnity cover is in place for present and past officers of CRDC, including Directors of the CRDC, consistent with provisions of the CAC Act.

CRDC's insurance cover is provided through Comcover; however, the insurance contract prohibits CRDC from disclosing the nature or limit of liabilities covered. In 2013–14, Directors and officers liability insurance premiums were paid and no indemnity-related claims were made.

Board Meeting	Dates	Location
Meeting 4 – 2013	5 and 6 August, 2013	CRDC Board Room, Narrabri, NSW
Meeting 5 – 2013	3 October, 2013	Teleconference
Meeting 6 – 2013	6 and 7 November 2013	Hotel Urban, Brisbane, QLD
Meeting 1 – 2014	22 January, 2014	Teleconference
Meeting 2 – 2014	24 and 25 February, 2014	CRDC Board Room, Narrabri, NSW
Meeting 3 – 2014	29 and 30 April, 2014	QT Hotel, Canberra, ACT
Meeting 4 – 2014	17 and 18 June, 2014	Maraboon Tavern, Emerald, Qld

Attendances at Board meetings

Director	Board meeting attendance							
	Meeting 4 2013	Meeting 5 2013	Meeting 6 2013	Meeting 1 2014	Meeting 2 2014	Meeting 3 2014	Meeting 4 2014	TOTAL
Mike Logan *(Chair) until 12 August 2013*	Yes	–	–	–	–			1 of 1
Mary Corbett *(Chair) from 13 August 2013.*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7 of 7
Hamish Millar	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7 of 7
Richard Haire	Yes	Yes	Yes	Yes	Yes	Yes	1st day only	6½ of 7
Michael Robinson	Yes	Yes	Yes	Yes	Yes	Yes	No	6 of 7
Cleave Rogan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7 of 7
Lorraine Stephenson	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7 of 7
Bruce Finney	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7 of 7

Board Committees

The Board operated the Audit, Intellectual Property and Remuneration Committees in 2013–14. In addition to formal meetings, much of the work of the Board and its Committees is conducted via email and telephone, supported by a secure online information portal. CRDC finds this arrangement to be effective, productive and cost effective.

Audit Committee

Established under section 89 of the PIRD Act and section 32 of the *Commonwealth Authorities and Companies Act 1997* (CAC Act), the Audit Committee's primary role is to ensure CRDC's financial reporting is a true and fair reflection of its financial transactions.

The Committee also provides a forum for communication between the Directors, the senior managers of CRDC and the internal and external auditors. It carries responsibility for identifying areas of significant business risk and stipulating the means of managing any such risk.

Richard Haire was Chair of the Committee, with members Mike Logan (until August 2013), Mary Corbett (from August 2013) and Michael Robinson. The Executive Director, Bruce Finney, attended the meetings as an observer. The Audit Committee met five times during 2013–14 with the 1 April 2014 meeting held by teleconference.

Intellectual Property Committee

The role of the Intellectual Property (IP) Committee is to assist CRDC's Board in fulfilling its responsibilities and to monitor the adequacy and effectiveness of CRDC's policies and procedures relating to the management of IP.

The Committee's specific responsibilities are to review the operation of CRDC's IP Policy and IP Operating Principles and to consider IP matters directed to it by the Board for consideration.

Mary Corbett was Chair of the Intellectual Property Committee until August 2013, with Lorraine Stephenson, Hamish Millar and Cleave Rogan as members. Executive Director, Bruce Finney, attended as an observer. Cleave Rogan was elected Chair in August 2013. The committee met four times during 2013–14.

Remuneration Committee

The Remuneration Committee advises the Board on the Executive Director's remuneration and senior staff remuneration adjustments. The Chair of the remuneration committee was Mary Corbett, and supported by Richard Haire and Hamish Millar as members. The Remuneration Committee met twice during 2013–14.

Attendances at Audit Committee meetings

Member	Date of Audit Committee meetings					
2013–14	5 Aug 2013	30 Oct 2013	3 Feb 2014	1 Apr 2014	14 May 2014	TOTAL
Richard Haire *(Chair)*	Yes	Yes	Yes	Yes	Yes	5 of 5
Michael Robinson	Yes	Yes	Yes	No	Yes	4 of 5
Mike Logan	Yes	–	–	–	–	1 of 1
Mary Corbett	–	Yes	No	Yes	Yes	3 of 4

Attendances at Intellectual Property Committee meetings

Member	Date of Intellectual Property Committee meetings				
2013–14	23 Jul 2013 Brisbane	22 Oct 2013 Teleconference	4 Feb 2014 Brisbane	29 Apr 2014 Canberra	TOTAL
Mary Corbett *(Chair until August 2013)*	Yes	–	–	–	1 of 1
Cleave Rogan *(Chair after August 2013)*	Yes	Yes	Yes	Yes	4 of 4
Lorraine Stephenson	Yes	Yes	Yes	Yes	4 of 4
Hamish Millar	Yes	Yes	Yes	Yes	4 of 4

Attendances at Remuneration Committee meetings

Member	Date of Remuneration Committee meetings		
2013–14	21 Nov 2013	26 Mar 2014	TOTAL
Mary Corbett, Chair	Yes	Yes	2 of 2
Hamish Millar	Yes	Yes	2 of 2
Richard Haire	Yes	Yes	2 of 2

Statement of principles

CRDC Directors and staff members are required to:

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

CRDC EMPLOYEES

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

CRDC Organisational Structure on 30 June 2014

CRDC Board of Directors

CRDC Chair Dr Mary Corbett

CRDC Executive Director Mr Bruce Finney

R&D Investment Team	CottonInfo	Business and Finance Team
General Manager R&D Investment Ian Taylor *(appointed December 2013)* **R&D Managers:** Jane Trindall Susan Maas *(Acting)* Allan Williams Bruce Pyke	**CottonInfo Program Manager** Warwick Waters *(appointed March 2014)* **Communication Manager** Ruth Redfern *(appointed January 2014)*	**General Manager Business and Finance** Graeme Tolson **Accountant** Emily Luff *(appointed April 2014)* **Trainee Accountant** Elizabeth Eather **Executive Assistant** Dianne Purcell **Project Administration Assistant** Megan Baker *(Acting)* **Clerk** Tamara Johnston

Employment

Staff members are employed under Section 87 of the PIRD Act, which provides that the terms and conditions of employment are to be determined by the Corporation. CRDC complies with the Australian Government Bargaining Framework when exercising its power to engage employees in relation to sections 12, 87 and 119 of the PIRD Act.

In 2013–14 CRDC had a number of staffing changes as the organisation aligned its operations under the new five year Strategic R&D Plan 2013–18. Including the Executive Director, there were 12 full-time employees and 4 part-time employees on 30 June 2014. R&D Manager Tracey Leven and Project Administration Manager Amy Withington were on extended leave, and Bruce Pyke retired after 21 years of service to CRDC and cotton industry research.

CRDC employees

CRDC people	2009–10	2010–11	2011–12	2012–13	2013–14
Full-time employees	7	7	7	12	10
Part-time employees	1	1	1	2	4
Parental leave	0	0	0	1	2
TOTAL CRDC staff	8	8	8	15	16*

** The number of CRDC staff employed by CRDC on 30 June 2014.*

Staff training and development

In 2013–14, CRDC spent $17,443 on training and $66,252 on recruitment for the senior roles of General Manager, R&D Investment; Program Manager, CottonInfo; and the Communications Manager. Areas of direct training activities were Director training, intellectual property management, Work Health and Safety, the Field to Fabric course, IT training, CPA workshop and support for a trainee undertaking academic studies in accounting.

Throughout the year, Directors and staff participate in a wide range of CRDC related activities involving external bodies, providing valuable experience, as well as skills and knowledge upgrades for the personnel involved.

Equal employment opportunity

CRDC is committed to a merit-based, non-discriminatory recruitment and promotion policy and staff members are chosen strictly according to their qualifications for the job. Scientists undertaking CRDC funded research are of diverse backgrounds and cultures.

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

Dr Oscar Alves, head of the Australian Bureau of Meteorology's forecasting unit, on farm at 'Kilmarnock', Boggabri with Andrew Watson, the cotton industry's Climate Champion in the Managing Climate Variability program to discuss climate application to irrigated and dryland farming systems. Photo courtesy Melanie Jenson.

GOVERNANCE AND ACCOUNTABILITY

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

Location

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

PIRD Act legislation

CRDC began operations in 1990 under the PIRD Act.

Charter

The CRDC charter under the PIRD Act is to invest in and manage a portfolio of research, development and extension projects and programs in order to secure economic, environmental and social benefits for the Australian cotton industry and the community. This is to be conducted in a framework of improved accountability for research and development spending in relation to the cotton industry.

PIRD objects

The objects of this PIRD Act are to:

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

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

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

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

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

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

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

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

Powers

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

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

Functions

Function	Application
Investigating and evaluating the cotton industry's requirements for research and development, and the preparation, review and revision of an R&D plan on that basis	This is achieved by continuing interaction with CRDC's legislated industry body, Cotton Australia, as well as the industry peak body, the Australian Cotton Industry Council (ACIC). Cotton Australia undertakes a range of functions relating to CRDC, including an annual review to ensure the CRDC Strategic Plan remains current and relevant. The cotton industry and cotton researchers were closely involved in development of the CRDC's new Strategic Plan, which incorporated Australian Government and cotton industry RD&E priorities, as well as advice from the Minister and the Department of Agriculture.
Preparing an Annual Operating Plan for each financial year	An Annual Operating Plan is submitted to the Australian Government in April each year. From December 2013, the Annual Operating Plan no longer requires Ministerial approval, however it is provided to the Minister for information prior to being implemented.
Coordinating and funding RD&E activities consistent with current planning documents	RD&E projects are approved or commissioned in line with the Annual Operating Plan each year. The Annual Operating Plan is devised to address the objectives and strategies outlined in the current Strategic R&D Plan.
Monitoring, evaluating and reporting to Parliament, the Minister for Agriculture, and to industry on RD&E activities coordinated or funded by the Corporation	The Corporation reports formally to the Australian Parliament through its Annual Report. In addition, CRDC informs the Minister for Agriculture of any matters of interest or concern in the current operating environment. This occurs in written and, where possible, face-to-face communication. CRDC is also in communication with the Department of Agriculture on a range of issues. Communication with the industry and Cotton Australia occurs continually on both a formal and informal basis, as outlined above. Communication with the broader community is a key focus of CRDC's communication activities. In order to ensure stringent evaluation of its RD&E activities, CRDC is committed to the ongoing Council of Rural Research and Development Corporation's Impact Evaluation process.
Facilitating the dissemination, adoption and commercialisation of research and development results in relation to the cotton industry	Over more than a decade, the Australian cotton industry benefited from having an industry-wide extension network, supported by CRDC and continually reviewed and modified to suit prevailing conditions. The CottonInfo joint venture by CRDC, Cotton Australia and Cotton Seed Distributors (CSD) provides the industry with a substantially revitalised development and delivery service to take research to the farm as quickly as possible. The CottonInfo team is already working to improve responsiveness to grower needs through better communication and regional representation, focusing on delivering research directly to the grower via agronomy consultants and agribusinesses. The new model recognises the importance of supporting adoption of RD&E through multiple delivery pathways and will be underpinned by the redevelopment of the industry best management practices program, *my*BMP. CRDC staff members play a pivotal role in facilitating fast and effective dissemination of CRDC funded research outcomes. More broadly, CRDC hosts forums, participates in roadshows and the annual cotton trade show, produces publications, sponsors the biennial research-based Australian Cotton Conference and has a communication strategy to extend and enhance the adoption of RD&E. CRDC also collaborates in the successful commercialisation of RD&E where possible.

The CAC Act

CRDC has been subject to the *Commonwealth Authorities and Companies Act 1997* (CAC Act) since August 1998. The CAC Act, which ceases on 1 July 2014, provides enhanced levels of accountability as well as a planning and reporting framework. From 1 July 2014, CRDC will be subject to the *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

Other legislation

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

Cotton R&D levy

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

The levy rate for cotton (excluding GST) is $2.25 per 227 kilogram bale of cotton. The Australian Government contributes matching funds up to a limit of 0.5 per cent of industry Gross Value of Production.

Minister

During 2013–14 CRDC was accountable to the Australian Parliament through:

- the Minister for Agriculture, Fisheries and Forestry, the Hon. Joel Fitzgibbon MP from 1 July 2013 to 18 September 2013.
- the Minister for Agriculture, the Hon. Barnaby Joyce MP from 18 September 2013 to 30 June 2014.

Minister's responsibilities

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

Ministerial directions

No formal Ministerial directions were issued to CRDC in 2013–14. CRDC complies with all Ministerial directions, legislative and policy requirements of the Australian Government that it has been able to ascertain.

Ongoing directions from previous years that are applicable to CRDC are the Commonwealth Procurement Rules, the Building Code, Commonwealth Property Management Framework, Australian Government Foreign Exchange Risk Management Guidelines and the Australian Government Protective Security Policy Framework.

CRDC role, responsibilities and accountabilities

- CRDC is formally accountable to the Australian people through the Australian Parliament and to the cotton industry through its industry representative body, Cotton Australia.
- CRDC's stakeholders set broad objectives, which the Corporation addresses through its Strategic R&D Plan and Annual Operating Plan.
- CRDC has used these objectives as a basis for the development of its planned outcomes and the identification of key outputs.
- CRDC's reporting processes include the presentation of a formal report to its industry stakeholder. Part of this presentation includes an opportunity for questioning and debating Board decisions.
- CRDC annually reports on investments, project outcomes, operation activities and financial statements every year via its Annual Report.
- CRDC's Annual Operating Plan 2013–14 marked the first year of CRDC operation under the new Strategic R&D Plan for 2013–18. The Annual Report 2013–14 reports on the outcomes of investments, projects, operations and financials in 2013–14.

Policies, procedures and charters

CRDC has 33 existing policies, procedures and charters to assist with the effective governance of the organisation. These documents are available from CRDC's internal shared folders and made available to all Directors and new staff during induction training. Directors and management conducted, commissioned or enacted 16 reviews during 2013–14 listed in the table below.

Reviews 2013–14

Description	Board, committee and management	Last review
Board	Board and committees:	
IP Committee Charter	IP	Feb 2014
Remuneration Committee Charter	Remuneration	Apr 2014
Audit Committee Charter	Audit	Jun 2014
Finance & Administration	Board, Audit committee and management	
Reserves policy		Feb 2014
Financial investments policy		Apr 2014
Conflict of Interest		Apr 2014
Human Resources	Remuneration and management	
Email and Internet Usage Policy		Jan 2014
Media Policy		Jan 2014
Social Media Policy		Jan 2014
Performance Counselling & Disciplinary Policy		Jan 2014
Grievance & Dispute Resolution Policy		Jun 2014
Equal Opportunity & Harassment Policy		Jun 2014
WH&S	Audit and management	
WH&S Management Arrangements		Apr 2014
Risk Management	Audit and management	
Fraud Risk Register & Plan		Nov 2012
Risk Register & Management Plan		Aug 2013
Fraud Control policy		Nov 2012
Business Continuity policy		Jun 2013
Crisis Management Plan		Feb 2013
Risk Management Framework Policy		Aug 2013

Corporate reporting

In accordance with the PIRD Act and the CAC Act, CRDC prepares a five-year Strategic R&D Plan, as well as an Annual Operating Plan for each financial year.

In 2013–14, CRDC submitted its Annual Operating Plan 2014–15 to the Minister for Agriculture, Senator the Hon. Barnaby Joyce with the plan commencing from 1 July 2014. The Annual Report 2012–13 was submitted to the Minister on 9 October 2013 and the Minister agreed to table the report in Parliament in 8 November 2013.

Fraud control

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

The Audit Committee endorses, monitors and reviews the fraud control plan, which is read in conjunction with the Risk Management Plan and the Board Charter for Directors and Statement of Principles for staff.

CRDC's Audit Committee, Executive Director and General Manager Business and Finance (the nominated fraud control officer) carry out the functions of a fraud investigation unit collectively, as described in the Commonwealth Fraud Investigation Model. The support of the Australian Federal Police would be sought if CRDC felt there was a prima facie case of fraud and further investigation was required. No such action was necessary in 2013–14.

Service charter

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

National Disability Strategy

CRDC working conditions and procedures for employees and stakeholders align with the *Commonwealth Disability Discrimination Act 1992* in the broader context of the National Disability Strategy 2010–20 due to its small size and physical nature of the CRDC building allow. CRDC has ensured that any person with a disability could be properly accommodated and carry out all functions, as either a staff member or a visitor. Should a future staff member or visitor need more specialised disability assistance, CRDC will assess and meet these needs.

Equal Opportunity and Harassment Policy

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

Significant events

CRDC had no significant events in 2013–14, as defined in section 15 of the CAC Act.

Significant changes in the state of affairs

CRDC had no significant change in its state of affairs in 2013–14, as defined in section 16 of the CAC Act.

Judicial decisions and reviews by outside bodies

CRDC had no judicial decisions or reviews by outside bodies in 2013–14.

Work Health and Safety

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

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

CRDC Work Health and Safety summary

Legislative reporting requirements Schedule 2 Part 4 of the *Work Health and Safety Act 2011*	Action undertaken 2013–14
Initiatives during 2013–14 and outcomes	■ An independent audit of WHS performance, which informed the review and updating of CRDC's WHS Policy and procedures. ■ Fire warden, evacuation, fire extinguisher, ergonomics training. ■ Safety issues discussed formally at workplace meetings, workplace inspections held (including vehicles) and staff consulted in resolving safety issues and physical conditions of the workplace. ■ A flu vaccination program for all CRDC staff was offered. ■ Work Health and Safety inductions for new staff, directors and contractors.
Statistics of any notifiable incidents as defined by s.38 of the WHS Act	■ CRDC had no notifiable incidents in 2013–14.
Details of any investigations conducted during the year, including details of all notices under Part 10 of the WHS Act	■ CRDC conducted no investigations and no notices were received from, or given to, an employee.

Freedom of information

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

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

During 2013–14, CRDC had one Freedom of Information request that CRDC managed in accordance with the provisions of its Freedom of Information plan, which complied with subsection 8(1) of the *Freedom of Information Act 1982*.

Categories of documents held

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

C: Documents customarily made available

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

Contractors and consultants

CRDC employs consultants and contractors on a needs basis and after background checks to ensure proposed appointees have the necessary skills and experience. During the reporting year CRDC spent $638,114 exclusive of GST, to remunerate consultants and contractors.

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

Contractor	Service provided 2013–14
Aboriginal Employment Strategy Ltd	HSC student traineeships
ACIL Allen Consulting	Strategic advice
Banki Haddoc Fiora Lawyers	Legal advice
Datacom Systems (ACT) Pty Ltd	Software consultants
F1 Solutions Consulting	Software consultants
Helen Wheels HR	Project management
Infinity Outsourcing Group	ICT system management
P Jones	Project management
J Hamparsum	Committee chair
M Jenson	Publication content
Neil Deacon Design	Publication design
Nexia Court & Co	Internal audit services
Oakton Services Pty Ltd	Internal audit services
Sefton & Associates	Strategic advice
TechMAC Pty Ltd	Program management
Weemalah WriteAbility	Publication content, editing & design
Y Cunningham	Web design

Payments to advertising agencies

CRDC did not engage the services of any advertising agency, market research organisation, polling organisation, direct mail organisation or media promotion organisation during the reporting year.

Payment to representative body

CRDC's industry representative body is Cotton Australia. In 2013–14, CRDC contributed a total of $130,566 to Cotton Australia for industry consultation and project work. In accordance with the *Guidelines on Funding of Consultation Costs by Primary Industries and Energy Portfolio Statutory Authorities* these funds included $18,816 for their industry consultation role including several specific activities:

- Industry consultation for development and reviewing the CRDC Strategic R&D Plan. This ensures CRDC's strategic planning continues to address evolving industry RD&E needs.
- Industry consultation and participation in CRDC forums to review RD&E funding applications and scoping future directions in research.
- A meeting to receive and discuss the CRDC annual report for the preceding year. This enables the industry representative body to ensure CRDC's activities for that year have met its strategic objectives and to question senior staff on any matters of interest or concern.

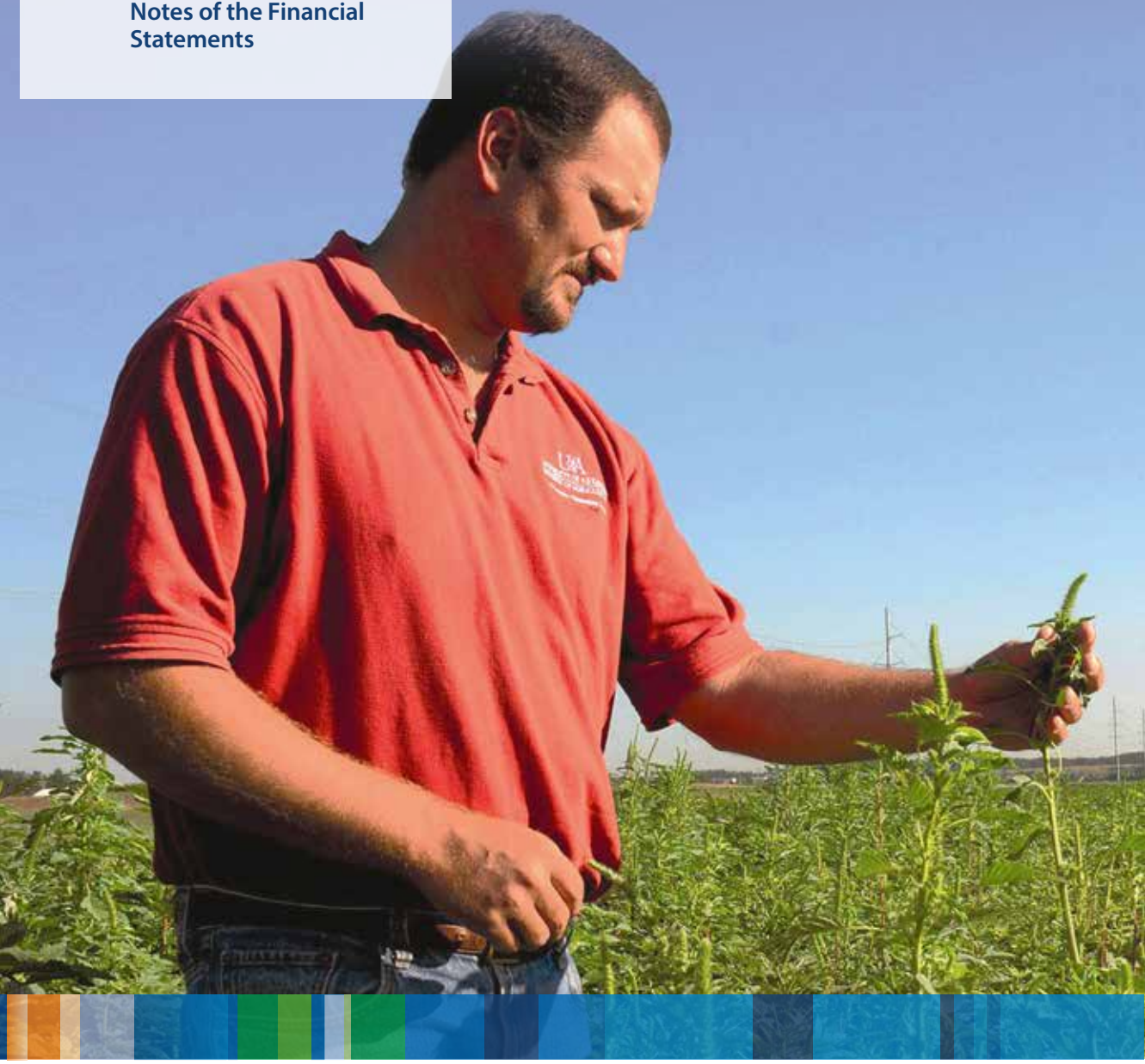
While CRDC does not pay a fee for service to the industry representative body for these activities, it contributes to the expenses they incur in carrying them out, as authorised by section 15 of the PIRD Act, which relates to consultation with the industry stakeholder.

In 2013–14, CRDC contributed a total of $111,750 to Cotton Australia for the following co-funded project activities:

- $25,000 p.a. to co-funding support for the Primary Industries Education Foundation to support the cotton industry's participation in cross-sectoral education initiatives.
- $15,000 co-funding support for the Plant Health Australia and Cotton Australia project to provide biosecurity training for cotton growers and agronomists to support cotton industry awareness of the national framework for biosecurity as an education initiative.
- $30,500 support for the 2014 Australian Cotton Conference to increase awareness in the Australian cotton industry of research outcomes.
- $5,000 co-funding support for the cross-sector CottonMap project lead by Cotton Australia and supported by GRDC and other commercial organisations. The project increases awareness within the grains industry of where cotton crops may exist near grain crops with the aim of decreasing the risk of spray-drift damaging cotton crops.
- $36,250 co-funding support for the Australian Future Cotton Leaders Course, a Ruralscope education program which supports the cotton industry's participation in leadership education initiatives.

The Bollgard III® efficacy team: university student Katherine Grellman, CSIRO/CSD assistant Jamala Gordon, CSIRO technical assistant Susie Thomson and CSIRO technical officer Trudy Staines. Photo courtesy of Melanie Jenson.

Section 6
Financials



International herbicide resistance expert, Dr Jason Norsworthy of the University of Arkansas, inspects a cotton field in the US that has been taken over by Palmer amaranth as a result of over-reliance on glyphosate a s a control method. Herbicide resistance is recognised as a serious issue for the Australian cotton industry, and the CRDC invests heavily in this area as a result.

CONTENTS

Australian National
Audit Office

INDEPENDENT AUDITOR'S REPORT

To the Minister for Agriculture

I have audited the accompanying financial statements of the Cotton Research and Development Corporation for the year ended 30 June 2014, which comprise: a Statement by the Directors, Executive Director and Chief Financial Officer; the Statement of Comprehensive Income; Statement of Financial Position; Statement of Changes in Equity; Cash Flow Statement; Schedule of Commitments; Schedule of Contingencies; and Notes comprising a Summary of Significant Accounting Policies and other explanatory information.

Directors' Responsibility for the Financial Statements

The directors of the Cotton Research and Development Corporation are responsible for the preparation of financial statements that give a true and fair view in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, including the Australian Accounting Standards, and for such internal control as is necessary to enable the preparation of financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

My responsibility is to express an opinion on the financial statements based on my audit. I have conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. These auditing standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Cotton Research and Development Corporation's preparation of the financial statements that give a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Cotton Research and Development Corporation's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made by the directors, as well as evaluating the overall presentation of the financial statements.

GPO Box 707 CANBERRA ACT 2601
19 National Circuit BARTON ACT 2600
Phone (02) 6203 7300 Fax (02) 6203 7777

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Independence

In conducting my audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the requirements of the Australian accounting profession.

Opinion

In my opinion, the financial statements of the Cotton Research and Development Corporation:

(a) have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997,* including the Australian Accounting Standards; and

(b) give a true and fair view of the matters required by the Finance Minister's Orders, including the Cotton Research and Development Corporation's financial position as at 30 June 2014 and its financial performance and cash flows for the year then ended.

Australian National Audit Office

Peter Kerr

Delegate of the Auditor-General

Canberra

18 August 2014

Cotton Research and Development Corporation

STATEMENT BY THE DIRECTORS, EXECUTIVE DIRECTOR AND CHIEF FINANCIAL OFFICER

In our opinion, the attached financial statements for the year ended 30 June 2014 are based on properly maintained financial records and give a true and fair view of the matters required by the Finance Minister's Orders made under the Commonwealth Authorities and Companies Act 1997, as amended.

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

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

Signed

Dr Mary Corbett
Chairperson
18th August 2014

Signed

Richard Haire
Director
18th August 2014

Signed

Bruce Finney
Executive Director
18th August 2014

Signed

Graeme Tolson
Chief Financial Officer
18th August 2014

STATEMENT OF COMPREHENSIVE INCOME
for the period ended 30 June 2014

	Notes	2014 $	2013 $
NET COST OF SERVICES			
Expenses			
Employee benefits	3A	**1,937,109**	1,910,084
Supplier	3B	**1,151,790**	614,382
Grants	3C	**18,771,311**	16,728,779
Depreciation and amortisation	3D	**62,756**	47,464
Losses from asset sales	3E	**–**	737
Total expenses		**21,922,966**	19,301,446
OWN-SOURCE INCOME			
Own-source revenue			
Interest	4A	**1,778,946**	1,725,869
Rental income	4B	**5,000**	10,478
Royalties	4C	**1,830,006**	3,971,210
Other revenue	4D	**1,649,394**	1,884,238
Total own-source revenue		**5,263,346**	7,591,795
Net cost of services		**16,659,620**	11,709,651
Revenue from Government			
PIRD Act 1989 Contribution	4E	**11,238,949**	11,522,788
Levies and penalties	4F	**10,977,077**	11,801,096
Total revenue from Government		**22,216,026**	23,323,884
Surplus attributable to the Australian Government		**5,556,406**	11,614,233
OTHER COMPREHENSIVE INCOME			
Changes in asset revaluation surplus		**–**	–
Total other comprehensive income		**–**	–
Total comprehensive income attributable to the Australian Government		**5,556,406**	11,614,233

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

STATEMENT OF FINANCIAL POSITION
as at 30 June 2014

	Notes	2014 $	2013 $
ASSETS			
Financial assets			
Cash and cash equivalents	6A	**11,098,065**	12,260,782
Investments held to maturity	6B	**31,000,000**	27,000,000
Trade and other receivables	6C	**6,252,649**	5,763,085
Total financial assets		**48,350,714**	45,023,867
Non-financial assets			
Land and buildings	7A	**790,443**	694,412
Property, plant and equipment	7B,C	**42,871**	65,182
Intangibles	7D,E	**92,282**	17,585
Other non-financial assets	7F	**4,205**	–
Total non-financial assets		**929,801**	777,179
Total assets		**49,280,515**	45,801,046
LIABILITIES			
Payables			
Suppliers	8A	**96,137**	161,613
Grants	8B	**4,286,734**	6,270,194
Other payables	8C	**99,406**	95,990
Total payables		**4,482,277**	6,527,797
Provisions			
Employee provisions	9A	**310,337**	341,754
Total provisions		**310,337**	341,754
Total liabilities		**4,792,614**	6,869,551
Net assets		**44,487,901**	38,931,495
EQUITY			
Reserves		**345,937**	345,937
Retained surplus		**44,141,964**	38,585,558
Total equity		**44,487,901**	38,931,495

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

STATEMENT OF CHANGES IN EQUITY
for the period ended 30 June 2014

	Retained earnings		Asset revaluation reserve		Total equity	
	2014 $	2013 $	**2014 $**	2013 $	**2014 $**	2013 $
Opening balance						
Balance carried forward from previous period	**38,585,558**	26,971,325	**345,937**	345,937	**38,931,495**	27,317,262
Adjustment for errors	–	–	–	–	–	–
Adjustment for changes in accounting policies	–	–	–	–	–	–
Adjusted opening balance	**38,585,558**	26,971,325	**345,937**	345,937	**38,931,495**	27,317,262
Comprehensive income						
Surplus for the period	**5,556,406**	11,614,233			**5,556,406**	11,614,233
Other comprehensive income	–	–	–	–	–	–
Total comprehensive income	**5,556,406**	11,614,233	–	–	**5,556,406**	11,614,233
Transfers between equity components	–	–	–	–	–	–
Closing balance as at 30 June	**44,141,964**	38,585,558	**345,937**	345,937	**44,487,901**	38,931,495

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

CASH FLOW STATEMENT
for the period ended 30 June 2014

	Notes	2014 $	2013 $
OPERATING ACTIVITIES			
Cash received			
Industry levies and penalties		**10,177,874**	12,958,210
Commonwealth contributions		**10,902,082**	10,462,148
Royalties		**2,799,908**	3,548,596
Grants		**1,254,535**	1,437,504
Grants – Parental Leave		**18,731**	–
Interest		**1,850,561**	1,281,554
Net GST received		**1,765,315**	817,418
Other		**389,395**	560,464
Total cash received		**29,158,401**	31,065,894
Cash used			
Employees		**1,987,101**	1,765,672
Grants		**22,789,370**	15,536,369
Suppliers		**1,333,475**	570,733
Novation grants paid		**–**	91,196
Novation suppliers paid		**–**	–
Total cash used		**26,109,946**	17,963,970
Net cash from operating activities	10	**3,048,455**	13,101,924
INVESTING ACTIVITIES			
Cash received			
Investments		**13,000,000**	22,000,000
Total cash used		**13,000,000**	22,000,000
Cash used			
Purchase of property, plant and equipment		**211,172**	46,208
Investments		**17,000,000**	29,000,000
Total cash used		**17,211,172**	29,046,208
Net cash used by investing activities		**(4,211,172)**	(7,046,208)
Net increase/(decrease) in cash held		**(1,162,717)**	6,055,716
Cash and cash equivalents at the beginning of the reporting period		**12,260,782**	6,205,066
Cash and cash equivalents at the end of the reporting period	6A	**11,098,065**	12,260,782

SCHEDULE OF COMMITMENTS
as at 30 June 2014

	2014 $	2013 $
BY TYPE		
Commitments receivable		
Research grant commitments[3]	**1,982,477**	1,149,500
Net GST recoverable on commitments[1]	**2,382,773**	1,915,470
Total commitments receivable	**4,365,250**	3,064,970
Commitments payable		
Other commitments		
Operating leases[2]	**242,254**	153,561
Research grant commitments[3]	**25,968,241**	20,916,610
Total other commitments	**26,210,495**	21,070,171
Net commitments payable by type	**21,845,245**	18,005,201

BY MATURITY		
Commitments receivable		
Other commitments receivable		
Within 1 year	**2,333,667**	1,339,155
Between 1 to 5 years	**2,031,583**	1,725,815
Total other commitments receivable	**4,365,250**	3,064,970
Commitments payable		
Operating lease commitments		
Within 1 year	**123,825**	74,967
Between 1 to 5 years	**118,429**	78,594
Total operating lease commitments	**242,254**	153,561
Other Commitments		
Within 1 year	**14,873,762**	11,962,943
Between 1 to 5 years	**11,094,479**	8,953,667
Total other commitments	**25,968,241**	20,916,610
Net commitments by maturity	**21,845,245**	18,005,201

Note 1: Commitments are GST inclusive where relevant.

Note 2: Operating leases are effectively non-cancellable and comprise of agreements for the provision of motor vehicles for the Corporation.

Note 3: Research grant commitments receivable and payable are Agreements Equally Proportionately Unperformed for research, development and extension contracts.

This schedule should be read in conjunction with the accompanying notes.

SCHEDULE OF CONTINGENCIES
as at 30 June 2014

Refer to Note 11.

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

Note 1: Summary of Significant Accounting Policies

1.1 Objective of Cotton Research and Development Corporation

No matters or circumstances have arisen since the end of the financial year which significantly affected or may affect the operations of the Corporation, the results of these operations or state of affairs of the Corporation in subsequent years.

Cotton Research and Development Corporation is an Australian Government controlled entity. The objective of the Corporation is to bring industry and researchers together to establish research and development strategic directions and to fund projects that provide the cotton industry with the innovation and productivity tools to compete in global markets.

The Corporation is structured to meet one outcome:

"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 continued existence of the Corporation in its present form and with its present programs is dependent on Government policy and on continuing funding by Parliament for the Corporation's administration and programs.

1.2 Basis of Preparation of the Financial Statements

The financial statements are general purpose financial statements and are required by clause 1(b) of Schedule 1 to the *Commonwealth Authorities and Companies Act 1997.*

The financial statements have been prepared in accordance with:

a) Finance Minister's Orders (FMOs) for reporting periods ending on or after 1 July 2013; and

b) Australian Accounting Standards and Interpretations issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

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

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

Unless an alternative treatment is specifically required by an accounting standard or the FMOs, assets and liabilities are recognised in the statement of financial position when and only when it is probable that future economic benefits will flow to the Corporation or a future sacrifice of economic benefits will be required and the amounts of the assets or liabilities can be reliably measured. However, assets and liabilities arising under Agreements Equally Proportionately Unperformed are not recognised unless required by an accounting standard. Liabilities and assets that are unrecognised are reported in the schedule of commitments or the schedule of contingencies.

Unless alternative treatment is specifically required by an accounting standard, income and expenses are recognised in the Statement of Comprehensive Income when, and only when the flow, consumption or loss of economic benefits has occurred and can be reliably measured.

1.3 Significant Accounting Judgements and Estimates

In the process of applying the accounting policies listed in this note, the Corporation has made the following judgements that have the most significant impact on the amounts recorded in the financial statement:

- The fair value of land and buildings has been taken to be the market value of similar properties as determined by an independent valuer.
- Leave provisions also involve actuarial assumptions based on the likely tenure of existing staff, patterns of leave claims and payouts, future salary movements and future discount rates.

No accounting assumptions or estimates have been identified that have a significant risk of causing a material adjustment to carrying amounts of assets and liabilities within the next accounting period.

1.4 New Australian Accounting Standards

Adoption of New Australian Accounting Standard Requirements

No accounting standard has been adopted earlier than the application date as stated in the standard.

No new standards, amendments to standards or interpretations applicable to the current reporting period had a material financial impact, and are not expected to have a future financial impact on the entity.

Future Australian Accounting Standard Requirements

Of the new standards, amendments to standards or interpretations that have been issued by the Australian Accounting Standards Board that are applicable to future reporting periods, none will have a material impact on the Corporation.

1.5 Revenue

Revenue from the sale of goods is recognised when:

a) the risks and rewards of ownership have been transferred to the buyer;

b) the Corporation retains no managerial involvement or effective control over the goods;

c) the revenue and transaction costs incurred can be reliably measured; and

d) it is probable that the economic benefits associated with the transaction will flow to the Corporation.

Revenue from rendering of services is recognised by reference to the stage of completion of contracts at the reporting date. The revenue is recognised when:

a) the amount of revenue, stage of completion and transaction costs incurred can be reliably measured; and

b) the probable economic benefits associated with the transaction will flow to the entity.

The stage of completion of contracts at the reporting date is determined by reference to the proportion that costs incurred to date bear to the estimated total costs of the transaction.

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

Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement.*

Resources Received Free of Charge

Resources received free of charge are recognised as revenue when, and only when, a fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense. Resources received free of charge are recorded as either revenue or gains depending on their nature.

Revenue from Government

Funding received or receivable from agencies (appropriated to Department of Agriculture as a CAC Act body payment item for payment to this Corporation) is recognised as Revenue from Government unless they are in the nature of an equity injection or a loan. Revenue from the Department of Agriculture is recognised on an accrual basis from the date that the Department of Agriculture notifies the Corporation of the amount receivable. Revenue from government includes:

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

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

Parental Leave Payments Scheme

Amounts received under the Parental Leave Payments Scheme by the Corporation not yet paid to employees were presented as gross cash and a liability (payable). The total amount received under this scheme was $18,731 (2013: $nil).

1.6 Royalties

Revenue from royalties are recognised on an accruals basis in accordance with the substance of the relevant agreements except when the royalty cannot be measured with sufficient reliability and are recognised based on cash received.

CRDC's major agreement in plant breeding royalties with CSIRO ceases at 30th June 2017.

1.7 Gains

Sale of Assets

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

1.8 Grants for Research and Development

The CRDC recognises project liabilities through project agreements that require the research partner to perform services or provide facilities, or to meet eligibility criteria. A grant R&D expense is recognised when the research provider has provided the services, or facilities and meet the eligibility criteria. Eligibility criteria includes but is not limited to providing progress reports, financial statements and intellectual property reports.

On the 1st July 2013 at the commencement of the new 5 year R&D Plan expenses previously referred to as Grants R&D Corporate were reallocated to Grants Corporate R&D Activities or to Suppliers as R&D Administration expenses. The 2012–13 comparative figures have not been reclassified as they represent the allocation expenditure under the previous 2008–13 R&D Plan. The following table illustrates the impact that the new R&D Plan would have had if it had been applied to the comparative figures.

Impact of new R&D Plan for the period ended 30 June 2013	**As reported for 2012–13 $**	**Impact of change in R&D Plan $**	**Potential impact on comparatives $**
Supplier	614,382	384,493	998,875
Grants	16,728,779	(384,493)	16,344,286
Total expenses	19,301,446	–	19,301,446
Total comprehensive income attributable to the Australian Government	11,614,233	–	11,614,233

1.9 Employee Benefits

Liabilities for 'short-term employee benefits' (as defined in AASB 119 *Employee Benefits*) and termination benefits expected within twelve months of the end of reporting period are measured at their nominal amounts.

The nominal amount is calculated with regard to the rates expected to be paid on settlement of the liability.

Leave

The liability for employee benefits includes provision for annual leave and long service leave. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees of the Corporation is estimated to be less than the annual entitlement for sick leave.

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

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

Separation and Redundancy

Provision is made for separation and redundancy benefit payments. The Corporation recognises a provision for termination when it has developed a detailed formal plan for the terminations and has informed those employees affected that it will carry out the terminations.

Superannuation

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

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

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

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

The liability for superannuation recognised as at 30 June represents outstanding contributions for the final fortnight of the year.

1.10 Leases

A distinction is made between finance leases and operating leases. Finance leases effectively transfer from the lessor to the lessee substantially all the risks and rewards incidental to ownership of leased assets. An operating lease is a lease that is not a finance lease. In operating leases, the lessor effectively retains substantially all such risks and benefits.

Where an asset is acquired by means of a finance lease, the asset is capitalised at either the fair value of the lease property or, if lower, the present value of minimum lease payments at the inception of the contract and a liability is recognised at the same time and for the same amount.

The discount rate used is the interest rate implicit in the lease. Leased assets are amortised over the period of the lease. Lease payments are allocated between the principal component and the interest expense.

Operating lease payments are expensed on a straight-line basis which is representative of the pattern of benefits derived from the leased assets.

1.11 Borrowing Costs

No borrowing costs were incurred by the Corporation during the year.

1.12 Fair Value Measurement

The Corporation deems transfers between levels of the fair value hierarchy to have occurred when either the quotable prices or observable inputs for each class of asset become available or cease to be available.

1.13 Cash and cash equivalents

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

1.14 Financial Assets

The Corporation classifies its financial assets in the following categories:

a) financial assets at fair value through profit or loss;

b) held-to-maturity investments;

c) available-for-sale financial assets; and

d) loans and receivables.

The classification depends on the nature and purpose of the financial assets and is determined at the time of initial recognition. Financial assets are recognised and derecognised upon trade date.

Effective Interest Method

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset, or, where appropriate, a shorter period.

Income is recognised on an effective interest rate basis except for financial assets that are recognised at fair value through profit or loss.

Financial Assets at Fair Value Through Profit or Loss

Financial assets are classified as financial assets at fair value through profit or loss where the financial assets:

a) have been acquired principally for the purpose of selling in the near future;

b) are derivatives that are not designated and effective as a hedging instrument; or

c) are a part of an identified portfolio of financial instruments that the Corporation manages together and has a recent actual pattern of short-term profit-taking.

Assets in this category are classified as current assets.

Financial assets at fair value through profit or loss are stated at fair value, with any resultant gain or loss recognised in profit or loss. The net gain or loss recognised in profit or loss incorporates any interest earned on the financial asset.

The Corporation has no derivative financial assets in both the current and prior year.

Investments Held-to-Maturity

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

Loans and Receivables

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market are classified as 'loans and receivables'. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate.

Impairment of Financial Assets

Financial assets are assessed for impairment at the end of each reporting period.

Financial assets held at amortised cost – if there is objective evidence that an impairment loss has been incurred for loans and receivables or held to maturity investments held at amortised cost, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the Statement of Comprehensive Income.

Financial assets held at cost – If there is objective evidence that an impairment loss has been incurred, the amount of the impairment loss is the difference between the carrying amount of the asset and the present value of the estimated future cash flows discounted at the current market rate for similar assets.

1.15 Financial Liabilities

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

Financial Liabilities at Fair Value Through Profit or Loss

Financial liabilities at fair value through profit or loss are initially measured at fair value. Subsequent fair value adjustments are recognised in profit or loss. The net gain or loss recognised in profit or loss incorporates any interest paid on the financial liability.

Other Financial Liabilities

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

The effective interest method is a method of calculating the amortised cost of a financial liability and of allocating interest expense over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash payments through the expected life of the financial liability, or, where appropriate, a shorter period.

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

Grants

Grant liabilities are recognised to the extent that:

- the services required to be performed by the grantee have been performed, or
- the grant eligibility criteria have been satisfied, but payments due have not been made.

A commitment is recorded when the Corporation enters into an agreement to make these grants but services have not been performed or criteria satisfied.

1.16 Contingent Liabilities and Contingent Assets

Contingent liabilities and contingent assets are not recognised in the statement of financial position but are reported in the relevant schedules and notes. They may arise from uncertainty as to the existence of a liability or asset or represent an asset or liability in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

1.17 Acquisition of Assets

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

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

1.18 Property, Plant and Equipment

Asset Recognition Threshold

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

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

Revaluations

Fair values for each class of asset are determined as shown below:

Asset Class	**Fair value measured at**
Land	Market selling price
Buildings	Market selling price
Office equipment	Depreciated replacement cost
Computer equipment	Depreciated replacement cost
Fittings & furniture	Depreciated replacement cost

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

Fair value is measured at market selling price where the market value can be determined in an "Active Market" in accordance with AASB 116 Property, Plant and Equipment, and AASB 136 Impairment. Where an active market is not available then "Depreciated Replacement Cost" has been used.

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

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

Depreciation

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

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

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

	2014	2013
Buildings on freehold land	40 years	40 years
Office Equipment	5 to 10 years	5 to 10 years
Computer Equipment	3 years	3 years
Fittings & Furniture	10 years	10 years

Impairment

All assets were assessed for impairment at 30 June 2014. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

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

No indicators of impairment were found for assets at fair value.

Derecognition

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

1.19 Intangibles

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

Software is amortised on a straight-line basis over its anticipated useful life. The useful lives of the Corporation's software are 3 to 5 years (2012–13: 3 to 5 years).

All software assets were assessed for indications of impairment as at 30 June 2014.

1.20 Taxation / Competitive Neutrality

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

Revenues, expenses and assets are recognised net of GST except:

a) where the amount of GST incurred is not recoverable from the Australian Taxation Office; and

b) for receivables and payables.

Note 2: Events After the Reporting Period

No matters or circumstances have arisen since the end of the financial year which significantly affected or may affect the operations of the Corporation, the results of these operations or state of affairs of the Corporation in subsequent years.

	2014 $	2013 $
Note 3: Expenses		
Note 3A: Employee Benefits		
Wages and salaries	**1,688,962**	1,531,907
Superannuation:		
Defined contribution plans	**153,518**	152,072
Defined benefit plans	**40,100**	37,770
Leave and other entitlements	**54,529**	188,335
Total employee benefits	**1,937,109**	1,910,084

	2014 $	2013 $
Note 3B: Suppliers		
Goods and services		
External Parties	**1,079,188**	542,631
Total goods and services	**1,079,188**	542,631
Goods and services are made up of:		
Provision of goods – external parties	**386,532**	58,936
Rendering of services – external parties	**692,656**	483,695
Total goods and services	**1,079,188**	542,631
Other supplier expenses		
Operating lease rentals – external parties:		
Minimum lease payments	**69,639**	68,957
Workers compensation expenses	**2,963**	2,794
Total other supplier expenses	**72,602**	71,751
Total supplier expenses	**1,151,790**	614,382

Note 3C: Grants		
Public sector:		
Australian Government entities (related entities)	**6,536,619**	5,742,554
State and Territory Governments	**4,540,041**	3,694,028
Universities & Colleges	**4,971,850**	3,881,201
Other Research Institutions	**111,750**	713,372
Corporate extension activities	**567,827**	1,096,437
Private sector:		
Commercial entities	**2,043,224**	1,601,187
Total grants	**18,771,311**	16,728,779

	2014 $	2013 $
Note 3D: Depreciation and Amortisation		
Depreciation:		
Buildings	**15,944**	13,500
Office equipment	**10,737**	10,238
Computer equipment	**15,353**	14,809
Fixtures & Fittings	**1,350**	1,260
Total depreciation	**43,384**	39,807
Amortisation:		
Intangibles		
Computer Software	**19,372**	7,657
Total amortisation	**19,372**	7,657
Total depreciation and amortisation	**62,756**	47,464

Note 3E: Losses from Asset Sales		
Other Property, plant and equipment:		
Proceeds from sale	–	–
Carrying value of assets sold	–	737
Total losses from asset sales	–	737

	2014 $	2013 $

Note 4: Own-Source Income

OWN-SOURCE REVENUE

Note 4A: Interest

Deposits	**1,778,946**	1,725,869
Total interest	**1,778,946**	1,725,869

Note 4B: Rental Income

Operating lease:		
Other	**5,000**	10,478
Total rental income	**5,000**	10,478

Note 4C: Royalties

Royalties	**1,830,006**	3,971,210
Total royalties	**1,830,006**	3,971,210

Note 4D: Other Revenue

Project refunds	**395,244**	437,771
Industry grants	**1,243,287**	1,356,167
Other revenue	**10,863**	90,300
Total other revenue	**1,649,394**	1,884,238

REVENUE FROM GOVERNMENT

Note 4E: Revenue from Government

Department of Agriculture:		
PIRD Act 1989 Contribution	**11,238,949**	11,522,788
Total revenue from Government	**11,238,949**	11,522,788

Note 4F: Levies and Penalties

Industry Levies	**10,961,887**	11,799,850
Penalties	**15,190**	1,246
Total fees and fines	**10,977,077**	11,801,096

Note 5: Fair Value Measurements

The following tables provide an analysis of assets and liabilities that are measured at fair value. The different levels of the fair value hierarchy are defined below.

Level 1: Quoted prices (unadjusted) in active markets for identical assets or liabilities that the entity can access at measurement date.

Level 2: Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly.

Level 3: Unobservable inputs for the asset or liability.

Note 5A: Fair Value Measurements

Fair value measurements at the end of the reporting period by hierarchy for assets and liabilities in 2014

	Fair value measurements at the end of the reporting period using			
	Fair value $	Level 1 inputs $	Level 2 inputs $	Level 3 inputs $
Non-financial assets				
Land	180,000	–	180,000	–
Buildings on freehold land	610,443	–	610,443	–
Other property, plant and equipment	42,871	–	42,871	–
Total non-financial assets	833,314	–	833,314	–
Total fair value measurements of assets in the statement of financial position	833,314	–	833,314	–

Fair value measurements – highest and best use differs from current use for non-financial assets (NFAs)

The highest and best use of all non-financial assets are the same as their current use.

Note 5B: Level 1 and Level 2 Transfers for Recurring Fair Value Measurements

There were no transfers of recurring fair value measurements between level 1 and level 2 in the current or prior year.

The Corporation's policy for determining when transfers between levels are deemed to have occurred can be found in Note 1.

Note 5C: Valuation Technique and Inputs for Level 2 and Level 3 Fair Value Measurements

Level 2 and 3 fair value measurements – valuation technique and the inputs used for assets and liabilities in 2014

	Category (Level 2 or Level 3)	Fair value $	Valuation technique(s)[1]	Inputs used	Range (weighted average)[2]
Non-financial assets					
Land	Level 2	180,000	Market comparables	Sale prices of comparable land Land size Long-term land appreciation rate	N/A
Buildings on freehold land	Level 2	610,443	Discounted cash flow	Price per square metre Market rate of interest	N/A
Other property, plant and equipment	Level 2	42,871	Depreciated replacement cost	Market prices of similar assets less depreciation	N/A

1. No change in valuation technique occurred during the period.

2. Significant unobservable inputs only. Not applicable for assets or liabilities in the Level 2 category.

	2014 $	2013 $

Note 6: Financial Assets

Note 6A: Cash and Cash Equivalents

Cash on hand or on deposit	**11,098,065**	12,260,782
Total cash and cash equivalents	**11,098,065**	12,260,782

Note 6B: Investments held to maturity

Investments held to maturity	**31,000,000**	27,000,000
Total Investments held to maturity	**31,000,000**	27,000,000

	2014 $	2013 $
Note 6C: Trade and Other Receivables		
Goods and services:		
Goods and services – related entities	**8,211**	–
Goods and services – external entities	**59,020**	768,007
Total receivables for goods and services	**67,231**	768,007
Department of Agriculture		
PIRD Act 1989 Contributions receivable	**3,502,865**	3,165,998
Industry levies receivable	**1,639,873**	840,670
Total receivables from government	**5,142,738**	4,006,668
Other receivables:		
GST receivable from the Australian Taxation Office	**419,884**	293,998
Interest	**622,796**	694,412
Total other receivables	**1,042,680**	988,410
Total trade and other receivables	**6,252,649**	5,763,085
Receivables are expected to be recovered in:		
No more than 12 months	**6,252,649**	5,763,085
Total trade and other receivables	**6,252,649**	5,763,085
Receivables are aged as follows:		
Not overdue	**6,250,274**	5,732,785
Overdue by:		
0 to 30 days	**1,000**	350
31 to 60 days	**–**	–
61 to 90 days	**–**	–
More than 90 days	**1,375**	29,950
Total receivables (gross)	**6,252,649**	5,763,085

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

	2014 $	2013 $

Note 7: Non-Financial Assets

Note 7A: Land and Buildings

Land:		
Land at fair value	**180,000**	180,000
Buildings on freehold land:		
Fair value	**639,887**	527,912
Accumulated depreciation	**(29,444)**	(13,500)
Total buildings on freehold land	**610,443**	514,412
Total land and buildings	**790,443**	694,412

No indicators of impairment were found for land and buildings.
No land or buildings were expected to be sold or disposed of within the next 12 months.

Note 7B: Other Property, Plant and Equipment

Office equipment:		
Fair value	**60,052**	60,052
Accumulated depreciation	**(39,907)**	(29,170)
Total office equipment	**20,145**	30,882
Computer equipment:		
Fair value	**82,158**	78,027
Accumulated depreciation	**(63,651)**	(48,298)
Total computer equipment	**18,507**	29,729
Fittings and furniture:		
Fair value	**13,596**	12,598
Accumulated depreciation	**(9,377)**	(8,027)
Total fittings and furniture	**4,219**	4,571
Total other property, plant and equipment	**42,871**	65,182

No indicators of impairment were found for property, plant and equipment.
No property, plant or equipment is expected to be sold or disposed of within the next 12 months.

Revaluations of non-financial assets

All revaluations were conducted in accordance with the revaluation policy stated at Note 1. On 30th June 2012, an independent valuer conducted the revaluation.

All increments were transferred to the asset revaluation surplus by asset class and included in the equity section of the balance sheet.

Note 7C: Reconciliation of the Opening and Closing Balances of Property, Plant and Equipment (2013–14)

	Land $	Buildings $	Total land and buildings $	Office equipment $	Computer equipment $	Fittings & furniture $	Total other property, plant & equipment $	Total $
As at 1 July 2013								
Gross book value	**180,000**	**527,912**	**707,912**	**60,052**	**78,027**	**12,598**	**150,677**	**858,589**
Accumulated depreciation and impairment		**(13,500)**	**(13,500)**	**(29,170)**	**(48,298)**	**(8,027)**	**(85,495)**	**(98,995)**
Net book value 1 July 2013	**180,000**	**514,412**	**694,412**	**30,882**	**29,729**	**4,571**	**65,182**	**759,594**
Additions	**–**	**111,975**	**111,975**	**–**	**4,131**	**998**	**5,129**	**117,104**
Revaluations recognised in other comprehensive income	**–**	**–**	**–**				**–**	**–**
Depreciation expense		**(15,944)**	**(15,944)**	**(10,737)**	**(15,353)**	**(1,350)**	**(27,440)**	**(43,384)**
Reclassification:		**–**	**–**	**–**	**–**	**–**	**–**	**–**
Disposals:								
Gross book value	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**
Accumulated depreciation and impairment	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**
Net book value 30 June 2014	**180,000**	**610,443**	**790,443**	**20,145**	**18,507**	**4,219**	**42,871**	**833,314**
Net book value as of 30 June 2014 represented by:								
Gross book value	**180,000**	**639,887**	**819,887**	**60,052**	**82,158**	**13,596**	**155,806**	**975,693**
Accumulated depreciation and impairment		**(29,444)**	**(29,444)**	**(39,907)**	**(63,651)**	**(9,377)**	**(112,935)**	**(142,379)**
	180,000	**610,443**	**790,443**	**20,145**	**18,507**	**4,219**	**42,871**	**833,314**

Note 7C: Reconciliation of the Opening and Closing Balances of Property, Plant and Equipment (2013–14)

	Land $	Buildings $	Total land and buildings $	Office equipment $	Computer equipment $	Fittings & furniture $	Total other property, plant & equipment $	Total $
As at 1 July 2012								
Gross book value	180,000	510,000	690,000	56,812	75,089	12,598	144,499	834,499
Accumulated depreciation and impairment		–	–	(18,945)	(33,490)	(6,766)	(59,201)	(59,201)
Net book value 1 July 2012	180,000	510,000	690,000	37,867	41,599	5,832	85,298	775,298
Additions	–	17,912	17,912	3,990	2,939	–	6,929	24,841
Revaluations recognised in other comprehensive income	–	–	–				–	–
Depreciation expense		(13,500)	(13,500)	(10,238)	(14,809)	(1,261)	(26,308)	(39,808)
Reclassification:		–	–	–	–	–	–	–
Disposals:								
Gross book value	–	–	–	(750)	–	–	(750)	(750)
Accumulated depreciation and impairment	–	–	–	13	–	–	13	13
Net book value 30 June 2013	180,000	514,412	694,412	30,882	29,729	4,571	65,182	759,594
Net book value as of 30 June 2013 represented by:								
Gross book value	180,000	527,912	707,912	60,052	78,027	12,598	150,677	858,589
Accumulated depreciation and impairment		(13,500)	(13,500)	(29,170)	(48,298)	(8,027)	(85,495)	(98,995)
	180,000	514,412	694,412	30,882	29,729	4,571	65,182	759,594

	2014 $	2013 $

Note 7D: Intangibles

Computer software:		
Purchased & internally developed software	**237,901**	143,832
Accumulated amortisation	**(145,619)**	(126,247)
Total intangibles	**92,282**	17,585

No indicators of impairment were found for intangible assets.
No intangibles are expected to be sold or disposed of within the next 12 months.

Note 7E: Reconciliation of the Opening and Closing Balances of Intangibles

	Computer software purchased	Computer software purchased
As at 1 July		
Gross book value	**143,832**	122,465
Accumulated amortisation and impairment	**(126,247)**	(118,590)
Net book value 1 July	**17,585**	3,875
Additions	**94,069**	21,367
Amortisation	**(19,372)**	(7,657)
Net book value 30 June	**92,282**	17,585
Net book value as of 30 June represented by:		
Gross book value	**237,901**	143,832
Accumulated amortisation and impairment	**(145,619)**	(126,247)
	92,282	17,585

Note 7F: Other Non-Financial Assets

Prepayments	**4,205**	–
Total other non-financial assets	**4,205**	–
Total other non-financial assets – are expected to be recovered in:		
No more than 12 months	**4,205**	–
More than 12 months	**–**	–
Total other non-financial assets	**4,205**	–

Non-financial assets are expected to be recovered in no more than 12 months.
No indicators of impairment were found for other non-financial assets.

	2014 $	2013 $

Note 8: Payables

Note 8A: Suppliers

Trade creditors and accruals	**96,137**	161,613
Total supplier payables	**96,137**	161,613
Supplier payables expected to be settled within 12 months:		
Related entities	**1,840**	3,289
External entities	**94,297**	158,324
Total	**96,137**	161,613

Settlement was usually made within 30 days.

Note 8B: Grants, Subsidies and Personal Benefits

Grants:		
Public sector:		
Australian Government entities (related entities)	**484,172**	1,333,484
State and Territory Governments	**1,774,454**	2,568,362
Universities and colleges	**973,776**	1,079,852
Other research organisations	**200,997**	540,962
Private sector:		
Other	**853,335**	747,534
Total grants	**4,286,734**	6,270,194
Total grants, subsidies and personal benefits are expected to be settled in:		
No more than 12 months	**4,286,734**	6,270,194
More than 12 months	**–**	–
Total grants, subsidies and personal benefits	**4,286,734**	6,270,194

Settlement was usually made according to the terms and conditions of each grant. This was usually within 30 days of performance or eligibility.

	2014 $	2013 $
Note 8C: Other Payables		
Salaries and wages	**39,900**	39,556
Superannuation	**4,466**	4,491
PAYG & FBT	**48,989**	45,170
State payroll tax	**6,051**	6,658
Other	**–**	115
Total other payables	**99,406**	95,990
Total other payables are expected to be settled in:		
No more than 12 months	**99,406**	95,990
More than 12 months	**–**	–
Total other payables	**99,406**	95,990

Note 9: Provisions

Note 9A: Employee Provisions

Leave	**310,337**	341,754
Total employee provisions	**310,337**	341,754
Employee provisions are expected to be settled in:		
No more than 12 months	**179,712**	218,701
More than 12 months	**130,625**	123,053
Total employee provisions	**310,337**	341,754

	2014 $	2013 $

Note 10: Cash Flow Reconciliation

Reconciliation of cash and cash equivalents as per Statement of Financial Position to Cash Flow Statement

Cash and cash equivalents as per:		
Cash flow statement	**11,098,065**	12,260,782
Statement of financial position	**11,098,065**	12,260,782
Difference	–	–
Reconciliation of net cost of services to net cash from operating activities:		
Net cost of services	**(16,659,620)**	(11,709,651)
Add revenue from Government	**22,216,026**	23,323,884
Adjustments for non-cash items		
Depreciation / amortisation	**62,756**	47,464
Net write down of non-financial assets	–	737
Movements in assets / liabilities		
Assets		
(Increase) / decrease in net receivables	**(489,564)**	(1,281,573)
(Increase) / decrease in prepayments	**(4,205)**	7,965
Liabilities		
Increase / (decrease) in employee provisions	**(31,417)**	111,531
Increase / (decrease) in employee withholdings	**3,779**	14,559
Increase / (decrease) in supplier payables	**(65,473)**	70,785
Increase / (decrease) in other payable	**(365)**	21,969
Increase / (decrease) in grants payable	**(1,983,462)**	2,585,450
Increase / (decrease) in novation payable	–	(91,196)
Net cash from operating activities	**3,048,455**	13,101,924

	2014 No.	2013 No.

Note 11: Contingent Assets and Liabilities

The Corporation had no contingent assets and liabilities in the current or prior period.

Significant Remote Contingencies

Commonwealth Contributions

The Cotton Research and Development Corporation was established under the *Primary Industries Research and Development Act, 1989*. This Act states the Commonwealth government will make payments to the Corporation equal to one half of the Corporation's annual expenditure. However, government matching payments must not exceed industry levy receipts nor exceed 0.5% of the amount that the Minister determines to be the gross value of production (GVP) for that financial year. In 2013–14 Commonwealth contributions were capped to levy receipts of $11,238,950, leaving a remote contingent receivable of $4.581m for unmatched R&D expenditure.

Note 12: Directors Remuneration

The number of non-executive directors of the entity included in these figures are shown below in the relevant remuneration bands:		
$0 to $29,999	**6**	6
$30,000 to $59,999	**1**	1
Total	**7**	7
Total remuneration received or due and receivable by directors of the entity	**$172,399**	$179,796

The number of non-executive directors includes directors that ceased to be directors or were appointed as directors during the year.

Remuneration of executive directors is included in Note 14: Senior Executive Remuneration.

Note 13: Related Party Disclosures

Grants were made to a number of research institutions which are director related entities. They were approved under the normal terms and conditions of the Corporation. Following full disclosure of their relevant interests, the relevant Directors may or may not take part in discussion and abstain from decisions of the Board.

Grants to Director-Related Entities	2014 $	2013 $
Primary Industries Education Foundation	–	25,000
Plant Biosecurity CRC	**3,027**	–
Grants to director-related entities	**3,027**	25,000

	2014 $	2013 $

Note 14: Senior Executive Remuneration

Note 14A: Senior Executive Remuneration Expense for the Reporting Period

Short-term employee benefits:		
Salary	**515,475**	500,077
Annual leave accrued	**45,231**	44,311
Other[1]	**21,118**	18,550
Total short-term employee benefits	**581,824**	562,938
Post-employment benefits:		
Superannuation	**63,375**	59,437
Total post-employment benefits	**63,375**	59,437
Other long-term benefits:		
Long-service leave	**(56,308)**	7,521
Total other long-term benefits	**(56,308)**	7,521
Total	**588,891**	629,896

Notes:

1. *Other includes motor vehicle benefits, other benefits and fringe benefit tax on those benefits.*
2. *Note 14A was prepared on an accrual basis.*
3. *Note 14A excludes acting arrangements and part-year service where remuneration expensed for a senior executive was less than $195,000.*

Note 14B: Average Annual Reportable Remuneration Paid to Substantive Senior Executives during the Reporting Period

	as at 30 June 2014				
	Fixed elements				
Average annual reportable remuneration[1]	**Senior Executives No.**	**Reportable salary[2] $**	**Contributed superannuation[3] $**	**Reportable allowances[4] $**	**Total remuneration $**
Total remuneration (including part-time arrangements):					
less than $195,000	4	135,362	15,877	–	151,239
$255,000 to $284,999	1	236,062	20,851	–	256,913
Total	**5**				

	as at 30 June 2013				
	Fixed elements				
Average annual reportable remuneration[1]	Senior Executives No.	Reportable salary[2] $	Contributed superannuation[3] $	Reportable allowances[4] $	Total remuneration $
Total remuneration (including part-time arrangements):					
less than $195,000	3	125,007	15,285	–	140,292
$225,000 to $254,999	1	229,088	19,809	–	248,897
Total	4				

Notes:

1. *This table reports substantive senior executives who received remuneration during the reporting period. Each row is an averaged figure based on headcount for individuals in the band.*
2. *'Reportable salary' includes the following:*
   a) gross payments (the Corporation currently does not provide bonuses); and
   b) reportable fringe benefits (at the net amount prior to 'grossing up' to account for tax benefits).
3. *The 'contributed superannuation' amount is the average cost to the entity for the provision of superannuation benefits to substantive senior executives in that reportable remuneration band during the reporting period.*
4. *'Reportable allowances' are the average actual allowances paid as per the 'total allowances' line on individuals' payment summaries.*
5. *Various salary sacrifice arrangements were available to senior executives including superannuation, motor vehicle and expense payment fringe benefits. Salary sacrifice benefits are reported in the 'reportable salary' column, excluding salary sacrificed superannuation, which is reported in the 'contributed superannuation' column.*
6. *For the purposes of this note, the Authority has defined senior executives as those employees who report directly to the Board and Executive Director. These employees are the only employees considered to have the capacity and responsibility for decision making that can have a significant and direct impact on the strategic direction and financial performance of the group. The Executive Director and General Managers of the Corporation are classified as senior executives and are disclosed in sections A and B of this note.*

Note 14C: Average Annual Reportable Remuneration Paid to Other Highly Paid Staff during the Reporting Period

The Corporation did not employ any highly paid staff.

	2014	2013

Note 15: Average Staffing Levels

The average staffing levels for the Corporation during the year were:	**13.0**	12.6

	2014 $	2013 $

Note 16: Remuneration of Auditors

Financial statement audit services were provided to the Corporation by the Auditor General.

Fair value of the services provided:	**16,500**	13,500
Total	**16,500**	13,500

No other services were provided by the auditors of the financial statements.

Note 17: Financial Instruments

Note 17A: Categories of Financial Instruments

Financial Assets		
Loans and receivables:		
Cash and cash equivalents	**11,098,065**	12,260,782
Trade and other receivables	**67,231**	768,007
Carrying amount of financial assets	**11,165,296**	13,028,789
Financial Liabilities		
At amortised cost:		
Grants payable	**4,286,734**	6,270,194
Other payables	**96,137**	161,613
Carrying amount of financial liabilities	**4,382,871**	6,431,807

Note 17B: Net Income and Expense from Financial Assets

Loans and receivables		
Interest revenue	**1,778,946**	1,725,869
Net gain from financial assets	**1,778,946**	1,725,869

Note 17C: Fair Value of Financial Instruments

	Carrying amount 2014 $	Fair value 2014 $	Carrying amount 2013 $	Fair value 2013 $
Financial Assets				
Cash and cash equivalents	**11,098,065**	**11,098,065**	12,260,782	12,260,782
Trade and other receivables	**67,231**	**67,231**	768,007	768,007
Total	**11,165,296**	**11,165,296**	13,028,789	13,028,789
Financial Liabilities				
Grants payable	**4,286,734**	**4,286,734**	6,270,194	6,270,194
Other payables	**96,137**	**96,137**	161,613	161,613
Total	**4,382,871**	**4,382,871**	6,431,807	6,431,807

The Corporation's financial assets and financial liabilities comprise cash and deposits held at banks, current receivables and current liabilities. It is held that their carrying amount and fair value are the same.

Note 17D: Credit Risk

The Corporation's maximum exposure to credit risk is the risk that arises from the potential default of a debtor. This amount is equal to the total amount of trade receivables (2014: $67,231 and 2013: $768,007). The Corporation has assessed that there is no risk of default and has not recognised an impairment allowance account.

The Corporation manages its credit risk through monthly reviews by management of the Corporation's investments and the use of policies and procedures that guide employees in managing debtors.

The Corporation holds no collateral to mitigate against credit risk.

Credit quality of financial instruments not past due or individually determined as impaired

	Not past due nor impaired 2014 $	Not past due nor impaired 2013 $	Past due or impaired 2014 $	Past due or impaired 2013 $
Cash and cash equivalents	**11,098,065**	12,260,782	**–**	–
Trade and other receivables	**64,856**	737,707	**2,375**	30,300
Total	**11,162,921**	12,998,489	**2,375**	30,300

Ageing of financial assets that were past due but not impaired for 2014

	0 to 30 days $	31 to 60 days $	61 to 90 days $	90+ days $	Total $
Trade and other receivables	**1,000**	–	–	**1,375**	**2,375**
Total	**1,000**	–	–	**1,375**	**2,375**

Ageing of financial assets that were past due but not impaired for 2013

	0 to 30 days $	31 to 60 days $	61 to 90 days $	90+ days $	Total $
Trade and other receivables	350	–	–	29,950	30,300
Total	350	–	–	29,950	30,300

The following list of assets have been individually assessed as impaired

The Corporation's receivables overdue are not impaired as the majority relate to grant refunds due from government entities and the grants have not been finalised.

Note 17E: Liquidity Risk

The Corporation's financial liabilities are payables. The exposure to liquidity risk is based on the notion that the Corporation will encounter difficulty in meeting its obligations associated with financial liabilities. This is highly unlikely due to the internal policies and procedures put in place to ensure there are appropriate resources to meet its financial obligations.

Maturities for non-derivative financial liabilities 2014

	On demand $	within 1 year $	1 to 5 years $	> 5 years $	Total $
Grants payable	–	**4,286,734**	–	–	**4,286,734**
Other payables	–	**96,137**	–	–	**96,137**
Total	–	**4,382,871**	–	–	**4,382,871**

Maturities for non-derivative financial liabilities 2013

	On demand $	within 1 year $	1 to 5 years $	> 5 years $	Total $
Grants payable	–	6,270,194	–	–	6,270,194
Other payables	–	161,613	–	–	161,613
Total	–	6,431,807	–	–	6,431,807

The Corporation manages its finances to ensure it has adequate funds to meet payments as they fall due. In addition, the Corporation has policies in place to ensure timely payments are made when due and has no past experience of default.

The Corporation has no derivative financial liabilities in both the current and prior year.

Note 17F: Market Risk

The Corporation holds basic financial instruments that do not expose it to certain market risks. The Corporation is not exposed to 'currency risk' or 'other price risk'.

Interest Rate Risk

The only interest-bearing items on the statement of financial position are the 'Cash and cash equivalents'. Cash at bank has variable interest rates and term deposits have fixed interest. Interest will fluctuate due to changes in the market interest rate. The interest rate risk does not have any impact on the fair value of the 'Cash and cash equivalents'.

Interest rates for cash held at banks in operating accounts and at call accounts ranged from 0% to 3.0% as at 30th June 2014. Term deposit fixed interest rates during the year decreased from a high of 5.10% down to 3.74%. Interest rates on term deposits held at the end of the year ranges from 3.80% to 4.62%. Although Australian interest rates are at record lows it is expected there will continue to be downward pressure on interest rates due to volatility in the world economy continuing to effect the Australian economy. The sensitivity analysis has used 60 basis points as a reasonable representation of the continued volatility in the economy.

Sensitivity analysis of the risk that the entity is exposed to for 2014

	Risk variable	Change in risk variable %	Effect on	
			Profit and loss $	Equity $
Interest rate risk	**Interest**	**+0.60%**	**291,939**	**291,939**
Interest rate risk	**Interest**	**-0.60%**	**(291,939)**	**(291,939)**

Sensitivity analysis of the risk that the entity is exposed to for 2013

	Risk variable	Change in risk variable %	Effect on	
			Profit and loss $	Equity $
Interest rate risk	Interest	+1.20%	465,519	465,519
Interest rate risk	Interest	-1.20%	(465,519)	(465,519)

Note 18: Reporting of Outcomes

The Corporation is structured to meet one outcome:

"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."

Note 18A: Net Cost of Outcome Delivery

	Outcome 1	
	2014 $	2013 $
Expenses	**21,922,966**	19,301,446
Income from non-government sector		
Industry Contributions	**10,977,077**	11,801,096
Royalties	**1,830,006**	3,971,210
Interest	**1,778,946**	1,725,869
Other	**1,654,394**	1,894,716
Total	**16,240,423**	19,392,891
Other own-source income	**–**	–
Net cost/(contribution) of outcome delivery	**5,682,543**	(91,445)

Section 7
Appendices

CRDC-supported PhD student Kate Marshall, NSW DPI, examines a helicoverpa moth at the Australian Cotton Research Institute, Narrabri during CRDC's PhD tour. Kate is researching molecular genetic methods to detect neonicotinoid resistance in cotton aphids. Photo courtesy Ruth Redfern.

APPENDIX 1: Measuring Performance

Through focusing on CRDC's five programs: farmers, customers, industry, people and performance – CRDC will strive to achieve its stated 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 continues to monitor, evaluate and report on the achievement of all program key performance indicators by submitting Portfolio Budget Statements (PBS) and annual reporting.

Portfolio Budget Statement performance indicators

The following deliverables and Key Performance Indicators (KPIs) formed part of CRDC's Portfolio Budget Statement for 2013–14.

Deliverables 2013–14

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

Key Performance Indicators

KPI	2013–14	Measure of Success
Industry productivity growth per hectare per annum.	3 per cent	***In progress.*** Average production per hectare has continued to increase annually by 2.5 to 3 percent (averaged over the past five years).
Industry reports to customer needs for sustainability indicators.	95 per cent	***In progress.*** Forty-five recognised sustainability indicators have been developed for the cotton industry under the key aspects of economic, environment and social. The industry's first ever sustainability report is currently under development and due for public release in late 2014.
Coverage of Best Management Practice systems across Australian cotton industry.	65 per cent	***In progress.*** CRDC and Cotton Australia are partners in the Best Management Practice program *my*BMP. The *my*BMP program comprises of 11 modules which cover areas of production and farm business operations. Adoption of *my*BMP is supported by linking with the industry's joint extension program CottonInfo.
*Agriculture Senior Officials Committee's (AgSOC) cotton and cross-sectoral Research Development and Extension (RD&E) strategies supported.	Report	***In progress.*** CRDC continues to support cross-sectoral priorities and strategies such as climate change, soils, plant biosecurity and water use through the delivery of the Cotton Sector RD&E Strategy and CRDC's Strategic R&D Plan.

** During 2013–2014 the Primary Industries Standing Committee (PISC) was replaced by the Agriculture Senior Officials Committee (AgSOC).*

APPENDIX 1: Measuring Performance *(continued)*

CRDC Strategic R&D Plan progress during 2013-14

Program One: Farmers		
Will be achieved by:	**Measure of success**	**Progress**
Theme: Successful Crop Protection		
Outcome: Cotton Crops protected from pest, weed and disease threats		
Monitoring and investigating the ecological behaviours and responses of cotton pest, weeds and diseases.	World-class science foundations for managing ecological adaptations in cotton insect pests, weeds and diseases.	***In progress.*** Understanding the ecology of cotton pests (insect, weed and pathogens) is the focus of 10 projects, including three PhDs and two Post Doctorial positions. This information ensures a strong scientific basis for development of best practice and is the foundation for integrated pest, weed and disease management.
Testing practices that deliver improved management of insect pests, weeds and diseases.	85% of farmers adopting improved practices that reduce the reliance on pesticide inputs.	***In progress.*** Current investments are aimed at developing and testing new and novel products and practices to improve insect pest, weed and disease management. New thresholds and tactics have been developed for a number of emerging insect pests, weeds and diseases. A number of innovative crop monitoring technologies and bio-pesticides are under development and are likely to significantly change the reliance on pesticides inputs. High adoption of insect best practice has seen total insecticide active applied (g/ha) continue to decrease, with a 90 per cent reduction over the last decade.
Improving capacity, knowledge and adoption of techniques to successfully protect the cotton crop.	50% of farmers adopting improved practices that reduce the incidence of insect pests, weeds and diseases affecting cotton on their farm.	***In progress.*** The ecology and best practice recommendations developed by research are packaged and communicated to industry through investment in the CottonInfo partnership.

Program One: Farmers		
Will be achieved by:	**Measure of success**	**Progress**
Theme: Productive Resource Efficiencies		
Outcome: Inputs for cotton production are optimised		
Delivering benchmarks of on-farm resource use efficiencies.	Farmers are able to increase their productivity: ■ per hectare of land. ■ per unit of nitrogen fertiliser. ■ per ML of water. ■ per unit of CO_2 emitted.	***In progress.*** Two projects are specifically providing benchmarks of on-farm resource use efficiencies regarding water and energy use. The Australian cotton industry has used values of Gross Production Water Use Index (GPWUIfarm) to benchmark water use efficiency since 1988–89 and in the 2012-13 season, which saw record planting and full production, the GPWUI farm was 1.12 bales/ML. This is not significantly different from the past two surveys GPWUIfarm for 2006-07 and 2008-09 were 1.17 and 1.14 bales/ML respectively indicating the cotton industry is performing as water efficient in years of full production. Regarding energy, a Federal grant is being utilised to benchmark energy efficiency on farms, the results of which will be available in 2015.
Developing and proving decision systems and practices that deliver optimal resource efficiencies on cotton farms.	Farmers are able to increase their productivity: ■ per hectare of land. ■ per unit of nitrogen fertiliser. ■ per ML of water ■ per unit of CO_2 emitted.	***In progress.*** A number of projects continue to investigate nitrogen, in particular looking at developing a comprehensive understanding of the: ■ Nitrogen requirements of high-yielding cotton crops. ■ Nitrogen loss pathways associated with each stage of the cotton farming system. Research is also on-going into phosphorous and potassium nutrition, and managing carbon in a cotton farming system. The latter research has demonstrated the potential for a range of benefits by incorporating a corn rotation, such as: ■ Increased yield of cotton in the crop following corn. ■ Higher levels of soil carbon (especially at depth i.e. 60–120 cm). ■ Increased cotton root densities and rooting depth. ■ A decrease in black root rot infestation.

APPENDIX 1: Measuring Performance *(continued)*

Program One: Farmers		
Will be achieved by:	**Measure of success**	**Progress**
Developing new systems and tools to support farm decision making processes.	Farmers are able to increase their productivity: ■ per hectare of land. ■ per unit of nitrogen fertiliser. ■ per ML of water ■ per unit of CO_2 emitted.	***In progress.*** Current irrigation projects have led to advances in the optimisation and automation of irrigation applications. Remote sensing and satellite imagery can now be used as indicators of crop stress and spatial variability – and the industry is close to fully understanding how weather forecasts and canopy temperature sensors can be used to refine scheduling decisions. The development of a control system for variable rate irrigation application, and software that sequences irrigations and controls the communications between the system components, brings the industry close to smart automated furrow irrigation.
Improving capacity, knowledge and adoption of techniques to optimise resource uses.	Farmers are able to increase their productivity: ■ per hectare of land. ■ per unit of nitrogen fertiliser. ■ per ML of water. ■ per unit of CO_2 emitted.	***In progress.*** CRDC is supporting the enhancement of a crop carbon management tool. The tool allows farmers to better understand the source and extent of greenhouse gas emissions from their cotton farm, and how to reduce them by improving their farming efficiency.
Theme: Profitable Futures		
Outcome: Innovations in cotton production		
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.	Farmers are profitable: ■ On farm innovations and partnerships established to drive profitability. ■ Improving gross margins for Australian cotton systems.	***In progress.*** CRDC is developing a futures based program to ensure the industry has research underway to meet its needs for a 15-20 year horizon. The objective of the profitable futures theme is to increase cotton producer profitability through improved productivity and certainty of production. The targets for the profitable futures theme are: ■ Doubling input efficiency by 2029. ■ Reducing per hectare volatility of yield by half by 2029. ■ Reducing per bale volatility of quality grade by half by 2029. ■ By 2029 Australian cotton production is resilient to seasonal impacts and can consistently produce the world's best quality cotton in increasing quantity.

Program Two: Industry		
Will be achieved by:	**Measure of success**	**Progress**
Theme: Respected stewardship		
Outcome: Industry protects its production technologies and its biosecurity		
Monitoring for and investigating changes in pest and weed susceptibility to biotechnologies and crop protection products used by the cotton industry.	Industry is able to maintain access to, and the effectiveness of, biotechnologies and crop protection products.	***In progress.*** Current investments include monitoring for resistance to conventional insecticides/mitricides in aphids, mites, silverleaf whitefly and *Helicoverpa* spp, as well monitoring *Helicoverpa* spp for resistance to Cry1Ac, Cry2Ab and VIP proteins.
Exploring tactics and strategies that lower the risks of pesticides to the environment and resistance evolution in populations of key insect pests and weeds.	100% of farmers are aware of the underlying risks of trait and agricultural chemical resistance. 100% of insecticide use decisions are consistent with the Insecticide Resistance Management Strategy (IRMS). The cotton industry demonstrates pesticide management practices that lower the risks posed to the environment and the evolution of resistance in target insect pest and weed populations.	***In progress.*** There is a high level of awareness of the risks of trait and agricultural chemical resistance. The 2013 Growing Practices Survey found 83 per cent of growers agreed that all their insecticide use decisions were consistent with the IRMS. Herbicide resistance has been identified as a significant emerging issue. Investments have been made in identifying practices to reduce the risk of herbicide resistance including development of a herbicide resistance management strategy.
Developing and supporting the industry's capacity to effectively steward key technologies and products.	The cotton industry has the necessary science to provide informed input into the development of resistance management plans for biotech traits.	***In progress.*** The range of research investment into determining an effective Resistance Management Plan (RMP) for third generation transgenic cotton includes: ■ Efficacy and expression characteristics of the toxins contained in Bollgard III®. ■ Reviewing the effectiveness of key tactics in the current RMP, *Helicoverpa* spp ecology. ■ Examining resistance levels and characteristics. This science has been used by the Transgenic and Insect Management Strategy (TIMS) *Bt* Technical Panel, to provide advice to industry on the development of the RMP for the third generation *Bt* technology.

APPENDIX 1: Measuring Performance *(continued)*

Program Two: Industry		
Will be achieved by:	**Measure of success**	**Progress**
Supporting the industry's preparedness and ability to deal with biosecurity threats.	Industry is capable of managing its biosecurity responsibilities: ■ The cotton industry is able to meet its biosecurity obligations. ■ The cotton industry is prepared to effectively respond to biosecurity incursions.	***In progress.*** Investment in biosecurity research and diagnostic capacity has resulted in surveillance and diagnostic capacity within existing CRDC funded disease projects for each of the six priority disease threats. Biosecurity awareness is promoted through industry publications and through the CottonInfo team.
Theme: Responsible Landscape Management		
Outcome: Industry leads in managing natural assets		
Defining the values and drivers relating to the management of natural landscapes and systems in cotton growing regions.	Industry participation in the collective management of natural landscapes: ■ Regional delivery partnership for every major cotton growing region.	***In progress.*** A project titled Resilience assessment of the Australian cotton industry at multiple scales has commenced. This project proposes using a resilience assessment approach to assist the cotton industry to develop a whole-of-system perspective that incorporates the economic, social and ecological dimensions of the industry, how these interact, influence each other and change over time. Of particular importance is how the industry copes in the face of major expected and unexpected future changes and events (or shocks) such as droughts or market fluctuations.
Recording and demonstrating improved environmental performance of the cotton industry.	Industry contributes to the improvement of landscape systems knowledge and science: ■ A comprehensive database documenting the extent and condition of the natural assets the industry utilises and manages.	***In progress.*** The first Australian Grown Cotton Sustainability Report has compiled all data documenting the progress and status of a set of environmental indicators shortlisted for and by the cotton industry. It has also identified gaps for further investigation.

Program Two: Industry		
Will be achieved by:	**Measure of success**	**Progress**
Identifying and proving integrated management strategies which deliver environmental and productivity gains.	Recognition by national and global initiatives for biodiversity management.	***In progress.*** The current investments underway will provide knowledge to use trees to arrest lateral saline water movement, boost the carbon footprint of cotton farms, and keep pest thresholds lower for longer. A NRM Technical Specialist will deliver these innovative management strategies through *my*BMP and the CottonInfo platforms.
Researching the connectivity between cotton farms and natural systems in the landscape.	One million hectares of floodplain vegetation managed under best practice.	***In progress.*** The current investments provide knowledge for key environmental assets in cotton landscapes – riparian vegetation, deep drainage, groundwater and ecosystem services.
Supporting initiatives and partnerships to improve the knowledge and capacity to manage natural landscapes and systems in cotton regions.	Two national based science based collaborations for the industry to inform surface and groundwater management.	***In progress.*** Science partnerships remain a work in progress as research and NRM funding programs are uncertain at a state and national level.
Theme: Sustainable Futures		
Outcome: An industry achieving its vision		
Scoping and investigating critical threats and opportunities which may influence the long term sustainability of the Australian cotton industry.	Industry is capable of leading and adapting to change.	***In progress.*** CRDC is developing a futures based program to ensure the industry has research underway to meet its needs for a 15-20 year horizon. The objective of the sustainable futures theme is to achieve an increasingly resilient and responsible cotton industry. The targets for the sustainable theme program are: ■ Cotton industry is minimally reliant on irrigation for production by 2029. ■ Australian Cotton Industry is carbon neutral by 2029. ■ Industry participation is more inclusive and diverse by 2018. ■ Industry collaborates on strategic issues in more respectful, open and creative ways by 2018. ■ Measured performance of the industry drives continuous improvement by 2018. ■ Every bale of cotton is traceable back to origin by 2018.
Supporting Innovative approaches to solve traditional industry issues and drive future sustainability.	Innovations and partnerships established to drive cotton industry sustainability.	

APPENDIX 1: Measuring Performance *(continued)*

Program Three: Customers		
Will be achieved by:	**Measure of success**	**Progress**
Strategic theme: Assured Cotton		
Outcome: The integrity and qualities of Australian cotton set global benchmarks for customers		
Improving Australian fibre quality testing standards and procedures and the capacity to measure and manage contamination.	Australia has the best ranking for non-contamination in The International Textile Manufacturers Federation (TMF) survey.	***In progress.*** Two projects have been initiated to further improve the non-contamination and quality status of Australian cotton, looking at minimising plastic contamination and improving moisture management in the round-module harvester system. Work investigating how to best measure and manage fibre elongation is on-going.
Supporting the development and implementation of post farm gate BMP's.	Customers recognise and use Australia's BMP standards as their guarantee of quality assurance.	***In progress.*** CRDC continues to support the training of cotton ginners and the investigation of how farm management and ginning practices influence fibre quality. The *my*BMP program has been recognised by the Better Cotton Initiative so certified *my*BMP cotton can be sold as Better Cotton.
Developing and implementing a standardised reporting system for Australian cotton product quality and traceability.	Australia uses standardised reporting systems for product quality and traceability for farmers industry and customers.	***In progress.*** A project has been initiated to determine whether the geographic origin of cotton lint can be objectively identified, and terms of reference to investigate options for enhancing the retrospective traceability of cotton have been developed.
Benchmarking Australian cotton against key international programs for product stewardship and sustainability.	Australia can respond to customer needs for reporting against sustainability indicators.	***In progress.*** Sustainability indicators for Australian cotton farming have been developed, which were informed by international initiatives, including the Better Cotton Initiative and the International Cotton Advisory Committee's Expert Panel on the Social, Economic and Environmental impact of cotton.

Program Three: Customers		
Will be achieved by:	**Measure of success**	**Progress**
Theme: Differentiated Products		
Outcome: Customers recognise the differentiated value of Australian cotton products		
Identifying opportunities for improvements in fibre quality and cotton products.	Customers value the qualities of Australian cotton.	***In progress.*** Collaborations have been established with six spinning mills to test CottonSpec, and with eight mills (under the Premium Cotton Initiative) to produce high quality yarns and fabrics from Australian cotton.
Demonstrating the value of different fibre classes and defining fibre quality parameters that secure a premium market.	New fibre classification systems established.	***In progress.*** A project investigating novel spinning technologies to produce fine and high-quality yarns from Australian cotton has been initiated. Research has demonstrated that Australian Long Staple cotton is a viable replacement for a proportion of extra-long staple yarn in high quality fabrics.
Developing customer based partnerships for the development of high value and novel products, which differentiate Australian cotton.	Partnerships established to demonstrate the potential for differentiating Australian cotton.	***In progress.*** A collaborative project with the integrated spinning mill Esquel Limited is developing novel cotton/wool fabrics.
Theme: Competitive Futures		
Outcome: The demand for Australian cotton products is positively transformed		
Investigating existing and future markets for Australian cotton and communicate these findings to the Australian cotton industry.	Customers continue to demand Australian cotton products: ■ Provide the Australian cotton industry with knowledge of fabric innovations and future market opportunities.	***In progress.*** CRDC is developing a futures based program to ensure the industry has research underway to meet its needs for a 15-20 year horizon. The objective of the competitive futures theme is to capture increased value through supply chain transformation and development of new products and markets. The targets for the competitive futures theme are: ■ Reduce the length and complexity of the supply chain to add $1 billion of value to the Australian cotton industry by 2029. ■ Explore, identify and realise new end uses of cotton to add $2 billion of value to the Australian cotton industry by 2029. ■ Develop systems and capability to extract value for the Australian cotton industry from its information assets by 2018.

APPENDIX 1: Measuring Performance *(continued)*

Program Three: Customers		
Will be achieved by:	**Measure of success**	**Progress**
Facilitating the development of new technologies and systems to improve the competitiveness of Australian cotton.	Development of alternative and high value cotton products.	***In progress.*** A number of projects have been initiated that are aiming to develop new technologies to add value to cotton products, including: new finishes for anti-wetting, self-sterilising cotton fabrics, and ever-dry self-cooling cotton fabrics.
Program Four: People		
Will be achieved by:	**Measure of success**	**Progress**
Theme: Workforce Capacity		
Outcome: A skilled, educated and progressive industry workforce		
Investigating effective strategies for attracting, developing and retaining people in cotton.	Opportunities for workforce development are demanded by industry.	***In progress.*** CRDC has three investment projects to support this objective: One research project with University of Melbourne and two PhD projects with University of Southern Queensland. Collectively these projects are contributing to the development of a whole of industry workforce development strategy.
Supporting initiatives which lead to the continuous improvement of human resource management including on-farm Workplace Health and Safety.	A 10% reduction in cotton farm related injuries by 2018.	***In progress.*** CRDC currently has two investment projects aimed at addressing on farm health and safety with University of Sydney and Australian Centre for Agricultural Health and Safety. These projects have delivered a profile of incidents occurring on cotton farms and are developing campaigns to increase awareness and tactics to address specific incidents (such as roll over protection for Quad bikes). CRDC has co-invested with other RDC's in the People in Ag program, as well as in the *myBMP* Human Resource Management (HRM) module update, to ensure that growers are able to access best practice HRM information.
Understanding opportunities for greater Aboriginal participation in cotton and partnering with organisations to support the development of a culturally aware cotton workforce.	Opportunities for learning are demanded by industry.	***In progress.*** CRDC currently supports student workplace scholarships through the Aboriginal Employment Strategy and has provision for the support for an additional two placements.

Program Four: People		
Will be achieved by:	**Measure of success**	**Progress**
Supporting educational opportunities which increase the skills and knowledge of current workforces and will meet the needs of future workforces.	■ 50 Horizon scholars by 2018. ■ 30 completed summer scholarships by 2018. ■ 300 students having completed the UNE Cotton Course by 2018. ■ On-farm skill development ■ 50 Cotton farmers awarded a new Diploma in Human Resources by 2018.	***In progress.*** In 2013–14 CRDC supported an additional five summer and honours scholarships and five Horizon Scholarships through RIRDC – taking the total number of Horizon scholars to 13. CRDC also invested in 14 new PhD scholarships during the 2013–14 year, taking the total number of PhD scholars supported by CRDC to 26. An additional 68 students enrolled in the UNE Cotton production course supported by CRDC in 2013–14, while initiatives to support on-farm skill development and a new Human Resource Management Diploma continue to be developed.
Creating opportunities for, and supporting the development of leadership skills.	Participation in leadership programs.	***In progress.*** CRDC is a significant supporter of the Future Cotton Leaders program, which attracted 15 participants in 2013–14 with the course due to finish in December 2014. CRDC also supported a Nuffield scholar, two participants in the Australian Rural leadership Program and a participant in the Peter Cullen Trust.
Theme: Networks		
Outcome: An industry connected by dynamic networks		
Establishing and empowering creative forums and initiatives which build relationships.	■ Ten conferences and forums are coordinated which promote industry, cross sectoral and community knowledge sharing.	***In progress.*** CRDC supported the Inaugural Association of Cotton Scientists Research Conference and is an active participant in the cross RDC collaborative forums held biannually. Additionally CRDC supported numerous industry and technical forums throughout 2013–14.
Supporting and participating in collaborative cross sectoral RD&E initiatives.	■ CRDC is an active member of key industry and government initiatives. ■ Agriculture Senior Officials Committee (AgSOC) cotton and cross sectoral strategies.	***In progress.*** CRDC participated in activities that include joint national strategic R&D planning with AgSOC, particularly in relation to climate change, soils and water, human capacity, communication and impact evaluation. CRDC is a participant in the soils cross sectoral strategy with the Department of Agriculture and other RDC's.

APPENDIX 1: Measuring Performance *(continued)*

Program Four: People		
Will be achieved by:	**Measure of success**	**Progress**
Creating and facilitating opportunities for national and international RD&E exchange.	■ 50 Travel scholarships are supported by 2018.	***In progress.*** CRDC supported 11 travel scholarships and scientific exchanges during 2013–14. Additionally CRDC has established relations with its US counterpart (Cotton Incorporated) and is seeking to co-invest in projects that have significance at an international scale.
Facilitating engagement with stakeholders for prioritising and capturing advice on RD&E issues. Honing research expertise and the application of science from core research disciplines.	The cotton industry has effective collaborative structures for prioritising RD&E.	***In progress.*** CRDC supported the activities of the grower panels, which provide advice on RD&E. Additionally CRDC supports the activities of the Cotton Innovation Network, which is part of the AgSOC RD&E framework and was formed to help the cotton industry form strategy. The main purpose of the Cotton Innovation Network is to ensure the industry gets best value for its investment in research and establishes the best projects to achieve key outcomes.
Theme: Communication		
Outcome: Stakeholder information needs are met		
Providing information for demand driven communication strategies and performance reporting.	Communications systems for all CRDC stakeholders are meeting their communication needs.	***In progress.*** CRDC invested $3.4 million in the CottonInfo joint venture during 2013–14 to assist in the development and extension of research outcomes. As part of this investment, CRDC employed a new Communications Manager to develop systems to enhance accessibility and availability of key information for cotton growers and industry stakeholders.
Applying innovative communication methods.	The information and services derived from CRDC investments are in demand and the technologies adopted.	***In progress.*** CRDC is currently supporting the development of a new CottonInfo website to meet grower information demands. The website will also host interactive blogs, podcasts, and YouTube videos to enable growers to access information when they need it.

Program Five: Performance		
Will be achieved by:	**Measure of success**	**Progress**
Theme: Best Practice		
Outcome: World's best practice underpins the performance of the cotton industry		
Supporting a best practice framework as the primary integrated planning, risk management, benchmarking, knowledge development and delivery system.	The cotton industry's *my*BMP program is the primary resource for farmers accessing best practice knowledge and tools.	***In progress.*** CRDC invests in two projects to support the achievement of this objective. The investments have developed a centralised information repository for the storage of all extension materials and CRDC reports with appropriate metadata attached. The centralised repository is accessible through the CottonInfo, *my*BMP and CRDC websites, ensuring that a common set of materials is referenced and that material is stored in a single location. CRDC is also investing in a GIS referenced database.
Promoting best practices through the development and delivery Joint Venture.	■ An 80% coverage of best management practice systems across the Australian cotton industry. ■ The cotton industry's *my*BMP program is nationally recognised and integrated with other agricultural sector best management practice programs.	***In progress.*** As part of the CottonInfo joint venture, CRDC invests in a number of Technical Specialists whose role is to update *my*BMP modules, ensuring that the content of the modules reflects the latest in research findings and outcomes. CRDC recently commissioned a review of *my*BMP and a number of key recommendations have been developed to ensure that *my*BMP continues to meet industry needs. Coverage of *my*BMP is 40% of the cotton industry.
Theme: Monitoring and Evaluation		
Outcome: Industry and RD&E performance is captured		
Developing and implementing an internal M&E framework for evaluating CRDC's investment portfolio balance and its RD&E performance.	A rigorous monitoring and evaluation platform which measures and reports on the performance of CRDC's research and development investments.	***In progress.*** CRDC invested in the development of an M&E framework through Roth Rural. The framework, being developed on a program logic basis, is close to completion and will be implemented by CRDC in 2014–15.

APPENDIX 1: Measuring Performance *(continued)*

Program Five: Performance		
Will be achieved by:	**Measure of success**	**Progress**
Conducting annual surveys to capture practice change.	An industry performance monitoring and evaluation framework that is consistent with national and international standards.	***In progress.*** CRDC invests in two projects to assess industry performance: an annual grower practices survey and a survey conducted by Crop Consultants Australia. These two surveys provide details of current industry practice both from a grower perspective and from consultants who provide much of the advice. Key findings from the 2013 growers practices survey include: ■ 86% of respondents believe that cotton is profitable and consistently their crop of choice. ■ 32% indicated they will not be able to farm profitably into the future if recent trends in inputs costs and cotton prices continue. ■ Water and weather were the most frequently identified limitations to productivity and profitability, followed by farm characteristics, labour, costs, finance and varieties. The most mentioned drivers of productivity and profitability were yield and price followed by water, costs and nutrition.
Establishing a framework through which industry performance can be nationally and internationally reported.	Providing the industry with cotton sustainability indicators and supporting its capacity to report against these indicators.	***In progress.*** CRDC invested in a project to develop sustainability indicators enabling the industry to report its performance at a national and international level. Forty-five indicators have been developed for industry and the first industry sustainability report is due for release in the latter half of 2014.

Program Five: Performance		
Will be achieved by:	**Measure of success**	**Progress**
Theme: Reviews		
Outcome: Continuous improvement in industry and RD&E performance.		
Undertaking scientific discipline reviews of the industry's RD&E.	Independent reviews of the CRDC's research and development performance.	***Achieved.*** CRDC has undertaken a review of soil science in cotton.
Commissioning and participating in independent reviews of CRDC's RD&E and organisational performance.	Independent reviews of the CRDC's research and development performance.	***In progress.*** CRDC has invested in the development of an M&E framework to enable performance monitoring of the R&D portfolio.
Commissioning independent reviews of the social, environmental and economic performance of the industry.	Independent reviews of the social, environmental and economic performance of the industry's performance.	***In progress.*** CRDC, in conjunction with the peak industry body Cotton Australia, has developed 45 sustainability indicators to enable to the industry to benchmark and monitor its performance against these indicators.
Participating in cross sectoral RD&E impact evaluations and reviews.	Independent reviews of the social, environmental and economic performance of the industry's performance.	***In progress.*** CRDC, in conjunction with the peak industry body Cotton Australia, has developed 45 sustainability indicators to enable to the industry to benchmark and monitor its performance against these indicators.

APPENDIX 2: Australian Government Priorities

National Research Priorities

The National Research Priorities (NRPs) were issued by the Australian Government in 2002, and enhanced and refined in 2003. They were being phased out by 30 June 2014 and will be replaced by new priorities in 2015.

During 2013–14 CRDC did not fund projects related to National Research Priorities A2, A6, B3, D1, D2, D4 and D5.

Priority 1 – An Environmentally Sustainable Australia	**Priority 2 – Promoting and Maintaining Good Health**
A1: Water – a critical resource	B1: A healthy start to life
A2: Transforming existing industries	B2: Ageing well, ageing productively
A3: Overcoming soil loss, salinity and acidity	B3: Preventive healthcare
A4: Reducing and capturing emissions in transport and energy generation	B4: Strengthening Australia's social and economic fabric
A5: Sustainable use of Australia's biodiversity	
A6: Developing deep earth resources	
A7: Responding to climate change and variability	
Priority 3 – Frontier Technologies for Building and Transforming Australian Industries	**Priority 4 – Safeguarding Australia**
C1: Breakthrough science	D1: Critical infrastructure
C2: Frontier technologies	D2: Understanding our region and the world
C3: Advanced materials	D3: Protecting Australia from invasive diseases and pests
C4: Smart information use	D4: Protecting Australia from terrorism and crime
C5: Promoting an innovation culture and economy	D5: Transformational defence technologies

Rural Research and Development Priorities

The Australian Government issued five revised Rural Research and Development Priorities in May 2007, and all are addressed below. During 2013-14, CRDC achieved the following outputs related to applicable priorities.

Australian Government Priorities		CRDC RD&E outputs 2013–14
Rural R&D Priorities	**Applicable NRPs & goals**	
Productivity and Adding Value Improve the productivity and profitability of existing industries and support the development of viable new industries.	**B4**	■ Supported ongoing R&D cross-sector partnerships that addressed climate change, natural resource management, irrigation, farm health and safety, and encouraged the development of future scientists. ■ Consolidated new collaborations with GRDC addressing productivity and climate change preparedness in cotton and grains farming systems, including weeds. ■ Extended R&D to farmers of farming systems innovations for improved production efficiencies, with a focus on resource management (soils, water, fertiliser use, energy use and carbon), as well as environmental performance. ■ Undertook further testing and commercialisation of novel biopesticides for key cotton and grains pests. ■ Further enhanced the Best Management Practices program to integrate planning, risk management and benchmarking with development of skills, knowledge and adoption of research outputs throughout the value chain.
Supply Chain and Markets Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the whole supply chain, including to consumers.	**B4**	**Maintaining and improving international market access opportunities** ■ Further improved industry awareness and preparedness for major biosecurity threats, particularly silverleaf whitefly, Solenopsis mealybug, *Helicoverpa* spp., aphids, mites and viruses. ■ Continued to improve market intelligence and customer feedback on Australian cotton's competitive advantage. ■ Facilitated post-farm gate best practices for harvest, classing, ginning, transport, storage and handling. ■ Further enhanced the Best Management Practices system to integrate planning, risk management and benchmarking with development of skills, knowledge and adoption of research outputs throughout the value chain. ■ Continued to develop collaborative R&D partnerships with Australian cotton shippers and overseas cotton spinning mills and domestic brand owners to facilitate opportunities for using newly developed Australian premium quality cotton, innovations in objective fibre measurement and textile processing knowledge.

APPENDIX 2: Australian Government Priorities *(continued)*

Australian Government Priorities		CRDC RD&E outputs 2013–14
Rural R&D Priorities	**Applicable NRPs & goals**	
Natural Resource Management Support effective management of Australia's natural resources to ensure primary industries are both economically and environmentally sustainable.	**A1; A3; A5; A7**	■ Supported ongoing R&D cross-sector partnerships addressing climate change, natural resource management, irrigation, and biodiversity, and encouraged the development of future natural resources scientists. ■ Enhancement of the best management practices system (as above).
Climate Variability and Climate Change Build resilience to climate variability and adapt to and mitigate the effects of climate change.	**A7**	■ Undertook R&D investments in biosecurity, as well as cropping systems for improved nitrogen, energy and water use efficiencies that will increase farm businesses' climate change preparedness and reduce greenhouse gas emissions. ■ Extended farming systems innovations to farmers, facilitating production efficiencies with an emphasis on resource management (soils, water, fertiliser, energy and carbon) and environmental performance. ■ Consolidated new collaborations with GRDC addressing productivity and climate change preparedness in cotton and grains farming systems. ■ Continued to scope the potential impacts of climate change on textile production and markets. ■ Supported ongoing R&D cross-sector partnerships addressing climate change, natural resource management, irrigation and biodiversity, and encouraged the development of new scientists in these areas.
Biosecurity Protect Australia's community, primary industries and environment from biosecurity threats.	**D3**	■ Improved industry awareness and preparedness for major biosecurity threats, particularly silverleaf whitefly, Solenopsis mealybug, *Helicoverpa* spp., aphids, mites and viruses. ■ Further tested and commercialised novel biopesticides for key cotton and grain pests. ■ Continued surveying for the incidence of endemic diseases and pests, and surveillance for the presence of exotic diseases and pests, in all cotton growing districts. ■ Undertook R&D investments and activities that underpinned the stewardship of biotechnologies and chemicals. ■ Enhanced the Best Management Practices system to integrate planning, risk management and benchmarking, with development of skills, knowledge and adoption of research outputs for biosecurity.

Australian Government Priorities		CRDC RD&E outputs 2013–14
Rural R&D Priorities	**Applicable NRPs & goals**	
Supporting the Rural R&D Priorities		
Improve the skills to undertake research and apply its findings.	**C5**	**Workforce, skills, education** ■ Supported ongoing R&D cross-sector partnerships addressing climate change, irrigation and farm health and safety, and encouraged the development of future scientists in areas related to the cotton industry and its local environments. ■ Continued support for school and undergraduate level programs, the Undergraduate Studentship Program and other scholarship systems. Continued support for postgraduate scholarships (PhD and Masters) and leadership programs for a broadly based response to the cotton industry's future capacity. ■ Built on the 'Sustaining Rural Communities Initiative' established by CRDC and the Cotton CRC, with support for a conference in 2013 and supported and activated broader engagements based on that initiative. ■ Continued to support and enhance networks and collaborations with education providers to activate a supply chain approach for the industry's future R&D human capacity. ■ Further enhanced the Best Management Practices system to integrate planning, risk management and benchmarking, with development of skills, knowledge and adoption of research outputs. ■ Invested in projects and partnerships with Wincott (Women's Industry Network – cotton), the Aboriginal Employment Strategy, an Aboriginal traineeship pilot training scheme (through the Australian Government's Caring for our Country initiative) and the Future Cotton Leaders program.
Promote the development of new and existing technologies.	**C2; C4**	Further enhanced the Best Management Practices system, with new technologies; invested in new technologies such as the CottonInfo (cotton symptoms) app and the EnergyCalc Lite iPad application.

Composition of National Research Priorities attributed to each CRDC RD&E Program 2013–14 ($'000)

National Research Priorities (NRP)	An Environmentally Sustainable Australia							Promoting and Maintaining Good Health				Frontier Technologies for Building and Transforming Australian Industries					Safeguarding Australia					TOTAL
Expenditure	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**B1**	**B2**	**B3**	**B4**	**C1**	**C2**	**C3**	**C4**	**C5**	**D1**	**D2**	**D3**	**D4**	**D5**	
	$'000							$'000				$'000					$'000					
Program 1: **Farmers**	550		349	246	144		919	123			3,137	5	199		403	358			1,983			8,415
Program 2: **Industry**	536				374		845				656	70	55		55	68			2754			5,412
Program 3: **Customers**											1,281		137	281	70	17						1,787
Program 4: **People**	29		23	12	109		78		44		548				59	1,115						2018
Program 5: **Performance**	57		34		58		60				296					44			21			570
TOTAL	1,172		406	258	685		1,902	123	44		5,918	75	391	281	587	1,603			4,758			18,203

Some funding totals have been rounded up or down to the closest whole number.

Composition of Rural Research and Development Priorities attributed to each CRDC RD&E Program 2013–14 ($'000)

Rural Research & Development Priorities (RRDP)	Productivity and Adding Value	Supply Chain and Markets	Natural Resource Management	Climate Change and Climate Variability	Biosecurity	Supporting the Priorities		TOTAL
						Innovation Skills	Technology	
Expenditure	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
Program 1: **Farmers**	3,338	222	1,021	901	1,944	295	694	8,415
Program 2: **Industry**	866	222	947	730	2,399	104	145	5,413
Program 3: **Customers**	625	662				102	397	1,787
Program 4: **People**	412	105	49	65		1,212	175	2,018
Program 5: **Performance**	198	99	138	70	21	44		570
TOTAL	5,440	1,310	2,155	1,766	4,364	1,757	1,411	18,203

Some funding totals have been rounded up or down to the closest whole number.

APPENDIX 3: Environmental Performance

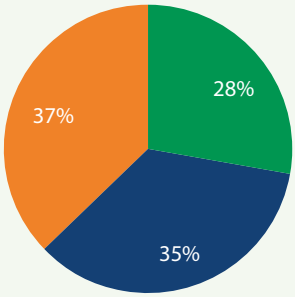
CRDC has integrated the principles of ecologically sustainable development under s.516A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) into its planning framework. This meant developing contributions to Strategic Plan Measures of Success within each program for the broader triple bottom line outputs contained in the Strategic R&D Plan 2013–18.

In line with this, the Annual Operating Plan 2013–14 was designed to ensure strategic research initiatives that provide measurable environmental, economic and social benefits to the cotton industry and the wider community.

Environmental and social objectives underpin the economic viability of the industry. Improvements in the efficient use of resources (water, energy, nutritional supplements and chemicals), crop yields per hectare, and efficient farming methods aid the economic performance of cotton growers.

A contract with Crop Consultants Australia gathers information about on-farm practices and attitudes across the industry, which CRDC then analyses and which provides researchers with valuable guidance to future RD&E directions.

Measures of success – Triple bottom line outputs



Economic – Profitability and International Competitiveness	28%
Environmental – Sustainable Production Systems and Catchments	35%
Social – Empowered People and Communities	37%
TOTAL	**100%**

Number of CRDC projects which contributed to economic, environmental and social outcomes during 2013–14:

CRDC programs	Economic		Environmental		Social		Total sum of CRDC 2013-14 Investment	TOTAL number of projects
	Sum of CRDC 2013-14 Investment	Number of projects	Sum of CRDC 2013-14 Investment	Number of projects	Sum of CRDC 2013–14 Investment	Number of projects		
Program 1: Farmers	$ 3,516,519.00	33	$ 3,465,571.00	24	$ 1,433,291.00	8	$ 8,415,381.00	65
Program 2: Industry	$ 1,094,058.00	15	$ 3,566,236.00	33	$ 752,061.00	15	$ 5,412,355.00	63
Program 3: Customers	$ 303,548.00	3	$ 891,657.00	9	$ 591,851.00	8	$ 1,787,056.00	20
Program 4: People	$ 24,553.00	2	$ 27,149.09	6	$ 1,967,244.00	46	$ 2,018,946.09	54
Performance 5: Performance	$ 305,341.00	7	$ 64,000.00	3	$ 200,405.00	1	$ 569,746.00	11
Grand Total	$5,244,019.00	60	$8,014,613.09	75	$4,944,852.00	78	$18,203,484.09	213

APPENDIX 4 – RD&E Portfolio

List of CRDC projects active during 2013–14:

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Farmers program projects					
AOTA1401	Action on the ground – operating costs	CRDC	Jane Trindall	01/07/2013	30/06/2014
AOTG1401	Determining optimum nitrogen strategies for abatement of emissions for different irrigated cotton systems	NSW DPI	Steve Kimber	01/07/2013	30/06/2017
AOTG1403	Determining optimum nitrogen strategies for abatement of emissions for different irrigated cotton systems-testing emissions from different formulations and soil types	QUT	Francois Visser	01/10/2013	30/06/2014
CFEA1401	Carbon farming initiative – operating costs	CRDC	Jane Trindall	01/07/2013	30/06/2014
CFEO1401	Carbon farming in the Australian cotton industry (Carbon Farming Specialist)	CSD	Jon Welsh	01/07/2013	30/06/2017
CFEO1402	Carbon farming extension project	Cooler Carbon Consulting	Francois Visser	01/12/2013	30/06/2014
CFEO1403	Consultancy agreement	Back Paddock Company	Tom Cowlrick	01/11/2013	30/04/2014
CLW1401	Monitoring greenhouse gas emissions from irrigated cropping systems	CSIRO	Ben Macdonald	01/07/2013	30/06/2016
CRC1212	National extension development and delivery – crop protection	QDAFF	Ngaire Rougley	01/07/2011	30/06/2014
CRDC1333	Turning around back-to-back cotton fields with efficiency and precision	BIPL	Miles Ellery	07/06/2013	30/10/2013
CRDC1405	Network Development Officer – Upper Namoi Valley	CGA	Sarah Clift	01/07/2013	30/06/2016
CSE1401	Management options enhancing beneficial microbial functions in cotton soils	CSIRO	Gupta Vadakattu	01/07/2013	30/06/2016
CSE1403	Automated insect monitoring for pest management	CSIRO	Nancy Schellhorn	01/07/2013	30/06/2015
CSP1104	Applying plant-based measurements for irrigation in water limited environments.	CSIRO	Onoriode Coast	01/07/2012	30/06/2016

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Farmers program projects					
CSP1302	Assisting cotton industry diversification in coastal North Queensland and tropical Australia	CSIRO	Steve Yeates	01/07/2012	30/09/2015
CSP1303	Identification of beneficials attacking silver leaf whitefly and green vegetable bug	CSIRO	Lewis Wilson	01/07/2013	30/06/2015
CSP1305	Irrigation Strategies in a limited water environment	CSIRO	Rose Brodrick	01/07/2012	30/06/2015
CSP1308	Agronomic management for better fibre and textile quality	CSIRO	Michael Bange	01/07/2012	30/06/2015
CSP1401	Enhancing IPM in cotton systems	CSIRO	Lewis Wilson	01/07/2013	30/06/2018
CSP1403	Improving cotton productivity with crop nutrition	CSIRO	Ian Rochester	01/07/2013	30/06/2016
CSP1406	Moisture at picking	CSIRO	Michael Braunack	01/05/2013	30/06/2014
DAN1202	Managing carbon in cotton-based farming systems	NSW DPI	Nilantha Hulugalle	01/07/2011	30/06/2014
DAN1205	Promoting water smart infrastructure investment in NSW	NSW DPI	Janelle Montgomery	01/12/2011	30/06/2014
DAN1305	Updating and expanding Weedpak in support of the cotton industry and *my*BMP	NSW DPI	Graham Charles	01/07/2012	30/06/2015
DAN1306	Cotton Gin Trash (CGT) to bioethanol	NSW DPI	Tony Vancov	01/10/2012	31/01/2014
DAN1401	Closing the soil carbon balance in cotton-farming systems	NSW DPI	Nilantha Hulugalle	01/07/2013	30/06/2016
DAN1402	Hard to control weeds in northern farming systems – understanding key processes to improve control methods	NSW DPI	Sudheesh Velayudhan	01/07/2013	30/06/2016
DAN1403	Diseases of Cotton XI	NSW DPI	Karen Kirkby	01/07/2013	30/06/2016
DAN1404	Centre for Biopesticides and Semiochemicals: Development of new tools and strategies for IPM	NSW DPI	Robert Mensah	01/07/2013	30/06/2018
DAN1405	Capital: Flumes and other ancillary instrumentation	NSW DPI	Guna Nachimuthu	01/07/2013	31/12/2014

APPENDIX 4: RD&E Portfolio *(continued)*

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Farmers program projects					
DAN1408	An evaluation of the current understanding of cotton-growing soils and soil management practice issues in Southern NSW	NSW DPI	Johnathon Holland	06/01/2014	30/09/2014
DAQ1204	Management of mirids, stinkbugs and Solenopsis mealybug	QDAFF	Moazzem Khan	01/07/2011	30/06/2014
DAQ1401	Strengthening the central highlands cotton production system	QDAFF	Paul Grundy	01/07/2013	30/06/2016
DAQ1401C	Capital: Biodegradable film layer	QDAFF	Paul Grundy	01/02/2014	30/06/2014
DAQ1402	Fusarium wilt management in cotton	QDAFF	Linda Smith	01/07/2013	30/06/2016
DAQ1404	Optimising water and energy use in the Central Queensland irrigation sector	QDAFF	Lance Pendergast	01/07/2013	30/06/2016
EEIA1401	Energy efficiency information – operating costs	CRDC	Jane Trindall	01/07/2013	30/06/2014
EEIG1401	Improving energy efficiency on irrigated Australian cotton farms	NCEA	Craig Baillie	01/07/2013	30/06/2015
FTRA1401	Filling the research gap – operating costs	CRDC	Jane Trindall	01/07/2013	30/06/2014
FTRG1401	Indirect emissions of nitrous oxide from broad acre irrigated agriculture	CSIRO	Ben Macdonald	01/07/2013	30/06/2016
GVIA1302	Grower-led research in irrigation system comparisons in the Gwydir Valley	GVIA	Zara Lowien	01/07/2012	01/08/2014
NEC1201	The feasibility and development of alternate energy sources for cotton	NCEA	Craig Baillie	01/07/2011	30/06/2014
NEC1301	Assessing the impacts of new harvesting technologies on cotton	NCEA	John Bennett	01/07/2012	30/06/2015
NEC1302	Commercial prototype smart automation system for furrow irrigation of cotton	NCEA	Rod Smith	01/01/2013	30/03/2015
NEC1401	Advancing VARIwise with autonomous irrigation and a grower's guide	NCEA	Alison McCarthy	01/07/2013	30/06/2016
NEC1402	Commercial development and evaluation of a machine vision-based weed spot sprayer	NCEA	Cheryl McCarthy	01/07/2013	30/06/2016

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Farmers program projects					
NEC1403	PhD: Soil-specific strategic irrigation: Identifying saline-sodic water as a resource	NCEA	Aaditi Dang	03/03/2014	05/01/2017
QUT1401	Summer Scholarship: Andrew Dickson – Interaction between beneficial insects, aphids and biopesticides	QUT	Caroline Hauxwell	18/11/2013	30/01/2014
SCHOL00W	PhD: Improved resource use efficiency via improved cotton root growth	CSIRO	Post Graduate	01/07/2012	30/06/2015
UA1101	The use of biological control agents in resistance management of *Helicoverpa*	UA	Kay Anantanawat	01/07/2010	30/11/2013
UNE1303	Microbial solutions for sustainable cotton and soil health management	UNE	Lily Pereg	01/07/2012	30/06/2015
UNE1305	PhD: Sarah Cooper – Microbial tools for advancing the management of soil and seedling health in cotton production systems	UNE	Sarah Cooper	01/02/2013	01/02/2016
UNE1403	Oliver Knox – Professor of soil biology	UNE	Oliver Knox	01/01/2014	31/12/2018
UNE1404	Centre for Biopesticides and Semiochemicals: Semiochemical management for occasional pests of cotton and grains	UNE	Peter Gregg	01/10/2013	30/06/2018
UNE1405	Summer Scholarship: Brook McAlister – Field investigations of subsoil sodicity in cotton	UNE	Chris Guppy	01/11/2013	30/10/2014
UQ1203	Improved Integrated Weed Management systems in transgenic farming landscapes	QDAFF	Jeff Werth	01/07/2011	30/06/2014
UQ1302	Developing soil testing and fertiliser response guidelines to manage P, K and S fertility for irrigated and dryland cropping systems	UQ	Mike Bell	01/07/2012	30/06/2017
UQ1305	Viruses, vectors and endosymbionts: Exploring interactions for control	UQ	Sharon van Brunschot	01/04/2013	30/06/2016
UQ1402	PhD: Host plant relationships of green mirids – is alternative control possible?	UQ	Justin Cappadonna	18/11/2013	17/11/2016

APPENDIX 4: RD&E Portfolio *(continued)*

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Farmers program projects					
UQ1403	PhD: Multiple host use and gene-flow in green vegetable bug relative to cotton crop	UQ	Dean Brookes	01/10/2013	01/10/2016
UQ1404	Capital: Soil moisture monitoring equipment	UQ	John Smith	01/04/2004	31/03/2015
UQ1405	Capital: New Holland Boomer 25 Tractor and Trailer	QDAFF	Jeff Werth	12/06/2014	31/08/2014
UQ1502	PhD: The impact of irrigation methods and management strategies on nitrogen fertiliser recovery in cotton	UQ	John Smith	01/07/2014	30/06/2017
US1301	PhD: The physiology of cotton crop nutrition, shade and waterlogging	US	Najeeb Ullah	31/03/2012	31/03/2015
US1402	Summer Scholarship: Richard Quigley – Effect of wide (1.5m) and conventional (1m) row spacing on cotton growth, maturity, yield, fibre quality and water use efficiency in Warren	US	Daniel Tan	30/11/2013	30/04/2014
USQ1402	PhD: Self-guided drones for tracking irrigation in a cotton field	USQ	Derek Long	01/03/2014	01/03/2017
USQ1404	PhD: Quantifying and mapping the impacts of herbicide drift on cotton (non-target crop)	USQ	Angelica Cadavid	09/12/2013	08/12/2016
UTS1202	PhD: Image processing method to estimate cotton requirements for nitrogen fertiliser	UTS	Mahdi Mousa Ali	01/05/2012	30/06/2015
UWS1401	Centre for Biopesticides and Semiochemicals: Novel insecticides and synergists from endemic and exotic flora	UWS	Robert Spooner-Hart	01/10/2013	30/06/2018
UWS1402	Summer Scholarship: Brendan Delroy – Variation in colonisation and resource uptake of cotton mycorrhizal partnerships	UWS	Jeff Powell	06/01/2014	28/02/2014
Outcome 1: Farmers program TOTAL					**$8,415,381**

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Industry program projects					
BGC1301	Increasing capacity to deliver accredited drift management workshops	Bill Gordon Pty Ltd	Bill Gordon	01/07/2012	30/06/2015
CA1201	Biosecurity training for growers and agronomists: Training of an industry-wide network in emergency response procedures	CA	Greg Kauter	01/07/2011	30/06/2014
CA1402	Cotton map 2013–14	CA	Greg Kauter	01/07/2010	30/06/2014
CCA1401	*Helicoverpa* egg collecting in cotton regions to support *Bt* and insecticide resistance monitoring	CCA	Fiona Anderson	01/07/2013	30/06/2016
CLW1301	Measuring deep drainage from a cotton/wheat trial	CSIRO	Anthony Ringrose-Voase	01/07/2012	30/06/2015
CRC1015	PhD: Economic environmental water trade-offs in the Namoi under climate change and variability	UWA	Alison Wilson	01/04/2010	31/10/2013
CRC1101	PhD: Improving prediction of cotton growth and production in a changing climate	CSIRO	Katie Broughton	01/07/2010	31/03/2014
CRC1109A	PhD: Ecology of *Helicoverpa punctigera* revisited: migration, overwintering and implications for *Bt* resistance	UNE	Kris Le Mottee	01/07/2010	31/12/2014
CRCP1401	Demonstration of novel evaporation mitigation technology in large scale trials	CRC Polymers	David Solomon	01/07/2013	30/06/2016
CRDC1403	National cotton NRM Technical Specialist	Stacey Vogel	Stacey Vogel	29/10/2013	30/06/2014
CRDC1411	Developing an industry-agreed strategy for managing herbicide resistance in cotton	Annabelle Guest	Annabelle Guest	15/11/2013	31/08/2014
CRDC1414	National NRM regional conference	Stacey Vogel	Stacey Vogel	13/03/2014	20/03/2014
CSE1201	The characterisation of Vip3A resistance in *Helicoverpa* spp.	CSIRO	Tom Walsh	01/07/2011	30/06/2014
CSE1202	Efficacy of Bollgard III® cotton against *Helicoverpa*	CSIRO	Sharon Downes	01/07/2011	30/06/2014

APPENDIX 4: RD&E Portfolio *(continued)*

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Industry program projects					
CSE1302	Area-wide pest suppression in transgenic landscapes: Implications for IRM strategy	CSIRO	Cate Paull	01/07/2012	30/06/2015
CSE1304	Managing *Bt* resistance and induced tolerance with effective refuge crops in preparation for Bollgard III®	CSIRO	Mary Whitehouse	01/07/2012	30/06/2015
CSE1306	Managing *Bt* resistance, *H.punctigera* movements and cotton planting windows	CSIRO	Geoff Baker	01/07/2012	30/06/2015
CSE1402	Monitoring to manage resistance to *Bt* toxins	CSIRO	Sharon Downes	01/07/2013	30/06/2016
CSE1404	Economic risk assessment of resistance management strategies for *Bt* cotton	CSIRO	Stuart Whitten	01/05/2014	30/06/2016
CSP1402	National Facility for Cotton Climate Change Research	CSIRO	Michael Bange	01/07/2013	30/12/2016
DAN1201	PhD: Molecular genetic methods to detect neonicotinoid resistance in cotton aphid	NSW DPI	Kate Marshall	01/01/2012	31/12/2014
DAN1203	Sustainable resistance management of mites, aphids and mirids in Australian cotton	NSW DPI	Grant Herron	01/07/2011	30/06/2014
DAN1204	*Helicoverpa* resistance management and novel method to protect Bollgard II®	NSW DPI	Lisa Bird	01/07/2011	30/06/2014
DAN1406	Investigating the on-farm risks of aflatoxin contamination of cottonseed	NSW DPI	Kathy Schneebeli	01/01/2014	31/12/2016
DAN1407	Capital: Roller Mill	NSW DPI	Chris Anderson	01/10/2013	30/06/2014
DAQ1201	Surveillance and monitoring for endemic and exotic virus diseases of cotton	QDAFF	Murray Sharman	01/07/2011	30/06/2015
DAQ1403	Silverleaf whitefly resistance monitoring	QDAFF	Jamie Hopkinson	01/07/2013	30/06/2016
DAQ1405	Surveillance for exotic cotton viruses: Multiple targets in and nearby Australia	QDAFF	Cherie Gambley	01/07/2013	30/06/2016

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Industry program projects					
DNRM1401	The impact of improved water use efficiency (WUE) on paddock and catchment health	DNRM	Mark Silburn	01/07/2013	30/06/2016
DNRM1402	Capital: Geophysical Surveying Terrameter	DNRM	Mark Silburn	01/11/2013	30/06/2014
GRDC1301	Climate champion program	GRDC	GRDC	01/07/2012	30/06/2015
GRDC1401	Managing climate variability program	GRDC	Beverley Henry	01/07/2013	30/06/2016
GU1401	Critical thresholds for riparian vegetation regeneration in the northern Murray-Darling Basin (MDB)	GU	Samantha Capon	01/07/2013	30/06/2016
PHA1401	Provision of independent technical, secretarial and operational services to the National Working Party for Pesticide Applications (NWPPA)	PHA	Nicholas Woods	01/07/2013	30/06/2014
QUT1402	PhD: Evolution of viral diversity and virus ecology in the management of resistance to biopesticides	QUT	Chris Noune	12/01/2014	30/06/2017
SC1301	National cotton extension development and delivery – stewardship of biotechnologies	Sally Ceeney	Sally Ceeney	01/07/2012	30/06/2015
UNE1201	Positioning growers to take advantage of future ecosystem service markets	UNE	Rhiannon Smith	01/03/2012	01/03/2015
UNE1202	PhD: Next generation rural landscape governance –the Australian dimension	UNE	Tanya Howard	01/07/2011	30/06/2015
UNE1301	Substitutes for pupae busting – commercial scale trials of moth busting	UNE	Peter Gregg	01/07/2012	30/06/2015
UNE1306	The characterisation of triacylglycerides as plant biomarkers in *Helicoverpa* moths	UNE	Ben Greatrex	28/03/2013	30/06/2014
UNE1406	PhD: Sustainable water extractions: Low flow regia and critical flow thresholds	UNE	Marita Pearson	01/01/2014	30/06/2017

APPENDIX 4: RD&E Portfolio *(continued)*

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Industry program projects					
UNSW1401	Quantifying the uncertainty associated with predicting coal seam gas production impacts	UNSW	Bryce Kelly	01/07/2013	30/06/2015
UNSW1402	Summer Scholarship: Charlotte Iverach – Baseline measurements of methans in the groundwater and air throughout the Condamine Catchment	UNSW	Charlotte Iverach	01/12/2013	30/11/2014
UNSW1403	PhD: Spatial and temporal importance of diffuse and stream recharge in semiarid environments – Implications for integrated water management	UNSW	Calvin Li	01/03/2014	28/02/2017
UQ1001	PhD: Flight characteristics of *Helicoverpa* spp in relation to the efficacy of transgenic cotton refuges	UQ	Jason Callander	15/09/2009	01/03/2014
UQ1301	Can genetic diversity predict the potential for emergent glyphosate resistance?	UQ	James Hereward	01/07/2012	30/06/2015
US1403	PhD: Effects of climatic fluctuation and land use change on soil condition in the Lower Lachlan	US	Patrick Filippi	03/03/2014	02/03/2017
UTS1301	Assessing climate change impacts and adaption options in the cotton industry	UTS	Qunying Luo	01/07/2012	30/06/2015
UWS1301	Cotton Industry adaptation to extreme weather and climate change	UWS	Brajesh K Singh	01/07/2012	30/12/2015
Outcome 2: Industry program TOTAL					**$5,412,355**

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Customer program projects					
CMSE1201	PhD: Identifying the glass transition (Tg) temperature behaviour of Australian cotton	CSIRO	Chantal Denham	01/07/2011	30/03/2015
CMSE1203	Post Harvest BMP (including classing, ginning and harvesting)	CSIRO	Rene Van der Sluijs	01/07/2011	30/06/2014
CMSE1305	Commercial ready CottonSpec	CSIRO	Shouren Yang	01/07/2012	31/10/2014
CMSE1308	PhD: Effects of cotton cellulose structure and interactions on dye uptake	CSIRO	Genevieve Crowle	01/07/2012	30/06/2016
CMSE1310	Influence of fibre length on HVI strength measurement	CSIRO	Geoffrey Naylor	01/07/2012	30/09/2013
CMSE1312	Cotton contamination detection sensors	CSIRO	Andrew Krajewski	01/07/2012	30/06/2014
CMSE1401	A preliminary investigation into the colour characteristics of various cotton varieties	CSIRO	Rene Van der Sluijs	01/07/2013	30/06/2014
CMSE1402	Automated gin seed fingers – commercial application	CSIRO	Andrew Krajewski	01/07/2013	30/06/2015
CMSE1403	PhD: Low wax Australian cotton – reducing the scouring requirements of cotton fabric	CSIRO	Katherine Birrer	01/04/2014	31/03/2017
CMSE1404	Scientific exchange: Eric Hequet – visiting fellowship	CSIRO	Stuart Gordon	01/05/2014	30/08/2014
CRDA1403	Facilitating interaction between cotton ginners and QUT biofuels researchers	CRDC	Tracey Leven	15/05/2014	15/05/2014
DU1102	Development of low twist fine count yarns and fabrics from Australian long staple upland cotton	DU	Xungai Wang	01/07/2010	31/07/2014
DU1301	Design of thermal cotton/wool fabrics made from Australian fibre	DU	Xungai Wang	01/07/2012	30/06/2015
DU1302	New developments and opportunities for cotton yarns and fabrics	DU	Xungai Wang	01/02/2013	30/06/2014
DU1401	PhD: Improving length, strength and fineness of cotton fibre	DU	Rechana Remadevi	10/01/2013	09/01/2016

APPENDIX 4: RD&E Portfolio *(continued)*

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Customer program projects					
DU1402	Ever-dry self-cooling cotton fabrics	DU	Tong Lin	01/01/2014	31/12/2015
QTT1401	Cotton gin trash as a potential resource: Reassessing risk factors	QTT	Angus Crossan	01/11/2013	31/12/2014
QUT1301	The development of a web-based carbon footprint calculator for the Australian cotton industry	QUT	Francois Visser	01/01/2013	31/012/2013
TSW1401	Traceability of Australian cotton pilot study	TSW Analytical	Chris May	01/05/2014	31/12/2014
UTS1201	Accounting for value chain sustainability and competitive advantage	UTS	David Brown	01/07/2011	30/06/2014
Outcome 3: Customers program projects TOTAL					**$1,787,056**
CRDC People program projects					
ABA1401	2014 Science and Innovation Awards for young people in Agriculture, Fisheries and Forestry	Dept. Ag	Dept. Ag	01/07/2013	30/06/2016
CA1401	Cotton Conference Foundation Sponsorship	CA	Barb Grey	01/03/2013	30/06/2016
CA1403	Primary Industries Education Foundation membership	CA	Adam Kay	01/07/2012	30/06/2014
CA1404	2014 Australian Future Cotton Leaders Program	CA	Jo Eady	01/02/2014	31/12/2014
CCA1402	Professional Soils and Nutrition Management Course, Goondiwindi	CCA	Fiona Anderson	27/08/2013	28/08/2013
CCR1201	Climate Change Research Strategy for Primary Industries (CCRSPI)	RIRDC	Heather Hemphill	01/07/2013	30/06/2016
CFOC1401	5th National NRM Knowledge Conference (Target 4)	CRDC	Jane Trindall	01/12/2013	19/03/2014
CGA1402	Celebrating the season	CGA	Claire Jenkins	23/09/2013	31/12/2013
CGA1403	Cotton picking women's picnic	CGA	Chantal Corish	01/01/2014	30/06/2014
CGA1404	Building the relationship with the local high school to better the future cotton industry workforce	CGA	Alexander Roughley	01/01/2014	31/12/2014

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
CRDC People program projects					
CGA1405	Understanding soils and plant nutrition for cotton growers	CGA	Nigel Corish	14/11/2013	30/06/2014
CGA1406	Cotton communities health empowerment	CGA	Kelly Foran	01/01/2014	30/06/2014
CGA1407	The great northern bus tour	CGA	Claire Jenkins	08/12/2013	30/06/2014
CGA1408	Understanding the weather	CGA	Geoff Hunter	01/01/2014	30/06/2014
CGA1409	Grower workplace health and safety capacity building in the Darling Downs	CGA	Sandy Cowell	01/01/2014	30/09/2014
CMSE1301	Cotton field to fabric training program	CSIRO	Rene Van der Sluijs	01/07/2012	30/06/2014
CMSE1302	Cotton ginning training program	CSIRO	Rene Van der Sluijs	01/07/2012	30/06/2015
CRDC1321	Enviro story books – 2013	PeekDesign	Trudy Staines	01/07/2013	30/06/2014
CRDC1328	Building the capacity of cotton farms: employer driven staff development	Waters Consulting	Warwick Waters	01/03/2013	30/06/2014
CRDC1404	Australasian Pacific Extension Network International Conference, NZ	Blue Dog Agri	Liz Alexander	26/08/2013	29/08/2013
CRDC1410	Land and Water Australia (LWA) database	Lynda George	Lynda George	01/08/2013	30/06/2014
CRDC1412	2014 Nuffield Scholarship: Nigel Corish	Nuffield Australia	Jim Geltch	01/07/2013	30/09/2015
CRDC1413	2015 Nuffield Scholarship: Matthew McVeigh and Tom Quigley.	Nuffield Australia	Jim Geltch	01/06/2014	30/09/2016
CRDC1415	PhD program 2014 – Postgraduate tour	CSIRO	Trudy Staines, Helen Dugdale	01/01/2014	30/06/2014
CRDC1416	Enviro story books – 2014	PeekDesign	Trudy Staines	01/01/2014	30/12/2014
CRDC1417	Sponsorship: Rotary youth in cotton camp	Rotary	Tamsin Quirk	01/05/2014	30/05/2014
CRDC1418	Cotton futures initiative	Paula Jones	Paula Jones	02/04/2014	09/05/2014
CRDC1419	Supporting the adoption of agronomy best practices for cotton production by cotton consultants in Southern NSW	Warden Ag	Steve Warden	01/02/2014	30/04/2014

APPENDIX 4: RD&E Portfolio *(continued)*

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
CRDC People program projects					
CRDC1423	Consultancy agreement	ACIL Allen Pty Ltd	JP van Moort	02/05/2014	28/05/2014
CRDC1424	Visit key researchers and consultants in the United States cotton industry	David Thornby	David Thornby	01/06/2014	30/07/2014
CRDC1425	Visit key researchers and consultants in the United States cotton industry	RowAg	Cleave Rogan	01/06/2014	30/07/2014
CSD1401	Visit key researchers and consultants in the United States cotton industry	CSD	Kieran O'Keefe	01/06/2014	30/07/2014
CSE1305	Developing education capacity in the Australia cotton industry	CSIRO	Trudy Staines	01/07/2012	30/06/2015
CSP1404	Scientific exchange: Dr Payton, USDA – Climate Change Effects	CSIRO	Michael Bange	01/01/2014	28/02/2014
CSP1405	Scientific exchange: Dr Gwathmey – Mentorship in cotton	CSIRO	Rose Brodrick	01/02/2014	31/03/2014
DAFF1401	Soils cross-sectoral strategy	GRDC	GRDC	01/07/2014	30/06/2017
DAN1302	Building the cotton industry knowledge hub	NSW DPI	David Larsen	01/07/2012	30/06/2015
DAN1304	Namoi Regional Cotton Development and Delivery Officer	NSW DPI	Peter Verwey	01/07/2012	30/06/2015
DAN1409	Visit key researchers and consultants in the United States cotton industry	NSW DPI	Graham Charles	01/06/2014	30/07/2014
DAQ1302	Australian cotton production and best practice documentaries	QDAFF	Paul Grundy	01/07/2013	30/06/2016
DAQ1406	Beltwide Cotton Conference, New Orleans	QDAFF	Linda Smith	03/01/2014	10/01/2014
DAQ1407	Scientific exchange: invitation to four cotton pathology experts to attend an international FUSCOM workshop	QDAFF	Linda Smith	01/05/2014	30/11/2014
DAQ1408	Visit key researchers and consultants in the United States cotton industry	QDAFF	Jeff Werth	01/06/2014	30/07/2014
GSA1401	Piloting a succession and professional development in the cotton agri-business sector	CDI	Gordon Stone	01/04/2014	30/04/2014
MQ1401	Visit to Arid-Land Agriculture Research Centre in Arizona	MU	Dalila Rendon	16/05/2014	30/05/2014
PCT1401	2013 Science to Policy Leadership Program	Peter Cullen Trust	Sandy Hison	09/09/2013	15/11/2013

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
CRDC People program projects					
RIR1401	Cotton Industry Leadership Development Strategy (ARLP, TRAIL and TRAILBlazer programs).	ARLF	Lesley Fitzpatrick Matthew Linnegar	01/07/2013	30/06/2016
RIRDC1103	Horizon scholarship 2011: Rebecca Dunsmuir	RIRDC	Rebecca Dunsmuir	01/01/2011	31/12/2015
RIRDC1201	Horizon Scholarships 2012: Kirsty McCormack and Billy Browning	RIRDC	Kirsty McCormack and Billy Browning	01/01/2012	31/12/2015
RIRDC1301	Collaborative Partnership Primary Industries Health and Safety	RIRDC	Simon Winter	28/08/2012	30/06/2017
RIRDC1302	Horizon Scholarship 2013: Jessica Kirkpatrick	RIRDC	Jessica Kirkpatrick	30/04/2013	31/12/2016
RIRDC1303	Horizon Scholarship 2013: Charlie French	RIRDC	Charlie French	30/04/2013	31/12/2015
RIRDC1304	Horizon Scholarship 2013: Paul Sanderson	RIRDC	Paul Sanderson	30/04/2013	31/12/2016
RIRDC1305	Horizon Scholarship 2013: Alana Johnson	RIRDC	Alana Johnson	30/04/2013	31/12/2015
RIRDC1306	Horizon Scholarship 2013: Emily Miller	RIRDC	Emily Miller	30/04/2013	31/12/2015
RIRDC1401	Horizon Scholarship 2014: Felicity Taylor	RIRDC	Felicity Taylor	31/03/2014	31/12/2017
RIRDC1402	Horizon Scholarship 2014: Grace Scott	RIRDC	Grace Scott	31/03/2014	31/12/2017
RIRDC1403	Horizon Scholarship 2014: Sam Johnston	RIRDC	Sam Johnston	31/03/2014	31/12/2017
RIRDC1404	Horizon Scholarship 2014: Alana Martin	RIRDC	Alana Martin	31/03/2014	31/12/2017
RIRDC1405	Horizon Scholarship 2014: Michael Wellington	RIRDC	Michael Wellington	31/03/2014	31/12/2017
SH1201	Capacity building of Cotton Grower Associations (CGA) in project planning and grant applications.	Fundbase	Sally Hunter	01/07/2011	30/06/2014

APPENDIX 4: RD&E Portfolio *(continued)*

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
CRDC People program projects					
UA1401	Attend Refcom in Narrabri	UA	Kay Anatanawat	04/08/2013	07/08/2013
UM1201	Innovative work: Cotton workforce development for sustained competitive advantage	UM	Ruth Nettle	01/07/2011	31/12/2014
UNE1302	Cotton Production Course	UNE	Brendan Griffiths	01/07/2012	30/06/2015
UNE1402	PhD: Human capacity needs and management on cotton farms	UNE	Bernice Kotey supervisor	24/02/2014	28/02/2017
US1201	Managing cotton farm safety review and update	US	Tony Lower	01/07/2011	30/06/2014
US1401	Cotton industry injury and safety profile.	US	Tony Lower	01/11/2013	31/10/2014
USQ1401	PhD: Investigating retention strategies for growers and managers in the cotton industry	USQ	Geraldine Wunsch	01/07/2013	31/12/2016
USQ1403	PhD: The career motivational factors for farm employees in the Cotton Industry	USQ	Nicole McDonald	28/01/2014	27/01/2017
UT1301	Cotton industry young professionals program	PICSE	David Russell	01/01/2013	31/12/2015
WIN1101	On-farm environmental resources survey	Wincott	Helen Dugdale	01/07/2010	30/06/2013
Outcome 4: People program projects TOTAL					**$2,018,946**

CRDC No.	Project Title	Research Organisation	Principal Researcher	Start Date	Cease Date
Performance program projects					
BCA1401	BCA cotton comparative analysis	Boyce Chartered Accountants (BCA)	Phil Achin	01/07/2012	30/06/2015
CCA1201	Annual qualitative and quantitative surveys for Australian cotton industry	CCA	Fiona Anderson	01/07/2012	30/06/2015
CRDA1401	IrriComm review	CRDC	Paula Jones	01/07/2013	30/06/2014
CRDA1402	Futures forum	CRDC	Paula Jones	01/07/2013	30/06/2014
CRDC1406	Soil research review	Gus Hamilton	Gus Hamilton	01/08/2013	30/06/2013
CRDC1420	Consultancy agreement	Eco Logical Australia	Roland Breckwoldt	14/04/2014	30/06/2014
CRDC1422	Improving Perceptions – Blueprint for Australian Agriculture	NFF	Georgie Aley/Sophie Keatinge	06/05/2014	6/05/15
CRDC1426	Expert opinion agreement	Syme and Nancarrow Water Social Scientists	Geoff Syme	14/04/2014	25/06/2014
CRDC1427	Consultancy agreement	Paul Barnett	Paul Barnett	26/06/2014	29/08/2014
CRDC1428	Review of the content in and between the *my*BMP modules	Rachel Holloway	Rachel Holloway	11/06/2014	08/08/2014
CSP1201	Linking research, extension and *my*BMP – facilitation	CSIRO	Michael Bange	01/07/2011	30/06/2014
RRR1401	Developing a framework and benchmark for monitoring achievement of the CRDC's Strategic R&D Plan 2013–18	RRR	Ingrid Roth	18/10/2013	30/06/2014
RRR1402	*my*BMP lead certification	RRR	Guy Roth	01/07/2013	30/06/2015
RRR1403	Integrated economic environmental and social performance reporting of cotton industry	RRR	Guy Roth	01/07/2013	30/06/2016
Outcome 5: Performance program projects TOTAL					**$569,746**
CRDC TOTAL RD&E Investment					**$18,203,484**

APPENDIX 5: Glossary and Acronyms

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ACIC	Australian Cotton Industry Council
ACRI	Australian Cotton Research Institute
ACSA	Australian Cotton Shippers Association
AECL	Australian Egg Corporation Limited
AES	Aboriginal Employment Strategy
AFM	atomic force microscopy
AgSOC	Agriculture Senior Officials Committee
AGWA	Australian Grape and Wine Authority
ai/ha	active ingredient per hectare
ALS	Australian Long Staple cotton
AMPC	Australian Meat Processing Council Limited
APL	Australian Pork Limited
App	Application program available from smart devices such as mobiles
APVMA	Australian Pesticides and Veterinary Medicines Authority
ARLF	Australian Rural Leadership Foundation
ARLP	Australian Rural Leadership Program
AUSAgLCI	Australian Agriculture Life Cycle Inventory
AVG	aminoethoxyvinylglcine
AWI	Australian Wool Innovation Limited
BCA	Boyce Chartered Accountants
BIPL	Blast Industry Pty Ltd
BMP	Best Management Practices program
Bollgard II®	Cotton varieties contain two genes resistant to *Helicoverpa* spp.
Bollgard III®	Cotton varieties contain three genes resistant to *Helicoverpa* spp.
Bt	*Bacillus thuringiensis* (crystal protein gene expressed in Bollgard II® and Bollgard III® cotton varieties, resistant to *Helicoverpa* spp.)
C	carbon
CA	Cotton Australia
CAC Act	Commonwealth Authorities and Companies Act 1997
CBTV	Cotton Bunchy Top Virus
CCA	Crop Consultants Australia Inc.
CCMT	Crop Carbon Management Tool
CCRSPI	National Climate Change Research Strategy for Primary Industries
CDI	Corporate Development Institute
CGA	Cotton Grower Association
CGT	Cotton Gin Trash
CMSE	CSIRO Materials Science and Engineering
Corporation, the	Cotton Research and Development Corporation
Cotton CRC	Cotton Catchment Communities Cooperative Research Centre
CottonInfo team	Team of Regional Development Officers, technical specialists and *my*BMP specialists, formed under a joint venture between CRDC, Cotton Australia and CSD.
CottonLEADS	Australian and United States program to lead responsible cotton production sustainably.
CQ	Central Queensland
CRC	Cooperative Research Centre
CRC Polymers	Cooperative Research Centre for Polymers
CRDC	Cotton Research and Development Corporation
CRRDC	Council of Rural Research and Development Corporations
CSD	Cotton Seed Distributors Ltd (a grower-owned cooperative)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Dairy Australia Limited
DMA	dynamic mechanical analysis

DNRM	Queensland Department of Natural Resources and Mines
DSC	differential scanning calorimeter
DU	Deakin University
ELS	Extra Long Staple
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
EPI	Environmental Performance Indicator
ESD	Ecologically Sustainable Development
F1	F1 screens involve testing the offspring of single-pair matings between moths from Cry2Ab resistant strains maintained in the laboratory (SP15 for *H. armigera* and Hp4-13 for *H. punctigera*) and moths raised from eggs collected from field populations
FRDC	Fisheries Research and Development Corporation
FWPA	Forest and Wood Products Australia Limited
g/ha.	grams per hectare
GIS	Geographic Information System
GM	Genetically Modified
GPWUIfarm	Gross Production Water Use Index farm
GRDC	Grains Research and Development Corporation
GVIA	Gwydir Valley Irrigators Association
ha.	hectare
HAL	Horticulture Australia Ltd
Helicoverpa **spp.**	Cotton's major insect pests (*H. armigera* and *H. punctigera*)
HRMS	Herbicide Resistance Management Strategy
HVI	High Volume Instrument
ICT	Information and Communications Technology
IDM	Integrated Disease Management
IP	Intellectual Property
IPM	Integrated Pest Management
IRMS	Insecticide Resistance Management Strategy
IT	Information Technology
IWM	Integrated Weed Management
K	potassium
KPI	Key Performance Indicator (measure of success)
LCA	Life Cycle Assessment
Livecorp	Australian Livestock Export Corporation Limited
LWA	Land and Water Australia
M&E	Monitoring and Evaluation
M&E	Monitoring and Evaluation
MCF	Mill Correction Factor
MDB	Murray-Darling Basin
ML	mega litre
MLA	Meat and Livestock Australia
MP	Member of Parliament
MU	Macquarie University
***my*BMP**	*my* Best Management Practices
N	nitrogen
NAQS	Northern Australia Quarantine Strategy
NCEA	National Centre for Engineering in Agriculture
NFF	National Farmers' Federation
NPSI	National Program for Sustainable Irrigation
NQ	North Queensland
NRM	Natural Resource Management
NRP	National Research Priorities
NSW	New South Wales
NSW DPI	NSW Department of Primary Industries
NWPPA	National Working Party of Pesticide Application
NZ	New Zealand

APPENDIX 5: Glossary and acronyms *(continued)*

P	phosphorus
PBS	Portfolio Budget Statements
PHA	Plant Health Australia
PhD	Post Doctorate
PIB	Peak Industry Body
PICSE	National Primary Industry Centre for Science Education
PIEF	Primary Industries Education Foundation
PIHSP	Primary Industries Health and Safety Partnership
Pima cotton	*Gossypium barbardense*. Related to Egyptian cotton, having extra long and fine staples. Limited Australian production.
PIRD Act	Primary Industries Research and Development Act 1989
PISC	Primary Industries Standing Committee
QAAFI	Queensland Alliance for Agricultural and Food Innovation
QDAFF	Queensland Department of Agriculture, Fisheries and Forestry
Qld	Queensland
QTT	Quick Test Technology
QUT	Queensland University of Technology
R&D	Research and Development
RD&E	Research, Development and Extension
RDC	Rural Research and Development Corporation
RDO	Regional Development Officers
RH	relative humidity
RIC	Research and Innovation Committee
RIRDC	Rural Industries Research and Development Corporation
RMP	Resistance Management Plan
RRDP	Rural Research and Development Priorities
RRR	Roth Rural and Regional Pty Ltd
S	sulphur
SLW	silverleaf whitefly
spp.	species
SRA	Sugar Research Australia
Tg	glass transition
TIMS	Transgenic and Insect Management Strategy Committee
TRAIL	Training Rural Australians in Leadership
TSW	TSW Analytical
UA	University of Adelaide
UNE	University of New England
Upland cotton	*Gossypium hirsutum*. Comprises the vast majority of the Australian cotton crop, with Pima cotton comprising the remainder
US	University of Sydney
USDA	United States Department of Agriculture
USQ	University of Southern Queensland
UTS	University of Technology, Sydney
UWA	University of Western Australia
UWS	University of Western Sydney
VCG	Vegetative Compatibility Group
Vic	Victoria
WHS	Workplace Health and Safety
Wincott	Women's Industry Network - Cotton
WUE	Water use efficiency
Zn	zinc

Appendix 6: Annual Report list of requirements

Commonwealth Authorities and Companies Act 1997

A. ANNUAL REPORT REQUIREMENTS

Primary Industries and Research and Development Act 1989

ANNUAL REPORT REQUIREMENTS

OTHER REPORTING REQUIREMENTS

NOTES

CRDC's three futures themes profitable futures, sustainable futures and competitive futures will provide a clear framework through which CRDC can invest in long-term innovations, like the one pictured here. B&W agronomist Brad Donald and Manager Peter Birch are enthusiastic about the use of drone technology in agriculture, and foresee benefits in productivity and efficiency for growers and consultants alike. Photo courtesy of Melanie Jenson.

Australian Government

Cotton Research and Development Corporation

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