Australian Government

Cotton Research and Development Corporation

COTTON RESEARCH AND DEVELOPMENT CORPORATION

Annual Report 2005–06

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Cotton Research and Development Corporation
2 Lloyd Street (PO Box 282)
Narrabri NSW 2390
ABN: 71 054 238 316
Telephone: 61 +2 6792 4088
Facsimile: 61 +2 6792 4400
Email: crdc@crdc.com.au
Website: www.crdc.com.au

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Australian Government

Cotton Research and Development Corporation

9 October 2006

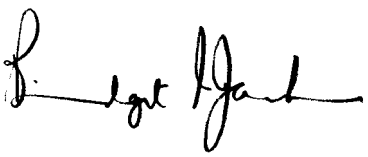
The Hon Sussan Ley MP
Parliamentary Secretary to the Minister
for Agriculture, Fisheries and Forestry
Parliament House
Canberra ACT 2600

Dear Ms Ley

It is with great pleasure that I submit the Corporation's Annual Report for 2005–06, prepared in accordance with the provisions of section 28 of the *Primary Industries and Energy Research and Development Act 1989* and section 9 of the *Commonwealth Authorities and Companies Act 1997*.

Under Section 9 of the *Commonwealth Authorities and Companies Act 1997*, the Directors of the CRDC 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 has been prepared in accordance with a resolution of the Directors on 7 August 2006.

Yours sincerely



Bridget Jackson
Chair

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LOOKING BACK.....

The cotton industry has faced challenging circumstances for several years and 2005–06 was no exception. Seasonal conditions added to the pressure of limited availability of irrigation water, with temperatures approximately ten per cent hotter than average and a number of regions experiencing their hottest season on record. Also adding to the impact was the continuation of below average cotton prices during 2005-06.

Despite these constraints the latest forecast for the 2006 harvest is a crop of 2.6 million bales: some 600,000 bales higher than CRDC's pre-season estimate and worth over $1 billion in export value. This remarkable achievement is due to a combination of factors, but reflects the resilience of a dynamic and innovative industry where growers are noted for their willingness to adopt the outcomes of research.

With prudent budgeting and the use of reserves in recent years, CRDC has been able to maintain R&D investments at a level that underpins delivery of the outcomes sought in its Strategic Plan for 2003 to 2008. This plan focuses R&D effort into six key research programs: People and Knowledge, Integrated Natural Resource Management, Crop Protection, Farming Systems, Plant Breeding and Biotechnology and Value Chain.

In early 2006 the Corporation, its industry stakeholder, the Australian Cotton Growers Research Association (ACGRA), and other key cotton industry and government personnel put R&D progress and outcomes against the Strategic Plan under the microscope. This review resulted in a range of updated priorities, which are being used to guide R&D investments for the coming year.

CRDC Executive Director Bruce Finney and ACGRA Chair Hamish Millar at a 2006 review of CRDC's progress and outcomes measured against its Strategic Plan

The Corporation made submissions during 2005–06 to important inquiries, including the Australian Government's review of corporate governance in statutory authorities and Agriculture and Food Policy review. CRDC was able to use these opportunities to highlight the strengths of the Rural Research and Development Corporations model. CRDC believes that the new commitment to, and increased resourcing of, dedicated Secretariat services to the Council of Rural R&D Corporation Chairs will assist the Corporations to respond to the challenges communicated in the report "Creating our Future" by the Agriculture and Food and Policy Reference Group report.

The industry is well served by CRDC's current framework: an expertise-based Board, excellent industry involvement with the ACGRA, strong collaboration and partnerships, well-focused and capable industry researchers, regional adaptation and adoption supported by industry-funded extension, plus a relative lack of duplication in infrastructure and R&D.

Collaboration and partnership in research is an important means of avoiding duplication and adding value to the total research investment. The Cotton Catchment Communities Cooperative Research Centre was formally established during 2005-06. CRDC is its largest investor, with an annual commitment of $4 million to research projects that address the strategic objectives of both organisations.

The Corporation partnered in a number of other arrangements including the RIRDC Farm Health & Safety and Cooperative Venture for Capacity Building; the Land and Water Australia Healthy Soils for Sustainable Farms and National Program for Sustainable Irrigation, and CottTech: a joint venture in biotechnology with CSIRO and Cotton Seed Distributors. During the last year, CRDC contributed to a report by the Rural R&D Corporations on Natural Resource Management (NRM) R&D, which highlighted that 12 per cent of the $78.5 million invested for natural resource management outcomes in 2004–05 was spent in collaboration by RDCs.

The ever-increasing cost:price squeeze faced by cotton growers means they must constantly seek improvements and economies in their on-farm operations. This saw CRDC place an even greater focus on the Farming Systems program, with expenditure increasing to $2.36 million from $1.8 million in the previous year. An important part of on-farm efficiencies is better use of available water – not only to achieve environmental and economic gains but also to meet community expectations.

Cotton growers have achieved significantly higher yields in recent years without using more water. In fact leading growers have doubled their water use efficiency (WUE) from one to two bales of cotton per megalitre. CRDC-funded projects have sought to build on these gains. This involves both the method of water delivery – optimising the use of technologies such as lateral move and centre pivot that can present a water use-efficient and less labour intensive alternative to furrow irrigation – and ensuring that water is used at the right time and in a precisely delivered manner. CRDC, the Cotton Catchment Communities CRC and New South Wales Department of Primary Industries have developed an extension project that will improve WUE monitoring and on-farm WUE practice and thus the level of production per megalitre.

The industry's Best Management Practices (BMP) program was a focal point for review and recommitment by the industry during 2006. CRDC was instrumental in creating industry awareness of concerns with the implementation of the program and levels of grower adoption through organising independent reviews of the BMP Audit Office and the BMP Land and Water Management pilot module.

The latter review found that the BMP process and the Land and Water Management module provided "...effective, well developed tools for reviewing and planning changes to activities on farm. It effectively addresses most key NRM issues of relevance to cotton growing regions and as such presents a tool that has the potential to deliver NRM and profitability outcomes." The review concluded that the industry has gained significant and valuable external recognition for having had the courage to develop BMP and openly address environmental issues but that individual growers see inadequate value in undertaking a process to demonstrate compliance with practices that many believe they are already doing.

The Australian Cotton Industry Council (ACIC), Cotton Australia and CRDC take this issue seriously, as there is no doubt BMP has been a significant driver for the industry's greatly improved environmental performance. In mid 2006, ACIC, assisted by Cotton Australia and CRDC, brought grower stakeholders together to discuss the opportunities for reinventing or repackaging BMP to provide greater value to individual growers whilst maintaining the program's credibility with external stakeholders. CRDC will work with ACIC and Cotton Australia over the next twelve months to introduce improvements to BMP that will increase its value to the grower. Importantly, while the industry envisages changes to the current BMP program by the end of 2006, stakeholders indicated that it is imperative to continue to encourage growers to engage in the existing program.

The appointment of the Corporation's new Board was announced by the then Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry, Senator the Hon. Richard Colbeck, in October 2005. The Corporation owes much to the retiring Board Members, Ms Kathryn Adams, Mr Jeff Bidstrup, Dr Neil Forrester and Mr Adam Kay. Dr TJ Higgins and Mr Dick Browne were reappointed, together with Ms Leith Boully, Mr David Conners, Mr Glen Fresser and Ms Lisa Wilson, who bring a wide range of expertise to the Board.

CRDC was delighted to be able to familiarise the new Parliamentary Secretary, the Hon Sussan Ley MP, with CRDC and the local cotton industry when she visited Narrabri shortly after taking up her appointment in early 2006.

CRDC's new Board of Directors: left to right, Dick Browne, Lisa Wilson, Bruce Finney, Leith Boully, Simon Smalley, Bridget Jackson, TJ Higgins, Glenn Fresser and David Conners

Parliamentary Secretary, the Hon Sussan Ley MP, toured a local cotton farm during her visit to CRDC

LOOKING FORWARD....

Indications are that the issue of profitability will remain a concern for many cotton growers in the coming year. With this in mind, CRDC will invest in the transfer of knowledge to assist growers with their bottom line performance and will be a major investor in the 2006 Australian Cotton Conference, which has the very relevant theme of *Production, Product and Profit – Progressing our Natural Advantage*.

With increasing pressure for cotton growers to demonstrate their sustainable environmental management of the water resource at a farm and catchment scale and to continue to improve their water use efficiency, R&D in this area will continue as a major focus. CRDC is seeking to establish an irrigation program, delivered through the Cotton Catchment Communities CRC, which will target whole-of-farm water use efficiency and profitability, with more direct linkages to the industry's environmental management system, the BMP program.

The contribution of breeding and biotechnology to the ability of the Australian cotton industry to remain competitive in the global marketplace continues to increase. Fibre quality and disease resistance will form part of the Corporation's increased investment in breeding and biotechnology, through the CSIRO Plant Industry breeding and biotechnology team. The joint venture, CottTech, will further enhance the range of investment and scope of R&D in this important area.

The level of investment in the Value Chain program will continue to increase, as the industry seeks to broaden the scope for adding value to Australian cotton. The coming year will see the final stage of the cotton industry *Pathways to Environmental Management Systems* project, which is seeking to extend the BMP program throughout the entire production chain, as well as associated work which aims to develop a brand for Australian cotton using its quality and environmental performance credentials.

The Australian Cotton Extension Team has long been one of the success stories of the Australian industry. A review of extension and education services in early 2005, followed by industry workshops in 2005–06 to define grower needs and priorities, means 2006–07 will see an increased emphasis on the coordinated delivery of R&D outcomes and advice to growers. This will be achieved through increased investment in the number and reach of extension personnel, as well as by integrating more fully the links between the Extension Team and the BMP program.

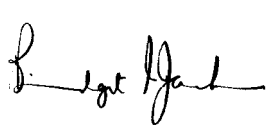
Fusarium continues as one of the two major disease threats within the industry. Although losses due to this disease were reportedly in decline during the 2005–06 season, due to significant advances in the breeding program and a favourable season, the disease has spread further throughout cotton growing areas and a new form of the disease has been identified. CRDC will be conducting an external review of its R&D investment in Fusarium during 2006–07 to ensure it remains on track.

Continuing an increased emphasis on issues of soil health, CRDC will be partnering in a Cotton CRC project to be conducted as part of Land and Water Australia's *Healthy Soils for Sustainable Farms* program. This project will extend research information about soil health in cotton and grain crops.

CRDC will be part of the Australian Government delegation attending the 65th plenary meeting of the International Cotton Advisory Council, to be held in Brazil in September 2006. Of note in the agenda are the environmental and social implications of cotton production. The Australian industry will be seeking to highlight its achievements and ongoing challenges with the sustainable production of cotton as part of its aims at the meeting.

The coming year will be one of continuous improvement for the Corporation itself. A new computerised Program Management Information System will facilitate increased administrative efficiency and effectiveness in decision making and reporting on the outcomes of R&D investments. At the same time, CRDC will be fully implementing a new, staged R&D procurement procedure, which will introduce Preliminary Research Proposals for the first time. The CRDC Board will also be conducting an external review of its performance during 2006.

The coming year marks the fourth of five years of operation under the current strategic plan; consequently, CRDC will begin development of the Strategic Plan 2008–2013 during the year, well armed with the wide range of reviews and workshops that have spelt out future challenges for the industry and how they can best be addressed through CRDC's research, development and extension effort.



Bridget Jackson
Chair

Bruce Finney
Executive Director

CRDC's year at a glance

CORPORATE HIGHLIGHTS

October 2005 saw the appointment of a new Board of Directors. Existing Directors, Dick Browne and TJ Higgins were reappointed; Leith Boully, Lisa Wilson, Glenn Fresser and David Conners were appointed as new Directors. The newly appointed Directors undertook an extensive induction session shortly after their appointment, including comprehensive information about CRDC's policies and priorities and the cotton industry itself.

Leith Boully (left), Lisa Wilson (third from left), David Connor (second from right) and Government Director, Simon Smalley, (right) with Ben Stephens of Auscott at the CRDC induction session for new Directors in November 2005

CRDC was delighted to welcome the newly appointed Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry, the Hon. Sussan Ley MP, to CRDC in May 2006. The visit gave Ms Ley the chance to see CRDC and its operations, as well as to acquaint herself with the local cotton industry.

The Cotton Catchment Communities CRC commenced operations in July 2005 bringing, as its name implies, a holistic approach to the health of catchments and the economic and social wellbeing of local cotton communities. CRDC is closely involved in most aspects of the new CRC's program. As the CRC's major financial partner CRDC will provide it with $28 million over its seven years of operation for research, development and extension projects that address both organisations' strategic objectives.

As part of its plan of continuous Corporate improvement:

- The CRDC Board of Directors adopted its first 'Board Charter': a comprehensive resource to guide policy, procedures and responsibilities for Board members and staff.
- CRDC's focus on the adoption of R&D results lead to a change in intellectual property (IP) ownership strategies and adoption methods. In broad terms the principle of IP ownership being vested in the applicant has changed to one of varying from project to project, following consultation with relevant research providers. Through the new policy, CRDC aims to facilitate efficient and effective development and adoption of R&D results to achieve maximum benefits to the cotton industry. These policy changes are expected to help deliver these results. The full policy can be found at www.crdc.com.au.
- Two new positions were created on the CRDC team. Dr Ian Taylor was appointed as an additional Research Program Manager and Ms Bernie Robertson was appointed Assistant Accountant.

Bernie Robertson and Ian Taylor have joined the CRDC team in newly created positions

- During the year, CRDC provided staff with training in Intellectual Property policy, Information Technology, Occupational Health and Safety, ergonomics and manual handling training.

Three research and/or extension reviews undertaken during the reporting year have provided clarity of purpose and opportunities for effective collaboration:

- Recommendations arising from an external review of Soil Health Research in Cotton have contributed to the design of new research and extension initiatives in conjunction with the Cotton Catchment Communities CRC and Grains Research and Development Corporation. A CRDC-convened

workshop with ACGRA members and research and extension leaders considered goals and priorities for soil nutrition research and extension. A steering committee involving CRDC, the Cotton Catchment Communities CRC, the University of New England, the National Extension Team and commercial collaborators is using this information to direct crop nutrition research.

- A forum to review current research methodologies and the resistance status of *Helicoverpa armigera* to *Bt* was undertaken in March 2006 and has led to improved co-operation and understanding between research agencies in the techniques being used for Bt resistance monitoring and testing
- A review of research investments into cotton fibre, particularly those involving biotechnology, found the CSIRO breeding team to be a world leader in developing high quality varieties but that the major benefit of biotechnology is likely to be varieties delivering crop protection and increased yield, rather than improved quality. This means future fibre quality research will focus on developing markers that assist conventional breeding programs.

CRDC remains the major funder of extension services in the cotton industry. Following a review of extension and education in the previous year, 2005–06 was an important transition year for extension services. The establishment of the Cotton Catchment Communities CRC saw an emphasis on establishing new extension baselines that better address grower needs in all the cotton regions.

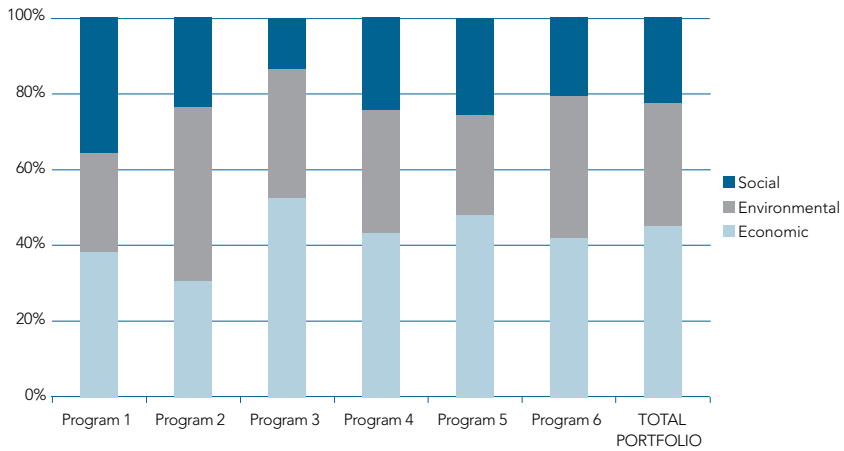
In partnership with CSIRO Plant Industry and Cotton Seed Distributors Ltd, CRDC has launched CottTech, a new and innovative research approach that will generate commercial outcomes for the cotton industry, building upon the existing capacity of the CSIRO cotton breeding team. With new research and development investment, cotton researchers in CottTech will undertake a suite of new cotton biotechnology projects to raise the level of cotton research in Australia and target key issues identified by the cotton industry as priorities. CottTech will concentrate on the fundamental science and allow researchers to be more creative and original in their research. It aims to remove constraints on production and ultimately deliver beneficial traits faster through improved breeding techniques.

During the year CRDC was visited by delegations from Brazil and Israel, examining the Australian cotton research model. The delegations had a particular interest in the unique Australian RDCs model under which CRDC operates.

CRDC, along with the Cotton Catchment Communities CRC and local grower, Mike Logan, co-hosted a visit to the Narrabri district by the National Water Commission in November 2005, during which they were briefed comprehensively about cotton water management issues and solutions.

Triple Bottom Line Highlights

Figure 1: CRDC R&D Triple Bottom Line investments 2005–06



Cotton Fibre

Did you know…?

Cotton breathes easily as a result of its unique fibre structure. This makes cotton more comfortable to wear than artificial fibres

While the average annual consumption of cotton in the world is 3.4 kilograms per person, in Australia it is 8.4 kilograms

Popular uses for cotton fibre include clothing, home furnishings and industrial/medical products such as tents, bandages and cotton swabs

Cotton fibre can be woven or knitted into fabrics such as velvet, corduroy, chambray, velour, jersey and flannel

The fibre from one 227kg cotton bale can produce 215 pairs of jeans, 250 single bed sheets, 750 shirts, 1,200 t-shirts, 2,100 pairs of boxer shorts, 3,000 nappies, 4,300 pairs of socks or 680,000 cotton balls

Cotton's adaptability allows it to blend easily with most other fibres, including synthetics such as polyester and lycra

Cotton is one of the easiest fabrics to dye, making it very popular with fashion and homeware designers

TRACKING ENVIRONMENTAL PERFORMANCE

Output

Sustainable production systems and catchments

- Over 180 farms are now involved in the Best Management Practices (BMP) program. The Australian Cotton Industry Council BMP Committee has introduced a set of Certification Standards and Cotton Australia Grower Service Managers are conducting Pre-certification Assessments, which apply the new standards to grower operations. This includes both existing BMP growers and those new to the program.
  (Source: Cotton Australia, 2006)
- Further extension of the BMP Land and Water Management module, launched in the previous year, is aiding sustainable on-farm and catchment management. Over 100 growers and consultants received information and training relating to this module in 2005–06.
- CRDC, together with the Cotton Catchment Communities CRC and Cotton Consultants Australia (CCA), is funding the gathering of benchmark data on a range of land and water management practices.
- The CRDC-supported CSIRO breeding program has continued to produce environmental benefits:
  - Adoption of Bollgard II® varieties, combined with holistic integrated pest management practices, has led to significant reduction of up to 85 per cent in pesticide use and improved the environmental performance of the industry.
  - 77 per cent of the cotton area was planted to Roundup Ready® cotton varieties containing the glyphosate-tolerance gene CP4 esps. This, combined with Integrated Weed Management practices, has seen a reduction of total in-crop herbicide use of 33 per cent.

Progress Towards Environmental Objectives

Environmental Ojectives	Targets	Progress Towards Targets 2005–06
Industry-wide adoption of improved integrated insect pest management systems.	A 50 per cent reduction in 2004 quantities of insecticide used by 2008	31 per cent reduction in insecticide use from 2003–04 to 2004–05. (2005–06 figures not yet available) (Source: CCA Market Audit Survey, 2005)
Industry-wide adoption of improved integrated weed management systems.	A 20 per cent reduction in 2004 quantities of residual herbicide used by 2008 Continued decline in riverine contamination by herbicides used only in cotton production	Declines in herbicide contamination in rivers correlate with changes in herbicide use as a result of increased planting of Roundup Ready® varieties. 2005–06 figures from four rivers in New South Wales show that riverine herbicide contamination continues to decline. Cotton growers recycle irrigation water on-farm to maximise water use efficiency and manage the risk of environmental impacts from the potential movement of pesticides and nutrients.

Environmental Ojectives	Targets	Progress Towards Targets 2005–06
Increased adoption of BMP that meets legal requirements, industry benchmarks and catchment scale targets	80 per cent of cotton production audited against BMP by 2007	Over 90 per cent of cotton growers surveyed by the Institute for Rural Futures in 2006 reported they are following BMP guidelines (and other measures of environmental improvements suggest this is essentially valid for most BMPs). At the same time there are currently few incentives for growers to become BMP certified and consequently BMP certification may not be the best indicator of the industry's commitment to achieving good environmental outcomes. It is now the belief of the industry that monitoring, measuring and reporting on key whole-of-industry environmental practices will provide a more accurate indicator of improved environmental stewardship. At the same time, growers will continue to be encouraged to participate in the BMP program. Over 180 farms are now formally involved in the BMP program. The Australian Cotton Industry Council BMP Committee has introduced a set of Certification Standards and Cotton Australia Grower Service Managers are conducting Pre-certification Assessments, which apply new certification standards to grower operations. (Source: Cotton Australia, 2006) Continued adoption of the Land and Water Management BMP module is improving on-farm environmental performance and contributing to on-farm sustainability and local catchment targets. An additional 100-plus growers and consultants received training in the module during 2005–06.
Improved Water Use Efficiency (WUE).	A 20 per cent improvement in farm WUE against the 2004 median by 2008.	A recent survey, conducted by the Institute of Rural Futures on behalf of CRDC, the Cotton Catchment Communities CRC and Cotton Consultants Australia Ltd, showed that a significant majority of growers regard improving WUE as a high priority; however, measuring WUE accurately is difficult. The CRC water extension team is currently seeking to improve the accuracy of WUE measures across a number of valleys. Figures from this work should be available during the coming year, enabling more accurate reporting against this target.

TRACKING ECONOMIC PERFORMANCE

Output

Profitability and international competitiveness

- Australian cotton remained consistently among the top prices listed for the highest category of upland cotton on the Liverpool *Cotton Outlook* 'A' index during 2005–06.
- CSIRO new seed varieties, bred with CRDC funding and marketed by the grower cooperative Cotton Seed Distributors Ltd, achieved a return of almost $5 billion for the Australian cotton industry between1984 and 2001, with a benefit to cost ratio of 86. (Source: Centre for International Economics, 2002). Since that time, returns have continued to increase and CRDC will contribute to a further analysis of the cost:benefits.

  CRDC income from cottonseed commercial royalties in 2005–06 is estimated at $2.5 million (16 per cent of annual income), which is returned to the industry in the form of further R&D investment.
- Australian irrigated cotton farms continue to achieve the world's highest yields per megalitre of water used for a major producer – some 30 per cent ahead of the nearest country, Syria. (Source: Cotton Yearbook, 2006)

Progress Towards Economic Objectives

Economic Ojectives	Targets	Progress Towards Targets 2005–06
Improved yield (through improved management and breeding of higher yielding, disease, insect and herbicide tolerant cotton varieties).	A ten per cent improvement in cotton yield per hectare (2 per cent annual or ten per cent over five years).	Australian cotton farms have the world's highest yields for a major producer (30 per cent ahead of the nearest country). There has been a 22 per cent increase in cotton yield comparing average yields for 1995–2000. Despite drought conditions in the 2005–06 growing season, the crop produced the second highest ever yield per hectare.
Improved cotton fibre quality that meets market and spinner needs.	Evidence of continuous improvement in five key parameters measured in spinning mill benchmark surveys by 2007. Evidence that prices for Australian cotton remain above those for competitive cotton growths.	A leading Indonesian cotton producer, PT.Apac Into Corpora, has identified Australian cotton as a …"spinners' delight" because of consistency in quality characteristics requiring minimum setting changes in the spinning process; a low level of honeydew and stickiness (from whitefly); a low level of contamination; and good maturity, whiteness, reflectance and grade. Australian cotton remained consistently among the top prices listed for the highest category of upland cotton on the Liverpool *Cotton Outlook* 'A' index during 2005–06.

Economic Ojectives	Targets	Progress Towards Targets 2005–06
Increased profitability through better whole farm management	Evidence that profit margins are maintained or improving over time (2003 to 2008 both annually and trends over time).	Ongoing drought conditions in many growing areas and current low prices have impacted on whole farm profitability. Annual and long term economic performance is captured through the annual CRDC-sponsored Boyce & Co. *Cotton Comparative Analysis*. The 2005 report, covering the 2004–05 season, indicated that while income received on a per hectare basis was above average due to both good yield and price, the amount of cotton grown was not sufficient, due to drought, on many farms to cover the fixed and semi-fixed costs. The result was that over half the participants in the analysis recorded a net farm loss after interest payments.

TRACKING SOCIAL PERFORMANCE

Output

Empowered people and communities

- External evaluation of the appropriateness of Extension Team roles, responsibilities and management structure carried out during 2004–05 allowed CRDC and the Cotton Catchment Communities CRC to use 2005–06 to set the foundations for addressing recommendations from the review, beginning with an extension workshop in July 2005. The revised structure will be implemented during 2006–07. The priorities of each cotton valley were addressed on a case-by-case basis during 2005–06 to ensure extension needs were met in the interim.
- Wincott (the Women in Cotton network), formerly funded by CRDC, became financially self-sustaining during 2005–06 and membership rose to over 200, up from 70 in 2004–05. More than 100 Wincott women attended three information and training days.
- Over 130 further copies of the searchable COTTONpak CD Rom, containing all the information 'paks' and a range of other CRDC-funded information resources were supplied on request by the Cotton Catchment Communities in 2005–06, adding to the 600 already in use.
- The reduced environmental footprint of cotton is helping to rebuild community perceptions of the Australian cotton industry.

Progress Towards Social Objectives

Social Objectives	Targets	Progress Towards Targets 2005–06
Improved skills and qualifications of people at all levels of the industry.	Between 2003 and 2008: • At least 15 new Postgraduates working in areas of high priority future need; • At least ten new post-doctoral positions working in areas of high current need; • 80 per cent of cotton growers having attended a relevant training course in OH&S, IPM or Water Management.	CRDC funded a total of 22 postgraduate scholarships in 2005–06 for students undertaking scientific research relating to cotton or broader natural resource management, with five of the scholarships commencing during the year. CRDC funded three new postdoctoral projects in 2005–06. The pilot *Cotton Field to Fabric Training Course: Managing for quality* through the production chain gave participants a useful perspective on where they fit in the production chain. It will be extended throughout the industry in 2006–07. CRDC funded 19 researchers to travel overseas during 2005–06 and a number of individual projects included payment for researchers to undertake travel related to their research projects. The water extension team ran a number of workshops on how to use WATERpak effectively, attended by over 100 growers and consultants.
Healthy and resilient communities in cotton producing regions.	Objective to be reached through combination of targeted areas: • A reduction in the cotton industry's environmental footprint (eg. reduced pesticide use, improved water use efficiency, reduced greenhouse gas production); • Contribution to career opportunities in cotton producing regions; • At least a ten per cent reduction in cotton farm related injuries; • Improved industry economic viability.	Biotechnology has contributed to an 85 percent reduction in insecticide use compared to conventional varieties and a 33 per cent reduction in total (residual and non-residual) in-crop herbicide use, addressing cotton's impact on regional environments. An ongoing collaborative program continues to benchmark greenhouse gas emissions. CRDC is on the steering committee of a pilot program, the *Cotton Industry Skills Development Project*, which Cotton Australia is conducting in the Namoi and Gwydir Valleys to address cotton industry skills shortages. The program is funded by the Australian Government Department of Education, Science and Training under the Regional Skills Shortages Program. Its three phases address senior school students, those already in the industry and senior management. CRDC sponsorship of the Rotary Science Challenge is encouraging younger school students to consider careers in science. CRDC-funded material was used in developing the Farmsafe Australia farm OH&S course. The BMP program contains OH&S information relating to topics such as the safe handling of chemicals. CRDC-funded workshops in 2006 explored the links between family, health, farm-related accidents and farm stability. A 22 per cent increase in yields achieved in recent years, plus lower chemical inputs, has helped to maintain returns in a low price market.

Social Objectives	Targets	Progress Towards Targets 2005–06
Adoption of research outcomes that is leading to improved and more sustainable management practices.	At least five adoption evaluations conducted per year by members of the National Cotton Extension Team.	An important transition year with the results of a review of extension and education, combined with the establishment of the Cotton Catchment Communities CRC, meant an emphasis on establishing new extension baselines in 2005–06, rather than evaluating existing activities. Normal evaluations will resume following the revamp of the extension network in 2006–07.

Cottonseed

Did you know…?

The majority of cottonseed is pressed for oil and cottonseed oil is one of the world's most popular vegetable oils

Cottonseed oil can be used for cooking or in a range of industrial products such as soap, margarine, emulsifiers, cosmetics, pharmaceuticals, rubber and plastics

Cottonseed oil is cholesterol-free, high in polyunsaturated fats and contains high levels of antioxidants (Vitamin E)

The whole cottonseed, including the hull, is fed to livestock and poultry

Linters (the very short fibres that remain on the cottonseed after ginning) are used to produce goods such as bandages, cotton buds and x-rays

Financial Highlights

REVENUE

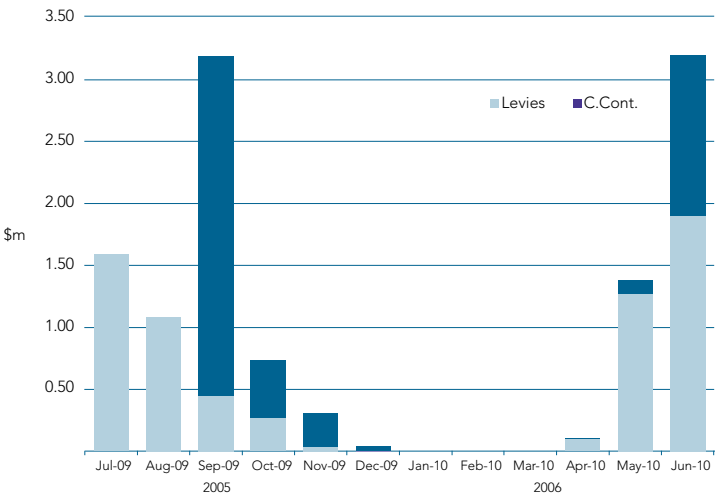
CRDC's revenue is drawn from two main sources. Cotton farmers pay a levy of $2.25 for each 227 kilogram bale of cotton. The Australian Government matches expenditure of levies on eligible R&D, capped at 0.05 per cent of the gross value of production or the cumulative levy receipts, whichever is the lesser. Royalties from the sale of domestic and international planting seed, interest on investments and research project refunds make up the balance of Corporation income.

Cotton production of 2.6 million bales in the 2005–06 season – some 600,000 bales above the pre-season estimate –saw an improvement in CRDC's financial position during the reporting year, compared to budget.

Cotton levy revenue is collected at the point of ginning – when cotton has been picked and delivered to cotton gins which then separate the cotton lint from the seed. This occurs from March to September of each calendar year, so that cotton levy revenue in any financial year is drawn from two consecutive cotton crops.

Revenue for 2005–06 was $3.876 million, or 33 per cent, above budget; the 2004–05 crop produced 2.8 million bales compared to a pre-season estimate of 2.5 million bales and the 2005–06 crop produced 2.6 million bales compared to the pre-season estimate of 2.0 million bales.

Figure 2: Levy and Commonwealth Contributions 2005–06



Total revenue for 2005–06 was $15.61 million, comprising:

- $6.71 million from industry levies or around 43 per cent of total receipts at 30 June 2006.
- $4.91 million of Australian Government matching of expenditure of levy money, which was capped when the expenditure reached .05 per cent of gross value of production of the cotton industry.
- $2.5 million from royalties from sales of CRDC-funded CSIRO seed varieties.
- $0.89 million from interest. This was $0.28 million above budget and $0.19 million above the previous year.
- $0.6 million from other sources. This includes project refunds and external grant revenue.

Australian Government and production-related industry levies formerly comprised almost all of CRDC's income but revenue from other sources now makes a significantly higher contribution. In particular, increased Australian and overseas sales of Bollgard II® and Roundup Ready® varieties bred by CSIRO with CRDC co-investment resulted in royalty payments of $2.5 million in 2005–06: $1.1 million more than the budgeted figure (which had been based on the previous year's royalty stream). Royalties now account for over 16 per cent of total revenue, which is double the percentage in 2003–04, only two years earlier.

Figure 3: 2005–06 Revenue by Source

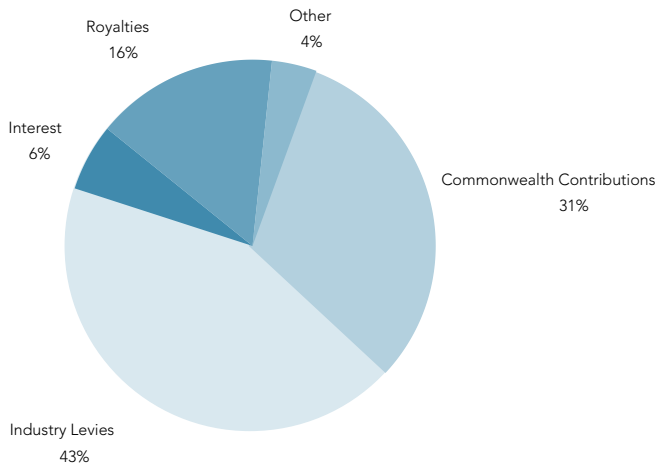
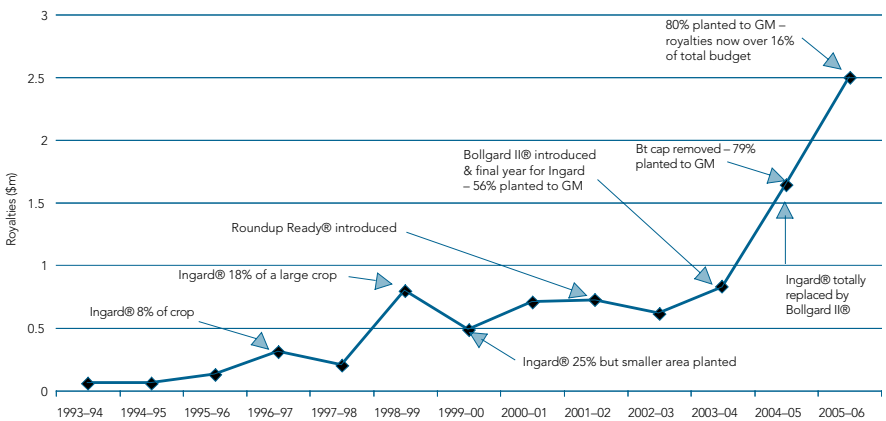


Figure 4: CRDC Royalties – a cotton breeding success story



EXPENDITURE

Total expenditure for 2005–06 was $12.79 million, in line with budget expectations.

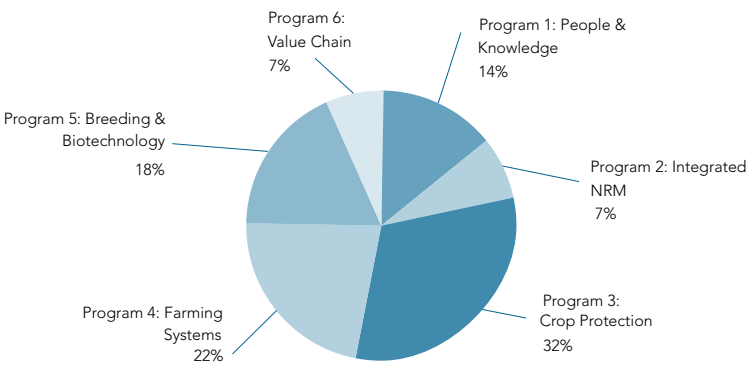
Research expenditure on CRDC's six strategic research programs and research-related Corporate activities was $11.14 million, which represented almost 90 per cent of the overall expenditure for the year. Other areas of expenditure for the Corporation included employees and operational expenditure.

R&D Program Breakdown*

	People and Knowledge	Integrated Natural Resource Management	Crop Protection	Farming Systems	Plant Breeding and Biotechnology	Value Chain	Total
No of projects	58	22	32	27	19	7	165
	$1.48m	$0.79m	$3.32m	$2.36m	$1.94m	$0.70m	$10.5m

*Excludes Cotton Catchment Communities CRC untied cash contribution of $100,000 and Corporate research activities of $450,000.

FIgure 5: R&D Program Expenditure 2005–06

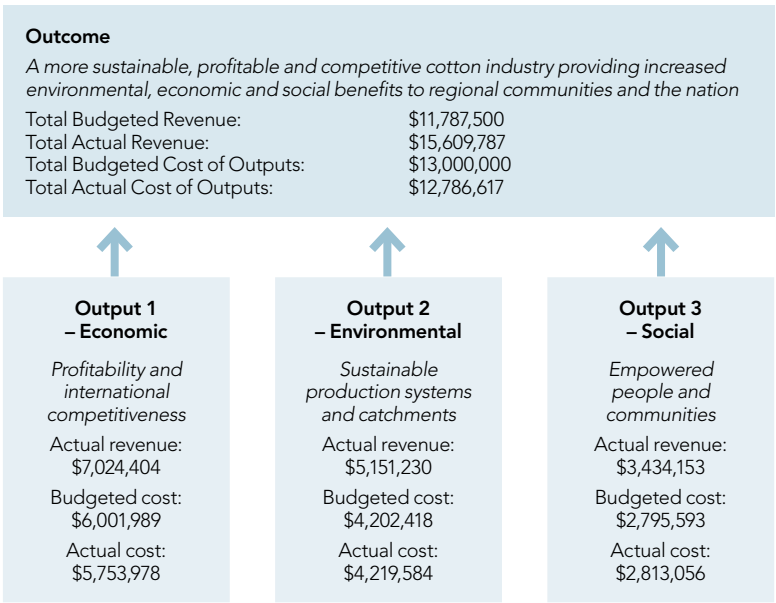


FINANCIAL POSITION

CRDC reported a net surplus of $2.82 million for 2005–06, as against a conservative budgeted deficit of $1.21 million, which was based on water shortages for irrigated cotton at the time of budgeting and the effect this was expected to have on crop size. The better than anticipated crop sizes in 2004–05 and 2005–06 (which both contributed to the Corporation's 2005–06 income), the flow-on effect on levy revenue and Commonwealth contributions and significantly higher royalty income than expected were the predominant reasons for the improved position.

The Corporation's total equity position of $15.84 million at 30 June 2006 marked a turn-around from a gradual decline that reflected the impact of drought on revenue streams, combined with the need to maintain research project expenditure at sustainable levels. As a consequence, the Corporation was not obliged to call on reserves to supplement research investment and operational needs as had been the case in the previous four years. The equity:expenditure ratio for 2005–06 was 81 per cent, above the 75 per cent minimum ratio that enables the Corporation to maintain reserves at a sustainable level.

Figure 6: Triple Bottom Line Outcome and Outputs



Total cost is shown rather than total price because the Corporation 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 one or more of the three Outputs. Total research expenditure for each Output is calculated, with the remaining expenditure attributed to the Outputs on a pro rata basis.

THE COMING YEAR

Revenue

The difficult drought-affected conditions faced by the Australian cotton industry in recent seasons have had a significant impact on levels of production. Increased water availability and newly developed regionally specific varieties saw the yield of 2.6 million bales from the 2005–06 crop return to a respectable level compared with the drought-related low point of 1.7 million bales in 2003–04. Nevertheless, the yield was still significantly below the pre-drought historic average of 3.2 million bales.

Levy revenue and Commonwealth contributions for 2006–07 will be drawn from both the 2005–06 and 2006–07 crops. Although water availability is still expected to be a constraint on production in the coming year, the continuing effect of low world cotton prices is expected to be the dominant constraining factor for the 2006–07 crop. Based on these factors, the Corporation is forecasting a total crop of 2 million bales for the 2006–07 crop, which will be harvested from March to May 2007.

As reported above, the 2005–06 crop produced 0.6 million bales more than the forecast 2.0 million bales; however, constrained levy and Commonwealth contributions mean a total revenue forecast of $13.23 million for the 2006–07 financial year.

Expenditure

The doubling of plant variety royalty revenue in the past two years from eight per cent of total revenue in 2003–04 to more than 16 per cent in 2005–06 has provided the impetus to increase total expenditure to $14.16 million in 2006– 07. This expenditure strategy will be monitored closely to ensure it remains appropriate.

This level of expenditure will produce an operating deficit of $0.92 million. The deficit will be funded from the Corporation's reserves, which currently sit well within CRDC's expenditure to equity policy guidelines.

Tracking CRDC's Position

	2002–03	2003–04	2004–05	2005–06
Cotton Crop Size (millions of bales)	1.7	1.5	2.8	2.6 (estimated)
Total Revenue	$16.17m	$9.94m	$11.95m	$15.61m
Industry levies	$7.14m	$2.58m	$4.58m	$6.71m
Commonwealth contribution	$7.28m	$4.77m	$4.32m	$4.91m
Royalties	$0.61m	$0.82m	$1.64m	$2.5m
Interest	$0.80	$0.75	$0.70	$0.89m
Other	$0.34	$1.02	$0.71	$0.6m
Expenditure Total	$15.62	$12.6	$12.62	$12.79m
Research and Extension Activities	$14.40	$11.34	$11.11	$11.14m
Financial Assets	$16.00	$13.45	$14.3	$18.00m

CRDC People				
Number of Employees: total	12	12	12	11
Number of Employees: full time equivalent	10.8	9.7	11	10.6

Operating Statistics				
Number of new R&D proposals received	108	78	52	100
Number of new R&D proposals approved	45	31	31	43
Number of continuing projects approved	95	111	70	55
Number of commissioned projects approved	22	12	21	32
Total number of R&D Projects managed	165	154	122	165
Total number of final reports received	75	41	11	60

	2002–03	2003–04	2004–05	2005–06
The operating statistics include:				
Total number of scholarship applications received	18	9	12	15
Total number of new scholarships awarded	6	2	3	6
Total number of travel grant applications received	24	8	15	22
Total number of travel grants awarded	10	7	12	19

About CRDC

About CRDC

OUR VISION

A globally responsible cotton industry

OUR MISSION

Invest and provide leadership in research, innovation, knowledge creation and transfer

We aim to achieve this through:

A 'Triple Bottom Line' approach to planning, implementation and reporting that seeks to ensure economic, environmental and social benefits for the Australian cotton industry, cotton valley communities and the Australian people; and

A holistic, integrated and systematic approach to research and development.

OUR OUTCOME

A more sustainable, profitable and competitive cotton industry providing increased environmental, economic and social benefits to regional communities and the nation.

We aim to achieve this by:

Making greater use of commissioned R&D

Seeking multidisciplinary approaches and integrated outcomes

Increasing co-investment and partnerships

Sharpening evaluation of projects

Using a triple bottom line framework for reporting outcomes

Broadening our range of research providers

Enhancing our communications with industry and the community

By working with our key research partners:

Cotton growers

CSIRO

Universities

The Cotton Catchment Communities Cooperative Research Centre

Other Cooperative Research Centres

New South Wales Department of Primary Industries

Queensland Department of Primary Industries and Fisheries

Other State Government Departments

Rural Research and Development Corporations

The Cotton Consultants Association

Agribusinesses

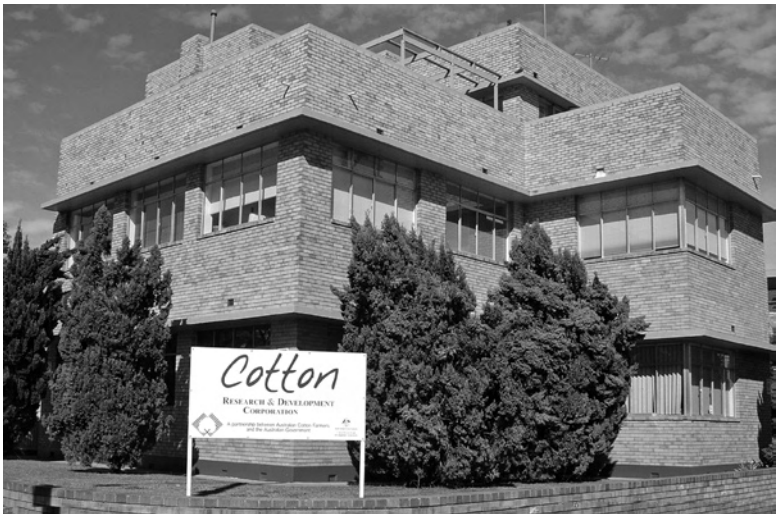
And by addressing the research priorities of our key stakeholders:

The Australian people, represented by the Australian Government

Cotton growers and the cotton industry, represented by the Australian Cotton Growers Research Association

WHO WE ARE

CRDC is based in Narrabri, New South Wales – the heart of one of Australia's major cotton growing regions. The Corporation is a research and development partnership between the Australian cotton industry and the Australian Government.



WHAT WE DO

CRDC invests in and manages a portfolio of research, development and extension projects that seek to enhance the ecological, social and economic values associated with cotton production systems and to increase benefit to cotton industry participants, regional communities and the Australian people.

CRDC funds and coordinates the development of technical and non-technical documents, guides and other information tools and coordinates workshops, seminars and field days for a range of purposes including research review and progression, information sharing or technology transfer to industry.

CRDC produces a range of publications about Corporate activities and operations and to disseminate research outcomes. It acts as a formal and informal information source for stakeholders and client groups (facilitated by its location in a cotton growing centre), through general industry media activities as well as through the Corporation's website, www.crdc.com.au.

CRDC researchers are actively involved in the dissemination of research results, working with the CRDC-supported National Cotton Extension Team.

OUR CORPORATE STANDARDS

Under the CRDC Statement of Principles, the Directors and staff of the Corporation:

- are committed to excellence and productivity
- are committed to providing the highest levels of accountability to stakeholders
- will act legally, ethically, professionally and responsibly in the performance of their duties
- strive to maximise return on investment of industry and public funds invested through our Corporation
- strive to make a difference in improving the knowledge base for sustainable cotton production in Australia
- value strategic, collaborative partnerships with research providers, other research and development bodies, industry organisations, stakeholders and clients, for mutual industry and public benefits; including cooperation with kindred organisations to address matters of national priority
- value the contribution, knowledge and expertise of the people within our organisation and that of our contractual consultants, external program coordinators and research providers
- promote active, honest and effective communication
- are committed to the future of rural and regional Australia
- comply with and promote best practice in corporate governance
- are committed to meet all statutory obligations and accountability requirements in a comprehensive and timely manner

Industry Context

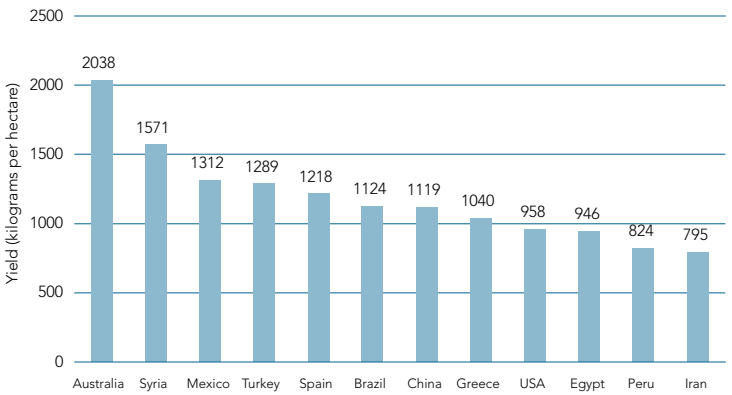
THE AUSTRALIAN COTTON INDUSTRY

There are normally about 1200 cotton farmers in Australia – representing 450 to 500 farming enterprises. Due to the drought conditions of recent years, Cotton Australia's records show that there are currently some 880 registered cotton farmers; however, when seasonal conditions and water availability return to normal, there is every reason to expect that the number of farmers will also return to previous levels.

Today's cotton farms are typically 500 to 2000 hectares, highly mechanised, capital intensive and technologically sophisticated. Around 70 per cent of Australia's cotton is grown in New South Wales, with almost all of the remainder grown in Queensland.

Under normal (non-drought) conditions, over 400,000 hectares of land is planted to cotton – producing about three million bales of cotton each year. The average yield for irrigated cotton in Australia is 1800 kilograms per hectare – the highest in the world and a 22 per cent increase over the past six years.

Figure 7: World's highest average yields 2004–05 (major producers)



Source: Cotton Yearbook 2006

On a global scale, Australia normally grows about three per cent of the world's cotton but is the third largest exporter in non-drought years.

The economic and environmental health of the industry can be largely attributed to high quality collaborative research and development, much of it coordinated and funded by CRDC. Combine this culture of innovation and continuous improvement with practical implementation and willingness to adopt new ideas by growers, and you have an industry that is very quick to pick up and act upon new research outcomes.

The cotton industry is geographically concentrated. This delivers a number of efficiencies but also makes the industry as a whole more susceptible to drought than other agricultural sectors, which operate over more diverse areas.

Because almost all the cotton crop is exported, the Australian cotton industry operates in an environment of intense global competition and must continually improve operational efficiency, environmental sustainability and the quality of product if it is to remain competitive. That is why the continued R&D effort of the CRDC, in conjunction with its government and industry stakeholders, remains of paramount importance to the industry and an essential tool in maintaining and enhancing the security of international markets.

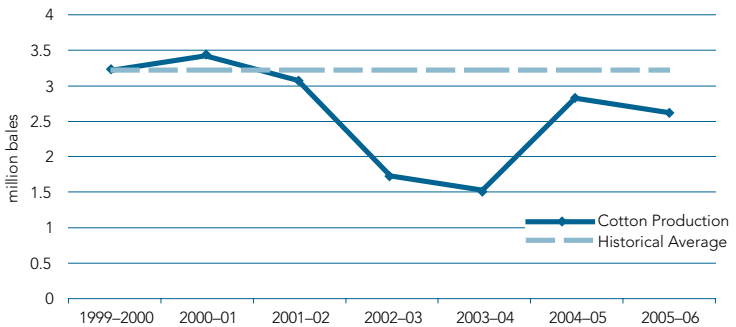
THE 2006 HARVEST AND BEYOND

The Australian cotton industry has faced difficult drought affected conditions in recent seasons but 2005 and 2006 saw a welcome improvement for the majority of cotton growing areas. The 2006 season was a historically hot one, which had some impact on fibre quality.

The 2006 harvest figure is expected to be some 600,000 bales greater than the pre-season forecast at 2.6 million bales: 200,000 bales less than the previous year but well ahead of the severely drought-affected yields in 2003 and 2004.

Although water availability is still expected to be a constraint on production in the coming year, international prices well below the historical average will continue to have a significant impact upon future cotton production. The forecast production of 2.0 million bales for the 2007 crop remains well below the pre-drought five-year average of 3.2 million bales.

Figure 8: Australian Cotton Production



Cotton: the Economics

Did you know…?

On a global scale, Australia normally grows about three per cent of the world's cotton but is the third largest exporter of cotton in the world in non-drought years

Cotton is normally Australia's fourth largest export crop

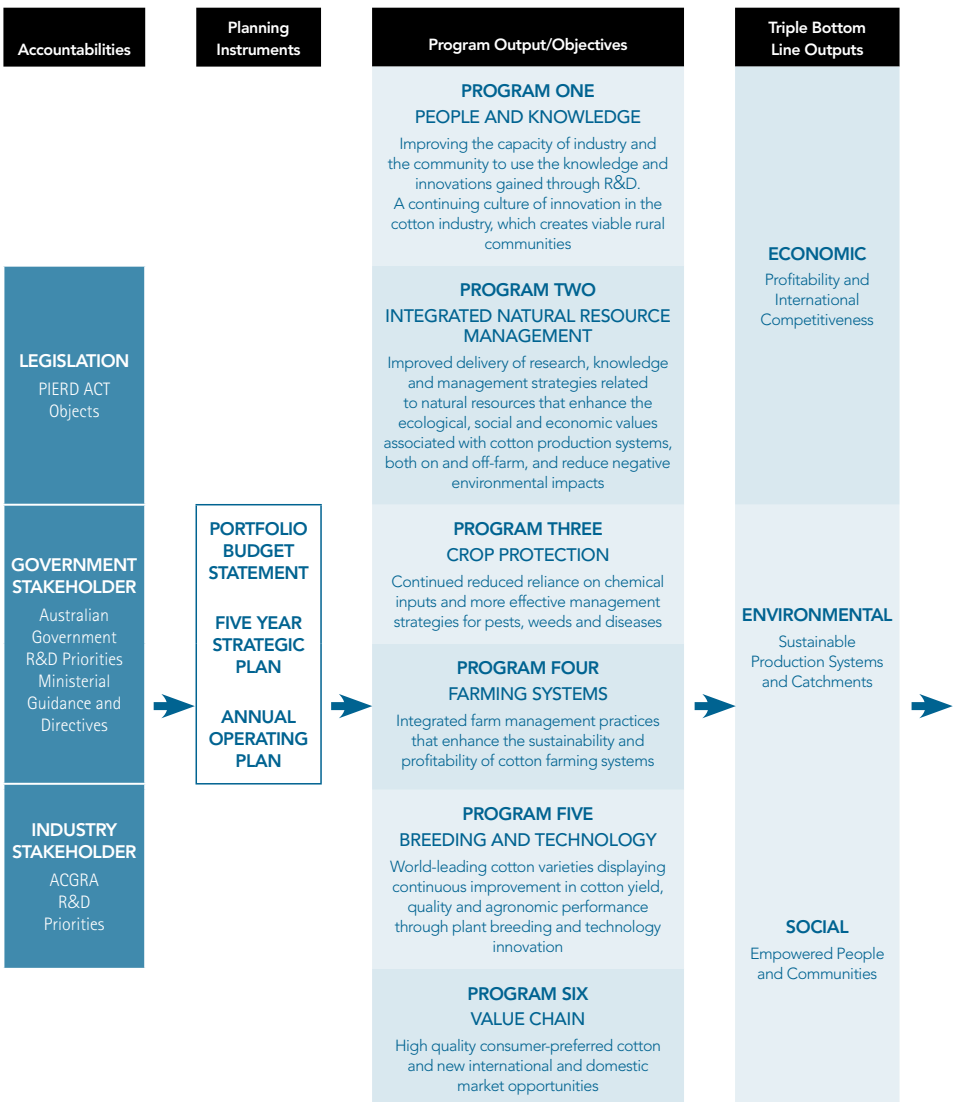
The cotton industry generates, on average, over $1 billion per year in export revenue, is one of Australia's largest rural exports and underpins the viability of many rural communities

The Australian cotton industry employs 10,000 people directly and indirectly and requires high levels of management expertise and a skilled workforce

Australian-bred seed varieties now hold more than a 25 per cent share of the US cottonseed market

CRDC Strategic Elements

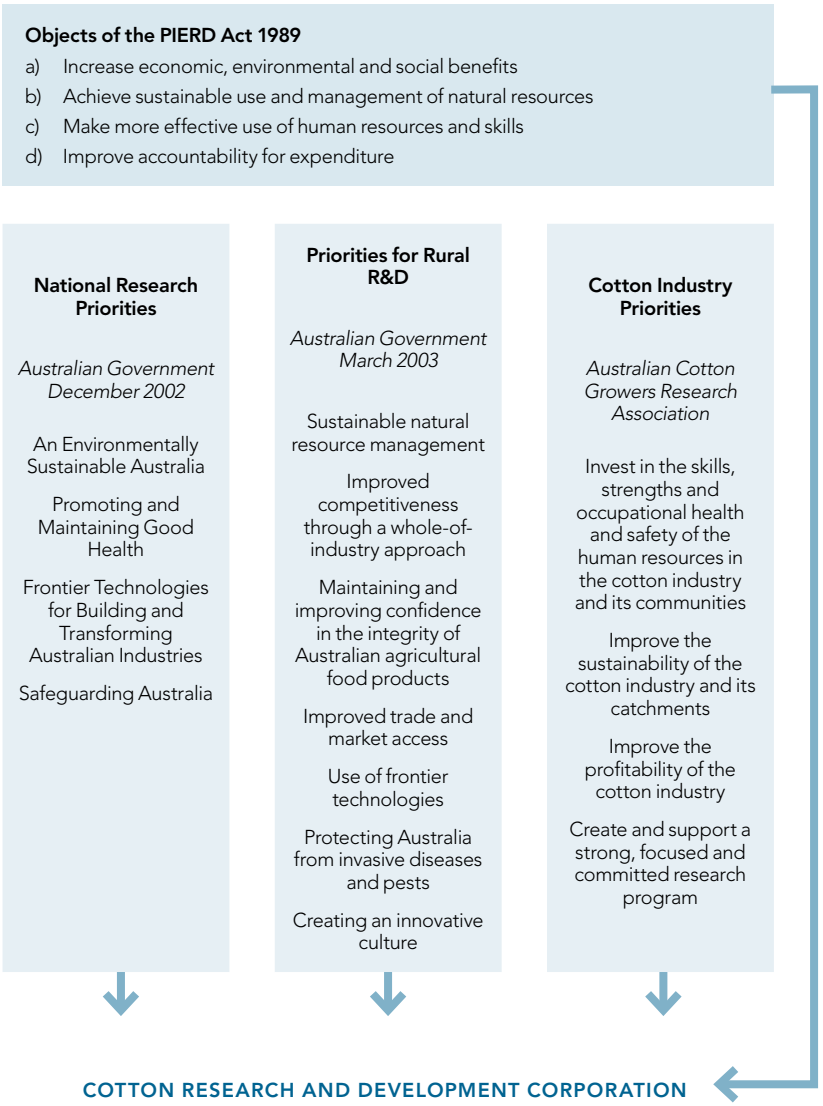
Figure 9: CRDC Strategic Elements



Triple Bottom Line Objectives	Key Targets	Outcome
Evidence that tools and knowledge products are contributing Employment of people in R&D Improved relative economic returns of cotton crops Increased returns per megalitre of water Increased yields per hectare and per megalitre of water÷ Evidence of management options and farming practices that reduce costs or improve profitability Evidence that new cotton varieties are increasing yield, improving fibre quality and potential returns Improved fibre quality to reduce financial discounts received by growers Increased market opportunities evidence by market analysis of pricing demand for Australian cotton in the world market	A 10% improvement in cotton yield per hectare by 2008 Evidence of continuous improvement in 5 key parameters measured in spinning mill benchmark surveys Evidence that prices for Australian cotton remain above those for competitive cotton growths in 2005 and 2007 Evidence that profit margins are improving over time: 2003–2008 both annually and trends over time	A more sustainable, profitable and competitive cotton industry providing increased environmental, economic and social benefits to regional communities and the nation
Reduced chemical inputs Improved water use efficiency Increased adoption of BMP Broader environmental coverage of BMP and recognition in the market place EMS evaluated as a farm management tool Improved trends in landscape and catchment indicators such as salinity, water quality and biodiversity Benchmark soil health and improved nutrient recover Published refereed science on environmental impacts of new transgenic technology Benchmarked greenhouse gas emissions, energy use and climate change impacts	A 50% reduction in 2004 quantities of insecticide used by 2008 A 20% reduction on 2004 quantities of residual herbicide used by 2008 Continued decline in riverine contamination by herbicides used only in cotton production by 2008 80% of cotton production audited against BMP Minimum Certification Standards by 2007 A 20% improvement in farm WUE against the 2004 median by 2008 measured in bales per megalitre	
Improved skills and qualifications of people at all levels of the industry Scholarships to students Study exchanges and conference support for people at all levels of the industry Improved OH&S performance in workplaces and reduced health and injury risks Employment of people in R&D including age, gender trends and location More women in key industry roles Capacity building activities with industry, schools, universities and community groups that improve social capital Evidence of proactive stewardship of transgenic and conventional technology Collaborative links and partnerships established to improve knowledge exchange into and out of the industry High quality cotton (lint and seed) that meets market needs and consumer preference Improved perception of cotton production by the community	Between 2003 and 2008: • At least 15 new Postgraduates in areas of high priority future need • At least 10 new Post-doc positions in areas of high current need • 80% of cotton growers having attended a relevant training course in OH&S. IPM or Water Management Healthy and resilient communities in cotton producing regions though: • A reduction in the cotton industry's Environmental footprint (eg. Reduced pesticide use. Improved water use efficiency, reduced greenhouse gas production) • Contribution to career opportunities in cotton producing regions • At least a 10% reduction in cotton farm-related injuries • Improved industry economic viability At least 5 adoption evaluations conducted per year by members of the National Cotton Extension Team	

Stakeholder Research Priorities

Figure 10: Stakeholder Research Priorities



Australian Government Research Priorities

In December 2002, the Prime Minister released National Research Priorities, which are:

- An environmentally sustainable Australia;
- Promoting and maintaining good health;
- Frontier technologies for building and transforming Australian industries; and
- Safeguarding Australia.

Following their release, the Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry wrote to the Corporation in March 2003 advising of revised Government priorities for rural research and development:

- Sustainable natural resource management;
- Improving competitiveness through a whole of industry approach;
- Maintaining and improving confidence in the integrity of Australian agricultural food products;
- Improved trade and market access;
- Use of frontier technologies;
- Protecting Australia from invasive diseases and pests; and
- Creating an innovative culture.

Both sets of Government research priorities were integrated into the CRDC Strategic Plan 2003–2008 and all Annual Operating Plans devised under that Strategic Plan. The interaction between Government research priorities and the R&D priorities of the cotton industry are shown in Figure 10 on page 34.

How CRDC is Addressing Government Research Priorities

Composition of Government Research Priorities attributed to each R&D Program 2005–06

National Research Priorities (NRP)	An Environmentally Sustainable Australia		Promoting and Maintaining Good Health (strengthening Australia's social & economic fabric)						Frontier Technologies for Building and Transforming Australian Industries				Safeguarding Australia	
Rural Research & Development Priorities (RRDP)	Sustainable Natural Resource Management		Improving Competitiveness through a Whole of Industry Approach		Maintaining & Improving Confidence in the Integrity of Australian Agricultural, Food, Fish and Forestry Products		Improved Trade and Market Access		Use of Frontier Technologies		Creating an Innovative Culture		Protecting Australia from Invasive Diseases and Pests	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%
Program 1 PEOPLE AND KNOWLEDGE	300,178	20.0	212,900	14.2	75,446	5.0	25,657	1.7	329,624	21.96	556,900	37.1	492	0.04
Program 2 INTEGRATED NRM	357,391	45.1	2,350	0.3	22,727	2.9	4,700	0.6	222,054	28.0	182,535	23.1		
Program 3 CROP PROTECTION	290,037	8.7							1,452,316	43.5	1,563,644	46.8	34,971	1.0
Program 4 FARMING SYSTEMS	410,866	17.4	30,718	1.3	30,000	1.3			873,353	37.0	1,012,742	43.0		
Program 5 BREEDING AND BIOTECHNOLOGY	164,022	8.4	174,786	9.0	7,500	0.4	284,148	14.6	686,892	35.3	627,851	32.3		
Program 6 VALUE CHAIN	6,651	1.6	29,397	7.2			144,955	35.6	145,718	35.7	80,830	19.9		

As can be seen in the preceding table, each CRDC program addresses most of the National and Rural Research Priorities and some address all. Below is information about the principal contributions to these priorities in 2005–06 and further details can be found throughout the Report of Operations – Research and Development.

National Priority

An environmentally sustainable Australia

Rural Priority

Sustainable natural resource management

CRDC Strategic Plan Objectives	Measures of Success	Progress in 2005–06
Incorporate a broader range of environmental issues in the Cotton BMP program and facilitate their adoption	Increased adoption and broader environmental coverage of the Cotton BMP program	External review of BMP found the new Land and Water Management module "…effectively addresses most key NRM issues of relevance to cotton growing regions and as such presents a tool that has the potential to deliver NRM and profitability outcomes." Over 100 additional growers and consultants received training in the module in 2005–06. BMP stakeholder workshop confirmed the importance of BMP but recommended that a greater focus on industry-wide practices will increase BMP's value to growers
Support multi-disciplinary approaches to developing farm management strategies that complement catchment and landscape outcomes in relation to salinity, water quality and quantity, and biodiversity	Improved trends in landscape and catchment indicators such as salinity, water quality and biodiversity. Project and funding links with other catchment and landscape programs related to biophysical targets and sustainability. Improved perception of cotton production by the community	Declines in herbicide contamination in rivers correlates with changes in residual herbicide use as a result of increased planting of CRDC-funded CSIRO Roundup Ready® varieties. Study finds area-wide management in the Emerald (central Queensland) district helps support a continuous cycle of improvement. Success in Emerald means opportunities can be investigated in other areas. Information collected on deep drainage is helping to gain an understanding of sustainable groundwater use and catchment health and will lead to new BMP irrigation management guidelines A CRDC and Cotton Catchment Communities CRC publication on designing on-farm water storages will aid in pesticide bioremediation and improved biodiversity on farms. A joint CRDC and Cotton Australia research report into public perceptions of the cotton industry in 2004–05, which showed that perceptions of the industry have improved in many areas but further work is needed to raise awareness levels of the industry's environmental performance. This information about community attitudes is confirming directions for environmental and social research.

CRDC Strategic Plan Objectives	Measures of Success	Progress in 2005–06
Facilitate the necessary environmental impact research for any new transgenic traits introduced into cotton varieties	Publication of refereed environmental impact research in scientific journals related to new transgenic traits	The development of genetically modified cotton varieties has produced excellent economic benefits by reducing the cost of chemicals and improved the environmental performance of the Australian cotton industry. A paper *Environmental impact of conventional and Bt insecticidal cotton expressing one and two Cry genes in Australia,* co-authored by CSIRO scientists and CRDC's General Manager Research and Extension was published in the Australian Journal of Agricultural Research in 2006. It showed that the adoption of Bollgard II® cotton in its first full year led to an overall reduction of 64 per cent in environmental impact compared to conventional cotton. Insecticide resistance to a number of key compounds has remained unchanged or has declined. A new Integrated Resistance Management Strategy (IRMS) produced this season is less restrictive, reflecting the improvements in the overall resistance situation. Background resistance to the Cry 2ab toxin remains the same at around four in 1000 individuals with no evidence of cross-resistance to Cry 1Ac detected.
Investigate the potential impact of climate change on cotton production, benchmark the industry's contribution to greenhouse gas emissions, energy use, and develop integrated management strategies to reduce emissions	Benchmarked greenhouse gas emissions, energy use and potential climate change impacts	Ongoing research during 2005–06 examined the contribution of nitrous oxide under irrigated cropping systems to the industry's greenhouse emissions. Initial results defined optimal rates of application under different conditions, which provides a cost benefit to the grower and significantly reduces greenhouse emissions. This project has also developed a greenhouse calculator, which allows users to obtain specific information on a town or locality. The project is also conducting a life cycle analysis of cotton in relation to greenhouse gas production and energy use.

National Priority

Promoting and maintaining good health

Rural Priorities

Improving Competitiveness through a Whole of Industry Approach

Maintaining and improving confidence in the integrity of Australian agricultural, food, fish and forestry products

Improved Trade and Market access

CRDC Strategic Plan Objectives	Measures of Success	Progress in 2005–06
Facilitate effective coordination and partnerships with research and development providers, industry and community organisations	Implementation of outcomes in partnership with a variety of research and development providers	The integrated structure of the Australian cotton industry, with the Australian Cotton Industry Council as the peak body, is one of its strengths and a major reason for industry 'ownership' of R&D outcomes. CRDC staff continue to play a major role in the development of a culture of communication and collaboration across all aspects of the cotton industry, including a number of pivotal industry roles such as program leadership within the Cotton Catchment Communities CRC, the Australian Cotton Industry Council (ACIC) and support for industry committees providing guidance on a range of key issues. Collaborative research is underpinning a range of gains: environmental (e.g. sustainable irrigation), economic (e.g. financial benchmarking) and social (e.g. community benefits, capacity building). CRDC had 38 key partners in 2005–06, along with collaboration with a large number of organisations through programs such as the Australian Government's National Program for Sustainable Irrigation. The integrated structure of the whole Australian cotton industry, with the Australian Cotton Industry Council as the peak body, is one of its strengths and a significant reason for the early adoption of R&D outcomes. CRDC staff members play a major role in the development of a culture of communication and collaboration across all aspects of the cotton industry, including a number of pivotal industry roles such as program leadership within the Cotton Catchment Communities CRC, the Australian Cotton Industry Council (ACIC) and support for industry committees providing guidance on a range of key issues.

CRDC Strategic Plan Objectives	Measures of Success	Progress in 2005–06
Develop new international and domestic market opportunities (through enhancing traits such as nutritionally improved cottonseed oil)	Release of varieties with appropriate seed characteristics	Current research that aims to map and understand genes involved in fibre initiation and elongation is proceeding well and may deliver a competitive advantage in fibre quality. The EMS Fibre Pathways project was in its third year in 2005–06 and is extending BMP through the entire production chain, using market-based incentives. This project will place Australia in a good position to benefit from the World Wildlife Fund global 'Better Cotton Initiative'. Garments made from Australian BMP cotton have gone on sale in Izumiya department stores in Japan under their in-house "Good-i" brand. Success of the trial will see Izumiya process a second shipment of BMP cotton for use in the campaign. Using biotechnology involving gene silencing, joint CSIRO/CRDC-funded research has modified cottonseed oil to produce healthier, highly stable oil requiring no hydrogenation or processing. With CRDC support, CSIRO Plant Industry is developing a business plan for this technology.
Continuous monitoring of the signals from cotton textile and oilseed marketplace to ensure Australian varieties maintain a place at the high quality end of the market	Market reports on the demand for Australian cotton lint and seeds	Australian cotton remained consistently among the top prices listed for the highest category of upland cotton on the Liverpool *Cotton Outlook* 'A' index during 2005–06.

Cotton: Nothing is wasted

Did you know…?

Almost all parts of the cotton plant are used in some way, including the cottonseed, lint (raw cotton fibre), stalk and hull (shell)

The stalk of the cotton plant is processed for the development of ethanol in petrol or diesel blends and also used as mulch to improve soil organic matter

The crop stubble that remains on the field following cotton picking is often retained to help limit erosion, conserve organic content and return nutrients to the soil

National Priority

Frontier technologies for building and transforming Australian industries

Rural Priorities

Use of frontier technologies

Creating an Innovative Culture

CRDC Strategic Plan Objectives	Measures of Success	Progress in 2005–06
World-leading cotton varieties displaying continuous improvement in cotton yield, quality and agronomic performance through plant breeding and biotechnology innovation	Release of varieties with appropriate fibre and seed characteristics	Eight new CSIRO-bred varieties were available for the 2005–06 growing season containing many improved traits in fibre quality, increased disease resistance, improved growth habit and maturity characteristics, as well as better regional adaptability. Breeding has improved at such a rate that none of the major varieties grown in 2000 were still in use in 2006 and it is fully expected that the same rate of change will occur in future. With limited release in 2006–07, new Roundup Ready FLEX® varieties will be assessed by Australian growers in the same year as their US counterparts, ensuring that Australia remains competitive. In partnership with CSIRO Plant Industry and Cotton Seed Distributors Ltd, CRDC has launched CottTech, a new and innovative research approach with a suite of new cotton biotechnology projects to raise the level of cotton research in Australia and target key issues identified by the cotton industry as priorities. CottTech will concentrate on the fundamental science and allow researchers to be more creative and original in their research.
	Evidence of the reduced time to introduce genes into cotton varieties	CRDC continues to invest in research exploring ways of speeding up the lengthy and cumbersome process of transferring genes. Monsanto Ltd has recently received approval from the Australian Quarantine Inspection Service to bring cotton containing new genetic modifications approved by the Office of the Gene Technology Regulator (OGTR) into their own quarantine glasshouse facilities. This means CSIRO researchers will gain access to new genes at the same time as the USA, which could save 12 to 18 months in development time for a new variety. The CottTech project, mentioned above, aims to remove constraints on production and ultimately deliver beneficial traits faster through improved breeding techniques
	Evidence that CRDC's biotechnology investments are delivering industry or community benefits	Bollgard II® varieties have contributed to an 85 per cent reduction in insecticide usage compared with conventional cotton. Roundup Ready® cotton varieties have been the major factor in the reduction of total in-crop herbicide use of 33 per cent. This has contributed to catchment environmental targets and reduced chemical input costs for growers.

CRDC Strategic Plan Objectives	Measures of Success	Progress in 2005–06
Support and coordinate a highly trained, efficient and effective cotton extension team	Evaluation of outcomes of activities conducted by the extension team	The establishment of the Cotton Catchment Communities CRC meant 2005–06 was used to establish new extension baselines (with specialised environmental extension a major priority), rather than evaluate existing activities.
Foster the professional development of innovative and highly trained researchers extension and technical officers, administrators, consultants and growers	Evidence of improved skills and qualifications of researchers, extension and technical personnel, administrators, consultants and growers	CRDC funded a total of 22 postgraduate scholarships in 2005–06, with five of the scholarships commencing during the year. Success of the pilot *Cotton Field to Fabric Training Course: Managing for quality through the production chain* means it will be delivered throughout the industry in 2006–07. 19 travel grants were awarded in 2005–06 to enhance the knowledge and experience of researchers, with other researchers undertaking approved travel within project funding.
Foster the development of opportunities for women in the cotton industry	Women in key industry roles	Women now occupy senior industry roles, including within CRDC. Wincott, formerly funded by CRDC, became a strong, self-sustaining organisation during 2005–06, with a number of 'Wincott Women' in senior industry roles, including Board positions.
Continue to develop a variety of effective decision support systems that support the implementation of research and extension outcomes and shorten the time to adoption		Evaluation of the use of decision support systems gave clearer picture of needs, which will be addressed by researchers. National Cotton Extension Network encouraged growers and consultants to use available decision support tools and trained them in their use.
Support the on-going development of information packages and tools that consolidate and disseminate research outcomes	Evidence that the use of information packages and tools is leading to the adoption of research outcomes and improved practices	New registrations for 2005–06 added to already high numbers and confirmed review findings that Information 'Paks' are well used and regarded by cotton growers and consultants.

National Priority

Safeguarding Australia

Rural Priority

Protecting Australia from invasive diseases and pests

CRDC Strategic Plan Objective	Measures of Success	Progress in 2005–06
This aspect is covered under the broader objective of:	Reduced distribution, presence and impact of diseases	Increased adoption of Roundup Ready® cotton to 77 per cent of the area planted in 2005-06 is indicative of the benefits this technology brings to weed management.
Improved integrated management of major pests, weeds and diseases	Monitor resistance levels with an aim to either avoid or keep resistance levels in pests and weeds at manageable levels	The rate of spread of major cotton diseases generally slowing down. Research is aiding in the development of a compound that utilises the plant's own defence mechanisms to resist infection by disease.
		Reports of losses due to Fusarium wilt were in decline, with plant breeding a major factor. The average F-rank (Fusarium tolerance measure) of the five leading varieties in 1996 was 57; in 2006 it was120.
		The search for novel resistance genes and markers for resistance to Fusarium wilt continues and researchers are optimistic of providing industry with solutions to this disease. In the shorter term, there has been widespread adoption of improved farm hygiene practices to slow its spread, based on research and extension activities supported by CRDC.
	Transgenic crop surveys and reports on performance, management and risk assessment	A *Bt* resistance workshop attended by over 20 industry personnel led to a collaborative project between agencies to better understand resistance mechanisms
		A restructure of the ACGRA Transgenic and Insect Management Strategy (TIMS) Committee will facilitate management of new resistance challenges, using the best possible science.
		CRDC-funded research provided comprehensive field monitoring in 2005–06 of resistance to insecticides and miticides by *Helicoverpa armigera*, aphids, mites and Silverleaf *whitefly*.
		CRDC staff have assisted ACGRA during the year in working with Plant Health Australia in the development of the cotton industry biosecurity plan. It is anticipated this will be launched in November 2006.

REPORT OF OPERATIONS
Research and Development

The Australian Cotton Industry: Challenges and Opportunities

Richard Haire
Chair
Australian Cotton Industry Council

In March 2006, members of the industry's peak body, the Australian Cotton Industry Council, held a planning workshop in Canberra to coincide with the Annual ABARE Conference. The meeting identified several key issues that will shape the industry's landscape over the coming years. In very broad terms those issues were as follows:

What does the Australian Cotton Industry need to do to continue to enjoy a price premium in international markets?

It was recognised that leading edge science and agronomy has placed our product amongst the elite products of the world's fibre markets but we must continue to produce an above average quality fibre if we are to defray our above average cost structures.

This discussion then identified a second key challenge for the industry, which is the challenge of costs of production. There was wide spread recognition that costs across our entire production base have risen substantially in recent years. The challenge therefore is for the industry to continue to drive productivity improvements and to invest in technologies that will promote our efficiency. To this end, it was recognised that the tight economic situation confronting all participants in the supply chain are currently an impediment to the investments in such technology.

In discussing productivity we then moved into a discussion on research and development as it applies to agronomy. It is critical to the industry's future that our science capability is developed with respect to agronomy and primary production. The outstanding performance of our plant breeding industry has delivered yield improvements that have been our most potent weapon against escalating costs.

On the assumption that our costs are going to continue to increase on a unit-of-input basis it is critical that our scientific contribution to yield improvements is maintained without any compromise on fibre quality. The ongoing support of governments of all levels was also considered to be an important component to our industry's sustainability. We will only maintain government support if we are able to demonstrate responsible stewardship of all the resources necessary to produce our cotton.

Over the past 10 years it is estimated that the Australian cotton industry has doubled its cotton productivity as measured by water input. This has been a wonderful achievement and reflects not just improved varietal performance in delivering higher yields but also emerged as a result of improved cultural practices and water management by cotton growers. The challenge for all participants in the industry be they researchers, agronomists, farmers and water service providers is to continue to make gains in water use efficiency.

We also recognised the currency of the climate change debate and have committed to understanding the potential impact of climate change together with the implications of our industry's overall green house gas emissions performance. The first step in this challenge is to understand the science surrounding these two important topics.

All participants at the workshop identified a diminishing human resource base as a real challenge for the industry. There was a time in the not too distant past when the Australian Cotton Industry was the employer of choice for skilled and unskilled people looking for rural industry employment. It is fundamental to our survival that we are once again able to attract the best and most willing people to provide human capital for our industry.

Finally, the group concluded that a priority for the cotton industry is to rejuvenate enthusiasm for Best Management Practice (BMP).

BMP is not just about managing farmgate risk. It is also about building external perceptions about our product. Those external stakeholders could be our customers, they could be our governors, they could be our employees and they could be our capital providers. By becoming synonymous with sustainable resource management and processing, sales and distribution systems of the highest integrity, BMP could become the badge that secures our industry's future.

PROGRAM ONE People and Knowledge

THE PROGRAM AT A GLANCE

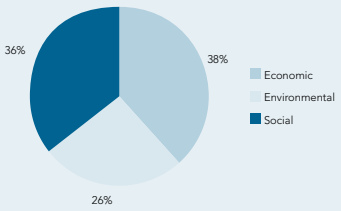
Objective

To improve the capacity of industry and the community to use the knowledge and innovations gained through research and development. A continuing culture of innovation in the cotton industry, creating viable rural communities

Number of projects 2005–06:	58
Compared with 2004–05:	41
Expenditure in 2005–06:	$1,478,697
Compared with 2004–05:	$$1,514,366

Strategies CRDC Strategic Plan 2003–2008	Measures of Success
1 Support and coordinate a highly trained, efficient and effective cotton extension team	Evaluation of outcomes of activities conducted by the extension team
2 Foster the professional development of innovative and highly trained researchers, extension and technical officers, administrators, consultants and growers	Evidence of improved skills and qualifications of researchers, extension and technical personnel, administrators, consultants and growers
3 Foster the development of opportunities for women in the cotton industry	Women in key industry roles
4 Continue to develop a variety of effective decision support systems that support the implementation of research and extension outcomes and shorten the time to adoption	Evidence that the use of decision support systems is leading to the adoption of research outcomes and improved practices
5 Support the on-going development of information packages and tools that consolidate and disseminate research outcomes	Evidence that the use of information packages and tools is leading to the adoption of research outcomes and improved practices
6 Promote safe, healthy workplaces through the adoption of appropriate Occupational Health and Safety work practices	The OH&S performance of industry workplaces is improving
7 Facilitate effective coordination and partnerships with research and development providers, industry and community organisations	Implementation of outcomes in partnership with a variety of research and development providers

Figure 11: Triple Bottom Line investments



Outcome

Innovative people in the cotton industry and community creating a sustainable industry and viable regional communities

BACKGROUND

The modern Australian cotton industry contains, overall, probably the most highly trained and highly skilled people working in agriculture today. They have a great depth of understanding of their industry, their environment, their business and their crop.

The capacity of the industry and its communities to continue to improve and acquire new skills and knowledge comes as a result of the high levels of investment in their training, skills and knowledge transfer. CRDC's investments in people and their capacity to access and use knowledge has been one of the keys to this success story. Supporting our people to conduct research, transfer research outcomes and improve the skills and capacity of the whole industry and its local communities will continue as a high priority for the Corporation.

The Cotton Catchment Communities CRC began operations in 2005–06 and plays a vital coordinating role in extension and education. It has a wide range of partners, including commercial organisations, and this has facilitated a new and invigorated 'CottonHolistic' approach to the development of innovative people in the cotton industry.

STRATEGY 1

Support and coordinate a highly trained, efficient and effective cotton extension team

CRDC remains the industry's principal funder of production-related extension. A major review of 'Extension, Education and Training' undertaken by CRDC and the Australian Cotton CRC (predecessor to the new Cotton Catchment Communities CRC) in early 2005 examined opportunities to develop a series of integrated extension, education and training programs. The aim of the review was to ensure that extension activities are effectively targeted at a regional level and that delivery and dissemination of national cotton research outcomes is relevant, practical and timely. The extension review also considered decision support systems and training programs for growers and other industry personnel. These are discussed under other Program One strategies.

The review recommended that there be a position within the CRC senior management team to provide extension leadership and coordination, encompassing not only CRDC-funded positions but also the CRC-linked water and environment specialist positions funded by the Australian Government's National Heritage Trust. Consequently, the CRC appointed Letitia Cross as Knowledge and Extension Manager in April 2006.

The advent of the new Cotton Catchment Communities CRC in 2005–06 has enabled extension priorities to form part of overall industry planning. CRDC and the CRC used 2005–06 to set the foundations for addressing

recommendations from the review, beginning with an extension workshop in July 2005.

CRDC has funded regional extension Industry Development Officers (IDOs) in most key cotton growing valleys for a number of years. The review found strong industry support for these positions; however, it raised issues such as levels of experience and the difficulty in creating career pathways for those IDOs employed by state agencies. It also recommended clarifying IDO roles and responsibilities and stronger interaction with and support from growers and consultants to boost the regional effectiveness of IDOs.

Full time extension staff who resigned during 2005–06 were not replaced, to ensure a better capacity for overall planning with the start of the new Cotton Catchment Communities CRC. This meant that in the interim CRDC worked with local Cotton Grower Associations to ensure extension services and activities were maintained where need was identified. This included measures such as the part-time employment of experienced people to work within the valleys, as well as sponsorship of spray application workshops, foliar fertiliser trials, regional information workshops and irrigation technique in-field demonstrations.

Feedback from cotton consultants, growers and key research and extension leaders was vital in order to build on the findings of the review by establishing the most appropriate new extension positions in 2006–07 and CRDC worked with the Cotton CRC Knowledge and Extension Manager to run industry workshops in mid-2006.

These workshops found that many of the regional extension services provided by IDOs are valued quite highly by both growers and consultants, which is consistent with the views expressed to the review panel in 2005. The workshops also defined growers' and consultants' highest priorities for regional extension services: information that can be used to refine services in specific regions.

The 2005 review had recommended that stronger research and extension linkages which would help to achieve effective and rapid development of extension information and services could best be achieved through the establishment of structured national extension projects (SNEPS).

These projects would address an area of priority for extension and involve extension researchers, growers and consultants whose expertise would contribute to the development of the extension, knowledge capture or information resource development and adoption plans. A good example of how such a project might work is the development of WATERpak in 2003–2004, which involved extension staff, researchers, state government personnel, consultants and growers in the development of a major resource that is now widely used by growers and consultants and as part of ongoing development of training resources for both the cotton and grains industries.

Leadership is a key element of effective SNEPS and one way that can be achieved is through the development or employment of more specialised

skills within the extension team. Participants in the industry workshops were asked to consider the relevance and priorities of such positions. They demonstrated support for the concept of introducing or developing more specialist skills and gave a clearer idea of the priority areas; however, support from both growers and consultants for extension specialists would be lower if it had an impact on the provision of regional extension services. This finding arguably reflects the strong ownership of the decade-long model of IDOs as the main means of delivering extension services.

Grower and consultant attitudes to extension services, extension workshops 2006

Figure 12: Grower and consultant prioritisation of regional extension services

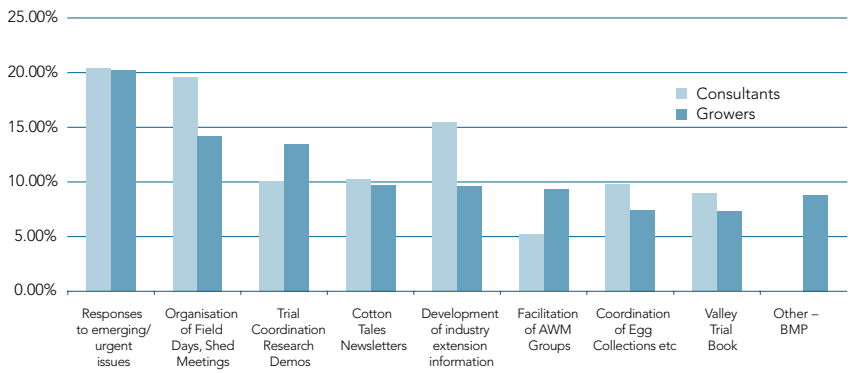


Figure 13: Value Placed on Extension Services

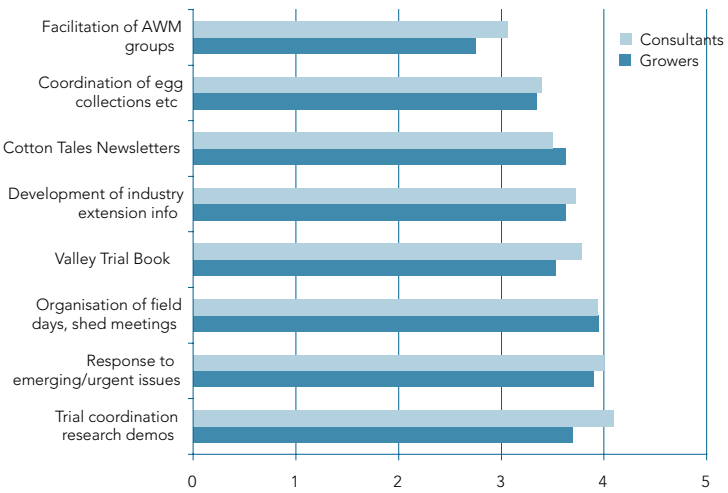
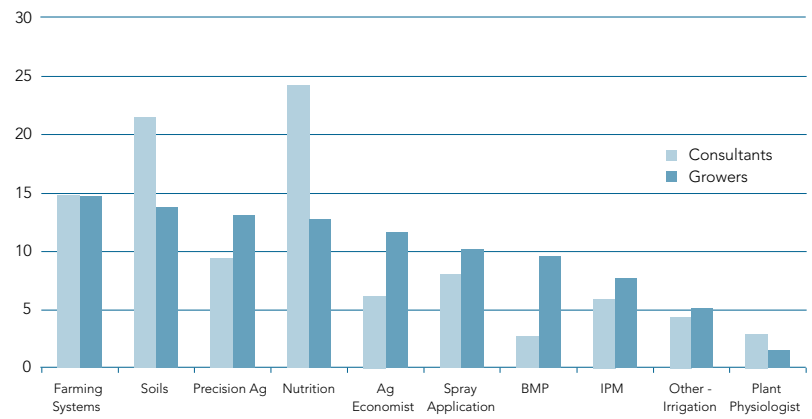


Figure 14: Value placed on specialist extension



CRDC sponsored Industry Development Officer Julie O'Halloran to the 2006 Beltwide Cotton Conference in Texas, USA. Here, she speaks about her experience.

My travel to the 2006 Beltwide Cotton Conference in San Antonio, Texas, USA helped to promote recognition and understanding of the role and achievements of the Australian Cotton Extension Team. I presented two papers on work undertaken by extension officers within the Australian cotton industry: the extension model we use; and the role of IDOs in progressing Australian cotton production through regional trials.

The conference gave me the opportunity to hear research that could be applied to the Australian cotton industry. For example, a large component of the insect control sessions focused on secondary pest control, which is also a significant problem for the Australian industry.

On a personal level, the highlight of the travel was meeting with various extension officers involved in the US cotton industry. Not only did the contacts I made provide an opportunity to establish links for exchange of information and future possible collaborations, it provided me with a different perspective on the Australian cotton industry and the role of extension within it. It meant I could take on board strengths I observed that would improve the way in which the Australian extension model works and keep in mind some of the weaknesses to ensure that we avoid them in our own extension model.

Attendance at the conference has also made a contribution to my professional development within the New South Wales Department of Primary Industries. As extension officers, a lot of our presenting is done either in the field or in farm sheds but presenting at the Beltwide conference was a different experience – one that was well outside my 'comfort zone'. It was a challenging experience and one I valued highly – on my own behalf and for the knowledge I can feed back into the Australian industry.

Julie O'Halloran (right) presented two papers on Australian extension services at the Beltwide Conference

While the Australian industry is already a world leader in terms of cotton produced per megalitre of water, the current drought has emphasised the importance of using water as efficiently as possible. As a consequence, CRDC has expanded its research and extension in efficient water use. There is no 'big bang' for achieving gains in water use efficiency (WUE) through on-farm practices; rather, it has been and remains a question of incremental gains. CRDC has worked with the Cotton Catchment Communities CRC and New South Wales Department of Primary Industries to develop an extension project that will improve WUE monitoring and on-farm WUE practice and thus the level of production per megalitre.

Existing links with regional catchment management bodies in Queensland and New South Wales continued to strengthen environmental extension during the year, addressing broader farm and catchment scale natural resource management (NRM) issues, with the overarching aim of enabling environmental management to be taken beyond the farmgate.

NRM has been a crucial part of the extension effort in recent years, with most NRM positions funded through the National Heritage Trust and local catchment authorities. CRDC contributes to NRM extension through its involvement in the continuing development of Best Management Practices (BMP) NRM-related resources and activities.

CRDC staff contributed to the production of *Envirodirectory 2006* by the environmental extension team, as well as *Design Principles for Healthy Waterways on Cotton Farms*. CRDC is also funding, with the Cotton Catchment Communities CRC and Cotton Consultants Australia (CCA), the gathering of benchmark data on a range of land and water management practices.

Measure of Success

Evaluation of outcomes of activities conducted by extension team

- An important transition year with establishment of the Cotton Catchment Communities CRC meant an emphasis on establishing new extension baselines, rather than evaluating existing activities
- Interim measures undertaken in consultation with local Cotton Grower Associations have ensured an appropriate level of extension in each region
- Under a National Heritage Trust-funded EMS Pathways pilot project, managed by Cotton Australia, CRDC coordinated an evaluation of the initial delivery of the new Land and Water Management module in BMP that will optimise its effectiveness
- The Cotton Extension Team, particularly the environment and water team members, provided technical support for Cotton Australia in delivery of the BMP Land and Water module, improving the breadth and depth of on-farm environmental management
- The publication of CRDC-assisted *Envirodirectory 2006* and *Design Principles for Healthy Waterways on Cotton Farms*, will aid the environmental performance of the industry

Water Use Efficiency: putting out the challenge

In March 2006 the industry's peak body, the Australian Cotton Industry Council (ACIC), held an industry planning meeting to discuss the key issues facing the industry and develop a set of goals and strategies that the industry needed to consider in the future. Access to, and management of, water was one of the major areas discussed. It was suggested that cotton growers had probably gone close to doubling water use efficiency (WUE) over the last decade, primarily through improved production per unit area; however, ACIC believes that the industry must continue to strive for further improvements. It set a goal for the industry to discuss and use as a challenge: to "double again water use efficiency by 2015."

CRDC conducted a workshop in June 2006 with Australian Cotton Growers Research Association (ACGRA) research and extension leaders to consider what this challenge means for R&D: is the goal achievable with current knowledge, research and extension and, if not, what are the RD&E gaps and priorities?

The workshop went a good distance towards defining the challenge and how it can best be addressed. A wide range of research possibilities were defined in areas such as deep drainage, management of riparian zones on-farm, better reporting and collection of water use information and benchmarking water use at a regional level.

Participants at the workshop certainly felt they have begun a valuable process and work will continue to further refine and define these water-related issues and achieve a workable plan that properly addresses the industry's aim of best practice in water use.

STRATEGY 2

Foster the professional development of innovative and highly trained researchers, extension and technical officers, administrators, consultants and growers

CRDC continues to invest in the training, education and capacity building of industry personnel to ensure that they have the appropriate skills and knowledge to be world leaders in profitable, environmentally and socially sustainable cotton production.

Training and Education

CRDC-funded cotton industry National Training Coordinator, Mark Hickman, was given responsibility for broadening industry training, with two important objectives: to make training quickly responsive to current industry needs and to align cotton courses to competencies associated with the Australian Quality Training Framework. This ensures industry personnel are adopting the latest research, while receiving formal qualifications that they can use in future employment.

"Time and resources to attend training events are precious commodities, so people need to maximise the outcomes of their attendance. I see the linkages being developed between traditional cotton extension activities, cotton BMP and vocational training as a significant step forward."

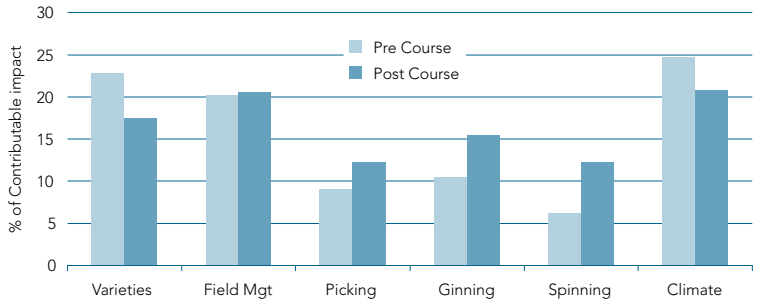
Mark Hickman
National Training Coordinator

Those involved in the cotton production pipeline – growers, merchants, ginners and spinners alike – should be aware of what spinners and fabric manufacturers need and expect when they process Australian cotton, if Australian cotton is to compete internationally.

The current year saw the delivery of the pilot *Cotton Field to Fabric Training Course: Managing for quality through the production chain*. This three-day course presented at CSIRO Textile and Fibre Technology (CTFT) in Geelong gave participants an opportunity to interact with leading researchers on all aspects of the cotton production pipeline including global perspective, fibre properties, agronomy, picking, ginning, classing, marketing, yarn formation, fabric formation and dyeing and finishing.

After completing the pilot course, participants came away with a new perspective on where they fit in the production chain; on how decisions they make in the field, the gin or the spinning mill, affect final quality. The shared understanding gained in the course changed knowledge and perceptions of quality issues, as the accompanying graph shows.

Figure 15: Cotton Field to Fabric Training Course: a mind shift in thinking



The course focuses on quality assurance and involves six competencies drawn from three sources: the Rural Production, Business Services and Textile, Clothing and Footwear training packages. These establish quality specifications for a product, identification of various industry benchmarks and the skills and knowledge needed to deliver continual improvement for that product. Competencies vary for participants from different sectors of the production chain.

The success of the pilot course means it is now being delivered throughout the industry, incorporating feedback from participants in the pilot course which provided guidance on how to further refine the content and format.

Participants in the pilot Cotton Field to Fabric Training Course gained a new perspective on their role in achieving high quality cotton fibre

"It is important for all stakeholders in the cotton industry to realise that we are in the retail fashion industry"

Grower Participant
Cotton Field to Fabric Training Course

A total of 221 people completed the Integrated Pest Management Short Course from 2001 to 2005, with a range of cotton researchers delivering specific components of the course. It has proven an excellent means of delivering research information to growers and has also provided direct feedback to researchers from growers about the practicalities of managing insect pests. The National Training Coordinator used 2005–06 to undertake a review of the course with a number of past students, to ensure it continues to meet grower needs.

CRDC is supporting the training program being developed under the Knowledge Management in Irrigation Cotton and Grains Project, funded by the National Program for Sustainable Irrigation (NPSI). CRDC is one of 14 NPSI funding partners, along with irrigators, water authorities, research agencies, commodity groups and state and national government departments. The course will be aligned to several national competencies from the Australian Training Framework. The pilot course will be delivered in September 2006.

CRDC and the National Cotton Training Coordinator are on the steering committee of a pilot program Cotton Australia is conducting in the Namoi and Gwydir Valleys to address cotton industry skills shortages. The *Cotton Industry Skills Development Project*, which is funded by the Australian Government Department of Education, Science and Training under the Regional Skills Shortages Program, has three components:

- *Cotton Seed* is a pre-vocational program for people looking for work and students undertaking agriculture in senior high school
- *Cotton Basics* provides training to enable those already in the industry to increase their mix of skills in areas ranging from tractor driving to farm safety and basic agronomy.
- *Cotton Advanced* is a professional development program for cotton farm owners and managers and covers business planning, human resource management and an environmental update.

National competencies have been selected from the various National Training Packages within the Australian Qualification Training Framework. Training developed at all these levels, with a mixture of business, human resources, production and environmental management will develop a sustainable industry for the future, while immediately addressing the rural skills shortages in the industry. Pilot courses are being delivered within the industry during 2006–07.

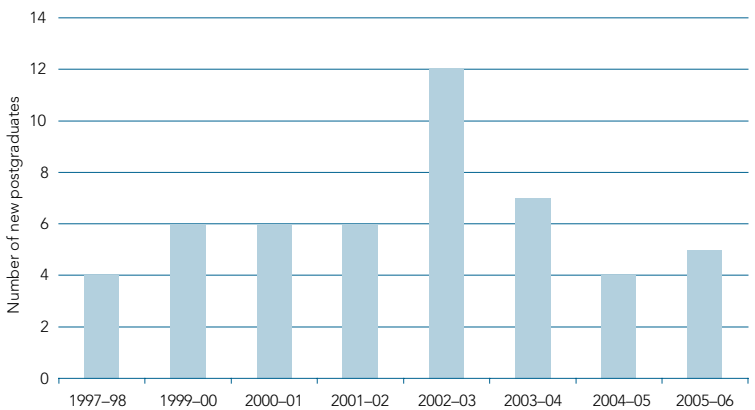
CRDC continues to co-invest in the future of the industry by sponsoring an industry participant in the Australian Rural Leadership Program (ARLP), which offers participants professional and personal leadership skills development, examination of key national and international issues and interaction with leaders in government, industry and the community. It comprises a part-time course of some 60 days conducted over 20 months and is followed by ongoing involvement through the Graduates' Association of the Australian Rural Leadership Network.

The water extension team ran a number of workshops on how to use WATERpak effectively, attended by over 100 growers and consultants.

CRDC provided financial support for a number of workshops to address herbicide drift management – a significant problem for a susceptible crop like cotton – to ensure best management practices in the use of glyphosate. Almost 100 cotton and grains growers attended five workshops: three in Queensland (on the Darling Downs) and two in New South Wales (Rowena and Gunnedah).

CRDC funded a total of 22 postgraduate scholarships in 2005–06 for students undertaking scientific research relating to cotton or broader natural resource management, with five of the scholarships commencing during the year. CRDC is also funding three new postdoctoral projects.

Figure 16: A decade of postgraduate scholarships



Investing in the Future

Current CRDC and Cotton Catchment Communities CRC-funded postgraduates visited Narrabri for the 2006 Cotton Postgraduates Tour, hosted by CRDC and the Cotton Catchment Communities CRC. The tour included a visit to a family-owned property, a fully operational gin, classing rooms and tour of both the Australian Cotton Research Institute (home to the CRC) and the Cotton Exhibition Centre in Narrabri.

The visit gave the students the opportunity to meet with researchers, growers and other industry personnel. It not only helped them to understand 'who's who' and 'what's what' in the cotton industry, it also gave them an insight into future opportunities and career paths.

Over the past five years CRDC has supported almost 30 postgraduate students. This is not only an investment in the valuable and much needed project work they carry out, it is also an investment in the future as many of the students go on to have very successful careers in the cotton industry.

"Taking part in the tour gave me a clearer idea as to how my own project fits into the big picture and extra motivation for my research. I would recommend taking part in this tour to any postgrad student … it was not only informative, but great fun too!"

Joy Conroy
CRDC-funded postgraduate student

CRDC and CRC-funded postgraduate students visited a cotton farm as part of their industry familiarisation tour in 2006

CRDC funding allowed 19 researchers to travel overseas during the reporting year. In addition, funding for a number of individual projects included payment for researchers to undertake travel related to their research projects. These scientists are bringing back new and valuable knowledge that feeds into the CRDC program. In turn, the advanced level of knowledge they contribute is well received at conferences, thus helping to build Australia's scientific reputation.

As part of working with local communities and promoting the benefits of science as subject choices in high school, and even a potential career path, CRDC was a major sponsor of the Rotary Science Challenge for Primary schools, held in Narrabri in June 2006. Six primary schools competed, with each team given a science-related challenge. The students enjoyed the experience and, reported that they 'got a kick' out of using their brains to solve problems.

Participating in the CRDC-sponsored Rotary Science Challenge, girls from Narrabri Public School built the strongest bridge out of paddle pop sticks and string by devising a suspension method

Looking forward, CRDC has reached agreement with the Grains Research and Development Corporation (GRDC) for a joint-funded project to improve spray application training, information and extension across the summer crop grains growing region, where cotton is mostly grown.

August 2006 will see the thirteenth ACGRA Australian Cotton Conference, with a theme of "Product; Production; Profit: Progressing our natural advantage." CRDC will, once again, sponsor industry personnel and community members to attend the conference as a training and development opportunity on this important subject. Around 1200 growers, researchers, consultants and other industry personnel are expected to attend – an extraordinary industry commitment to a conference that is all about R&D. The conference also provides an excellent opportunity for CRDC to promote its achievements under the Rural R&D Corporations model.

Measure of Success

Evidence of improved skills and qualifications of researchers, extension and technical personnel, administrators, consultants and growers

- The pilot *Cotton Field to Fabric Training Course: Managing for quality through the production chain* gave participants a useful perspective on where they fit in the production chain. Success of the course means it can now be delivered throughout the industry
- CRDC funded a total of 22 postgraduate scholarships in 2005–06, with five commencing in 2005–06
- 19 travel grants were awarded in 2005–06

STRATEGY 3

Foster the development of opportunities for women in the cotton industry

Wincott is the organisation for women right across the cotton industry and CRDC has provided it with seed funding since its inception. But 2005–06 was a landmark: the year in which membership fees were abolished and, almost paradoxically, the first year in which the organisation became self-sustaining. Members have used the skills, confidence and contacts they have gained over recent years to seek other sources of sponsorship and project funding. As a result, Wincott enters 2006–07 as a strong, viable, self-sustaining organisation. CRDC will continue to liaise closely with Wincott in the coming year and to offer logistical support and advice where necessary.

In 2005–06, Wincott continued to organise field days, training courses, assistance with applications for grants and awards, and regular newsletters to keep members up to date with what is going on in the cotton industry and the wider world of Australian agriculture. A number of Wincott members have used the skills gained through Wincott to take up important leadership roles and make a contribution to their regional communities.

Other cotton industry organisations now regard Wincott as a valuable means of promoting industry events such as farm health and skills shortage workshops and Wincott's excellent cotton industry 'starter kit' is also being used by other organisations. Wincott will assist with succession planning workshops in all cotton valleys in the coming year.

Sandy Young (bottom left) runs the Australian Cotton Centre in Narrabri and was ACGRA's Young Achiever of the Year for 2005. Sandy is an enthusiastic participant in Wincott activities and says her public speaking has advanced in leaps and bounds as a result

Emerald cotton grower, Alicia Dunbar, undertook the Australian Government's Corporate Governance for Rural Women course with CRDC sponsorship and is Chair of Fitzroy Basin Food and Fibre

Measure of Success

Women in key industry roles

- Wincott became financially self-sustaining during 2005–06 and membership rose to over 200, up from 70 in 2004–05. More than 100 Wincott women attended three information and training days
- 70 per cent of CRDC staff are women; Ms Bridget Jackson is Chair of CRDC; Ms Lisa Wilson and Ms Leith Boully are Directors

- Some other examples of successful women: Ms Christine Campbell is a Director of Cotton Australia and former Chair of the Australian Cotton Industry Council; there are three women Directors on the Board of the Cotton Catchment Communities CRC; Mrs Joanne Grainger is a Director of Cotton Australia; former CRDC Director, Ms Bobby Brazil is Chair of Land and Water Australia and Chancellor of the University of Southern Queensland, as well as a partner in her family's cotton farming enterprise; Alicia Dunbar is Chair of Fitzroy Basin Food and Fibre.

STRATEGY 4

Continue to develop a variety of effective decision support systems that support the implementation of research and extension outcomes and shorten the time to adoption

CRDC commissioned Brendan Doyle of the Institute for Rural Futures at the University of New England to undertake an evaluation of decision support CD systems through the Cotton Consultants Association in September 2005. The evaluation used focus groups and surveyed growers and consultants to understand how they use and value a range of decision support tools, including the PC-based CottonLOGIC and a range of web-based tools.

The evaluation showed that consultants use tools more than growers do and tend to value them more highly. The use of some tools is much greater than others: for example, some of the more simply accessed tools such as weed and insect identification on the web were highly regarded and used. Other tools such as HydroLOGIC, which provides a range of decision support for irrigation management, were not used as widely (although there were 64 new registrations during 2005–06) because they were more complex, requiring a certain level of understanding or training before a user was able to benefit from them.

Figure 17: Average Rating of CottonLOGIC tools

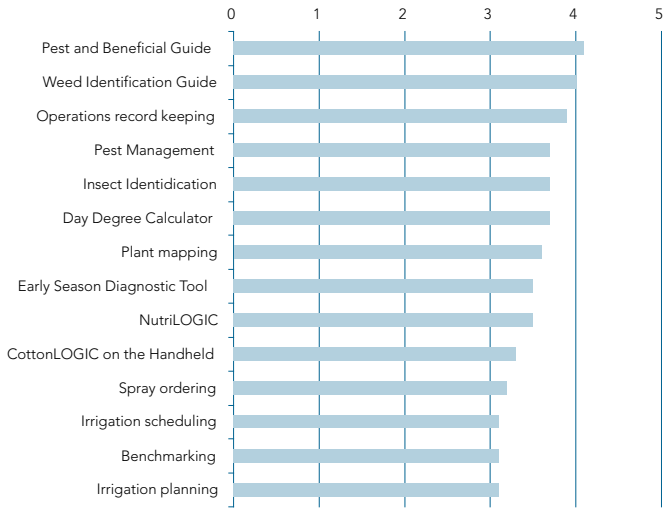


Figure 18: Cotton CRC website tools – Consultants

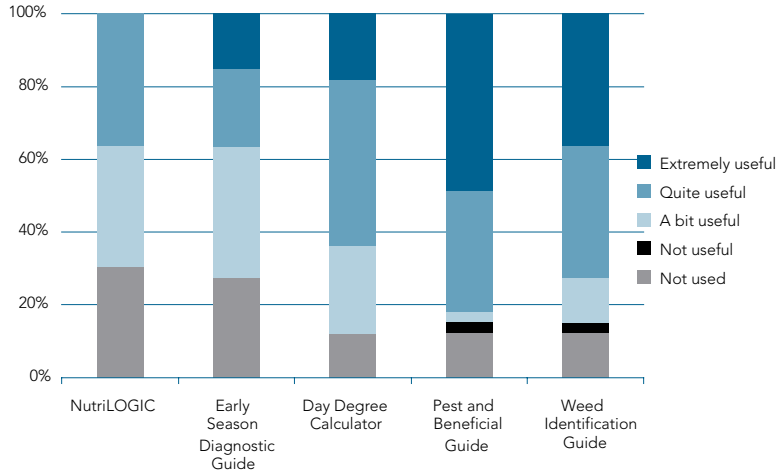
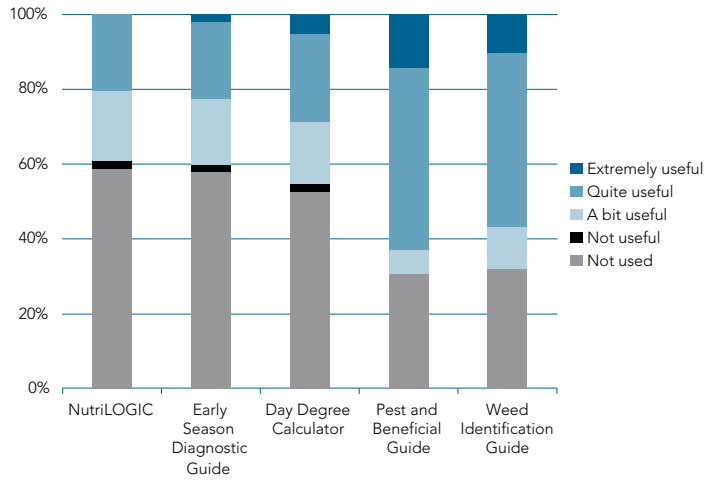


Figure 19: Cotton CRC website tools – Growers



This evaluation has highlighted the need for a more structured process for the industry and researchers to prioritise and develop tools that address the reality of how much time and capacity growers and consultants can reasonably devote to them. Researchers have been asked to devise a more structured development plan and establish a steering committee with growers and consultants who can provide stronger linkages back to their own organisations.

Measure of Success

Evidence that the use of decision support systems is leading to the adoption of research outcomes and improved practices

- Evaluation of the use of decision support systems by growers and consultants has given a clearer picture of needs, which will be addressed by researchers
- CRDC continues to utilise the skills of the National Cotton Extension Network to encourage growers and consultants to use available decision support tools and to train them in their use.
- 64 new registrations for HydroLOGIC and 26 for CottonLOGIC in 2005–06

STRATEGY 5

Support the on-going development of information packages and tools that consolidate and disseminate research outcomes

A broad range of information 'paks' developed by CRDC, or with support from CRDC, were in use during the current year: SPRAYpak, ENTOpak, NUTRIpak, SOILpak, the *Australian Dryland Production Guide, Cotton Production during Drought, Integrated Disease Management Guidelines for Cotton*, WEEDpak, WATERpak and *Managing Riparian Lands in the Cotton Industry*. CRDC and the Cotton Catchment Communities CRC are encouraging the use of the CRC's CD Rom, which represents a fully searchable 'one stop shop' for these decision support tools. The CD also contains the cotton BMP manual, including the new Land and Water Management module. This PDF version of the BMP manual provides links to relevant sections of the 'paks', enabling easier and quicker navigation.

During the coming year, the potential for a fully electronic version of BMP will be explored, to provide integrated access to production information that can be used to benchmark on-farm practices and as a basis for reporting on environmental management practices on an industry-wide basis.

Measure of Success

Evidence that the use of information packages and tools is leading to the adoption of research outcomes and improved practices

- Information packages and tools are sent to growers and consultants when they specifically request them, meaning distribution numbers have a high correlation with actual use
- Over 130 new copies of searchable edition of COTTONpak CD Rom containing all the 'Paks' and other information packages distributed in 2005–06

- WEEDpak was updated in 2005–06, providing wider coverage: 74 weed sets have been included in the identification and information guide with information on the biology and ecology provided for 43 of these
- Study has shown 'Paks' are well used and well regarded by cotton growers and consultants; steady and ongoing demand in 2005–06 meant new registrations for:
  - ENTOpak (incorporating IPM Guidelines): 44
  - NUTRIpak: 17
  - WEEDpak: 20
  - SPRAYpak: 15
  - WATERpak: 59

STRATEGY 6

Promote safe, healthy workplaces through the adoption of appropriate Occupational Health and Safety work practices

CRDC continued to contribute to the joint venture Farm Health and Safety R&D program in 2005–06. This project, which was established in 2002, is managed by the Rural Industry Research and Development Corporation (RIRDC). It aims to increase the adoption of safe systems of work on farms and to develop health and safety resources for agricultural sectors.

The ongoing implementation of BMP practices on farms continues to ensure that improvements in issues such as the safe handling and storage of chemicals are addressed. At a Corporate level, CRDC and its employees remain committed to OH&S and to achieving best practice with a focus on continual improvement.

The links between family health, farm-related accidents and farm sustainability were explored at the inaugural CRDC-funded Sustainable Farm Families project for the cotton industry, which took place in Dalby and Wee Waa in February 2006. This project takes farmers and their family members through an intensive health evaluation, education and training process, which identifies potential health and wellbeing risks. Almost 40 people attended the workshops and feedback from participants has been extremely positive.

"The program was a wake up call to stop taking things for granted and start taking greater control of our lives – health, wellbeing and family safety"

"The course caused us to examine our lifestyle and set goals for our future. It alerted us to the dangers to our health and gave us strategies to help live a healthier and more productive life. We are encouraged to make some changes to our personal and family life. Hopefully better health outcomes will lead to better farm outcomes"

Participants
Sustainable Farm Families project

Measure of Success

OH&S performance of industry workplaces is improving

- CRDC-funded workshops which explored the links between family, health, farm-related accidents and farm stability had an enthusiastic reception – a recognition that healthy families mean a healthy industry
- CRDC continues to co-fund the Farm Health and Safety joint venture with other rural R&D Corporations.

STRATEGY 7

Facilitate effective coordination and partnerships with research and development providers, industry and community organisations

CRDC was engaged in a number of collaborative programs with a range of different partners throughout the reporting year. These included, first and foremost, the Cotton Catchment Communities CRC – with CRDC investing four million dollars in the new CRC in 2005–06. All but $100,000 of that sum was tied to specific projects that were required to address CRDC's strategic objectives in addition to meeting the CRC's needs. CRDC staff and Directors were heavily involved in developing the successful business case for the new CRC and will continue to be involved in its strategic planning and implementation. CRDC will invest $28 million in the Cotton Catchment Communities CRC over its seven years of operation.

CRDC is one of 14 funding partners of the National Program for Sustainable Irrigation (NPSI), which also includes irrigators, water authorities, research agencies, commodity groups and state and national government departments. CRDC is also supporting the training program being developed under the Knowledge Management in Irrigation Cotton and Grains Project.

The Corporation works closely with Catchment Management Authorities and other regional bodies. As part of the Rural Research and Development Corporations Natural Resource Management working group, CRDC helps to develop and coordinate plans to communicate with these organisations on natural resource management research and extension issues.

CRDC is participating in the Cooperative Venture for Capacity Building and Innovation in Rural Industries (CVCB) with the Department of Agriculture, Fisheries and Forestry, the Murray-Darling Basin Commission and other Rural R&D Corporations: Australian Wool Innovation, Dairy Australia, Grains Research and Development Corporation, Grape and Wine Research and Development Corporation, Land & Water Australia, Meat & Livestock Australia, Rural Industries Research and Development Corporation and the Sugar Research and Development Corporation.

A CVCB definition of capacity building is "externally or internally initiated processes designed to help individuals and groups associated with rural Australia to appreciate and manage their changing circumstances, with the objective of improving the stock of human, social, financial, physical and natural capital in an ethically defensible way."

Once again, CRDC supported production of the joint Cotton Comparative Analysis with Boyce Chartered Accountants and the Cotton Catchment Communities CRC, helping producers to financially benchmark their operations.

In addition to collaborative projects such as those described above, CRDC works with other R&D Corporations at a strategic and conceptual level and constantly seeks further opportunities to increase the range of collaborative research projects and programs with other Corporations.

CRDC staff continued to play a major role in the development of a culture of communication and collaboration across all aspects of the cotton industry, including a number of pivotal industry roles such as program leadership within the Cotton Catchment Communities CRC, the Australian Cotton Industry Council (ACIC) and support for industry committees providing guidance on a range of key issues.

CRDC's key partner organisations in 2005–06					
Government	Cotton industry	CRCs	Universities	Private Enterprise	Other RDCs
CSIRO Plant Industry	Cotton Australia	Cotton Catchment Communities CRC	National Centre for Engineering in Agriculture	A & A Williams	Grains R&D Corporation
CSIRO Entomology	Australian Cotton Growers Research Association	CRC for Greenhouse Accounting	University of Adelaide	Australian Cotton Exhibition Centre (ACEC)	Rural Industries R&D Corporation
CSIRO Textile and Fibre Technology	Australian Cotton Ginners Association	CRC for Irrigation Futures	Australian National University	Australian Rural Leadership Foundation	Land & Water Australia
NSW Department of Primary Industries	Australian Cotton Shippers Association		University of NSW	Boyce Chartered Accountants	Fisheries R&D Corporation
Queensland Department of Primary Industries & Fisheries	Australian Cotton Industry Council		University of New England	Bill Gordon Consulting	
Australian Government Department of Agriculture, Fisheries and Forestry	Cotton Consultants Association		University of Queensland	Shaws Cotton Services	
Victorian Department of Primary Industries	Women in Cotton (Wincott)		University of South Australia	Hassalls & Associates	
	Cotton Classers Association of Australia		University of Sydney		
			LaTrobe University		

Measure of Success

Implementation of outcomes in partnership with a variety of research and development providers

- Collaborative research is underpinning a range of gains: environmental (e.g., sustainable irrigation), economic (e.g., financial benchmarking) and social (e.g., community benefits, capacity building)
- 38 key partners in 2005–06, along with collaboration with a large number of organisations through programs such as NPSI

PROGRAM TWO
Integrated Natural Resource Management

THE PROGRAM AT A GLANCE

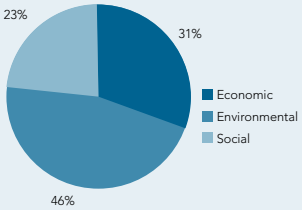
Objective

Improved delivery of research, knowledge and management strategies related to natural resources that enhance the ecological, social and economic values associated with cotton production systems, both on and off farm, and reduce negative environmental impacts

Number of projects 2005–06:	22
Compared with 2004–05:	17
Expenditure in 2005–06:	$791,757
Compared with 2004–05:	$1,051,182

Strategies CRDC Strategic Plan 2003–2008	Measures of Success
1 Incorporate a broader range of environmental issues in the Cotton BMP program, and facilitate their adoption	Increased adoption and broader environmental coverage of the Cotton BMP program
2 Investigate and evaluate environmental management systems as an industry-led approach to improved natural resource management	An evaluation of environmental management systems as a farm and natural resource management tool
3 Support multi-disciplinary approaches to developing farm management strategies that complement catchment and landscape outcomes in relation to salinity, water quality and quantity, and biodiversity	Improved trends in landscape and catchment indicators such as salinity, water quality and biodiversity. Project and funding links with other catchment and landscape programs related to biophysical targets and sustainability. Improved perception of cotton production by the community
4 Facilitate the necessary environmental impact research for any new transgenic traits introduced into cotton varieties	Publication of refereed environmental impact research in scientific journals related to new transgenic traits
5 Investigate the potential impact of climate change on cotton production, benchmark the industry's contribution to greenhouse gas emissions, energy use, and develop integrated management strategies to reduce emissions	Benchmarked greenhouse gas emissions, energy use and potential climate change impacts

Figure 20: Triple Bottom Line investment 2005–06



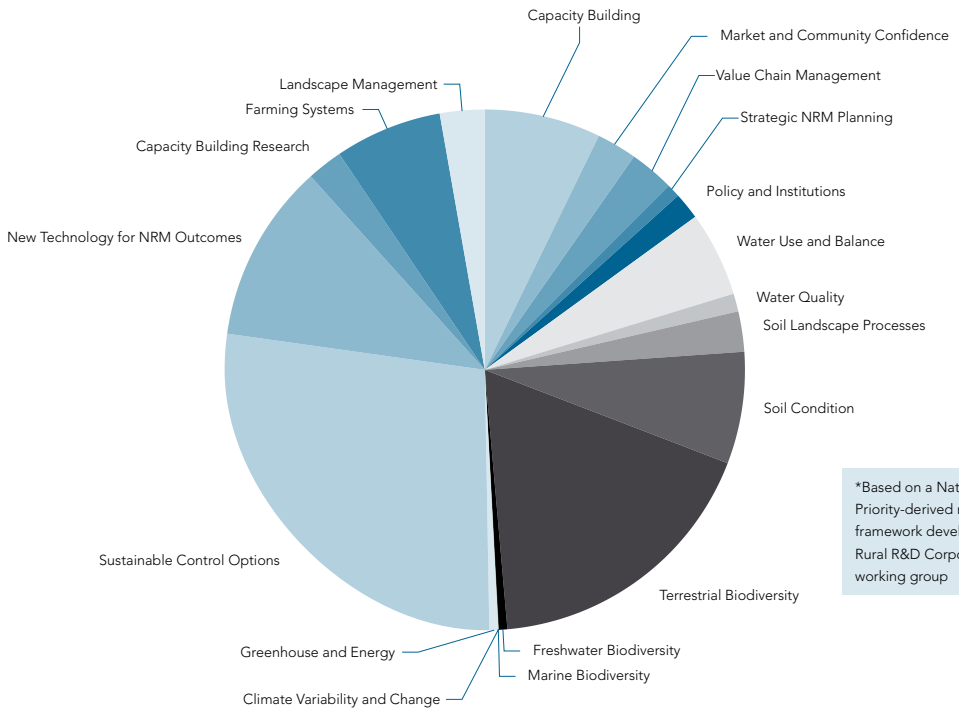
Outcome

Increased ecosystem health, community wellbeing and economic wealth of cotton growing regions and a reduction of the negative environmental impacts on cotton production systems.

BACKGROUND

Natural Resource Management (NRM) has been a major strategic focus for CRDC over recent years, with the NRM R&D effort ranging from field to catchment scale. The past decade has seen remarkable improvements in pesticide use and pest management, as well as improvements in water use efficiency, vegetation and land management, waste recycling and disposal, wildlife management and biodiversity. Research projects within this program seek to enhance and extend these benefits in coming years.

Figure 21: CRDC NRM Investment 2005–06*



*Based on a National Research Priority-derived reporting framework developed by a joint Rural R&D Corporations NRM working group

STRATEGY 1

Incorporate a broader range of environmental issues in the Cotton BMP program and facilitate their adoption

What is BMP?

Best Management Practices, or BMP, is the Australian cotton industry's commitment to continuous improvement focused on reducing the impacts of cotton farming on the natural environment, neighbours, workers and the community: in other words, its environmental management system. The BMP program is a coordinated industry effort, with CRDC managing the development and Cotton Australia managing the implementation and auditing.

BMP is one of the biggest tasks the cotton industry has ever undertaken and sets an example for the rest of the rural sector. Combining sound science and practical farm management, BMP is a tool for growing cotton under best practice. So far, over 95 per cent of the industry has been introduced to BMP via a practical 'how-to' BMP Manual that has been distributed to growers. Training seminars have been conducted on how to use it. A BMP Coordinator oversees the adoption of BMP at the grass-roots level. While there is a long way to go before it can be demonstrated through certification that there has been full adoption of BMP on every farm, there has been a hastening of positive change in cotton farming practices over the last few years.

Best Management Practices helps cotton growers:

- Identify and manage environmental risks
- Create a safe workplace for staff
- Design cotton farms that minimise environmental impact
- Use pesticides in a safe and responsible manner
- Use all available options to control pests
- Minimise usage of, and recycle, water
- Store and handle chemicals safely
- Contribute to catchment targets through individual on-farm improvements.

Almost seven million dollars has been invested in the research that supports the development of the BMP program over the past eleven years, including development of the BMP manual and auditing system for cotton growers.

CRDC's objective of advancing the BMP program towards a catchment scale became more achievable with the release of the BMP Land and Water Management module in early 2005. This module is helping cotton growers manage land, water and vegetation resources, with the aim of protecting and enhancing the natural environment on their farms, improving water use efficiency and, at the same time, improving profitability.

The current year saw further implementation of this module by Cotton Australia in partnership with CRDC, a number of catchment management bodies and environmental extension staff within the new Cotton Catchment Communities CRC.

CRDC coordinated an evaluation of the BMP process in early 2006, as part of an Australian Government *Environmental Management Systems (EMS) Pathways* project. The project was funded by the National Heritage Trust and conducted by Hassall and Associates. The evaluation largely focused on the introduction of the new Land and Water Management module. The review ranked BMP against the key catchment targets of two regional NRM bodies in cotton growing regions – the Condamine Alliance and Namoi Catchment Management Authority – in order to determine the likely NRM outcomes from the Land and Water Management module. It found that the BMP process and Land and Water Management module provided "...effective, well developed tools for reviewing and planning changes to activities on farm. It effectively addresses most key NRM issues of relevance to cotton growing regions and as such presents a tool that has the potential to deliver NRM and profitability outcomes."

The review also concluded that the benefits of BMP had not been well marketed to the industry and many of these benefits are not evident until a grower is well into working with BMP. When BMP was first established, it was quite clear that pesticide management was the key issue for the industry. Now that the quantity of pesticide use has reduced greatly, through the application of principles encouraged by the BMP program, and remaining use is more careful and strategic, there is no longer a single significant driver and there are few readily apparent incentives for growers to fully participate in the BMP process up to the point of being audited. The review concluded that the industry has gained significant and valuable external recognition for having had the courage to develop BMP and openly address environmental issues but that individual growers see inadequate value in undertaking a process to demonstrate compliance with practices that many believe they are already doing.

The Australian Cotton Industry Council (ACIC), CRDC and Cotton Australia view this issue with some concern, as it means the key measure of BMP's success (that is, the number of growers and/or area planted to cotton audited) has not been increasing. Yet we know there has been substantial improvement

across a range of environmental on-farm practices due to BMP and adoption of outputs from R&D.

In mid-June 2006, Cotton Australia and CRDC assisted ACIC to bring grower stakeholders together to discuss the successes and failures of the current program and the opportunities for reinventing or repackaging BMP to provide greater value to individual growers whilst maintaining the program's credibility with external stakeholders such as government, non-government organisations, the community and, importantly, the industry's customers. The workshop clearly supported the industry having a program like BMP and concluded that perhaps there needs to be a greater focus on the industry being able to monitor industry-wide practices – including their linkages to good NRM outcomes – and report on those as opposed to reporting on individual compliance with a process. CRDC will work with ACIC and Cotton Australia over the next twelve months to introduce improvements to BMP that will increase its value to the grower.

Because of these changes, the method of reporting progress has also changed from the 2004–05 year, when CRDC used the Cotton Australia figure of 40 per cent of growers in the BMP audit process and 60 per cent of the 2005 crop produced to BMP standards. During the current year, the ACIC BMP Committee has introduced a set of Certification Standards and Cotton Australia Grower Services Managers have been conducting Pre-certification Assessments (PCAs), applying these standards to growers operations. This includes growers who were previously considered to be in the BMP program and some who are new to it.

Previously growers were classed as being in the BMP program if they could demonstrate their understanding of the process and had made a commitment to continuous improvement. The introduction of the certification standards means that standards are more rigorous and fewer growers fully meet these standards. It does not in any way indicate that there has been a deterioration of practices in the industry; nevertheless, it does highlight the need for the industry to be able to measure, monitor and report on a range of key practices as well as the number of growers meeting BMP standards or bales produced under them.

Measure of Success

Increased adoption and broader environmental coverage of the Cotton BMP program

- BMP stakeholder workshop that confirmed the importance of BMP but recommended a greater focus on industry-wide practices rather than individual compliance, leading to improvements that will increase BMP's value to growers
- 184 cotton farms are involved in the BMP program at a pre-certification or full certification level

- The introduction of new BMP Certification Standards means more consistent and rigorous standards are applied to growers who are seeking full certification and the benefits of BMP certification are more readily conveyed to external stakeholders
- Continuing implementation of the BMP Land and Water Management module is improving environmental performance – more than 100 growers and consultants received training through the National Cotton Extension Team in 2005–06

STRATEGY 2

Investigate and evaluate environmental management systems as an industry-led approach to improved natural resource management

The Best Management Practices (BMP) program is now broadly recognised as the Australian cotton industry's environmental management system. As well as wide recognition of the strength of the BMP process by external stakeholders such as state and federal governments and other industries, a number of New South Wales and Queensland catchment management bodies have expressed their support for the BMP program. Changes taking place to strengthen internal commitment to BMP are detailed in Strategy 1.

Amendments to the *Queensland Water Act 2000* during 2005 included a provision to accredit industry-developed farm management systems, bringing the cotton industry one step closer to having the BMP program recognised against the Land and Water Management Plans required by the Queensland Government.

BMP has also provided a framework through which the industry as a whole continues to implement *Taking Responsibility for our Future* (2005), the action plan formulated response to recommendations in the second Australian cotton industry environmental audit, commissioned by CRDC in 2003.

Needless to say, BMP is not yet a perfect environmental management system. CRDC is concentrating on how to improve it further and has commissioned a project to review the contents of the BMP manual. The review will help identify any overlaps within the current manual and how they can be streamlined. It will also consider the currency of federal and state legislative information and seek to address emerging issues such as 'BMP for the reduction of greenhouse emissions' and 'energy use'.

Measure of Success

An evaluation of environmental management systems as a farm and natural resource management tool

- BMP is providing a framework for the CRDC-coordinated industry action plan to continue to address recommendations on environmental performance in the second cotton industry independent environmental audit
- BMP continues to make incremental gains in external recognition as a credible environmental management system delivering measurable environmental improvements

STRATEGY 3

Support multi-disciplinary approaches to developing farm management strategies that complement catchment and landscape outcomes in relation to salinity, water quality and quantity, and biodiversity

The long and harsh drought drags on in nearly all cotton production valleys, ensuring a continuing focus on the sensitive issue of water supply. CRDC continues to invest in research and new technologies to improve water use efficiency.

Research projects are assessing the impact of the industry on groundwater systems, including the level of deep drainage under irrigation systems. CRDC and the Cotton Catchment Communities CRC established a large collaborative project with Queensland Department of Natural Resources and Water, the University of New South Wales, University of Technology Sydney, CSIRO Land and Water and New South Wales Department of Primary Industries. A range of techniques is being used to assess deep drainage from the cotton plant's root zone to the groundwater system, including traditional lysimeter and piezometer measurements, as well as a new technique of underground electrical imagery.

CRDC continues to invest in an expansion of the lysimeter network to ensure comprehensive assessment of deep drainage across different soil types and cotton regions. This work will improve the industry's understanding of sustainable yields for groundwater use, as well as the impact of the cotton industry on catchment health in terms of salinity and groundwater-dependent ecosystems. It will lead to development of new BMP field and farm scale irrigation management guidelines that are consistent with maintaining healthy catchments and NRM targets developed by regional NRM bodies.

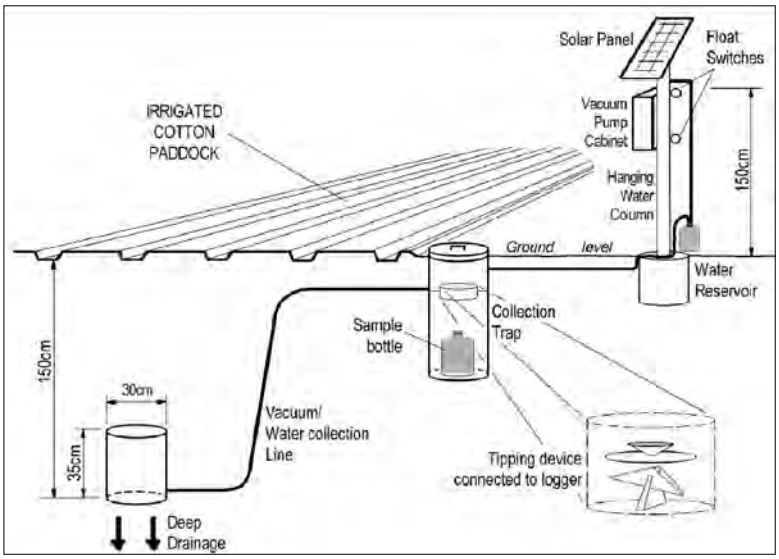


Diagram: Dr Thusitha Gunawardena, Queensland Department of Natural Resources and Water

The information collected on deep drainage at a field and farm scale using lysimeters such as these will be integrated into regional water flow models that link surface and groundwater flows

The cotton industry has a significant number of on-farm water storages and a CRDC project is investigating how these can best be used to enhance the aquatic and terrestrial biodiversity on cotton farms. Ongoing drought conditions are hampering research in this area; however, its importance to the sustainability of catchment biodiversity is such that CRDC believes it is worth persisting.

Past research has shown that modification of on-farm storages into artificial wetlands provides a useful technique for bioremediating water by removing pesticides. In cooperation with the Cotton Catchment Communities CRC, CRDC has released a publication, *Design principles for healthy waterways on cotton farms*, summarising the benefits of this technique, not only for pesticide management but also for improving biodiversity on farms.

On-farm water storages such as this one near Narrabri can be used for both water bioremediation and to enhance biodiversity

Pesticide risk assessment has been a focus of CRDC's program for a number of years. A commissioned research project has identified Diuron, a herbicide used across a range of agricultural industries, as the highest priority target for reducing environmental contamination. The introduction of herbicide-tolerant cotton has reduced the level of Diuron used in the cotton industry, based on a survey conducted by Cotton Consultants of Australia (CCA 2005). In addition, future research will investigate the use of artificial wetlands, in combination with CRC-developed bioremediation tools, including enzymes that rapidly degrade pesticides like Diuron.

During the reporting year, CRDC received the final report on an earlier-funded project, *Evaluation of Integrated Area Wide Management in Rural Landscapes*, conducted in the Emerald region in Queensland. CRDC had funded the original project, with the Queensland Department of Natural Resources, Mines and Water later contributing matching funds.

Several recommendations from the report will provide guidance for future research. The author, Bill Wilkinson, recommended that CRDC and Cotton Australia invest in Geographic Information System (GIS) training and consider

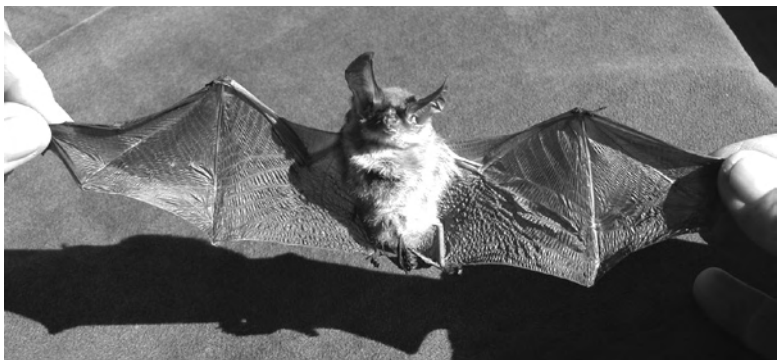
providing GIS software to their field operatives. He also suggested that the cotton industry examine its role in information management, particularly environmental and biophysical information, and guide the development of an acceptable industry managed information framework. He suggests that this will encourage cotton growers and local area groups to participate confidently in the management and provision of information that will support farm-based, area-wide and regional outcomes. He also recommended that future production and environmental research be captured in geo-spatial forms and stored in an agreed format in an agreed place.

Mr Wilkinson concluded that the area-wide management approach helps support the continuous cycle of improvement on which BMP is founded and provides a tangible means of demonstrating that biophysical condition and trend is being monitored and acted upon. He recommended that the cotton industry continue to work with other commodity groups to seek efficiencies on an area-wide basis.

Integrated Area Wide Management (IAWM) initially used available information and further information gathered from growers spatially with GIS to indicate practice change such as insect movement across the district. This was then expanded to include soil management issues such as salinity and sodicity and now includes issues such as water quality monitoring which has been addressed through a training program for growers and associated material and biodiversity, such as a bird identification booklet.

One important by-product of the Emerald IAWM is that it has demonstrated to growers how combining the information collected from individual growers by different government departments can be used to the benefit of the whole district. For example, growers were asked to measure runoff into government drains; once measurements were made it became clear that the drains were leaking and, faced with this evidence, the Queensland Government moved to remedy the problem.

Based on the success of the Emerald IAWM project, opportunities for extending it to other cotton valleys will be explored.

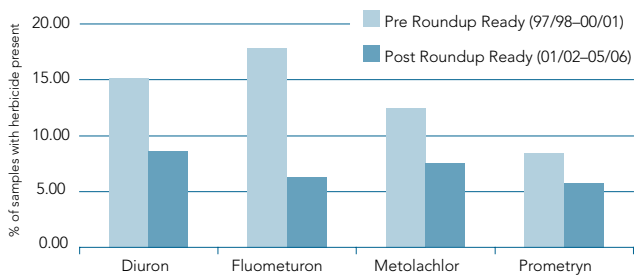


Postgraduate student Leah MacKinnon is undertaking research into the role of insect-eating microbats such as this one in irrigated cotton, indigenous vegetation remnants and intensive production landscapes

CRDC continued to focus investment in riparian zone and flood plain management. In particular, collaborative projects were established in 2004–05 with several catchment management bodies, including co-investment in NRM extension in conjunction with the Cotton Catchment Communities CRC. This collaboration continued in 2005–06, with several catchment management bodies committing investment towards further adoption and extension of on-farm NRM activities.

Since 1990, the New South Wales Department of Infrastructure, Planning and Natural Resources (now the Department of Natural Resources), with funding support from irrigators in north-western New South Wales, has conducted an annual water quality monitoring program in the Macintyre, Gwydir, Namoi and Macquarie rivers. This program has regularly detected a number of residual herbicides commonly used by cotton growers as low level contaminants of these rivers. The figure below shows how the percentage of water samples containing four of the most common "cotton" herbicides contaminants has generally declined in these rivers since the introduction of Roundup Ready® varieties.

Figure 22: Percentage of river water samples in NW NSW with herbicide contamination pre vs post Roundup Ready®



Source: based on data from the New South Wales Department of Natural Resources

Measure of Success

Improved trends in landscape and catchment indicators such as salinity, water quality and biodiversity. Project and funding links with other catchment and landscape programs related to biophysical targets and sustainability. Improved perception of cotton production by the community

- Declines in herbicide contamination in rivers correlates with changes in residual herbicide use as a result of increased planting of CRDC-funded CSIRO Roundup Ready® varieties
- Study finds area-wide management in the Emerald district helps support a continuous cycle of improvement. Success in Emerald means opportunities can be investigated in other areas

- Information collected on deep drainage is helping to gain an understanding of sustainable groundwater use and catchment health and will lead to new BMP irrigation management guidelines
- A CRDC and Cotton Catchment Communities CRC publication on designing on-farm water storages will aid in pesticide bioremediation and improved biodiversity on farms

STRATEGY 4

Facilitate the necessary environmental impact research for any new transgenic traits introduced into cotton varieties

The development of genetically modified cotton varieties has been a high priority for CRDC over recent years and this investment has produced excellent returns by way of greatly reduced dependence on pesticides to combat pests and diseases. This has brought economic benefits by reducing the cost of chemicals and improved the environmental performance of the Australian cotton industry.

A recent evaluation of the environmental impact of conventional and *Bt* cotton found that the adoption of *Bt* cotton leads to an overall reduction of 64 per cent in environmental impact compared to conventional cotton. These findings were reported in a paper *Environmental impact of conventional and Bt insecticidal cotton expressing one and two Cry genes in Australia*, co-authored by CSIRO scientists and CRDC's General Manager Research and Extension, Bruce Pyke, and published in the Australian Journal of Agricultural Research in 2006. CRDC research now concentrates on optimising the management of this technology to make further environmental gains.

In 2002, the NSW Environmental Protection Agency (now the Department of Environment and Heritage) informed cotton ginners that cotton gin trash – the pieces of stick leaves, bolls and soil cleaned from lint during ginning – was being considered for classification as a hazardous waste because of possible pesticide contamination. This meant costly compliance with a whole new raft of strict requirements for disposing of the trash, as well as the establishment of expensive disposal infrastructure.

In a study commissioned by CRDC, Hassall and Associates (2005) estimated that compliance would cost the New South Wales industry a minimum of $64.55 million per year, with initial disposal set-up costs of $8.6 million. The benefit to the industry of avoiding this classification was calculated at a very significant $1.23 billion over twenty years.

The NSW Ginners Association decided to challenge the hazardous classification but needed some good science to back their case. CRDC initiated a research project which found that detected chemical residues in samples from gins in the Namoi, Gwydir and Border River valleys pose minimal risk to the ecosystem, demonstrating that the trash could be classified as a much less risky 'solid waste' rather than 'hazardous waste'.

Based on this information, the pressure on ginners has reduced. While some uncertainty remains, indications are that the management and classification of trash will now be on a case-by-case basis. This outcome frees producers to develop economically viable trash re-use options, as long as management guidelines are followed.

Bollgard II® technology now comprises 80 per cent of the cotton area planted and industry figures demonstrate that the quantity of pesticide applied to Bollgard crops is only 15 per cent of that applied to conventionally bred crops; consequently, pesticide residues on gin trash and cottonseed should also be reduced substantially. CRDC has funded a project, commencing in May 2006 (the ginning season), to measure pesticide residues in Bollgard II® and conventional gin trash and seed.

Measure of Success

Publication of refereed environmental impact research in scientific journals related to new transgenic traits

- Trash reclassification resulting from CRDC gin trash research saved the New South Wales cotton industry a minimum of $64.55 million per year and set-up costs of $8.6 million
- Gin trash research opens the way for producers to develop economically viable trash re-use options
- Scientific paper co-authored by CRDC General Manager Research and Development demonstrated that the adoption of Bt cotton leads to a reduction of 64 per cent in environmental impact compared to conventional cotton

STRATEGY 5

Investigate the potential impact of climate change on cotton production, benchmark the industry's contribution to greenhouse emissions and energy use and develop integrated management strategies to reduce emissions

CRDC funded ongoing research during 2005–06 on the contribution of nitrous oxide under irrigated cropping systems to the industry's greenhouse emissions. Initial results indicate that generally alkaline cotton soils with average nitrogen application results are substantially lower (around 0.5 per cent of nitrogen applied as N_20) than the Intergovernmental Panel on Climate Change (IPCC) standard benchmark of 1.25 per cent across worldwide agricultural industries. However, increasing nitrogen by another 50 per cent to levels of around 300 units of nitrogen per hectare increases N_20 to 2.5 per cent or above, clearly demonstrating the importance of optimising nitrogen rates. This not only provides a cost benefit to the grower but also significantly reduces greenhouse emissions.

This project has also developed a greenhouse calculator, which is available at the Cotton Catchment Communities CRC website (www.cotton.crc.org.au) and allows users to select a region and obtain specific information on a town or locality within that region. The project is also conducting a life cycle analysis of cotton in relation to greenhouse gas production and energy use.

Measure of Success

Benchmarked greenhouse gas emissions, energy use and potential climate change impacts

- Initial cotton greenhouse gas calculator available on the web for use by growers and consultants
- Initial estimates of N_20 production using average nitrogen application rates significantly lower than the IPCC benchmark
- CRDC, Australian Greenhouse Office and CRC Greenhouse Accounting are undertaking a greenhouse gas life cycle analysis of cotton production and manufacturing in Australia

PROGRAM THREE Crop Protection

THE PROGRAM AT A GLANCE

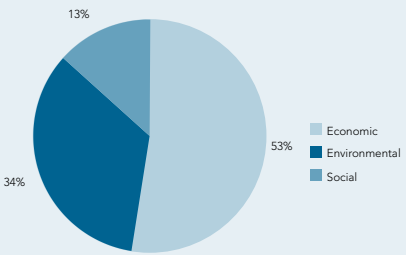
Objective

Improved integrated management of major pests, weeds and diseases, reflected by continued reductions in chemical insecticide and residual herbicide inputs to crops; and responsible management of transgenic technology.

Number of projects 2005–06:	32
Compared with 2004–05:	41
Expenditure in 2005–06:	$3,316,613
Compared with 2004–05:	$3,790,838

Strategies CRDC Strategic Plan 2003–2008	Measures of Success
1 Improve integrated non-chemical and chemical management of insect and mite pests	Evaluations on the adoption and outcomes of integrated practices, products and technologies, which improve returns, use less chemicals, reduce on and off site environmental impacts as well as any social outcomes
2 Improve integrated non-chemical and chemical management of weeds	Evaluations on the adoption and outcomes of integrated practices, products and technologies, which improve returns, use less chemicals, reduce on and off site environmental impacts as well as any social outcomes
3 Develop practices and technologies that reduce the spread and impact of cotton diseases	Reduced distribution, presence and impact of diseases
4 Ensure the development of resistance is minimised through the design and implementation of resistance management strategies for both insecticides and transgenic technologies	Monitor resistance levels with an aim to either avoid or keep resistance levels in pests and weeds at manageable levels
5 Ensure the benefits of transgenic crop technology are maximised through responsible management based on sound scientific risk assessment	Transgenic crop surveys and reports on performance, management and risk assessment

Figure 23: Triple Bottom Line investment



Outcome

Continued reduced reliance on chemical inputs and more effective management strategies for pests and weeds

BACKGROUND

The cotton industry was the first agricultural industry in Australia to move successfully to the commercial use of biotechnology. This has seen the dawn of a new era for crop protection throughout the industry but also the emergence of new challenges and opportunities, which are being addressed through a sustained and targeted R&D effort within this program.

STRATEGY 1

Improve integrated non-chemical and chemical management of insect and mite pests

The introduction of GM cotton has made a significant contribution to the dramatic reduction in the quantity of pesticides applied to Australian cotton crops over the past six years. The 2005-06 season saw the widespread planting of Bollgard II® cotton (two-gene *Bt* technology): 70 per cent of the cotton varieties planted across all regions contained both the Bollgard II® and Roundup Ready® genes, and a further 20 per cent of the varieties planted contained either the Bollgard II® or Roundup Ready® genes.

Helicoverpa pressure was extremely high across most cotton growing regions during the season and the technology performed very well under the stresses exerted by these populations. Even in a year of high *Helicoverpa* pressure, the number of insecticide applications required for *Helicoverpa* control in Bollgard II® cotton were much fewer than for conventional cotton. Prior to 1999–2000, Australian cotton received between 7 and 10 kilograms of insecticide active ingredient per hectare. In the last few seasons pesticide use has been reduced by 66 per cent and the figure is now between two and four kilograms of active ingredient per hectare. In 2005–06 it is estimated that Bollgard II® crops required less than 15 per cent of the insecticide for conventional crops.

A side effect of reduced insecticide spraying of Bollgard II® crops has been changes in the intensity of secondary pest species such as mirids, green vegetable bugs and silverleaf whitefly. For the first time an outbreak of silverleaf whitefly was reported on the Darling Downs in 2005–06, with smaller outbreaks occurring at St George and Bourke. Previous research investment by CRDC into silverleaf whitefly allowed the industry to rapidly respond to this new threat resulting in management of the species at these localities. Nevertheless, the increased populations of whitefly in these regions presents an ongoing threat to the industry both from a disease perspective and for lint quality, as the sticky honeydew left on the plant causes processing problems.

The silverleaf whitefly is a known carrier of the exotic cotton leaf curl disease and vigilance is required to ensure that Australian cotton remains disease free. CRDC is continuing its investment into the management of this troublesome pest species, along with a dedicated Integrated Pest Management approach for the management of other sucking insect pest species known to flare silverleaf whitefly populations (that is, cause their wider spread) if not managed correctly.

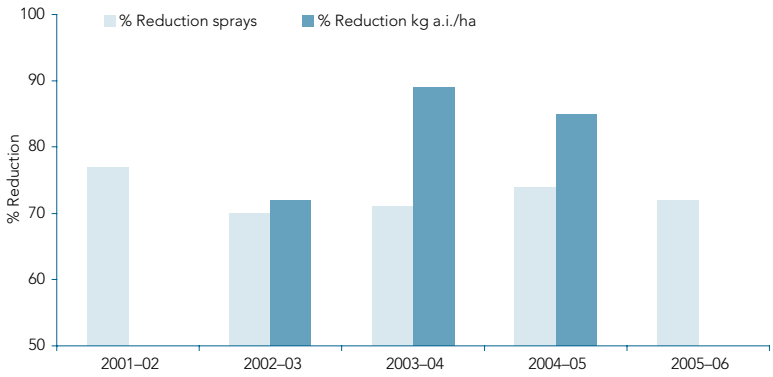
A forum aimed at better management of silverleaf whitefly and other sucking insect pests was held in Toowoomba in 2006, sponsored by CRDC and convened by the Queensland Department of Primary Industries and Fisheries. It brought together leading scientists and industry specialists from around Australia to ascertain better management options, as well as understand the threats posed by whitefly and other sucking pests of cotton.

A forum in 2006 looked at better management of sucking insect pests such as silverleaf whitefly

The IPM Short Course has been a valuable tool for the industry, completed by some 221 growers and consultants since 2001. The National Training Coordinator used 2005–06 to undertake a review of the course with past students to ensure it continues to meet current needs.

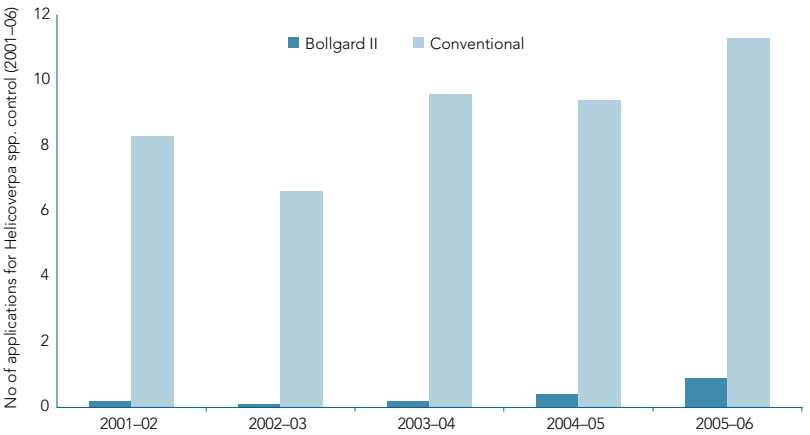
This Trichogramma wasp, seen parasitising a Helicoverpa egg, is one of the beneficial insects encouraged by growers as part of an IPM approach

Figure 24: Reduction in Chemical Use with Bollgard II®



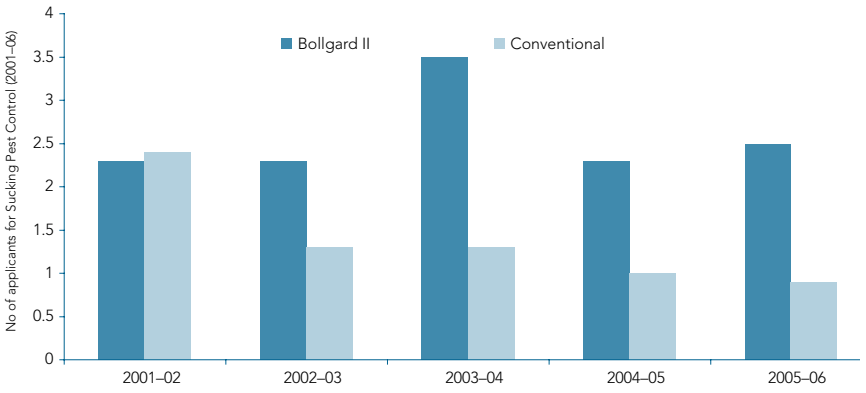
Source: Monsanto Ltd

Figure 25: Impact of Bollgard II® on Helicoverpa spp. management



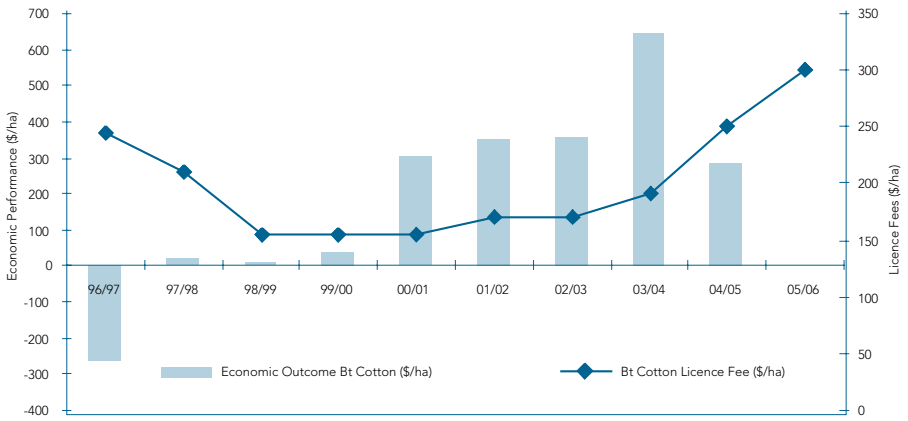
Source: Monsanto Ltd

Figure 26: Impact of Bollgard II® on Sucking Pest Management



Source: Monsanto Ltd

Figure 27: Impact of Bollgard II® on Sucking Pest Management



Measure of Success

Evaluation on the adoption and outcomes of integrated practices, products and technologies which improve returns, use less chemicals, reduce on and off site environmental impacts as well as any social outcomes

- *Bt* cotton market share increased to 80 per cent in 2005–06, demonstrating the usefulness and effectiveness of the technology, which requires 15 per cent of the insecticide required for conventional cotton to manage *Helicoverpa* spp.
- CRDC-sponsored forum provided better understanding of the silverleaf whitefly threat and better management of this pest
- Earlier CRDC-funded research allowed for prompt and effective management of silverleaf whitefly when new areas were affected in 2005–06
- A review of the Integrated Pest Management Short Course in 2005–06 will ensure it continues to meet grower needs

IPM: Holistic pest management

Integrated Pest Management (IPM) involves using a locally appropriate combination of a range of means of managing pest populations with the aim of reducing insecticide use while maintaining profitability, yield and fibre quality. IPM is a whole year approach to managing pests through the cotton growing season and the remainder of the year as well.

Cotton crops in Australia are attacked by a wide range of pests, the major ones being *Helicoverpa armigera* (cotton bollworm), *Helicoverpa punctigera* (native budworm), *Creontiades dilutus* (green mirid), *Aphis gossypii* (cotton aphid), *Tetranychus urticae* (two-spotted spider mite) and *Bemisia tabaci* B-Biotype (Silverleaf Whitefly). Control of these pests has largely relied on the use of synthetic insecticides; however, over-reliance on synthetic insecticides creates problems such as insecticide resistance (in *H. armigera*, silverleaf whitefly, aphids and mites), disruption of natural pest enemies, secondary pest outbreaks and environmental consequences. These problems have cast doubt over the long-term viability of the traditional insecticide-dominated approach to pest management. In Bollgard II® crops, the need to spray *Helicoverpa* spp. is dramatically reduced; however, these reductions have allowed secondary pests, such as mirids, green vegetable bugs, aphids and jassids, previously controlled by sprays targeting *Helicoverpa* spp., to emerge as pests.

Use of insecticides against these pests may disrupt natural enemies (beneficial insects), creating outbreaks of the pests; hence, there remains a strong incentive with both conventional (non-transgenic) and Bollgard II® cotton to use IPM to help reduce reliance on insecticides.

Taken at 'Coondarra' at Jimbour on the Darling Downs, this photograph shows a new way of farming for IPM – farmscaping. This involves growing complementary crops alongside each other to enhance the effect of beneficial insects by providing preferential food sources in close proximity to the cotton crop to be protected. In this case, a strip of sorghum provides the protein sources needed by beneficial insects so they remain in the vicinity of the cotton crop and destroy its insect pests

STRATEGY 2

Improve integrated non-chemical and chemical management of weeds

In recent years the focus of the weeds program has been on developing management systems for current and future industry issues. Spray drift has been a major issue for both the cotton and grains industry and CRDC has been instrumental in developing new research and extension projects to minimise spray drift and understand the damage caused by spray drift. CRDC anticipates that outcomes from this research will provide growers with management options for cotton damaged by spray drift. A further CRDC initiative was a joint project with Grains Research and Development Corporation (GRDC), which aims to provide chemical appliers and resellers with the necessary skills, training and information to reduce spray drift at the farm level.

Research continues into the management of problem weeds, particularly in dryland cotton systems. Research efforts are focusing on improved management of fleabane, a major new weed incursion onto many dryland and irrigated cotton properties. New research initiatives are planned to assist in understanding the biology, ecology and management of this particularly difficult to control weed.

The popularity of Roundup Ready® cotton continues to increase, with 77 per cent of the cotton area planted to varieties containing the glyphosate-tolerance gene *CP4 esps*. A PhD research project investigating the likely development of resistance to glyphosate in Roundup Ready® cotton systems was finalised in 2005–06. The results of this study, which focused on barnyard and liver-seed grass as indicator species, suggest that growers who adopt an integrated weed management strategy are unlikely to be affected by herbicide resistance. The industry eagerly awaits the introduction of new herbicide tolerance technologies (with limited release in 2006–07) with wider application windows that will allow more flexible weed management options.

The impact of Roundup Ready® varieties on herbicide use

The introduction of cotton varieties containing Roundup Ready® technology providing tolerance to the non-residual herbicide glyphosate has significantly lowered the total use of herbicides to control weeds in cotton:

- Total in-crop herbicide use has reduced by 33 per cent, mainly due to a reduction in residual herbicide use
- The quantities of contact herbicides used remained unchanged despite an increase in the use of glyphosate
- Residual herbicide use has changed least in the post-planting period
- Of the residual herbicides, Diuron use is 34 per cent less (in-crop) and 33 per cent less on channels post-Roundup Ready®. Although Diuron use on channels has reduced post-Roundup Ready®, it is still the main residual herbicide used
- Diuron use is highest post-planting and generally applied at the last cultivation, from which time protection of the soil by the crop canopy reaches its maximum.

In 2005–06 CRDC re-invested with CSIRO into the widely acclaimed breeding program based at Narrabri, which supports the ongoing development of both Roundup Ready FLEX® and Liberty Link® cotton varieties. Liberty Link cotton has been genetically modified to be tolerant to the broad-spectrum Liberty® herbicide. It is anticipated that a small amount of Sicot 80L seed containing the Liberty Link technology will be available in the 2006–07 season.

CRDC has invested with the Cotton Catchment Communities CRC in a project which aims to minimise the development of resistance and/or species shift in a system where the opportunity for glyphosate application is increased, by providing guidance on the timing of weed management measures for minimising yield losses.

Management practices used for weed control in cotton are broader than herbicide use and it is important that the alternatives to chemicals continue to be used by cotton growers in an integrated system. Integrated Weed Management (IWM) is a proactive weed management system, which has a number of important aims:

- To control all weed species at some point in the annual cycle in the farming system, using a range of methods (such as herbicides from different modes of action, strategic cultivation, hand chipping, rotation crops) but without relying on any one method completely
- To reduce the size of the weed seed bank
- To improve system sustainability by reducing reliance on the prophylactic use of residual herbicides.

IWM continues to be the central focus of weed research in cotton, with WEEDpak the principal resource and repository of information. In 2005–06, 74 weed sets had been included in the identification and information guide with information on the biology and ecology provided for 43 of these species. The updated version of WEEDpak is available via the CRC website, as well as on the CRC's COTTONpak CD.

Measure of Success

Evaluations on the adoption and outcomes of integrated practices, products and technologies, which improve returns, use less chemicals, reduce off site environmental impacts as well as any social outcomes

- Increased adoption of Roundup Ready® cotton to 77 per cent of the area planted in 2005-06, indicative of the benefits this technology brings to weed management
- Further reductions in the overall quantities of herbicides applied to cotton farming systems with the majority of growers indicating that best weed control results were achieved using conventional herbicide chemistries with the Roundup Ready technology (Source CCA 2005)
- Continued development of WEEDpak, with updates available via the internet and on the new COTTONpak CD
- Commercial release of limited quantities of seed containing Roundup Ready FLEX® technology for the first time in the 2006–07 season will provide a wider window for glyphosate application

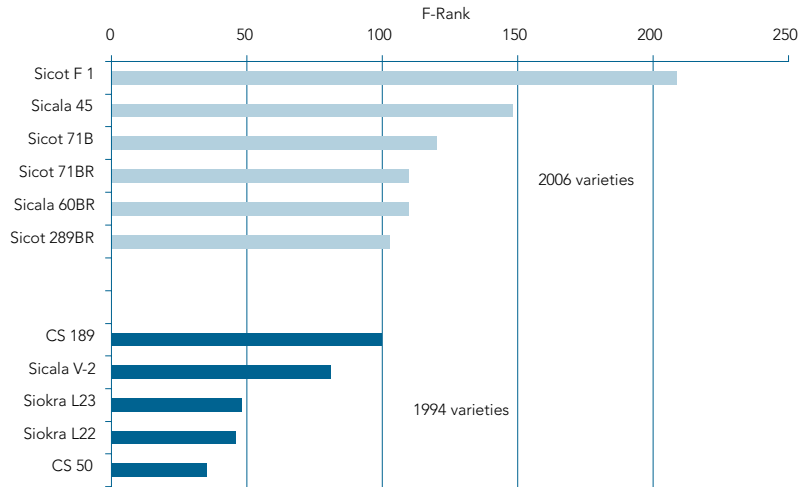
STRATEGY 3

Develop practices and technologies that reduce the spread and impact of cotton diseases

The soil borne diseases Fusarium wilt and Black Root Rot continued to be problematic in the 2005–06 season. Reports of losses due to Fusarium were in decline due to significant advances in the breeding program and a favourable season. The disease has spread further throughout cotton growing areas, although the rate of spread has been slowed. A new form of the disease has been identified and currently we are unsure as to the likely impact of this strain on production. Continued research at the molecular level, combined with increased understanding of the biology and ecology of the pathogen, are resulting in constant improvements in field management.

Research projects into Fusarium wilt include ecology, field management, novel sources of resistance and conventional breeding objectives. The search for novel resistance genes and markers continues and researchers are optimistic of providing industry with solutions to this disease. In the shorter term, there has been widespread adoption of improved farm hygiene practices to slow the spread of Fusarium, based on research and extension activities supported by CRDC.

Figure 28: Cotton Breeding has increased Fusarium Tolerance



Black root rot continues to spread and currently is found on the majority of cotton farms. While it does not have the same impact on cotton as Fusarium wilt, it predisposes the crop to insect infestation as well as making it more sensitive to weed pressure. CRDC has been funding research evaluating a new seed treatment (Bion®, Syngenta Crop Protection Pty Ltd) that initiates the natural self defence mechanisms of cotton. This seed treatment has so far yielded some promising results in terms of enhanced tolerance of both Fusarium wilt and black root rot. CRDC continues to invest in molecular studies of both pathogens as well as maintaining ecological studies of the pathogens at the field level.

In the fight against these diseases it is important that research and extension personnel communicate and share information relating to current and emerging research. The Fuscom group, which consists of some of Australia's leading plant pathologists and postgraduate students as well as growers, consultants and industry extension personnel, facilitates this exchange of important research information, leading to improved disease control.

Measure of Success

Reduced distribution, presence and impact of diseases

- Research aiding in the development of a compound that utilises the plant's own defence mechanisms to resist infection by disease
- Rate of spread of the major cotton disease reducing
- Improvements in germplasm with higher F ranks (a measure of resistance to Fusarium) is allowing growers to plant back into fields known to have Fusarium
- Continued improvements in the F rank of major commercial varieties. The average F-rank of the five leading varieties in 1996 was 57; in 2006 it was 120

STRATEGY 4

Ensure the development of resistance is minimised through the design and implementation of resistance management strategies for both insecticides and transgenic technologies; and

STRATEGY 5

Ensure the benefits of transgenic crop technology are maximised through responsible management based on sound scientific risk assessment

Monitoring for resistance and developing an understanding of the mechanisms that lead to resistance in conventional insecticides and the Bt proteins are crucial research areas of CRDC investments. Resistance management strategies are formulated through wide industry consultation to ensure the sustainability and stewardship of the technologies and chemistries available for insect control in the cotton industry.

The successful and widespread adoption of Bollgard II® in the 2005–06 season is a measure of the importance of this technology to industry for both improved productivity and environmental reform. The industry recognises that the improved quality of life on cotton farms and the reduced environmental footprint of cotton production is in part directly attributable to the advances in gene technology; hence, preserving and maintaining the integrity of the technology is of prime concern to CRDC.

Bt cotton has underpinned the management of *Helicoverpa* but it is only one aspect of good pest management. The continued presence of secondary pests such as green mirids, silver leaf whitefly and green vegetable bug emphasises the importance of an integrated approach to pest management, of which a fundamental component is the judicious use of conventional insecticides. To ensure the continued effectiveness of these compounds, CRDC supports a number or resistance monitoring projects that quantify the level of resistance in certain insect species. The success of the resistance management strategy and implementation of science-based integrated pest management strategies is demonstrated by a decline in the resistance levels to a number of important insecticides in the 2005–06 season.

The TIMS Committee: Time for a Change

The background

The ACGRA Transgenic and Insect Management Strategy (TIMS) Committee, with close collaboration by CRDC, has been responsible for managing resistance to insecticides and transgenic cotton for over ten years. But resistance needs have changed dramatically over the past few seasons – and these changes are gaining momentum.

With an extremely high market concentration of Bollgard II® cotton, insect dynamics and resistance management have to be viewed in a new way as the cotton industry now relies very heavily upon this technology. New transgenic technologies will be available to the Australian cotton industry in the near future and these must be managed correctly for potential resistance and cross-resistance to existing products. In addition, the growing use of herbicide-resistant transgenic crops of various types has provided more scope for their application and this will require close monitoring in case resistance develops because of changes in product use.

The changes

Following an internal ACGRA review, the current TIMS structure has been modified to meet these new challenges:

- The need to ensure that the TIMS Committee be seen as an independent body capable of reviewing and researching market sensitive data from providers has seen the voluntary resignation of some representatives of commercial organisations
- The geographic representation of the whole cotton industry has been widened through increased representation on the Committee and specific areas of responsibility attached to that representation
- Cotton consultants were viewed as a having a critical role in the management of resistance. Consequently, the Cotton Consultants Association now has an increased representation on the Committee, along with complete geographic representation and specific areas of responsibility
- The TIMS Technical Panels, made up of researchers able to review resistance issues and recommend changes for resistance management strategies, have been streamlined to ensure they operate efficiently and effectively on the scientific issues relating to resistance.

These changes will bring several benefits/improvements to the management of pest resistance:

- All providers, both current and future, can feel comfortable approaching the Committee with 'market sensitive' issues
- A close relationship can be maintained and further developed with regulatory authorities such as the Australian Pesticides and Veterinary Medicines Authority and the Office of the Gene Technology Regulator
- Clearer communication channels will ensure the improved transfer of issues and information between industry and research
- Timelines will be established and met, with ample time for industry and research to review proposed changes
- Cross-industry resistance issues can be discussed and possible management strategies developed to include other industries that may influence resistance issues within the cotton industry
- Stakeholders will have greater access to the TIMS Committee and its resources.

The newly restructured TIMS Committee will have a greater capacity to meet new resistance challenges

Measure of Success

Strategy 4

Monitor resistance levels with an aim to either avoid or keep resistance levels in pests and weeds at manageable levels

- A *Bt* resistance workshop attended by over 20 industry personnel led to a collaborative project between agencies to better understand resistance mechanisms
- A restructure of the ACGRA TIMS Committee will facilitate management of new resistance challenges, using the best possible science

Strategy 5

Transgenic crop surveys and reports on performance, management and risk assessment

- CRDC-funded research provided comprehensive field monitoring of insecticides and miticides with the following results:

Helicoverpa armigera

- Insecticide resistance to a number of key compounds has remained unchanged or has improved
- A new Integrated Resistance Management Strategy (IRMS) produced this season is less restrictive, reflecting the improvements in resistance
- Background resistance to the Cry 2ab toxin remains the same at around four in 1000 individuals with no evidence of cross-resistance to Cry 1Ac detected

Aphids

Resistance to some key insecticides has declined and in some instances was not evidenced

Mites

Results for mites are similar to those of aphids with less resistance detected in the 2005–06 season

Silverleaf whitefly

Confirmation that this introduced pest can develop resistance rapidly to the currently available insecticides: important in developing a resistance management strategy for whitefly given the broadening range of the pest.

PROGRAM FOUR Farming Systems

THE PROGRAM AT A GLANCE

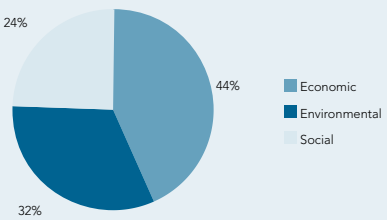
Objective

Integrated farm management practices that enhance the sustainability and profitability of cotton farming systems

Number of projects 2005–06:	27
Compared with 2004–05:	29
Expenditure in 2005–06:	$2,357,679
Compared with 2004–05:	$1,795,400

Strategies CRDC Strategic Plan 2003–2008	Measures of Success
1 Improve water use efficiency on farms using existing and new infrastructure, new tools and technologies	Increased yield per hectare and per megalitre of water and; Improved water use efficiency on farms
2 Understand salinity, sodicity and deep drainage on farms and develop appropriate farm management strategies to minimise these potential negative processes	Adoption of integrated management options for salinity and sodicity
3 Strengthen our understanding of soil health and improve crop nutrition management	Benchmark of soil health characteristics and optimise crop nutrition management
4 Increase profitability with better whole farm management strategies and innovative precision agricultural systems	Improved economic returns to farmers and; Data on changed farming practices including the economic, environmental or social benefits
5 Continue fundamental research on cotton agronomy and plant physiology and explore the interactions of different components for both conventional and transgenic varieties	Publication of cotton research related to crop physiology and transfer of agronomic knowledge into other research and extension project outcomes

Figure 29: Triple Bottom Line investment



Outcome

A more sustainable and profitable cotton farming system

BACKGROUND

The Australian cotton industry must maintain economic viability for growers through sustainable farming systems if it is to claim genuine 'triple bottom line' sustainability. The introduction of new GM varieties and integrated management systems such as those for pests, soils and weeds has seen the costs of chemical inputs decline significantly in recent years. That said, the ever-increasing costs of land, water, machinery and labour, coupled with prevailing drought and declining global prices, place ever-increasing financial pressure on cotton growers which CRDC-funded R&D must continue to address.

STRATEGY 1

Improve water use efficiency on farms using new and existing infrastructure, new tools and technologies

Water is the industry's most valuable resource. Drought, water reform processes and community perceptions of water use in the cotton industry are all helping to drive rapid improvement in water use efficiency (WUE). Growers continue to face limited water supplies and the prospect of continuing drought; however, recent years have seen increased yields per hectare that have been achieved without corresponding increases in water use per hectare, indicating that growers have significantly improved their on-farm water budgeting and scheduling techniques over recent years. Nevertheless, much work remains to ensure the best possible use of available water.

For a number of years, some 15 to 20 per cent (depending on seasonal conditions) of the Australian cotton area has been grown using only natural rainfall. There is an accumulation of expertise in dryland strategies for maximising yield in the face of limited rainfall, much of it gained through earlier CRDC-funded research. Irrigation farmers are adopting these dryland agronomic practices increasingly, so as to maximise the benefit from natural rainfall as an adjunct to irrigation.

Through CRDC's investment in the National Program for Sustainable Irrigation (NPSI), the project on knowledge management in irrigated cotton and grains is developing a version of WATERpak for the grains industry, which will underpin water management training for consultants and growers. WATERpak consists of a range of information that is to be disseminated through existing cotton, grains and irrigated industry networks.

While the vast majority of irrigated cotton uses furrow irrigation and considerable research funds have been committed to optimising this method, there is increasing interest in alternative methods such as lateral move and central pivot overhead irrigation systems. In the past, these systems were often viewed as not having sufficient daily application capacity for cotton but more modern systems are being designed to produce excellent cotton crops. These systems are very water use-efficient and less labour intensive, aiding

in one of CRDC's major goals of improving water use efficiency and helping the industry to further meet community expectations on water use. Australian growers have been quicker to adopt lateral move systems than centre pivot systems, although centre pivots offer additional benefits such as even lower labour costs than lateral move systems.

A CRDC project, which examined the precision placing of water in lateral move and central pivot systems, is helping to achieve 'more crop per drop' from irrigation water. With the same aim in mind, a post-doctoral project is looking at how to optimise irrigation scheduling through the use of continuous 'real time' plant monitoring sensors.

There are a number of siphon-less or bank-less irrigation systems in use in the cotton industry. In 2005–06 CRDC, in collaboration with the Cotton Catchment Communities CRC and the Queensland Governments Rural Water Use Efficiency III initiative, funded research to determine the efficiency of such systems for cotton production. The project evaluated the performance of alternative water delivery systems, bank-less channel irrigation, bank-less head ditch irrigation and pipes through the bank at ground level. Each of these systems was compared with a similar furrow-irrigated field on the same farm to reduce other variables to a minimum.

Although the comparisons are not yet finalised, preliminary irrigation performance data shows that the furrow system out-performed the bank-less head ditch and bank-less channel systems in all irrigation performance indices. Both systems suffered from agronomic and design issues, some of which are being addressed over the 2006 winter. The 'pipes through the bank' system, on the other hand, performed on a par with the adjacent furrow irrigated field.

As well as continuing to fund projects to increase the efficient use of water, CRDC is funding a major project through the Cotton Catchment Communities CRC to ensure that the latest research findings on water are extended thoroughly and rapidly throughout the industry via the National Extension Team.

Measure of Success

Increased yield per hectare and per megalitre of water; and improved water use efficiency on farms

- A major CRDC project is enhancing the water use efficiency extension effort.
- Publication of *Irrigation Storage Design Guidelines* is aiding the effective design of water storages on-farm
- CRDC projects, although not yet completed, are exploring WUE through better irrigation timing and water placement
- Continued uptake of support tools such as HydroLOGIC and WATERpak and their inclusion in the searchable 'COTTONpak' CD, combined with an increased uptake of commercial water use efficiency services, indicates industry commitment to improving on-farm water use efficiency

Innovation in Irrigation

The impacts of drought and reductions in water allocations have highlighted the need to move towards improving the efficiency of water use if cotton production is to remain both profitable and sustainable into the future. Recent experiences at Auscott Namoi Valley operations have demonstrated improvements in cotton yields, coupled with significant reductions in water use associated with lateral move irrigation.

Auscott installed the lateral move system in the 2004–2005 season, following encouraging results from growing cotton under laterals at their Gwydir Valley operations. The machine was installed on land that had previously been developed for furrow irrigation, with the objective of assessing the difference in water use compared with traditional furrow irrigation methods.

Analysis of final yield results demonstrated an average yield increase of approximately one bale per hectare in comparison with adjacent furrow-irrigated fields, repeated across both varieties used (Sicot. 71BGRR and Sicala 60BGRR).

Auscott attributed improvements in the efficiency of water use under the lateral directly to four factors:

- The application of smaller volumes of water per irrigation event minimises losses through surface runoff and deep drainage
- Water applications using droppers results in selective saturation of the soil surface, thereby minimising losses through evaporation
- The soil profile is rarely full; so the lateral move system is in a better position to make effective use of rainfall
- Increased yield due to less plant stress lifts the overall crop water use efficiency

Further information can be found in:

Tom Breen and Mitchell Carter, 'Lateral move towards improving water use efficiency', *The Australian Cottongrower,* June/July 2006

Auscott's lateral move system produced a yield increase of one bale per hectare

STRATEGY 2

Understand salinity, sodicity and deep drainage on farms and develop appropriate farm management strategies

Salinisation occurs as a function of complex interactions between various biophysical or causal factors, including agronomy, geology, hydrology, climate, and topography. CRDC invested $1.2 million over the nine years prior to 2003–04 on mapping salinity risks in cotton growing areas. This work involved extensive field and sub-catchment soil and electro magnetic surveys and demonstrated that the salinity risk in cotton growing areas was manageable. The research identified areas where problems attributable to salinity have occurred or are likely to occur in the future, so that effective management strategies can be implemented. CRDC has now received the final report from Phase IV of the mapping project: Interpretation and Extension.

In order to determine where salinisation may arise, information related to each biophysical or causal factor, such as agronomy and geology, needs to be collected and mapped. This includes a range of information such as identified areas of old salt deposits and deep drainage.

The underlying aim of the mapping project was to use similar methods to generate independent maps of these causal factors, store the information in Geographic Information Systems (GIS), format and generate salinity risk maps in various irrigated cotton growing areas. When the independent causal factors are stored in GIS, their interaction can be related to where salinisation is evident and assist to determine if and where these conditions may be encountered elsewhere. The project's final report contains information about various causal factors that have been mapped in the past and equivalent maps generated in three cotton-growing valleys (Macintyre, Darling and Macquarie) within four cotton-growing areas (Toobeah, Bourke, Trangie and Warren).

Following the conclusion of this project, results are now being collated and stored in various GIS for each of the four irrigated cotton growing areas described. Similar information is also being collated for Gunnedah, Ashley and Wee Waa. The Australian Federal Government's National Competitive Component of the Natural Heritage Trust Program is funding this work.

Sodic soils contain other sodium compounds that, unlike salt, are not transportable off-farm. Sodicity is seen as a more significant problem for the cotton industry than salinity, as cotton is particularly sensitive to sodic soils. CRDC research in Programs Two and Four, relating to crop rotation, irrigation, deep drainage and soil tillage, all has implications for sodicity. Research continued to focus on long-term farming system sites, investigating and comparing a range of crop rotation, irrigation and soil tillage practices for their impact on sodicity, long-term environmental sustainability and profitability. A PhD project which has looked at the impact of sodicity on cotton cropping systems over the last three years will be finalised in late 2006.

Projects examined both the measurement and implications of deep drainage under irrigated cotton systems during 2005–06. This research will help growers to better understand the intricacies of furrow irrigation and deep drainage.

Another key project, jointly supported by CRDC the Cotton Catchment Communities CRC and regional NRM bodies, is assessing the inter-connection of groundwater with the river, the depth to impermeable layers, location of major salt stores in the landscape, and the history of deposition of the various layers underlying cotton fields. Hydrological simulation models are used in conjunction with electro magnetic data to demonstrate dynamic processes such as deep drainage and the lateral flow of groundwater under contrasting soil and climatic conditions. It is anticipated that the framework developed for this project will be applicable to other major cotton growing areas; CRDC and Cotton Catchment Communities CRC will be seeking to follow up on this opportunity.

Measure of Success

Adoption of integrated management options for salinity and sodicity

- Extensive information gathered on salinity risk will be available on GIS and able to predict other areas where problems might occur
- Research on deep drainage will help growers better understand its relationship to furrow irrigation
- Hydrological simulation models developed with Electro Magnetic data to demonstrate dynamic processes under contrasting soil and climatic conditions;
- NPSI review of progress and co-ordination of deep drainage research in the Northern Darling basin.
- CRDC-funded research investigating and comparing a range of crop rotations, irrigation, and soil tillage practices for their impact on sodicity, long-term environmental sustainability and profitability

STRATEGY 3

Strengthen our understanding of soil health and improve crop nutrition management

SOILpak, the existing resource for soil management, encompasses a significant amount of research carried out on physical soil management; however, basic industry knowledge of and techniques in soil ecology management still needs further research.

Following on from a soil health forum convened by CRDC in early May 2005, CRDC instigated and organised both a survey and review of soil health. The survey captured the opinions of key cotton growers in each of the cotton growing valleys as to industry needs in terms of crop nutrition and soil biology research. An expert panel comprising both industry and scientific representation conducted the soil biology review. The panel gathered information from a wide range of researchers in soil health, included those supported by CRDC, Grains Research and Development Corporation (GRDC) and Land and Water Australia. Both the survey and review are providing direction for new research addressing identified industry needs.

In June 2006, CRDC convened a workshop with ACGRA members and research and extension leaders to consider goals and priorities for soil nutrition research and extension. A steering committee involving CRDC, the Cotton Catchment Communities CRC, the University of New England, the National Extension Team and commercial collaborators is utilising this information to direct crop nutrition research.

The reporting year also saw the successful conclusion of a project that developed molecular techniques to measure and quantify biological community composition and diversity of soil health. The study reported that there were significant differences in the composition and richness of specific bacterial and fungal communities related to the type of farming system employed. The differences in composition and functionality may impact on the resilience of a system when exposed to disease pressures and this aspect is being further examined in a new project commencing in 2006.

Soil greenhouse emission studies continued in 2005–06 and a greenhouse calculator is now available on the Cotton CRC website. A lifecycle analysis continued, as part of an ongoing project funded in conjunction with the Greenhouse Accounting CRC and the Australian Greenhouse Office. This work is expected to provide information which will assist the industry optimise the source and quantity of nitrogen obtained through the balance of applied nitrogen and nitrogen fixed under rotational crops.

Measure of Success

Benchmark of soil health characteristics and optimise crop nutrition management

- A survey and review of soil health R&D identified grower priorities for future CRDC research directions
- A greenhouse gas calculator on the Cotton Catchment Communities CRC website allowing growers and consultants to obtain information on a specific location

STRATEGY 4

Increase profitability with better whole farm management strategies and innovative precision agricultural systems

Over 80 people, comprising some 60 researchers and commercial representatives and 20 growers and consultants, attended a two-day Farming Systems Forum on Precision Agriculture held by CRDC and the Cotton Catchment Communities CRC in Goondiwindi in November 2005. The forum presented the latest Australian research findings and practical uses for precision agriculture technology.

Topics included the day-to-day uses and economic benefits of technologies such as Electro Magnetic (EM) surveys, precision irrigation techniques, variable rate application and remote sensing. The forum also included opportunities for farmers and consultants to input into the industry's future research, development and extension plans.

This forum made it clear that the extension of precision agriculture research, coupled with training in current technologies, is now a priority for the industry because of the wide range and great deal of very high tech and precise equipment currently on the market. This is very similar to the feedback that GRDC has obtained from grain growers. CRDC will work with the Cotton Catchment Communities CRC and GRDC on future requirements in this area.

For the fifth year, CRDC supported production of the joint Cotton Comparative Analysis with Boyce Chartered Accountants and the Cotton Catchment Communities CRC, helping cotton farmers to benchmark their own operations financially and better understand the drivers of profitability in cotton production. The 2004–05 report, released in October 2005 examined the 2003–04 season which was heavily impacted by prevailing drought conditions, with a large reduction in hectares planted on each farm. Key findings of the report were that:

- While income received on a per hectare basis was above average due to both good yield and price, the amount of cotton grown on each was not sufficient to cover the fixed and semi-fixed costs

- The costs on a per hectare basis increased dramatically due to the reduced economies of scale
- The result of a farm net loss after interest indicates that over half the participants in the analysis recorded a loss

The report continued to measure the components that give cotton farmers a stronger financial bottom. It shows the industry continues to invest in BMP, sustainability programs and its local communities.

Measure of Success

Improved economic returns to farmers. Data on changed farming practices including the economic, environmental or social benefits

- A CRDC and Cotton Catchment Communities CRC Precision Agriculture Farming Systems Forum provided comprehensive information on this rapidly evolving area and identified few research needs but significant knowledge and extension needs
- New *Cotton Comparative Analysis* confirms CRDC research investments in BMP and sustainable farming are helping farmers' economic bottom line
- As a direct result of research into IPM and the introduction of GM varieties, the cost of chemicals has declined in comparison to other farm inputs
- Pesticide use has reduced by two-thirds to between two and four kilograms of active ingredient per hectare, bringing significant savings for growers. In 2005-06 Bollgard II® crops required less than 15 per cent of the insecticide used for conventional crops

STRATEGY 5

Continue fundamental research on cotton agronomy and plant physiology and explore the interactions of different components for both conventional and transgenic varieties

With the introduction of Bollgard II® and its rapid adoption, CRDC's research effort continues to support the expansion and understanding of the physiology of cotton to improve agronomic management for high yields and good fibre quality. There has been much interest in examining how different Bollgard II® and Roundup Ready® row spacing configurations may affect crop production. In particular, narrow row configurations are of interest to southern cotton growing regions due to the potential advantages in earlier crop maturity during their short season environment.

A CRDC-funded PhD study is nearing completion on this topic and will provide an improved understanding of the physiological response of cotton under a range of row spacing configurations. Results of the study appear to show that there is little difference in crop maturity between narrow row systems and conventionally sown cotton. The main reason was thought to be lower and earlier fruit retention in the narrow row systems but results

over three season show that delays in the narrow row systems are from plant competition, which causes the rate of fruiting site production to slow. The narrow row systems averaged over all season produced slightly better yields; however, it is still to be established whether these benefits outweigh the losses associated with poor quality caused by harvesting.

As the most northerly commercial cotton production area, Central Queensland has some unique agronomic challenges. Research continues near Emerald to examine opportunities to modify planting dates in Central Queensland as a means of increasing yield from Bollgard II® varieties.

A new project that commenced during the reporting year aims to fill a gap in the development of management strategies in the field to optimise cotton fibre properties. Specifically, this project will initiate targeted research to improve the understanding of the effects of different climate, plant and agronomic management factors on fibre properties.

Measure of Success

Publication of cotton research related to crop physiology and transfer of agronomic knowledge into other research and extension project outcomes

- Crop physiology and agronomic research outcomes communicated to industry through CRDC, as well as agricultural science journal articles and trade publication articles by researchers and CRDC staff.

PROGRAM FIVE
Plant Breeding and Biotechnology

THE PROGRAM AT A GLANCE

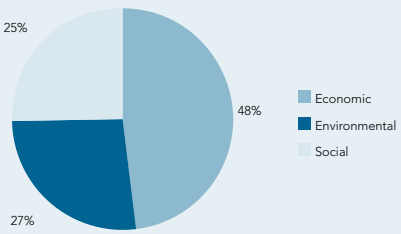
Objective

World-leading cotton varieties displaying continuous improvement in cotton yield, quality and agronomic performance through plant breeding and biotechnology innovations

Number of projects 2005–06:	19
Compared with 2004–05:	18
Expenditure in 2005–06:	$1,945,199
Compared with 2004–05:	$1,707,466

Strategies CRDC Strategic Plan 2003–2008	Measures of Success
1 Develop regionally adapted cotton varieties exhibiting improved yield, quality, insect and disease resistance and herbicide tolerance	Evidence that new cotton varieties are increasing yields and potential returns to the industry Evidence that new varieties can produce higher yields with lower inputs of chemicals and improved water use efficiency
2 Targeted, innovative biotechnology focused on solving production and quality constraints confronting the Australian cotton industry	Evidence that CRDC's biotechnology investments are delivering industry or community benefits
3 Reduction in time required to introduce improved or novel genes into elite cotton varieties through the development of frontier technologies, without compromising scientific rigour	Evidence of the reduced time to introduce genes into cotton varieties
4 Continuous monitoring of the signals from cotton textile and oilseed marketplace to ensure Australian varieties maintain a place at the high quality end of the market	Market reports on the demand for Australian cotton lint and seed

Figure 30: Triple Bottom Line investment



Outcome

Continually improving cotton varieties

BACKGROUND

The 2005–06 growing season produced Australia's second highest crop yields of 1780 kilograms per hectare for growers, despite a hot, dry season. There is no doubt that the CRDC-funded research can take a great deal of credit for this. Of the CSIRO-bred varieties commercially available during the season, the outstanding success was Sicot 71, which was easily the highest yielding variety.

A very hot season

The Accumulated Day Degrees for Narrabri West Post Office between October 1, 2005 and February 15, 2006 were 1852. This compares with 1610 during the same period last season and the historical average of 1666. In fact, this figure is greater than the highest historical year, 1957, which accumulated 1810 day degrees during this period.

Accordingly, the number of hot days is also high at 58. The historical average is 35 hot days and last year's total for this period was 27. Again, this season had more hot days than the 1957 high of 53.

Source: The Australian Cottongrower, Vol 27, No. 2

The breeding program is one of the most successful of its type in the world:

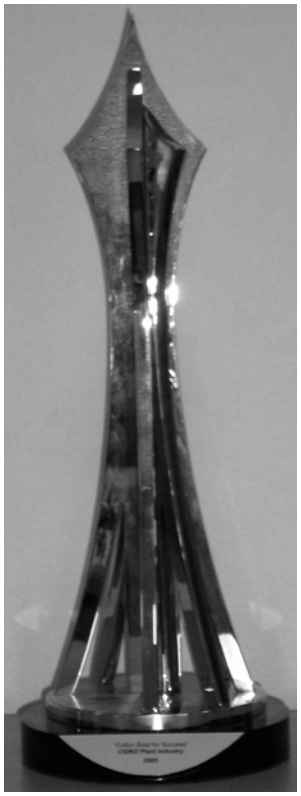
- CSIRO conventionally bred and transgenic varieties comprised more than 85 per cent of planting in Australia in 2005–06.
- Australian growers will assess new Roundup Ready FLEX® technology in the same year as their US counterparts, ensuring that Australia remains competitive.
- Breeding is improving at such a rate that none of the major varieties available in 2000 was still in use in 2006 – and it is fully expected that the same rate of change will occur in future.

The CSIRO breeding team has allowed Australian growers to capture the benefits from international developments in transgenic technology for pest and weed management while maintaining improvements through conventional breeding programs. The rate of adoption of CSIRO-bred varieties demonstrates the importance of CRDC continued support to the development of conventional varieties. The economic returns achieved from conventional improvements in disease resistance, yield and fibre quality provide the basis for Australia's international competitiveness.

In a cycle of continuous improvement, royalties from domestic and international seed sales are invested back into CRDC's Breeding and Biotechnology R&D portfolio and CSIRO's cotton research, which in turn develops new and improved seed varieties with additional yield, quality and environmental benefits. In 2005–06, royalties comprised 16 per cent of CRDC's research budget: a figure that was unimaginable a decade ago.

CSIRO cotton breeding team wins public acclaim

CRDC congratulates the CRDC-funded CSIRO Plant Industry Cotton Breeding Team, which won two prestigious awards during the reporting year.



Australian Government Prize for Rural Innovation

The team was awarded the 'Australian Government Prize for Rural Innovation' in September 2005, presented by the Deputy Prime Minister, the Rt Hon Mark Vaile MP, during a ceremony at Parliament House.

The award, which celebrates the best of Australian rural research and development, was given for the outstanding contribution that cotton breeding has made to the profitability and environmental performance of the Australian cotton industry.

Thanks to the work of the collaboratively funded CSIRO Plant Industry cotton breeding team, the cotton industry in Australia now has access to Australian-bred varieties that sit at the top end of market quality requirements, produce the world's highest yields and now incorporate genes which resist the crop's number one insect enemy, *Helicoverpa,* and are tolerant to the commonly used non-residual herbicide, glyphosate.

ATSE Clunies Ross Award

CSIRO researchers, Dr Danny Llewellyn (biotechnology) and Dr Greg Constable (plant breeding) from CSIRO Plant Industry and Dr Gary Fitt from CSIRO Entomology were each presented with an Academy of Technological Sciences and Engineering (ATSE) Clunies Ross silver medal award on 26 April 2006.

The researchers tackled the moth *Helicoverpa armigera*, the most destructive pest of cotton, using a combination of genetic modification, conventional breeding and insect ecology. They produced a suite of cotton varieties containing a protein from *Bacillus thuringiensis (Bt)*, a naturally occurring soil bacterium, that is toxic to *Helicoverpa* larvae but safe for humans and the environment and supported this new technology with a pre-emptive management plan devised by Dr Fitt.

The adoption of their research in the cotton industry has lead to 25-fold reduction in pesticide use.

The CSIRO cotton breeding team at the presentation of Clunies Ross Awards silver medals to Danny Llewellyn, third from the left, Gary Fitt, third from the right, and Greg Constable, on the far right

STRATEGY 1

Develop regionally adapted cotton varieties exhibiting improved yield, quality, insect and disease resistance and herbicide tolerance

Australia's reputation rests on the high quality of the cotton it produces. The challenge to maintain and enhance this has been met by the CSIRO breeding team with the release of Sicala 350B, which will provide growers with the opportunity to produce a quality of cotton that attracts a premium price on the international market.

New research will investigate how well this variety can blend with Pima varieties, which are recognised internationally as the highest quality of cotton because of their exceptionally long, strong and fine fibres.

CSIRO-bred varieties are commercialised through a grower cooperative, Cotton Seed Distributors Ltd (CSD). The eight new varieties released in time for the 2005–06 growing season contained many new traits such as improved fibre quality, increased disease resistance, improved growth habit and maturity characteristics, as well as better regional adaptability.

More than 30 CSIRO-bred varieties are available for the 2006–07 season: seven Bollgard II® varieties, five Bollgard II® Roundup Ready®, five Roundup Ready®, six conventionally bred and eight specialist varieties. Limited quantities of Roundup Ready FLEX® varieties will also be available for the first time in Australia and will provide growers with greater flexibility in weed control spray options, extending the period during which the plant is resistant to glyphosate.

Two new varieties, Siokra 24B with excellent fibre length and Sicot 81 with excellent yield, length and strength, will also be available in limited quantities, with both varieties particularly suited to dryland conditions. More than one-third of the varieties have above-average resistance to Fusarium and Verticillium wilt, while all CSIRO-bred varieties are highly resistant to bacterial blight.

Measure of Success

Evidence that new cotton varieties are increasing yields and potential returns to the industry; and evidence that new varieties can produce higher yields with lower inputs of chemicals and improved water use efficiency

- Eight new CSIRO-bred varieties released for the 2006–07 season and two new varieties for 2007–08 contain improved fibre quality, disease resistance, growth habit, maturity, and regional adaptability
- New varieties for 2007–08 are particularly suited to dryland production (some 20 per cent of the crop), which has its own particular requirements
- The first (limited) release of Roundup Ready FLEX® for the 2006–07 season will provide growers with greater flexibility in weed control spray options using glyphosate
- Estimated that in 2005–06 Bollgard II® crops required less than 15 per cent of the insecticide required for conventional crops

STRATEGY 2

Targeted, innovative biotechnology focused on solving production and quality constraints confronting the Australian cotton industry

The Australian cotton industry remains the only major agricultural industry in Australia to use biotechnology for crop protection. The CRDC-funded development and subsequent commercialisation of insect and herbicide-tolerant varieties of cotton has led to major reductions in insecticide and residual herbicide use and helped to maintain profitability for cotton farmers in the face of an ever-narrowing gap between costs and income.

The holy grail of cotton breeding is the development of superior varieties with increased fibre length and strength, together with low micronaire (fineness of the fibre). CRDC commissioned Dr David Stalker, Vice President for Corporate Development, Ventria Bioscience Inc, to undertake a review of CRDC's cotton fibre quality research. Dr Stalker is an internationally respected molecular biologist with experience in delivering agricultural biotechnology products from conception to practical application.

Dr Stalker found the CSIRO breeding team to be a world leader in developing high quality varieties but that the majority of quality improvements have been achieved through conventional breeding. He believes that improvements in fibre quality are difficult to achieve through biotechnology and that, apart from crop protection, the major benefit of biotechnology is likely to be varieties delivering increased yield. As a result of the review, CRDC will prioritise its fibre quality research.

Apart from quality and yield, developing resistance to the disease Fusarium wilt remains a significant objective for the breeding team. Conventional breeding programs have more than doubled the level of resistance to this disease, with more than one third of the CSIRO varieties currently commercially available having above average resistance to both Fusarium wilt and Verticillium wilt. However, Fusarium still remains a significant problem for the industry and CRDC-funded research is investigating the development of molecular markers and resistance genes for Fusarium, which will enhance the capacity of the breeders to use biotechnology to produce varieties with greater resistance.

Following the widespread take-up of Roundup Ready® varieties resistant to the non-residual herbicide glyphosate, varieties containing second generation Roundup Ready FLEX® will be available for the first time in Australia and will provide growers with greater flexibility in weed control spray options, extending the period during which the plant is tolerant to glyphosate.

A history of GM cotton in Australia

1996	Australia's first GM cotton, Ingard®, was commercially released. Ingard®, which contains a single gene from the soil bacterium *Bacillus thuringiensis (Bt)*, underwent a rigorous testing and approval process by regulatory authorities before its release was permitted under the Commonwealth regulatory system. Ingard® was available between the 1996–97 and 2003–04 seasons. During those eight seasons, Ingard® crops required 44 per cent less insecticide and miticide than conventional crops.
2000	The first genetically modified herbicide-tolerant cotton was introduced after a period of research and cultivar development under regulatory permits. There has been a steady increase in the area planted to Roundup Ready® as variety availability has improved. Since its introduction, there has been an estimated 30 per cent reduction in overall herbicide use and a 46 per cent reduction in the use of residual herbicides.
2002	Bollgard II® technology containing two *Bt* genes of resistance was approved for commercial use
2003	Bollgard II® varieties became available to cotton growers for planting. Over the first three seasons, they have required 85 per cent less insecticide and miticide than conventional cotton varieties.

What is Bollgard II®?

Bollgard II® was developed by Monsanto scientists by inserting two different genes from the soil bacterium *Bacillus thuringiensis (Bt)* into cotton, which built on the single *Bt* gene contained within Ingard®. These genes produce two separate proteins that are toxic to the main insect pest of cotton – *Helicoverpa* spp. – so that when the *Helicoverpa* caterpillars eat the Bollgard II® cotton they die.

Bt has been used as the basis of safe natural insecticides for many years. The *Bt* genes in Bollgard II®, provided by Monsanto under a licence agreement, have been demonstrated not to harm humans or other animals.

Helicoverpa have the capacity to completely destroy a cotton crop if not managed. Normally, pesticides are used to control these pests but many of these also kill the beneficial insects. The advantage of using Bollgard II® with Bt genes is that only Helicoverpa are affected.

What is Roundup Ready®?

Bollgard II genes have been introduced into CSIRO elite cotton cultivars through conventional plant breeding techniques, supported with funding from CRDC.

Roundup Ready® cotton contains one copy of the *cp4 epsps* gene, providing tolerance to the widely used non-residual herbicide, glyphosate. Normally, glyphosate inhibits this enzyme and as a result kills cotton as well as weeds. However, in Roundup Ready® cotton glyphosate can currently be applied directly to cotton up to the four-leaf stage of growth (that is, prior to flowering) to control weeds without affecting yield. Roundup Ready® varieties are available both with and without Bollgard II®.

Roundup Ready FLEX® cotton contains two copies of the herbicide tolerance gene. Roundup Ready FLEX® cotton has prolonged expression of the *cp4 epsps* gene and is tolerant to glyphosate at later stages of growth. This means the window in which glyphosate can be applied directly to the cotton crop is longer, giving growers increased flexibility in timing herbicide applications as part of integrated weed management. Cotton varieties carrying Roundup Ready FLEX® have been released in limited quantities for the 2006–07 season.

(Roundup Ready® and Roundup Ready FLEX® are registered trademarks of Monsanto Australia)

The CSIRO-bred Sicot 71 variety was the outstanding success of the 2005–06 season, producing easily the highest yield

Measure of Success

Evidence that CRDC's biotechnology investments are delivering industry or community benefits

- 85 per cent of 2005–06 plantings were CSIRO-developed CRDC-funded varieties, comprising both GM and conventionally bred varieties
- Increased adoption of innovative new varieties has contributed to a measurable improvement in public attitudes towards the cotton industry

STRATEGY 3

Reduction in time required to introduce improved or novel genes into elite cotton varieties through the development of frontier technologies, without compromising scientific rigour

Despite the timely development of new transgenic traits by the plant breeding team, the difficulties of transferring these traits direct into elite conventional varieties remain a worldwide problem. Instead, breeders must use older, unimproved varieties into which it is much easier to insert the transgenic material. They then must undertake considerable backcrossing to produce the conventional varieties containing a range of improved traits. For this reason, the process is as lengthy and cumbersome as it ever was. CRDC continues to invest in research exploring ways of speeding up this process. Meanwhile, Monsanto has recently received approval from AQIS to bring cotton containing new genetic modifications approved by the Office of the Gene Technology Regulator (OGTR) into their own quarantine glasshouse facilities. This means CSIRO researchers will gain access to new genes at the same time as the US. This could save 12 to 18 months in development time for a new variety.

Measure of Success

Evidence of the reduced time to introduce genes into cotton varieties

- CRDC continues funding research to reduce the time needed to transfer genes but the process remains slow and cumbersome. This remains a worldwide problem for scientists
- Faster access to new traits out of quarantine could mean a 12 to 18 month reduction in the time to develop a new variety.

STRATEGY 4

Continuous monitoring of the signals from cotton textile and oilseed marketplace to ensure Australian varieties maintain a place at the high quality end of the market

Australian cotton continued among the top prices listed for the highest category of upland cotton on the Liverpool *Cotton Outlook* 'A' index during 2005–06, indicating that the CSIRO breeding program is meeting the demands of the international market. Australian cotton compared well against the acala type cotton from the San Joaquin Valley of California (SJV). SJV cotton is a competition benchmark for the Australian industry as a high quality premium cotton type and to have reached a point where Australian cotton is quoted as an equal of SJV for significant periods of the year is a strong result for our industry.

A project that commenced in 2004–05 aims to map and seek to understand the genes involved in fibre initiation and elongation, using state-of-the-art microarray and molecular identification techniques. This work is fundamental to understanding the characteristics that drive fibre quality. It may provide a basis for long-term research into producing cotton cultivars with particular fibre quality-related qualities such as long fibres. This area is a focus of research in other cotton-producing countries such as the United States of America. Australian research in this area is proceeding well and may deliver the competitive advantage in fibre quality that growers are seeking.

The reporting year marked the third year of the EMS Fibre Pathways project, which extends the cotton industry's BMP program through the entire production chain. Its aim is to foster good natural resource management outcomes through potential market-based incentives. A workshop held in June 2006 by the Australian Cotton Industry Council, and part-funded by the Australian Government's EMS Pathways program, involved the whole industry in reviewing the focus of the BMP program in terms of growers needs.

CRDC continues to work with the World Wildlife Fund on the 'Better Cotton Initiative', which is looking to improve the global social and environmental performance of cotton production. Through the BMP program, Australia is well placed to support such an initiative and, potentially, to benefit from any market opportunities that may arise from it. The EMS Pathways project has established a traceability trial, whereby Australian cotton will be tracked and traced from grower to spinner. This will provide important information on the practicalities of demonstrating quality assurance through the supply chain.

Measure of Success

Market reports on the demand for Australian cotton lint and seed

- Australian cotton remained among the top prices listed for the highest category of upland cotton on the Liverpool Cotton Outlook 'A' index during 2005–06. It continued to perform well against the industry SJV (San Joachim Valley) benchmark
- The EMS Fibre Pathways project is exploring the extension of BMP through the entire production chain, opening opportunities for niche marketing of Australian cotton

PROGRAM SIX: Value Chain

THE PROGRAM AT A GLANCE

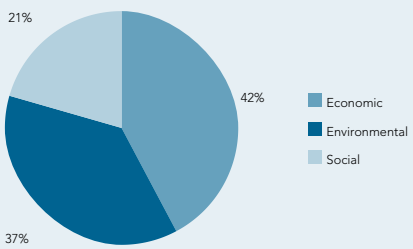
Objective

To produce high quality consumer-preferred cotton and develop new international and domestic market opportunities

Number of projects 2005–06:	7
Compared with 2004–05:	8
Expenditure in 2005–06:	$698,123
Compared with 2004–05:	$590,603

Strategies CRDC Strategic Plan 2003–2008	Measures of Success
1 A breeding program that releases varieties with high quality fibre characteristics, which satisfy consumer demand trends. To investigate the use of biotechnology to enhance other traits, for example, nutritionally improved cottonseed oil	Release of varieties with appropriate fibre and seed characteristics
2 To promote agronomic and management practices, including the Cotton BMP program, which preserve and protect optimal fibre quality characteristics	Evidence of improved practices that preserve fibre quality. Extension of the Cotton BMP program to post farm gate issues
3 Ginning improvements resulting from research to reduce nep generation and to preserve desirable fibre qualities	Improved ginning practice measured by ginning data
4 The development of more accurate and repeatable technology of fibre measurement for neps, fineness, maturity and other fibre characteristics and; Support changes to the traditional classing system, which better identifies and rewards superior fibre characteristics	Proportion of the crop objectively measured by HVI increased. Release of new fibre measurement technology
5 To support efforts to develop new markets and high premiums for Australian raw cotton as well as value adding cotton in Australia	Number of unsold stocks accumulated and increased relative premium of Australian cotton compared to competitors. Demonstration of value added developments in Australia

Figure 31: Triple Bottom Line investment



Outcome

High quality consumer-preferred Australian cotton in the world marketplace

BACKGROUND

Australian cotton continues to compete at the premium end of the world market. It has achieved this through Australian bred varieties that produce cotton fibre with the strength, length, fineness and maturity sought by spinners, combined with excellent agronomic practices producing consistent high quality and efficient ginning and shipping systems that deliver cotton on time. All of these success factors are underpinned by CRDC-funded research and a close working relationship with the Cotton Catchment Communities CRC and the CSIRO breeding team.

STRATEGY 1

A breeding program that releases varieties with high quality fibre characteristics, which satisfy consumer demand trends. To investigate the use of biotechnology to enhance other traits, for example, nutritionally improved cottonseed oil

Australia has traditionally been seen as a producer of high quality cotton, a reputation that needs to be protected. The 2005–06 season saw the release of eight new CSIRO varieties, which continued to provide improved fibre quality, disease resistance, growth habit, maturity, and regional adaptability. Expectations of reduced micronaire (that is, greater fineness of fibre) in the 2005–06 growing season were not met, principally because of the unusually hot season.

The major by-product of cotton production is cottonseed which is used as a high energy, high protein supplement in stock feed. The seed is also crushed, with the oil used within the food service industry. As a feed supplement the quality of cottonseed that can be used in a ration is limited by a particular fatty acid, cyclopropenoic fatty acid, present in the oil. Gene silencing technology has been used to significantly reduce this fatty acid in the oil and thereby making cottonseed a more attractive feed supplement.

Cottonseed oil was traditionally the key vegetable oil used in cooking and margarine products; however, due to the high level of saturated fatty acids in cottonseed oil, canola oil has replaced much of this market. Using biotechnology-involving gene silencing, joint CSIRO/CRDC-funded research has modified cottonseed oil to produce healthier oils, which have the potential to compete in the higher quality sector of the market. The key aim of this work has been to produce highly stable oil requiring no hydrogenation or processing. With CRDC support, CSIRO Plant Industry is developing a business plan for this technology.

Measure of Success

Release of varieties with appropriate fibre and seed characteristics

- Eight new CSIRO-bred varieties released for the 2005–06 and two for the 2006–07. CSIRO breeding team continues to address desired quality characteristics in the breeding program
- CRDC-funded CSIRO scientists continue to receive feedback from spinners on Australian cotton fibre quality

STRATEGY 2

To promote agronomic and management practices, including the Cotton BMP program, which preserve and protect optimal fibre quality characteristics

In order for Australian cotton to remain internationally competitive, everyone in the cotton production pipeline – growers, merchants, ginners and spinners alike – should be aware of what spinners and fabric manufacturers need and expect when they process Australian cotton.

Following on from a series of *"Fibre to Fabric Quality Workshops"* conducted at ten different locations in February 2005, early 2006 saw delivery of a CRDC-funded pilot *Cotton Field to Fabric Training Course: Managing for quality through the production chain*. The course is run at CSIRO Textile and Fibre Technology research facilities at Geelong and informs growers and processors of the key factors affecting fibre quality including agronomic, picking and ginning practices. The course has received positive feedback and will be extended throughout the industry in the coming year.

As part of CRDC's ongoing Field to Fabric cotton quality initiative, a project jointly funded by CRDC and the Cotton Catchment Communities CRC is assessing the influence of agronomic management, picking and ginning practices on fibre quality. The project involves collaboration between research agronomists as well as researchers from CSIRO TFT, thus covering the entire production chain.

It was found that late maturing bolls have reduced fibre characteristics, increasing the degree of neps (short, tangled fibres). This information will be compiled with other key fibre quality and crop management data into a 'FIBREpak' grower manual, to be launched in the second half of 2006.

EMS pathways partnership project has developed draft BMPs for defoliation, harvesting, module building and transport and will be trialled during the 2005–06 season. Further down the supply chain, the vast majority of classing houses in Australia are undergoing a voluntary audit against the draft classing BMPs. Work has also been commissioned to gain an accurate understanding of the actual contaminants being found in Australian cotton.

The advantages of Australian cotton: a view from Indonesia

M.N. Vijayshankar
Vice President
PT.Apac Into Corpora, Indonesia

- Consistency in quality characteristics and predictability of performance
- Enables consistent quality of yarn with minimum setting changes in the spinning process
- Low level of honeydew and stickiness (from whitefly) and hence good performance in spinning
- Low level of contamination and hence less number of complaints from end users
- Good maturity, whiteness, reflectance and grade
- ***In short, Australian cotton can be called a spinner's delight due to these many advantages.***

Measure of Success

Evidence of improved practices that preserve fibre quality. Extension of the Cotton BMP program to post farm gate issues

- EMS Fibre Pathways project continues to define how fibre quality can be maintained through the processing chain
- Pilot *Cotton Field to Fabric Training Course: Managing for quality through the production chain* was successful and will be extended throughout the industry
- A new component of the Field to Fabric cotton quality initiative is assessing the influence of agronomic and cotton picking management practices on fibre quality

STRATEGY 3

Ginning improvements resulting from research to reduce nep generation and to preserve desirable fibre qualities

Cotton ginning equipment and processing has changed little in recent years. Australia has one of the most modern and high capacity ginning processing systems in the world but high through-put gins can impart some fibre damage such as neps (immature, tangled fibres) and increased short fibre content, each of which is undesirable in the market place. CRDC continues to invest in research to improve ginning equipment to reduce mechanical damage to fibre during the ginning process to ensure fibre quality is maintained throughout processing.

An industry workshop was held in February 2006 with cotton ginners to explore best management practices for ginning. This workshop highlighted the need to better understand the impact of moisture levels throughout the ginning process. As a result, CRDC has developed a new project with CSIRO Textile and Fibre Technology to assess ginning practices, in particular moisture management and improved quality parameters throughout the ginning process.

International surveys have highlighted bale contamination from hessian wraps as an aspect of concern to spinners. The EMS Pathways project is currently examining the importance of bale coverings and their impact on contamination.

Measure of Success

Improved ginning practice measured by ginning data

- Industry workshop with ginners defined best management practices to retain fibre quality during ginning
- Arising from this workshop, a new project is assessing ginning practices such as moisture management and improved quality parameters during ginning
- An EMS Pathways project looking at hessian bale coverings and resulting contamination is further addressing spinners quality needs

STRATEGY 4

The development of more accurate and repeatable technology of fibre measurement for neps, fineness, maturity and other fibre characteristics; and support changes to the traditional classing system, which better identifies and rewards superior fibre characteristics

Cotton fibre maturity, combined with fineness, or low micronaire, is extremely important to spinners and fabric manufactures as it determines how well fibres will process and dye. Immature fibres (those with little or no fibre wall thickening) are associated with the formation of small entanglements called neps, irregularities in processed fibre assemblies including finished yarns, non-uniform dyeing of fabrics and decreased processing efficiency. While knowledge of cotton fibre maturity has always been important with regard to avoiding these problems, there is an increasing need for faster and more accurate measurements. An increasingly competitive international cotton market means Australia must meet this need.

There are a number of methods for measuring fibre maturity, although no one method is able to do so both accurately and with the speed required for classing purposes. The methods currently used range from direct measurement of fibre wall thickness from magnified fibre cross-sections to indirect methods that indicate maturity relative to some other fibre parameter. Cotton marketers and processors favour indirect methods because they provide fast results; however, effects of other fibre features tend to bias the results they give. For example, micronaire is the most widely used indirect method for measuring fibre maturity even though it actually measures a composite of fibre fineness and fibre maturity. This means that fine, mature cotton, which is premium cotton, might give the same micronaire reading as a coarse, immature cotton, which receives a much lower price.

With funding from CRDC, CSIRO developed an instrument, SiroMat, based around the automation of polarised light microscopy test for fibre maturity. The advantages of SiroMat are that it measures fibre maturity directly and because it does this on individual fibre snippets it is able to measure the fibre maturity distribution in a sample. The distribution of mature and immature fibres in a sample is important from the perspective of predicting textile problems, such as nep formation and dye uptake variation. The speed of the SiroMat test means that it has potential for use as a stand alone, medium volume instrument in mill and merchant laboratories. However, its greatest value may be as an effective tool to aid cotton breeders to select improved varieties.

Following work in 2004–05 to improve calibration and build duplicate instruments for inter-laboratory trials, 2005–06 saw a concentration on preparing SiroMat for commercialisation.

Cottonscan, also developed by the CSIRO researchers with CRDC support, is an innovative and fast instrument giving average maturity and fineness values. Extensive trials with the prototype instrument confirmed the validity of the

approach and potential of the instrument. Cottonscan's intellectual property is proceeding through Australian and international patent processes.

A two year project began in 2005–06 to further develop the Cottonscan technology and undertake independent inter-laboratory trials of the technology in both Australia and overseas with a view to obtaining international acceptance of the technology and instrument as a recognised technique for determining cotton maturity and fineness at High Volume Instrument (HVI) speeds.

As reported in the previous two years, an international Committee for Standardisation of Instrument Testing of Cotton (SCITC) is seeking to institute a single, agreed and scientifically valid measurement of fibre maturity. CRDC has supported this concept for a number of years; however, it is clear that this process will take some years.

Measure of Success

Proportion of the crop objectively measured by HVI increased. Release of new fibre measurement technology

- Business cases are preparing SiroMat and Cottonscan for commercialisation
- Presentation of Cottonscan at USA Beltwide Cotton Conference was well received by international audience
- Attempts to reach international agreement on measurements for fibre maturity continue, with no immediate prospects of resolution

STRATEGY 5

To support efforts to develop new markets and high premiums for Australian raw cotton as well as value adding cotton in Australia

The major EMS Fibre Pathways project, which was in its third year, aims to extend the cotton industry's BMP Program to the entire production chain to create a complete environmental and quality assurance supply chain program. It is anticipated that the project will create a point of market differentiation that can provide a market incentive for higher levels of adoption of the BMP Program.

International surveys are showing that consumers are getting more interested about where and how the products they buy are derived. One in five European consumers say they would be willing to pay for products that are socially and environmentally responsible.

The Industry's BMP program has the opportunity to develop an Australian cotton crop that can be promoted as environmentally responsible. In progressing opportunities to link BMP with retailers and consumers, branded garments made from Australian BMP cotton have gone on sale in Izumiya department stores in Japan under their in-house "Good-i" brand. Success of the trial will see Izumiya process a second shipment of BMP cotton for use in the campaign.

Cotton producers who follow proper management guidelines are now able to develop economically viable cotton gin trash re-use options following a research project initiated by CRDC. This project was able to demonstrate that detected chemical residues in samples from gins in the Namoi, Gwydir and Border River valleys pose minimal risk to the ecosystem, meaning the trash was 'solid waste' rather than 'hazardous waste', as the New South Wales Environmental Protection Agency was intending to classify it.

For the industry to achieve premiums in the market place, it must not only produce high quality cotton but also maintain that quality throughout the ginning process. The majority of ginning technologies used in Australia are not suited to cotton of superior length. As reported above, initiatives are underway to improve ginning techniques; however, an ambitious new project will take this one step further by bringing together a whole range of issues relating to the marketability of high quality Australian cotton. The issues it will cover will range as widely as the capacity of Australia to produce high quality cotton with long, strong and fine fibres, the capacity of gins to process such cotton and whether, indeed, spinners actually are interested in such a high quality product.

Measure of Success

Number of unsold stocks accumulated and increased relative premium of Australian cotton compared to competitors. Demonstration of value added developments in Australia

- Extension of BMP to post-farm gate sectors potentially opens up opportunities for differentiating Australian cotton in a competitive market place
- A business case is being prepared for marketing newly developed healthier cottonseed oil

REPORT OF OPERATIONS
Corporate Governance

CRDC'S BACKGROUND

The Cotton Research and Development Corporation was established in 1990 under the *Primary Industries and Energy Research and Development (PIERD) Act 1989*. The Act provides the Corporation with a charter to invest in and manage a portfolio of research, development and extension projects and programs to secure economic, environmental and social benefits for the Australian cotton industry and the community, to achieve sustainable use and management of natural resources and to make more effective use of the resources and skills of the scientific and general communities. All of this is to be conducted in a framework of improved accountability for research and development spending in relation to the cotton industry.

LOCATION OF OFFICES

CRDC's location in Narrabri in north-west New South Wales – one of Australia's major cotton-growing areas and centrally located in the broader cotton industry – enables the Corporation to develop and maintain important relationships with cotton growers, researchers, processors and members of regional cotton communities on a day-to-day basis. The Narrabri district is also the home of a key industry research facility, the Australian Cotton Research Institute. The Institute is a collaborative research site and headquarters of the Cotton Catchment Communities CRC, of which CRDC is a core partner.

THE BOARD

Composition

The Corporation has a nine-member Board, with six members nominated by an independent Selection Committee established by legislation. Appointment to the Board is subject to Ministerial approval. The Minister nominates and appoints the Chair and the Government Director. The Board selects the Executive Director who becomes its ninth member.

Appointments

The current term of the Chair, Ms Bridget Jackson, concludes in September 2007. The Government Member holds office at the Minister's pleasure and the Executive Director at the Board's pleasure. Directors other than the Executive Director and the Government Director are appointed for a term not exceeding three years. Two Board reappointments and four new appointments were made in October 2005. Further details can be found in the CRDC Selection Committee Report on page 182.

Expertise

Directors are selected from across the industry, business and research communities and together they bring expertise in cotton production, processing, marketing, science, research and development, intellectual property, business management, technology transfer, conservation and management of natural resources, economics and environmental and ecological matters.

Induction and Training

Following appointment to the Board, each Director is provided with an induction package designed to provide them with an appropriate level of information about the Corporation, its history and operations, and the rights, responsibilities and obligations of Directors.

Copies of the relevant legislation are also included in the package. The induction process for Directors includes an initial visit to CRDC offices in Narrabri to meet with management and staff for a comprehensive overview of Corporate activities and practices and tour key industry research facilities. Where necessary and appropriate, the Corporation sources training for Directors, either individually or as a group. The Board generally establishes the need for such training.

Directors' Responsibilities

The roles and responsibilities of Directors are clearly set out in the CRDC Board Charter adopted in June 2005. Directors are responsible for ensuring that the affairs of the Corporation are properly managed and for setting strategic directions. The Board assigns each Director key responsibility for specific research programs, based on their expertise. Under this structure, Directors review management's advice on project applications and reports for their allocated programs and make subsequent recommendations to the full Board.

The Board's functions include:

- Establishing strategic directions and targets
- Monitoring and evaluating the research and development needs of the industry and ensuring the Corporation'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

Responsibility for the day-to-day management of the Corporation lies with the Executive Director and senior management team. The close links between the Board 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 whenever appropriate.

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.

Board of Directors

Chair: Bridget Jackson
BScAg, MBus

Bridget Jackson is a Director of Cameron Agriculture Pty Ltd. She was appointed Chair of the CRDC Board in October 1999 and is Chair of the Remuneration Committee and a member of the Audit Committee.

Ms Jackson is an agricultural consultant with extensive experience in irrigated agriculture and the management of private farmer-group projects. She represents CRDC as a Director of the Australian Cotton Industry Council, was a Board member of the former Australian Cotton CRC and is the CRDC member representative for the new Cotton Catchment Communities CRC.

Vice-Chair: Richard Browne

Dick Browne was reappointed to the Board in October 2005. He has responsibility for the Farming Systems and Natural Resource Management programs and is a member of the Remuneration and Intellectual Property Committees.

Mr Browne worked in the cotton industry for 38 years, most of that at a senior management level in Corporate agriculture involving production and processing of cotton. His main interest has been promoting research and development for the benefit of the industry.

Mr Browne was Chair of the CRC for Sustainable Cotton Production for the life of the organisation, a past Chair of the Australian Cotton Growers' Research Association for three terms and was a Director of the Australian Cotton CRC. He was previously a member for the Cotton Research Council, the forerunner of the CRDC.

Government Director: Simon Smalley

BSc (Hons)

Simon Smalley is the General Manager, Water Policy, Australian Government Department of Agriculture Fisheries and Forestry. He was appointed Government Director on the CRDC Board in November 2004 and is a member of the Audit Committee. He has responsibility for the People and Knowledge program.

Mr Smalley's current focus is on implementing water policy reform (the National Water Initiative) to ensure sustainable use and management of Australia's water resources. His role also includes coordinating the Commonwealth Government's participation in the Murray-Darling Basin. For more than ten years he has been working on national and international natural resource management policies and strategies within the Australian Government, including the initial phase of the Natural Heritage Trust, the National Action Plan for Salinity and Water Quality and International Fisheries. During this time he has worked in the environment, and agriculture portfolios, as well as in the Department of the Prime Minister and Cabinet.

Executive Director: Bruce Finney

BSc Ag

Bruce Finney joined the Board in August 2004 by virtue of his appointment as Executive Director of CRDC. He has responsibility for the Crop Protection and Value Chain programs.

Mr Finney has extensive experience in the agricultural sector. Prior to his appointment to CRDC he worked for Twynam Agricultural Group for 17 years in various roles, including Company Agronomist, Regional Manager of the Central Region and Natural Resource Management Coordinator. He is a past chair of the Australian Cotton Growers Research Association, a graduate of the Australian Rural Leadership Program and of the Company Directors Course of the Australian Institute of Company Directors.

Leith Boully

BRuSc, DipBusStud

Leith Boully is a primary producer from Dirranbandi in Queensland and was appointed to the Board in October 2005. She has responsibility for the Integrated NRM and Farming Systems programs and is a member of the Audit Committee.

Ms Boully is an Adjunct Professor with the Center for Ecological Economics and Water Policy at the University of New England and the School of Natural and Rural Systems at the University of Queensland. She is also Chair of the Centre for Rural and Regional Innovation, Queensland, FarmBis Queensland and the Lower Balonne Water Resources Ministerial Advisory Council, a Board member of Murrumbidgee Irrigation Ltd and a member of the Wentworth Group of Concerned Scientists and the Australian Statistics Advisory Council. Ms Boully is a graduate of the Australian Rural Leadership Program.

David Conners

David Conners was appointed to the Board in October 2005. He has responsibility for the Value Chain program and is Chair of the Intellectual Property Committee and a member of the Remuneration Committee.

Mr Connors was Managing Director of Australian Wool Services/The Woolmark Company from 2000 to 2004 and a Director of the subsidiary, Andar Holdings Pty Ltd. Prior to the formation of AWS, he was Managing Director of its predecessor, Australian Wool Research and Promotion Organisation, from 1999, having previously served as the International Marketing and Operations Director, based in Europe. In 2004 Mr Conners chaired a review of the CSIRO Textile & Fibre Division.

Mr Conners spent 20 years in the book retailing and publishing industries including four years as CEO of Angus & Robertson Bookworld and five years as Marketing Director of Heinemann/Hamlyn Publishing in Australia.

Glenn Fleischfresser (Fresser)

Glenn Fresser has owned and operated a successful cotton and grain production business on the Darling Downs since 1981. He was appointed to the CRDC Board in October 2005 and has responsibility for the Farming Systems program and is a member of the Intellectual Property Committee.

Mr Fresser has extensive experience in the cotton industry. His farming approach is underpinned by a respect for the natural environment, and an interest in adopting new technology and farming systems approaches.

Mr Fresser is past Chairman of the Australian Cotton Growers Research Association (ACGRA) and has held other industry positions including member of the Australian Cotton Conference Committee and Cotton Biotechnology Review Panel. He is the past Chair of the ACGRA Transgenic Insect Management Strategy Committee, Australian Cotton Industry Council and its Pesticide and Biotechnology sub-committee, Queensland Department of Primary Industries and Fisheries' Darling Downs cotton extension agronomy and research team and the Darling Downs Cotton Growers Inc. Management Committee.

Mr Fresser has a strong understanding of the needs and issues of farmers and a genuine interest in ensuring the cotton industry continues to be sustainable, profitable and progressive.

TJ Higgins
BScAg, MAgSc, PhD

Dr Higgins is the Deputy Chief of Plant Industry at CSIRO. He was reappointed to the CRDC Board in October 2005 and has responsibility for the Crop Protection and Plant Breeding and Biotechnology programs. He is a member of the Intellectual Property Committee.

Dr Higgins is a distinguished research scientist and has been involved in plant research for 30 years, specialising in gene technology for a range of Australian agricultural ecosystems. He has been involved in research on gene technology and genetically modified legumes (grain and pasture) and is experienced in administrating research and development.

Lisa Wilson
BAgSci (Hons)

Ms Wilson is the Senior Manager Marketing & Compliance at AWB Limited. She was appointed to the CRDC Board in October 2005. She has responsibility for the People and Knowledge and Plant Breeding and Biotechnology programs and is Chair of the Audit Committee.

Ms Wilson is an experienced Director and General Manager with more than 18 years experience as an agribusiness professional. She is Deputy Chair of the Australian Rural Leadership Foundation, a Member of the Victorian Advisory Group for LandCare Australia Limited, a Member of the Albert Park Advisory Group for Parks Victoria and was a founding Director of the Foundation for Australian Agricultural Women. She is a Graduate of the Australian Institute of Company Directors and the Australian Rural Leadership Program.

Board meetings

The Board held seven meetings during 2005–06:

29 July, 2005	By Teleconference
5 September, 2005	Canberra ACT
16 November, 2005	Narrabri, New South Wales
19 December, 2005	By Teleconference
14 February, 2006	Acton, ACT
29 and 30 March, 2006	Narrabri, New South Wales
1 June, 2006	Geelong, Victoria

Directors' Attendance at Board Meetings

	July 2005	September 2005	November 2005	December 2005	February 2006	March 2006	June 2006
Adam Kay	Yes	Yes	Term of Directorship completed				
Bridget Jackson	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bruce Finney	Yes	Yes	Yes	Yes	Yes	Yes	Yes
David Conners	Not yet appointed		Yes	Yes	Yes	Yes	Yes
Dick Browne	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Glenn Fresser	Not yet appointed		Yes	Yes	Yes	Yes	Yes
Jeff Bidstrup	Yes	Yes	Term of Directorship completed				
Kathryn Adams	Yes	Yes	Term of Directorship completed				
Leith Boully	Not yet appointed		Yes	Yes	Yes	Yes	No
Lisa Wilson	Not yet appointed		Yes	Yes	Yes	Yes	Yes
Neil Forrester	Yes	Yes	Term of Directorship completed				
Simon Smalley	No	Yes	Yes	Yes	Yes	Yes	Yes
T.J. Higgins	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Board Committees

During 2004–05 the Board operated three committees: the Audit, Intellectual Property and Remuneration Committees. The number of committee meetings is not a reflection of the workload. Much of the work of the Committees is conducted via e-mail and telephone, rather than through formal meetings. The Corporation finds this arrangement to be effective and productive.

AUDIT COMMITTEE

Established under section 89 of the *Primary Industries and Energy Research and Development Act 1989* and section 32 of the *Commonwealth Authorities and Companies Act 1997*, the Audit Committee's primary role is to ensure the Corporation'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 the Corporation and the internal and external auditors of the Corporation. It carries responsibility for identifying areas of significant business risk and stipulating the means of managing any such risk.

Retiring Directors, Adam Kay and Kathryn Adams, were members of the Audit Committee until October 2005. Lisa Wilson, Leith Boully and Simon Smalley became members of the Committee in October 2005. Dick Browne ceased to be a member of the Committee at that time and Lisa Wilson succeeded him as Chair. The Corporation's Chair, Bridget Jackson, is also a member of the Committee and the Executive Director Bruce Finney and the Business Manager Robin Logan attend the meetings as observers.

The Committee met four times during 2005–06:

	August 2005	January 2006	February 2006	May 2006
Adam Kay	Yes	Term of Directorship completed		
Bridget Jackson	Yes	Yes	Yes	Yes
Dick Browne	Yes	n/a		
Kathryn Adams	Yes	n/a		
Leith Boully	n/a	No	Yes	No
Lisa Wilson	n/a	Yes	Yes	Yes
Simon Smalley	n/a	Yes	Yes	Yes

INTELLECTUAL PROPERTY COMMITTEE

The role of the Intellectual Property (IP) Committee is to assist the Corporation's Board in fulfilling its responsibilities and monitor the adequacy and effectiveness of the Corporation's policies and procedures that relate to the management of intellectual property (IP). The Committee's specific responsibilities are to review the operation of the CRDC's IP Policy and IP Operating Principles and to consider IP matters directed to it for consideration by the Board.

The Intellectual Property Committee met once during the reporting year, in February 2006. At that time the Chair of the Committee was David Conners and other members were Dick Browne, Glenn Fresser and TJ Higgins. All attended the meeting.

REMUNERATION COMMITTEE

The Remuneration Committee advises the Board on the Executive Director's remuneration and senior staff remuneration adjustments. During the reporting year, the Committee consisted of the Chair, Bridget Jackson, Dick Browne and, until her directorship concluded, Kathryn Adams. David Connors replaced Kathryn Adams from October 2005.

The Committee met twice during 2005–06:

	August 2005 (Teleconference)	March 2006
Bridget Jackson	Yes	Yes
Dick Browne	Yes	Yes
Kathryn Adams	Yes	Term of Directorship completed
David Connors	Not yet appointed	Yes

CONFLICTS OF INTEREST

In accordance with Section 131 of the *Primary Industries and Energy Research and Development Act 1989*, Directors are appointed on the basis of their expertise and do not represent any particular organisation or interest group.

The Board follows section 54 of the *Primary Industries and Energy Research and Development Act* and section 21 of the *Commonwealth Authorities and Companies Act 1997* regarding Directors' disclosures of interests. A Director who considers that he/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; it 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 which was further enhanced in 2004–05 with the adoption of a Board Charter that 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.

INDEMNITIES

The Board has taken the necessary steps to ensure adequate insurance cover is in place for Directors and officers of the Corporation. The Corporation's insurance cover is provided through Comcover; however, the insurance contract prohibits CRDC from disclosing the nature or limit of the liabilities covered, or the amounts of premiums paid.

LEGISLATION

The Cotton Research and Development Corporation began operations in 1990 under the *Primary Industries and Energy Research and Development (PIERD) Act 1989*, which sets out the following objectives:

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

b) achieving the sustainable use and management of natural resources

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

d) improving accountability for expenditure on research and development activities in relation to primary industries.

As can be seen in the diagrams on page 32–34, the requirements of the PIERD Act are central to the Corporation's R&D planning and these objectives are addressed in the six R&D programs devised under the current five-year Strategic Plan. The number and nature of these programs varies from those under the Strategic Plan 1998–2003, which reflects the Australian cotton industry's evolving challenges and opportunities in relation to achieving these objectives. The Corporation will begin formulation of the upcoming Strategic Plan in the 2006–07 year; again, this will closely reflect changed circumstances in relation to addressing the PIERD Act objectives.

The setting and collection of levies on the cotton industry is enabled by the *Cotton Levy Act 1982* and the *Primary Industries Levies and Collections Act 1991*. Accountability and reporting requirements are set out in the *Commonwealth Authorities and Companies (CAC) Act 1997*.

FUNCTIONS

CRDC's legislative functions are:

- 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, the Australian Cotton Growers Research Association (ACGRA), as well as the industry peak body, the Australian Cotton Industry Council, and its sub-committees. ACGRA reviews each year's planned R&D activities on behalf of the industry before the Annual Operating Plan is formulated and submitted to the Australian Government for approval. In addition, ACGRA participates with CRDC in an annual review to ensure the CRDC Strategic Plan remains current and relevant.

- preparing an Annual Operational Plan for each financial year;

  An Annual Operating Plan is submitted in April each year and implementation proceeds once Government approval is received.

- coordinating and funding R&D activities consistent with current planning documents;

  Research, development and extension projects are approved or commissioned in line with the Annual Operating Plan each year. The Annual Operating Plan is, itself, devised to address the objectives and strategies outlined in the current five-year Strategic Plan.

- monitoring, evaluating and reporting to Parliament, the Minister for Agriculture, Fisheries and Forestry, and to industry on R&D activities coordinated or funded by the Corporation;

  The Corporation reports formally to the Australian Government through its Annual Report, which is tabled in Parliament in October; in addition, the Corporation informs the Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry of any matters of interest or concern in the current operating environment. This occurs both in written and, where possible, face-to-face communication. CRDC is also in constant communication with the Department of Agriculture, Fisheries and Forestry on a range of issues. Communication with the industry occurs continually on both a formal and informal basis, as outlined above.

- facilitating the dissemination, adoption and commercialisation of research and development results in relation to the cotton industry.

  The Australian cotton industry has benefited greatly from having an industry-wide extension network, the Australian Cotton Extension Team. CRDC remains the major funder of this network, which is coordinated by the Cotton Catchment Communities CRC. In addition, CRDC staff members play a pivotal role in the activities of the network, including ensuring fast and effective dissemination of CRDC-funded research outcomes. More broadly, CRDC hosts forums, participates in roadshows, produces publications, sponsors the biennial research-based Australian Cotton Conference and has a communication strategy to extend and enhance the adoption of R&D. CRDC also partners in the successful commercialisation of R&D.

POWERS

Under Section 12 of the PIERD 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 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 or personal property; and,
- anything incidental to any of its powers.

MINISTERS

The Corporation is accountable to the Australian Parliament and the Minister for Agriculture, Fisheries and Forestry. In July 2005, the Hon Peter McGauran MP was appointed Minister, succeeding the Hon Warren Truss MP. The Hon Sussan Ley MP succeeded Senator the Hon Richard Colbeck as Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry on 24 January 2006.

The Minister's powers and responsibilities, as outlined under various sections of the PIERD Act, include:

- appointing the Corporation's Chair and Directors;
- the option to terminate the appointment of the Chair or any Director under certain conditions;
- approving the Corporation's Research and Development (Five Year) Plan and any variations;
- approving the Corporation's Annual Operating Plans and any variations;
- appointing a person as Presiding Member of the Corporation's Selection Committee, and other members of that Committee; and
- transferring to the Corporation any assets held by the Commonwealth that the Minister considers appropriate and which would assist the performance and function of the Corporation.

MINISTERIAL DIRECTIONS

CRDC did not receive any new Ministerial directions during the reporting year under its enabling legislation or any other legislation.

RESEARCH ACCOUNTABILITIES

The Corporation is accountable to the Australian people through the Australian Government and to the cotton industry through its industry representative body, the Australian Cotton Growers' Research Association. In August 1998 the Corporation became subject to the *Commonwealth Authorities and Companies (CAC) Act 1997* which provided new levels of accountability as well as a new planning and reporting framework. The *Annual Operating Plan 2005–06*, and thus this reporting year, marked the third year of operation under the framework requirements of the *Strategic Plan 2003–2008*.

CRDC's stakeholders set broad objectives, which the Corporation addresses through the *Strategic (Five Year) Plan* and the *Annual Operating Plan*. CRDC has used these objectives as a basis for the development of its outcomes and the identification of key outputs.

RISK MANAGEMENT

The Corporation has a Risk Management Plan as part of its approach to identifying and managing areas of significant business risk. The process also involves consulting widely and participating in appropriate industry, Rural Research and Development Corporation and Government forums to keep fully informed about the environment in which the Corporation operates. Situations involving even minor business risk are fully discussed at a Board level with policy developed through consensus. Management and staff have responsibility for implementing policy as directed by the Board.

The Board has instituted a policy of holding a focused and facilitated strategic review session in conjunction with Board meetings wherever possible. These focus on a specific issue or area of research. Depending on the topic, a variety of speakers and industry participants may also be invited to attend, to enable broad discussion and to expose risks and opportunities for the Corporation and the industry. Directors and employees conducted a number of strategic reviews during the year, including:

	Review	Outcome
Corporate Strategic Reviews	Intellectual Property	Development of CRDC Intellectual Property Policy and Toolkit
	Occupational Health and Safety	Amendment of OH&S Policy
	Information Technology	Revised Information Technology Procedures
Research and Extension Strategic Reviews	Review of Soil Health Research in Cotton	Recommendations from review have contributed to the design of new research and extension initiatives in conjunction with the Cotton Catchment Communities CRC and GRDC
Research Strategic Reviews	Bt Resistance Forum. A forum to review current research methodologies and the resistance status of *Helicoverpa armigera* to *Bt* was undertaken in March 2006	Outcomes from the review have led to improved co-operation and understanding between research agencies in the techniques being used for *Bt* resistance monitoring and testing
	A review of research investments into cotton fibre, particularly through biotechnology	The Board has discussed recommendations from the review and individual researchers have received comments from the review pertaining to their research

BOARD CHARTER

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

INDUSTRY STAKEHOLDER REPORTING

CRDC's reporting processes include the presentation of a formal report to its industry stakeholder, the Australian Cotton Growers' Research Association. Part of this presentation includes an opportunity for questioning and debating Board decisions. At least one CRDC staff member attends each ACGRA meeting.

CORPORATE PLANNING

In accordance with the *Primary Industries and Energy Research and Development (PIERD) Act 1989* and the *Commonwealth Authorities and Companies (CAC) Act 1997*, the Corporation prepares a Strategic (Five Year) Plan as well as an Annual Operating Plan for each financial year. The Corporation submitted the *Annual Operating Plan 2006–07* to the Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry, the Hon Sussan Ley MP, on 27 April 2006. Written advice of approval was received from Ms Ley on 30 June 2006.

FRAUD CONTROL

The Corporation fosters an environment that minimises the likelihood and impact of fraud. 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 Federal Government's *Fraud Control Policy*. The Audit Committee endorses, monitors and reviews the Corporation's Fraud Control Plan, which is read in conjunction with the Risk Management Plan and the Code of Conduct for Directors and staff.

The Corporation's Audit Committee, Executive Director and Business Manager, who is the nominated fraud control officer, collectively carry out the functions of a fraud investigation unit as described in the Commonwealth Fraud Investigation Model. The support of the Australian Federal Police would be sought if the Corporation felt there was a prima facie case of fraud and further investigation was required.

SERVICE CHARTER

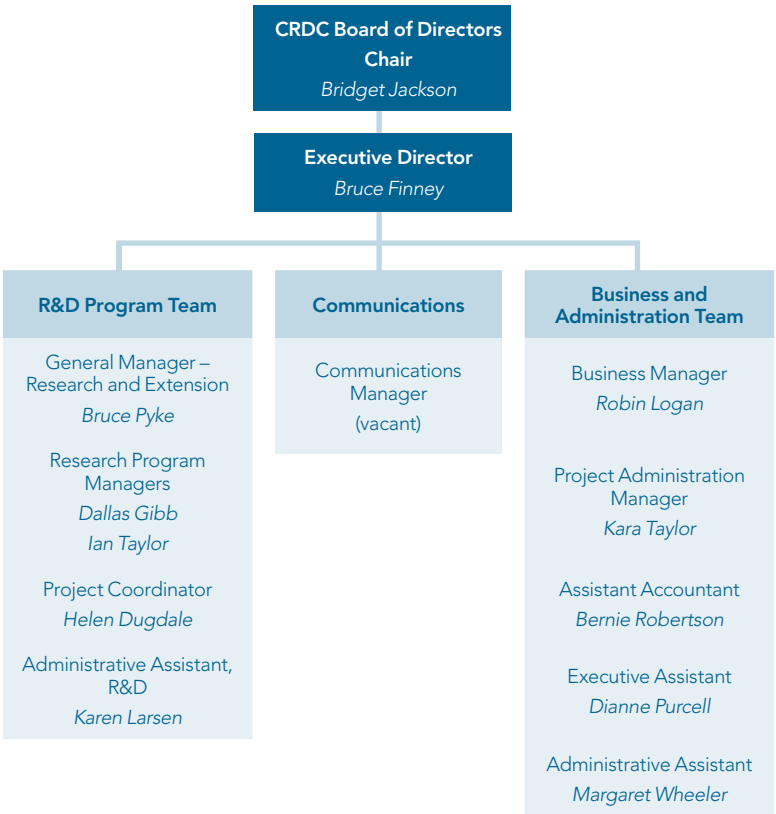
The Corporation does not provide services direct to the public and does not have a service charter; however, the Corporation has a Statement of Principles for the Board, management and staff, which can be found in the introductory section of this publication. It embodies the set of values underlying our decisions, actions and relationships.

STAFF

Staff members are employed under Section 87 of the *PIERD Act 1989*, which provides that the terms and conditions of employment are to be determined by the Corporation. Including the Executive Director, there were ten full-time employees and one part-time employee as at 30 June 2006.

ORGANISATIONAL STRUCTURE

(As at 30 June 2006)



The CRDC team

Bruce Pyke, Marg Wheeler, Helen Dugdale, Kara Taylor, Bernie Robertson, Ian Taylor, Dianne Purcell, Karen Larsen, Dallas Gibb, Bruce Finney and Robin Logan

STAFF CHANGES DURING 2005–06

Bernie Robertson was appointed Assistant Accountant on 8 August 2005; Dr Ian Taylor was appointed Research Program Manager on 24 October 2005; Communications Manger, Julie Burt, resigned on 15 March 2006; Research Program Coordinator, Rachel Holloway, resigned on 31 March 2006.

APPOINTMENTS AFTER THE REPORTING YEAR

No appointments have been made after the reporting year.

TRAINING AND DEVELOPMENT

During the reporting year, the Corporation spent $29,357 on training and recruitment. Direct training activities included:

- University fees
- Company Director's course
- Fire evacuation training
- Commercial negotiation training
- Intellectual Property workshops and conference
- Financial training
- Computer software training
- Meeting procedures training
- Program management training manuals

In addition, activities such as the attendance of staff members at workshops and meetings held by Wincott and internal staff training on Occupational Health and Safety occurred at no additional cost to the Corporation.

Throughout the year, Corporation Directors and staff participate in a wide range of activities relating to the operations of the Corporation, which provide valuable experience and additional training for the personnel involved.

CONTRACTORS AND CONSULTANTS

The Corporation employs consultants and contractors on a needs basis, and after background checks to ensure proposed appointees have necessary skills and experience. During the reporting year the Corporation spent $61,719 to remunerate consultants and contractors. It is Corporation policy not to disclose amounts paid to individual consultants due to privacy and confidentiality arrangements.

Contractor/Consultant	Service
ACIPA	Intellectual Property
AKA Consulting	Pesticide regulation support
Adelaide Research & Innovation	Review of scientific paper
Bytes & Bites	IT support
Dr David Stalker	Review of fibre projects
Denbigh International	Program management software review
Dr Bruce Hammock	Review of scientific paper
Jodie McLean	Plant variety trials
Lynette Smith	Software design
Octopus Communications	Corporate communications production
Ralph Schulze	ICAC Expert Panel
Sefton & Associates	Communications strategic planning
Vic Edge	Review of projects
Weemalah Writeability	Corporate document production

EQUAL EMPLOYMENT OPPORTUNITY

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

OCCUPATIONAL HEALTH AND SAFETY

CRDC is committed to creating a safe workplace and has a strong culture of continuous improvement in Occupational Health and Safety (OH&S). This is achieved through regular staff and OH&S meetings where safety issues are

formally discussed, workplace inspections held and staff are consulted in resolving safety issues and physical conditions of the workplace.

CRDC provides the necessary resources to ensure that OH&S functions effectively. The target for the year was to address the remaining action items identified by an external OH&S audit in 2004. Updated emergency evacuation procedures, increased signage, safe operating procedures for the vault, new OH&S management software and a number of physical hazards have been addressed. Training was completed in emergency evacuation procedures, ergonomics and manual handling, plus general OH&S inductions and Fire Extinguisher Training for new CRDC staff.

The focus of continuous improvement in 2006–07 will be further development of OH&S procedures and an external OH&S audit. Training planned for 2006–07 includes OH&S and Fire Extinguisher Training for new staff as well as training in defensive driving and managing driver fatigue.

CRDC had no OH&S incidents to report in 2005–06, as defined in Section 86 of the Occupational Health and Safety (Commonwealth Employment Act 1991). Should any such incident occur, it would be managed in accordance with the Act.

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 Business Manager. The Corporation did not receive any requests under the *Freedom of Information Act 1982* during the reporting year.

Funding information on individual projects funded by the Corporation is available on request. Information about CRDC projects is also available through the Australian Rural Research in Progress (ARRIP) database, which can be accessed through the Internet and through most Australian research and public libraries.

Categories of Documents Held

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

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

ECOLOGICALLY SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL PERFORMANCE

The principles of ecologically sustainable development under the *Environment Protection and Biodiversity Conservation Act 1999* apply to the Corporation. These include integrating long-term and short-term economic, environmental, social and equitable considerations into decision making processes; not using lack of full scientific certainty as a reason to postpone measures to prevent environmental degradation if there is the threat of serious or irreversible environmental damage; maintaining or enhancing the health, diversity and productivity of the environment for future generations; ensuring the conservation of biological diversity and ecological integrity is a fundamental consideration in decision-making; and promoting valuation, pricing and incentive mechanisms.

The Corporation has integrated these principles into its planning framework. The three Output groups – Sustainable Production Systems and Catchments, Profitability and International Competitiveness, and Empowered People and Communities – were a reflection of the need to factor 'triple-bottom-line' environmental, economic and social considerations into all decisions. Almost half the Corporation's budget is directed towards issues improving the industry's sustainability, encompassing natural resource management and biodiversity. CRDC continued to fund a specific research program (Best Management Practices and the Environment) designed to minimise environmental impacts.

COMMONWEALTH DISABILITY STRATEGY

Corporation working conditions and procedures for employees and stakeholders are compliant with the Commonwealth Disability Strategy insofar as the small size of the Corporation and physical nature of the CRDC building make this possible. CRDC enhanced disability access for staff and visitors in recent years through the installation of a wheelchair accessible ramp with adjacent disabled parking and disability signage. The next stage in enhanced disability facilities will be to change the male toilet on the ground floor to a disability access toilet.

SIGNIFICANT EVENTS

Under section 15 of the *Commonwealth Authorities and Companies (CAC) Act 1997*, the Corporation is required to notify the Minister of 'significant events'. CRDC had no significant events within the meaning of the Act during the reporting year.

SIGNIFICANT CHANGES IN THE STATE OF AFFAIRS

CRDC had no significant changes in its state of affairs during 2005–06.

PAYMENTS TO ADVERTISING AGENCIES

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

PAYMENT TO REPRESENTATIVE BODIES

The Corporation's industry representative body is the Australian Cotton Growers Research Association (ACGRA). In this role ACGRA undertakes several specific activities on an annual basis:

- A joint review with CRDC of the CRDC five year Strategic Plan. This ensures CRDC's strategic planning continues to meet evolving industry R&D needs.
- A meeting to receive and discuss the CRDC annual report for the preceding year. This enables ACGRA to ensure CRDC's activities for that year have met its strategic objectives (listed earlier in this report) and to question senior staff on any matters of interest or concern.
- Participation in the annual CRDC and Cotton Catchment Communities CRC Farming Systems forums. This addresses an area of current importance to the industry by addressing future research needs and aiding the extension of existing research. In 2005–06, the two-day Farming Systems Forum, held in Goondiwindi in November 2005, addressed Precision Agriculture.

While CRDC does not pay a fee for service to the ACGRA for these activities, it contributes to the organisation's expenses in carrying them out.

In 2005–06 CRDC contributed a total of $94,466 to ACGRA, as follows:

Sponsorship of 13th Australian Cotton Conference	$55,000
Workshops and training	$13,439
Industry-related consultation expenses	$26,027

FINANCIAL STATEMENTS

Australian National
Audit Office

INDEPENDENT AUDIT REPORT

To the Minister for Agriculture, Fisheries and Forestry

Scope

The financial statements and Directors' responsibility

The financial statements comprise:

- Statement by Directors and Chief Executive;
- Income Statement, Balance Sheet and Statement of Cash Flows;
- Statement of Changes in Equity;
- Schedules of Commitments and Contingencies; and
- Notes to and forming part of the Financial Statements

of the Cotton Research and Development Corporation for the year ended 30 June 2006.

The Directors are responsible for preparing the financial statements that give a true and fair view of the financial position and performance of the Cotton Research and Development Corporation, and that comply with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, Accounting Standards and mandatory financial reporting requirements in Australia. The Directors are also responsible for the maintenance of adequate accounting records and internal controls that are designed to prevent and detect fraud and error, and for the accounting policies and accounting estimates inherent in the financial statements.

Audit Approach

I have conducted an independent audit of the financial statements in order to express an opinion on them to you. My audit has been conducted in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing and Assurance Standards, in order to provide reasonable assurance as to whether the financial statements are free of material misstatement. The nature of an audit is influenced by factors such as the use of professional judgement, selective testing, the inherent limitations of internal control, and the availability of persuasive, rather than conclusive, evidence. Therefore, an audit cannot guarantee that all material misstatements have been detected.

While the effectiveness of management's internal controls over financial reporting was considered when determining the nature and extent of audit procedures, the audit was not designed to provide assurance on internal controls.

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

I have performed procedures to assess whether, in all material respects, the financial statements present fairly, in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, Accounting Standards and other mandatory financial reporting requirements in Australia, a view which is consistent with my understanding of the Cotton Research and Development Corporation's financial position, and of its financial performance and cash flows.

The audit opinion is formed on the basis of these procedures, which included:

- examining, on a test basis, information to provide evidence supporting the amounts and disclosures in the financial statements; and
- assessing the appropriateness of the accounting policies and disclosures used, and the reasonableness of significant accounting estimates made by the Directors.

Independence

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

Audit 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*; and

(b) give a true and fair view of the Cotton Research and Development Corporation's financial position as at 30 June 2006 and of its performance and cash flows for the year then ended, in accordance with:

(i) the matters required by the Finance Minister's Orders; and

(ii) applicable Accounting Standards and other mandatory financial reporting requirements in Australia.

Australian National Audit Office

Ron Wah
Senior Director

Delegate of the Auditor-General

Canberra
30 August 2006

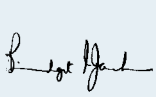
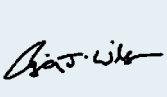
COTTON RESEARCH AND DEVELOPMENT CORPORATION

Statement by Directors and Chief Executive

In our opinion, the attached financial statements for the year ended 30 June 2006 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*.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the 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	Signed	Signed	Signed
			
Bridget Jackson Chair	**Lisa Wilson** Director	**Bruce Finney** Executive Director	**Robin Logan** Business Manager

30 August 2006

COTTON RESEARCH AND DEVELOPMENT CORPORATION

INCOME STATEMENT
for the year ended 30 June 2006

	Notes	2006 $	2005 $
INCOME			
Revenue			
Revenues from Government	4A	**4,907,880**	4,318,349
Industry Contributions	4B	**6,714,797**	4,575,830
Interest	4C	**888,998**	702,904
Other Revenues	4D	**3,098,112**	2,348,779
Total Revenue		**15,609,787**	11,945,862
TOTAL INCOME		**15,609,787**	11,945,862
EXPENSES			
Employees	5A	**1,185,165**	1,107,193
Suppliers	5B	**419,489**	342,461
Grants	5C	**11,139,809**	11,110,882
Depreciation and amortisation	5D	**26,985**	33,157
Write–down and impairment of assets	5E	**15,169**	17,710
Net loss from disposal of assets	5F	**–**	4,490
TOTAL EXPENSES		**12,786,617**	12,615,893
Operating result before income tax		**2,823,170**	(670,031)
Income tax equivalent expense		**–**	–
OPERATING RESULT		**2,823,170**	(670,031)

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

COTTON RESEARCH AND DEVELOPMENT CORPORATION

BALANCE SHEET
as at 30 June 2006

	Notes	2006 $	2005 $
ASSETS			
Financial Assets			
Cash and cash equivalents	6A	**15,750,353**	11,418,677
Receivables	6B	**2,256,968**	2,570,922
Total Financial Assets		**18,007,321**	13,989,599
Non–Financial Assets			
Land and buildings	7A,C	**455,000**	350,000
Infrastructure, plant and equipment	7B,C	**93,880**	111,921
Intangibles	7D	**44,000**	–
Other financial assets	7E	**29,930**	–
Total Non–Financial Assets		**622,810**	461,921
TOTAL ASSETS		**18,630,131**	14,451,520
LIABILITIES			
Payables			
Suppliers	8A	**58,313**	79,283
Grants	8B	**2,553,565**	1,258,144
Other Payables	8C	**30,994**	44,892
Total Payables		**2,642,872**	1,382,319
Provisions			
Employee provisions	9	**151,881**	161,212
Total Provisions		**151,881**	161,212
TOTAL LIABILITIES		**2,794,753**	1,543,531
NET ASSETS		**15,835,378**	12,907,989
EQUITY			
Reserves		**135,592**	31,373
Retained surpluses or (accumulated deficits)		**15,699,786**	12,876,616
TOTAL EQUITY		**15,835,378**	12,907,989
Current assets		**18,037,251**	13,989,599
Non–current assets		**592,880**	461,921
Current liabilities		**2,758,702**	1,511,258
Non–current liabilities		**36,051**	32,273

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

COTTON RESEARCH AND DEVELOPMENT CORPORATION

STATEMENT OF CASH FLOWS
for the year ended 30 June 2006

	Notes	2006 $	2005 $
OPERATING ACTIVITIES			
Cash received			
Commonwealth Contributions		**6,034,103**	4,018,184
Industry Levies		**6,044,458**	4,628,583
Interest		**886,979**	579,984
Net GST received from ATO		**72,608**	352,156
Other		**3,134,259**	2,510,055
Total cash received		**16,172,407**	12,088,962
Cash used			
Employees		**1,208,444**	1,121,426
Suppliers		**437,573**	552,587
Grants		**10,125,819**	9,906,774
Total cash used		**11,771,836**	11,580,787
Net cash from or (used by) operating activities	10	**4,400,571**	508,175
INVESTING ACTIVITIES			
Cash received			
Proceeds from sale of plant and equipment		**–**	1,586
Total cash received		**–**	1,586
Cash used			
Purchase of property, plant and equipment		**68,894**	31,099
Total cash used		**68,894**	31,099
Net cash from or (used by) investing activities		**(68,894)**	(29,513)
FINANCING ACTIVITIES			
Cash received		**–**	–
Cash used		**–**	–
Net cash from or (used by) financing activities		**–**	–
Net increase or (decrease) in cash held		**4,331,677**	478,662
Cash at the beginning of the reporting period		**11,418,677**	10,940,015
Cash at the end of the reporting period	6A	**15,750,354**	11,418,677

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

COTTON RESEARCH AND DEVELOPMENT CORPORATION

STATEMENT OF CHANGES IN EQUITY
for the year ended 30 June 2006

	Accumulated Results		Asset Revaluation Reserve		Total Equity	
	2006 $	2005 $	**2006** $	2005 $	**2006** $	2005 $
Opening Balance	**12,876,616**	13,546,647	**31,373**	26,861	**12,907,989**	13,573,508
Adjustment for errors	–	–	–	–	–	–
Adjustment for changes in Accounting policies	–	–	–	–	–	
Adjusted Opening Balance	**12,876,616**	13,546,647	**31,373**	26,861	**12,907,989**	13,573,508
Income and Expense						
Revaluation adjustment	–	–	**104,219**	4,512	**104,219**	4,512
Subtotal income and expenses recognised directly in equity	–	–	**104,219**	4,512	**104,219**	4,512
Net Operating Result	**2,823,170**	(670,031)	–	–	**2,823,170**	(670,031)
Total income and expenses	**2,823,170**	(670,031)	**104,219**	4,512	**2,927,389**	(665,519)
Transactions with Owners	–	–	–	–	–	–
Transfers between equity components	–	–	–	–	–	–
Closing balance at 30 June	**15,699,786**	12,876,616	**135,592**	31,373	**15,835,378**	12,907,989

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

COTTON RESEARCH AND DEVELOPMENT CORPORATION

SCHEDULE OF COMMITMENTS
as at 30 June 2006

	2006 $	2005 $
BY TYPE		
Capital Commitments	–	–
Other Commitments		
Operating leases	**10,984**	67,464
Research grant commitments	**22,876,809**	21,650,615
Total other commitments	**22,887,793**	21,718,079
Commitments Receivable	**2,080,708**	1,974,371
Net commitments by type	**20,807,085**	19,743,708
BY MATURITY		
Other Commitments		
Operating lease commitments		
One year or less	**10,984**	57,826
From one to five years	**–**	9,638
Total Operating Lease Commitments	**10,984**	67,464
Research Grant Commitments		
One year or less	**11,015,683**	11,942,222
From one to five years	**11,861,126**	9,708,393
Total Research Grant Commitments	**22,876,809**	21,650,615
Commitments Receivable	**2,080,708**	1,974,371
Net commitments by maturity	**20,807,085**	19,743,708

NB: Commitments are GST inclusive where relevant.

1 Operating leases included are effectively non–cancellable and comprise agreements for the provision of motor vehicles for senior executives

2 Research grant commitments are amounts payable under grant agreements in respect of which the recipient is yet to perform the services required or meet eligibility conditions

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

COTTON RESEARCH AND DEVELOPMENT CORPORATION

SCHEDULE OF CONTINGENCIES
as at 30 June 2006

	2006	2005
	$	$

The Cotton R&D Corporation has no contingent assets or liabilities to be tabled; however, remote receivables are reported in Note 11

COTTON RESEARCH AND DEVELOPMENT CORPORATION

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS
for the year ended 30 June 2006

Note 1: Summary of Significant Accounting Policies

1.1 Basis of Preparation of the Financial Statements

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

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

The statements have been prepared in accordance with:

- Finance Minister's Orders (or FMO's, being the *Commonwealth Authorities and Companies Orders (Financial Statements for reporting periods ending on or after 01 July 2005));*
- Australian Accounting Standards issued by the Australian Accounting Standards Board that apply for the reporting period; and
- Interpretations issued by the AASB and UIG that apply for the reporting period.

This is the first financial report to be prepared under Australian Equivalents to International Financial Reporting Standards (AEIFRS). The impacts of adopting AEIFRS are disclosed in Note 2.

The Income Statement, Balance Sheet and Statement of Changes in Equity have been prepared on an accrual basis and are in accordance with historical cost convention, except for certain assets and liabilities, which as noted, are 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 report is presented in Australian dollars and values are rounded to the nearest dollar.

Unless alternative treatment is specifically required by an accounting standard, assets and liabilities are recognized in the Balance Sheet when and only when it is probable that future economic benefits will flow 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 and reported in the Schedule of Commitments and the Schedule of Contingencies (other than unquantifiable or remote contingencies, which are reported at Note 11).

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

1.2 Significant Accounting Judgments and Estimates

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

- The fair value of land and buildings has been taken to be the market value of similar properties as determined by an independent valuer.

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.

1.3 Statement of Compliance

The financial report complies with Australian Accounting Standards, which include Australian Equivalents to International Financial Reporting Standards (AEIFRS).

Australian Accounting Standards require the Corporation to disclose Australian Accounting Standards that have not been applied, for standards that have been issued but are not yet effective.

The AASB has issued amendments to existing standards, these amendments are denoted by year and the number, for example 2005-1 indicated amendment 1 issued in 2005.

Title	Standard Affected	Application date*	Nature of impending change	Impact expected on financial report
2005-1	AASB 139	1 Jan 2006	Amends hedging requirements for foreign currency risk of a highly probable intra-group transaction.	No expected impact
2005-4	AASB 139, AASB 132, AASB 1, AASB 1023 and AASB 1038	1 Jan 2006	Amends AASB 139, AASB 1023 and AASB 1038 to restrict the option to fair value through profit or loss and makes consequential amendments to AASB 1 and AASB 132.	No expected impact
2005-5	AASB 1 and AASB 139	1 Jan 2006	Amends AASB 1 to allow an entity to determine whether an arrangement is, or contains, a lease. Amends AASB 139 to scope out a contractual right to receive reimbursement (in ccordance with AASB 137) in the form of cash.	No expected impact
2005-6	AASB 3	1 Jan 2006	Amends the scope to exclude business combinations involving entities or businesses under common control.	No expected impact
2005-9	AASB 4, AASB 1023, AASB 139 and AASB 132	1 Jan 2006	Amended standards in regards to financial guarantee contracts.	No expected impact
2005-10	AASB 132, AASB 101, AASB 114, AASB 117, AASB 133, AASB 139, AASB 1, AASB 4, AASB 1023 and AASB 1038	1 Jan 2007	Amended requirements subsequent to the issuing of AASB 7.	No expected impact

Title	Standard Affected	Application date*	Nature of impending change	Impact expected on financial report
2006-1	AASB 121	31 Dec 2006	Changes in requirements for net investments in foreign subsidiaries depending on denominated currency.	No expected impact
	AASB7 Financial Instruments: Disclosures	1 Jan 2007	Revise the disclosure requirements for financial instruments from AASB132 requirements.	No expected impact

* Application date is for annual reporting periods beginning on or after the date shown

1.4 Revenue

Revenue from the sale of goods is recognised when:
- The risks and rewards of ownership have been transferred to the buyer;
- The seller retains no managerial involvement nor effective control over the goods;
- The revenue and transaction costs incurred can be reliably measured; and
- It is probable that the economic benefits associated with the transaction will flow to the entity.

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:
- The amount of revenue, stage of completion and transaction costs incurred can be reliably measured; and
- The probable economic benefits 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 provision for bad and doubtful debts. Collectability of debts is reviewed at balance date. Provisions 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.

Revenues from Government

The full amount of the government grant revenue, appropriated to the Department of Agriculture, Fisheries and Forestry (DAFF) and forwarded to the Corporation for the year is recognised as revenue, at their nominal amount.

Resources Received Free of Charge

Services 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.

Contributions of assets at no cost of acquisition or for nominal consideration are recognised as revenue at their fair value when the asset qualifies for recognition.

1.5 Employee Benefits

As required by the Finance Minister's Orders, the Corporation has early adopted AASB 119 Employee Benefits as issued in December 2004.

Liabilities for services rendered by employees are recognised at the reporting date to the extent that they have not been settled.

Liabilities for 'short-term employee benefits' (as defined in AASB 119) and termination benefits due within twelve months 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.

All other employee benefit liabilities are measured as the present value of the estimated future cash outflows to be made in respect of services provided by employees up to the reporting date.

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, 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 work of an actuary as at 30 June 2006. The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Superannuation

Staff of the Corporation are members of the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS) or the PSS accumulation plan (PSSap).

The CSS and PSS are defined benefit schemes for the Commonwealth. 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.

The Corporation makes employer contributions to the Australian Government at rates determined by an actuary to be sufficient to meet the costs to the Government of the superannuation entitlement of the Corporation's employees.

From 1 July 2005, new employees are eligible to join the PSSap scheme.

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

1.6 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 non-current 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 a non-current asset is acquired by means of a finance lease, the asset is capitalised at 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 recognised at the same time and for the same amount.

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

1.7 Borrowing Costs

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

1.8 Cash

Cash means notes and coins held and any deposits held at call with a bank or financial institution. Cash is recognised at its nominal amount.

1.9 Financial Risk Management

The Corporation's activities expose it to normal commercial financial risk. As a result of the nature of the Corporation's business and internal and Australian Government policies, dealing with the management of financial risk, the Corporation's exposure to market credit, liquidity and cash flow and fair value interest rate risk is considered to be low.

1.10 Investments

Investments are initially measured at their fair value.

After initial recognition, financial assets are to be measured at their fair values except for;

a) Loans and receivables which are measured at amortised costs using the effective interest method,

b) Held-to-maturity investments which are measured at amortised cost using the effective interest method, and

c) Investments in equity instruments that do not have a quoted market price in an active market and whose fair value cannot be reliably measured and derivatives that are linked to and must be settled by delivery of such unquoted equity instruments, which shall be measured at cost.

1.11 Derecognition of Financial Assets and Liabilities

As prescribed in the Finance Minister's Orders, the Corporation has applied the option available under AASB 1 of adopting AASB 132 and 139 from 1 July 2005 rather than 1 July 2004.

Financial assets are derecognised when the contractual rights to the cash flows from the financial assets expire or the asset is transferred to another entity. In cases of transfer to another entity, it is necessary that the risk and rewards of ownership are also transferred.

Financial liabilities are derecognised when the obligation under the contract is discharged or cancelled or expires.

For the comparative year, financial assets are derecognized when the contractual right to receive cash no longer existed. Financial liabilities were derecognised when the contractual obligation to pay cash no longer existed.

1.12 Impairment of Financial Assets

As prescribed in the Finance Minister's Orders, the Corporation has applied the option available under AASB 1 of adopting AASB 132 and 139 from 1 July 2005 rather than 1 July 2004.

Financial assets are assessed for impairment at each balance date.

Financial Assets held at Amortised Costs

If there is objective evidence that an impairment loss has been incurred for loan and receivables or held to maturity investments held at amortised costs, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flow 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 profit and loss.

Financial Assets held at Cost

If there is objective evidence that an impairment loss has been incurred on an unquoted equity instrument that is not carried at fair value because it cannot be reliably measured, or a derivative asset that is linked to and must be settled by delivery of such an unquoted equity instrument, 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 flow discounted at the current market rate for similar assets.

Available for Sale Financial Assets

If there is objective evidence that an impairment loss on an available for sale financial asset has been incurred, the amount of the difference between its cost, less principal repayments and amortisation, and its current fair value, less any impairment loss previously recognised in profit and loss, is transferred from equity to the profit and loss.

Comparative Year

The above policies were not applied for the comparative year. For receivables, amounts were recognised and carried at original invoice amount less a provision for doubtful debts based on an estimate made when collection of the full amount was no longer probable. Bad debts were written off as incurred.

Other financial assets carried at cost which were not held to generate net cash inflows, were assessed for indicators of impairment. Where such indicators were found to exist, the recoverable amount of the assets was estimated and compared to the assets carrying amount and, if less, reduced to the carrying amount. The reduction was shown as impairment loss.

1.13 Interest Bearing Loans and Borrowings

No borrowing costs/interest was incurred by the Corporation during the year.

1.14 Trade Creditors

Trade creditors and accruals are recognised at their nominal amounts, being the amounts at which the liabilities will be settled. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

1.15 Contingent Liabilities and Contingent Assets

Contingent Liabilities and Assets are not recognised in the Balance Sheet but are discussed in the relevant schedules and notes. They may arise from uncertainty as to the existence of a liability or asset, or represent an existing liability or asset in respect of which settlement is not probable or the amount cannot be reliably measured. Remote contingencies are part of the disclosure. Where settlement becomes probable, a liability or asset is recognised. A liability or asset is recognised when its existence is confirmed by a future event. Settlement becomes probable (virtually certain for assets) or reliable measurement becomes possible.

1.16 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 cost where appropriate.

Assets acquired at no costs, or for nominal consideration, are initially recognised as assets and revenues 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 authority's accounts immediately prior to the restructuring.

1.17 Property, Plant and Equipment (PP&E)

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the Balance Sheet, 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).

Revaluations

Basis

Land, buildings, plant and equipment are carried at fair value, being revalued with sufficient frequency such that the carrying amount of each asset class is not materially different, at reporting date, from its fair value. Valuations undertaken in each year are as at 30 June.

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

Asset Class	Fair Value Measured at:
Land	Market selling price
Building	Market selling price
Plant & Equipment	Market selling price

Following initial recognition at cost, valuations are conducted with sufficient frequency to ensure that the carrying amounts of assets do not materially differ with the assets' fair values as at the reporting date. The regularity of independent valuations depends upon the volatility of movement in market values for the relevant assets.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under the heading of asset revaluation reserve except to the extent that it reverses a previous revaluation decrement of the same asset class that was previously recognised through profit and loss. Revaluation decrements for a class of assets are recognised directly through profit and loss except to the extent that they reverse 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 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:

	2006	2005
Buildings on freehold land	**40 years**	40 years
Plant and equipment	**3 to 10 years**	3 to 10 years

The aggregate amount of depreciation allocated for each class of asset during the reporting period is disclosed in Note 5D.

Impairment

All assets were assessed for impairment at 30 June 2006. Where indication 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 to sell* 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 costs

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

1.18 Intangibles

The Corporation's intangible comprises of software licences for internal use. These assets are carried at cost.

Software is amortised on a straight line basis over its anticipated useful life. The useful life of the Corporation's software is 5 years. All software assets were assessed for indications of impairment as at 30 June 2006.

1.19 Taxation

The Corporation is exempt from all forms of taxation except fringe benefits tax, the goods and services tax (GST) and payroll tax.

Revenues, expenses and assets are recognized net of GST:

- except where the amount of GST incurred is not recoverable from the Australian Taxation Office; and
- except for receivables and payables.

Note 2: The impact of the transition of AEIFRS from previous AGAAP

There was no AEIFRS impact on the Corporation's accounts.

Note 3: Events occurring after the Balance Sheet date

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.

	2006 $	2005 $
Note 4: Income		
Note 4A: Revenues from Government		
Grant revenue from Related Entity	**4,907,880**	4,318,349
Total revenues from government	**4,907,880**	4,318,349
Note 4B: Industry Contributions		
Industry contributions	**6,714,797**	4,575,830
Total Industry Contributions	**6,714,797**	4,575,830
Note 4C: Interest Revenue		
Interest on deposits	**888,998**	702,904
Total interest revenue	**888,998**	702,904

	2006 $	2005 $
Note 4D: Other Revenues		
Royalties	**2,499,134**	1,641,885
Project refunds	**358,739**	465,848
Levy penalties	**1,412**	3,606
Grants revenue	**216,750**	214,000
Other revenue	**22,077**	23,440
Total Other Revenue	**3,098,112**	2,348,779

Note 5: Operating Expenses

Note 5A: Employee Expenses		
Wages and Salaries	**1,054,871**	922,022
Superannuation	**126,369**	120,331
Leave and other entitlements	**3,925**	64,840
Total employee expenses	**1,185,165**	1,107,193
Note 5B: Supplier Expenses		
Goods from external entities	**349,621**	292,527
Operating lease rentals	**67,259**	48,321
Workers' compensation premiums	**2,609**	1,613
Total supplier expenses	**419,489**	342,461

Note 5C: Grants Expense

The Corporation makes grants to support the research and development of issues relating to the Australian cotton industry.

NON-PROFIT INSTITUTIONS		
Commonwealth organisations	**3,513,726**	4,803,838
State departments	**1,861,287**	2,903,475
Universities and colleges	**234,920**	709,558
Other research institutions	**4,047,139**	1,886,174
Corporate activities	**451,740**	365,149
	10,108,811	10,668,194
COMMERCIAL ENTITIES		
Grants to commercial entities	**1,030,997**	442,688
Total grants expense	**11,139,809**	11,110,882
Note 5D: Depreciation and Amortisation		
Depreciation		
Other infrastructure, plant and equipment	**18,981**	27,249
Building	**6,391**	5,908
Total depreciation	**25,372**	33,157
Amortisation		
Intangibles – Computer Software	**1,613**	–
Total depreciation and amortisation	**26,985**	33,157
Note 5E: Write-Down and Impairment of Assets		
Plant & equipment – revaluation decrement	**15,169**	17,710
Total write-down and impairment of assets	**15,169**	17,710
Note 5F: Net loss from disposal of assets		
Proceeds from disposal	**–**	1,586
Net book value of assets disposed	**–**	6,076
Net loss from disposal of assets	**–**	4,490

	2006 $	2005 $
Note 6: Financial Assets		
Note 6A: Cash and cash equivalents		
Cash at bank	**4,499,853**	3,668,109
Cash on hand	**500**	500
Deposits at Call	**11,250,000**	7,750,068
Total Cash and cash equivalents	**15,750,353**	11,418,677
The interest rates for Deposits at Call range from 5.40% to 6.0% (2005: 5.15% to 6.0%) and the frequency of payments range from monthly to annual.		
Note 6B: Receivables		
Commonwealth contributions receivable	**–**	1,125,341
Industry levies receivable	**1,736,452**	1,066,142
Interest receivable	**334,158**	332,138
GST receivable from ATO (net)	**152,416**	–
Other receivables	**33,942**	47,301
Total receivables (gross)	**2,256,968**	2,570,922
All receivables are current assets.		
Receivables is represented by:		
Current	**2,256,968**	2,570,922
Total receivables (net)	**2,256,968**	2,570,922
Note 7: Non-Financial Assets		
Note 7A: Land and Buildings		
Freehold land		
Valuation (2005 fair value)		100,000
2006 valuation (fair value) adjustment		
Valuation (2006 fair value)	**130,000**	
Total freehold land	**130,000**	100,000
Buildings on freehold land		
Valuation (2005 fair value)		250,000
2006 valuation (fair value) adjustment		
Valuation (2006 fair value)	**325,000**	
Total buildings on freehold land	**325,000**	250,000
Total Land and Buildings	**455,000**	350,000
Note 7B: Infrastructure, Plant and Equipment		
Office Equipment Valuation (2005 fair value)		48,476
2006 valuation (fair value) adjustment		
Valuation (2006 fair value)	**39,540**	
Total Office Equipment	**39,540**	48,476
Computer Equipment Valuation (2005 fair value)		30,725
2006 valuation (fair value) adjustment		
Valuation (2006 fair value)	**15,990**	
Total Computer Equipment	**15,990**	30,725
Fixtures and Fittings Valuation (2005 fair value)		32,720
2006 valuation (fair value) adjustment		
Valuation (2006 fair value)	**38,350**	
Total Fixtures and Fittings	**38,350**	32,720

	2006 $	2005 $
Total Infrastructure, Plant & Equipment (non-current)	**93,880**	111,921

All revaluations are conducted in accordance with the revaluation policy stated at Note 1. In 2005–06, an independent valuer, Spackman Valuers, conducted the revaluations as at 30 June 2006.

Note 7C: Analysis of Property, Plant and Equipment

Item	Land $	Buildings $	Office Equipment $	Computer Equipment $	Fixtures & Fittings $	Total $
As at 1 July 2005						
Gross book value	**100,000**	**250,000**	**48,476**	**30,725**	**32,720**	**461,921**
Accumulated depreciation	–	–	–	–	–	–
Opening Net Book Value	**100,000**	**250,000**	**48,476**	**30,725**	**32,720**	**461,921**
Additions by purchase	–	7,172	–	–	14,987	22,159
Net revaluation increment/ (decrement)	30,000	74,219	(4,088)	(4,493)	(4,966)	90,672
Depreciation	–	(6,391)	(4,848)	(10,242)	(3,891)	(25,372)
Recoverable Amount write–downs	–	–	–	–	(500)	(500)
Disposals	–	–	–	–	–	–
As at 30 June 2006						
Gross book value	**130,000**	**325,000**	**39,540**	**15,990**	**38,350**	**548,880**
Accumulated depreciation	–	–	–	–	–	–
Closing Net book value	**130,000**	**325,000**	**39,540**	**15,990**	**38,350**	**548,880**

	2006 $	2005 $
Note 7D: Intangibles		
Computer software: Valuation (2006 fair value)	**44,000**	–
Total intangibles (non–current)	**44,000**	–
Table A – reconciliation of opening and closing balances of intangibles		
As at 1 July 2005		
Opening Net book value	–	–
Additions	**46,735**	–
Depreciation/amortisation	**(1,613)**	–
Net revaluation decrement	**(1,122)**	–
As at 30 June 2006		
Total Intangibles	**44,000**	–
Note 7E: Other Financial Assets		
Prepayments	**29,930**	–
Total Other Financial Assets	**29,930**	–
All other non–financial assets are non–current assets		

Note 8: Payables

Note 8A: Suppliers		
Trade Creditors	**58,313**	79,283
Total Supplier payables	**58,313**	79,283
All supplier payables are current with settlement usually made net 30 days		
Note 8B Grants Payable		
Commonwealth organisations	**506,485**	374,615
State departments	**113,084**	779,066
Universities and colleges	**52,191**	96,463
Other research organisations	**1,881,805**	8,000
Total Research Payable	**2,553,565**	1,258,144

All grant payables are current. This liability is recognised because grant recipients have not completed the conditions of the grants and are yet to be paid.

Note 8C Other Payables		
GST payable to ATO	–	5,181
Other tax payable	**30,994**	39,711
Total Other Payables	**30,994**	44,892
All other payables are current.		

Note 9: Employee Provisions

Salaries and wages	3,589	15,959
Leave	147,832	143,907
Superannuation	460	1,346
Total employee provisions	**151,881**	161,212
Current	115,830	128,939
Non–current	36,051	32,273
Total employee provisions	**151,881**	161,212

Note 10: Cash Flow Reconciliation

Reconciliation of cash per Income Statement to Statement of Cash Flows		
Cash at year end per Statement of Cash Flows	**15,750,353**	11,418,677
Balance Sheet items comprising above cash: Financial Assets – Cash and Investments	**15,750,353**	11,418,677
Reconciliation of operating result to net cash from operating activities		
Operating result	**2,823,170**	(670,031)
Depreciation/amortisation	**26,985**	33,157
Net write down of non–financial assets	**15,169**	17,710
Gain on disposal of assets		4,490
Annual Leave		(25,558)
Long Service Leave		5,106
(Increase) / decrease in receivables	**313,953**	(326,558)
(Increase) / decrease in prepayments	**(29,930)**	–
Increase / (decrease) in employee provisions	**(9,331)**	4,735
Increase / (decrease) in supplier payables	**(20,970)**	13,103
Increase / (decrease) in grants payables	**1,295,423**	1,198,354
Increase / (decrease) in other payables	**(13,898)**	253,667
Net cash from / (used by) operating activities	**4,400,571**	508,175

Note 11: Contingent Liabilities and Assets

Remote Receivable

The Cotton Research and Development Corporation was established under the *Primary Industries and Energy 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 2005–06 Commonwealth contributions were capped to the GVP of $4,907,880, leaving a remote contingent receivable of $3,704,991. The probability of receiving this receivable is remote whilst cotton production and prices continue to remain low.

Note 12: Director Remuneration

The number of directors of the Corporation included in these figures are shown below in the relevant remuneration bands

	2006	2005
$Nil – $14,999	**8**	3
$15,000 – $29,999	**1**	5
$30,000 – $44,999	**1**	1
$105,000 – $119,999	**–**	1
$150,000 – $164,999	**–**	1
$180,000 – $194,999	**1**	–
Total number of Directors of the Corporation	**11**	11
Total remuneration received or due and received by Directors of the Corporation	**$325,883**	$391,655

Note 13: Related Party Disclosures

Other Transactions with Directors or Director related entities

Grants were made to CSIRO, a director-related entity. They were approved under the normal terms and conditions of the Corporation. Following full disclosure of their relevant interests, the relevant Directors take part in any discussion but abstain from decisions of the Board.

Grants to director related entities	**2006 $**	2005 $
CSIRO (Entomology, Plant Industry, Land & Water, Textile and Fibre Technology)	**3,513,725**	4,803,838
Australian Centre for Intellectual Property in Agriculture	**17,600**	$10,077

Note 14: Executive Remuneration

The number of senior executives who received or were due to receive total remuneration of $100,000 or more:		
$100,000 – $114,999	**1**	2
$115,000 – $129,999	**1**	
$130,000 – $144,999	**–**	
$150,000 – $164,999	**1**	1
Total	**3**	3
The aggregate amount of total remuneration of executives shown above	**$390,360**	$366,295
The aggregate amount of separation and redundancy/termination payments during the year to officers shown above	**Nil**	Nil

The Executive remuneration includes all senior executives concerned with or taking part in the management of the Corporation during 2005–06 excluding the Executive Director. Details in relation to the Executive Director have been incorporated into Note 12 Director Remuneration.

Note 15: Remuneration of Auditors

	2006	2005
The costs of financial statement audit services provided to the Corporation were:	**$9,350**	$9,350

No other services were provided by the Auditor-General.

Note 16: Average Staffing Levels

The average staffing levels for the Corporation during the year were:	**11**	11

Note 17: Financial Instruments

Note 17A: Interest Rate Risk

Financial Instrument	Notes	Floating Interest Rate		Fixed Interest Rate Maturing In				Non-Interest Bearing		Total		Weighted Average Effective Interest Rate	
				1 Year or Less		1 to 2 Years							
		2006 $	2005 $	**2006 $**	2005 $	**2006 $**	2005 $	**2006 $**	2005 $	**2006 $**	2005 $	**2006 $**	2005 $
Financial Asset													
Cash at bank	**6A**	**4,499,853**	3,668,109							**4,499,853**	3,668,109	5.4	5.2
Cash on Hand	**6A**							**500**	500	**500**	500		
Deposits at Call	**6A**			**11,250,000**	5,750,068		2,000000			**11,250,000**	7,750,068	5.7	5.6
Receivables	**6B**							**2,104,552**	2,570,922	**2,104,552**	2,570,922		
Total		**4,499,853**	3,668,109	**11,250,000**	5,750,068		2,000,000	**2,105,052**	2,571,422	**17,854,905**	13,989,599		
Total Assets										**18,630,131**	14,451,520		
Financial Liabilities													
Trade creditors	**8A**							**58,313**	79,283	**58,313**	79,283	**n/a**	**n/a**
Grants payable	**8B**							**2,553,565**	1,258,144	**2,553,565**	1,258,144	**n/a**	**n/a**
Total								**2,611,878**	1,337,427	**2,611,878**	1,337,427		
Total Liabilities										**2,794,753**	1,543,531		

Note 17B: Fair Values of Financial Assets and Liabilities

	Notes	2006 Total Carrying Amount $	2006 Aggregate Net Fair Value $	2005 Total Carrying Amount $	2005 Aggregate Net Fair Value $
Financial Assets					
Cash at bank	6A	4,499,853	4,499,853	3,668,109	3,668,109
Cash on Hand	6A	500	500	500	500
Deposits at Call	6A	11,250,000	11,250,000	7,750,068	7,750,068
Receivables	6B	2,104,552	2,104,522	2,570,922	2,570,922
Total Financial Assets		17,854,905	17,854,905	13,989,599	13,989,599
Financial Liabilities (recognised)					
Trade creditors	8A	58,313	58,313	79,283	79,283
Grants payable	8B	2,553,565	2,553,565	1,258,144	1,258,144
Total Financial Liabilities		2,611,878	2,611,878	1,337,427	1,337,427

Note 18: Reporting of Outcomes

Note 18A: Outcomes of the Corporation

The Corporation is structured to meet one outcome:

"A more sustainable, profitable and competitive cotton industry providing increased environmental, economic and social benefits to regional communities and the nation."

Output 1: Economic – Profitability and International Competitiveness

Output 2: Environmental – Ecologically Sustainable Development

Output 3: Social – People and Communities

Note 18B: Net Cost of Outcome Delivery

	2006 $	2005 $
Total Expenses	12,786,617	12,615,893
Funded by external revenues:		
Industry contributions	6,714,797	4,575,830
Sale of goods and services		–
Interest	888,998	702,904
Other	3,098,112	2,348,779
Total other external revenues	10,701,907	7,627,513
Net cost/(contribution) of outcome	2,084,710	4,988,380

The net costs shown above include intra-government costs that would be eliminated in calculating the actual Budget outcome.

Note 18C: Corporation Revenues and Expenses by Output

	Output 1 Economic		Output 2 Environmental		Output 3 Social	
	2006 $	2005 $	**2006** $	2005 $	**2006** $	2005 $
Total Operating expenses	**5,753,978**	5,361,755	**4,219,584**	4,554,337	**2,813,055**	2,699,801
Funded by:						
Total Operating revenues	**7,024,404**	5,076,991	**5,151,230**	4,312,456	**3,434,153**	2,556,415

The Corporation's outcome and outputs are described at Note 18A.

Each research project and its corresponding funding contribute to one or more of the three outputs. Total research expenditure for each output is then calculated with the remaining expenditure being prorated accordingly.

APPENDICES AND INDEX

APPENDIX ONE

COTTON RESEARCH AND DEVELOPMENT CORPORATION SELECTION COMMITTEE

Jenny Varcoe-Cocks
Presiding Member
CRDC Selection Committee
Canberra ACT 2600

1 July 2006

Hon Sussan Ley MP
Parliamentary Secretary to
the Minister for Agriculture, Fisheries and Forestry
Parliament House
Canberra ACT 2600

Dear Ms Ley

I am pleased to submit to you this report summarising the activities of the CRDC Selection Committee, as required under Section 141 of the Primary Industries and Energy Research and Development (PIERD) Act 1989.

Background

In your letter to me dated 27th June, 2005 you requested me to continue the selection process which had commenced under the previous Presiding Member, Margaret Thomson.

For your reference the Selection Committee that you had previously appointed comprised the following:

- Mr Hamish Millar: Chair, Australian Cotton Growers Research Association
- Mr Harley Bligh: member, Australian Cotton Growers Research Association
- Mr Ben Stephens: executive, Auscott Ltd
- Mr Bob Granger: Chair, Sugar Research and Development Corporation

After consultation, the fields of search were particularly focused around international marketing, biotechnology, and superior financial and business management capability. Existing Board members were also invited to reapply. Some 37 applications were received, seven of them from women. The Committee interviewed thirteen candidates, including searched applicants, five of whom were women.

The following nominations were proposed to your predecessor, Senator the Hon. Richard Colbeck, in my letter of 26th August, 2005 and subsequently appointed by him for three year terms, commencing 1 October 2005.

Reappointed Directors:

- Mr Richard Browne: experienced in the cotton industry and natural resource management
- Dr TJ Higgins: Deputy Chief, CSIRO Plant Industry

New Directors:

- Ms Lisa Wilson: Senior Manager, Marketing and Compliance, AWB
- Ms Leith Boully: cotton grower and Director of water and conservation entities
- Mr David Connors: formerly Managing Director of The Woolmark Company
- Mr Glen Fresser: cotton grower and former Chair of the Australian Cotton Growers Research Association

Upon Senator Colbeck's request, and pursuant to Section 129 of the PIERD Act, I subsequently dissolved the Selection Committee.

Expenses incurred were as follows:

Advertising	$3,467.00
Presiding Member's Fees	$6,136.00
Secretarial and Administration	$2,805.00
Travel & Accommodation	$18,025.00
Total	**$30,433.00**

Yours sincerely

Jenny Varcoe-Cocks

APPENDIX TWO

RESEARCH AND DEVELOPMENT PORTFOLIO

Research Providers

AAW	A&A Williams Pty Ltd
AKC	AKC Consulting Pty Ltd
ANU	Australian National University
AWA	Agriculture Western Australia
CLW	CSIRO Land and Water
COT	CSIRO Plant Industries & CSD (for the CottTech Unincorporated Joint Venture)
CRC	Australian Cotton Cooperative Research Centre (pre July 2005)
CRC	Cotton Catchment Communities Cooperative Research Centre (post July 2005)
CRDC	Cotton Research and Development Corporation
CSE	CSIRO Entomology
CSP	CSIRO Plant Industry
CTFT	CSIRO Textile and Fibre Technology
DAN	New South Wales Department of Primary Industries (formerly New South Wales Agriculture)
DAQ	Department of Primary Industries, Queensland
DNR	Department of Natural Resources and Mines, Queensland
DPIF	Department of Primary Industries and Fisheries, Northern Territory
FCRC	Cooperative Research Centre for Freshwater Ecology
GCRC	Cooperative Research Centre for Greenhouse Accounting
HEX	Hexima Ltd
MU	Melbourne University
NEC	National Centre for Engineering in Agriculture, University of Southern Queensland
RIR	Rural Industries Research and Development Corporation
UA	University of Adelaide
ULA	La Trobe University
UNE	University of New England
UniSA	University of South Australia
UQ	University of Queensland
UTS	University of Technology, Sydney
US	University of Sydney
VDP	Department of Primary Industries, Victoria

R&D Program 2005–06

CRDC No.	Project Title	Researcher	Start Date	Cease Date
Program 1 – People & Knowledge				
AAW5	Travel: Allan Williams – ICAC meeting in Liverpool	Allan Williams	1–9–05	4–10–05
CRC22C	National Cotton Extension Coordinator – Additional expenses	Ingrid Christiansen	1–7–00	30–6–06
CRC63	CSP164 – Delivering science to agribusiness: Smart approaches to cotton irrigation management	Dirk Richards	1–7–04	30–6–07
CRC64	Cotton Industry Development Extension Officer – Central Queensland	Doug Sands	1–7–05	30–6–08
CRC65	Cotton Industry Development Extension Officer – Border Rivers	Rebecca Smith	1–7–05	30–6–08
CRC66	Cotton Industry Development Officer – Gwydir	Julie O'Halloran	1–7–05	30–6–08
CRC67	"Water Wise" Exhibition	Sandy Young	1–7–05	30–6–06
CRC68	Cotton Training Coordinator	Mark Hickman	1–7–05	30–6–08
CRC70T	Travel: Susan Lutton – Environmental Research Event, Hobart	Susan Lutton	27–11–05	2–12–05
CRC92	Cotton IDO – Griffith (Part-time) (Commissioned)	Scott Vaessen	1–7–05	30–6–06
CRC93	Delivering Science to Agribusiness – Cotton Management Support Systems (Commissioned)	Michael Bange	1–7–05	30–6–07
CRC97	Publication of Irrigation Storage Design Guidelines (Commissioned)	Nick Reid	1–7–05	30–6–06
CRC98	Cotton Extension Support for Lower Namoi (Commissioned)	Tracey Farrell	1–1–06	30–6–06
CRC102	Cotton IDO – St George & Dirranbandi (2005–06) (Commissioned)	TBA	1–11–05	30–5–06
CRC103	Water-use Efficiency of Siphon-less Irrigation Systems (Commissioned Extension)	Des McGarry–Sarah Hood	2–11–05	30–6–06
CRC104	Effectiveness of Foliar Nutrition Trial (Commissioned Extension)	Lindsay Campbell	1–1–06	31–12–06
CRC107	Australian Cotton Comparative Analysis 2005 – Boyce Chartered Accountants (Commissioned)	David Newnham	1–1–06	30–6–06
CRC108	Spray Application Training – Darling Downs, Queensland & Rowena (Commissioned)	Bill Gordon	1–1–06	30–6–06
CRC114	Triple Bottom Line Reports from Cotton Consultants Australia (Commissioned)	Jon-Maree Baker	1–7–05	30–6–06

CRDC No.	Project Title	Researcher	Start Date	Cease Date
CRC117	Vocational skills & needs audit (Commissioned)	Peter Gregg	1–7–06	30–6–06
CRC118	Travel: Scientific Exchange Derek Collinge – 7th International Workshop on Molecular Biology & Genetics, Crete (Contingency)	Derek Collinge	18–8–06	28–8–06
CRC119	Travel: Scientific Exchange Oliver Knox – 6th Pacific Rim Conference, Canada (Contingency)	Oliver Knox	28–10–05	5–11–05
CRC120	Travel: Scientific Exchange Michael Bange – 2006 Cotton Beltwide Conference, San Antonio (Contingency)	Mike Bange	1–1–06	31–1–06
CRC121	Travel: Scientific Exchange Stella Loke – 5th International Conference on Mycorrhizas, Spain in July 2006 (Contingency)	Stella Loke	1–6–06	8–8–06
CRC122	CCA 2006 Survey Program – Reporting on the 2005–06 Cotton Season (Contingency)	Jon-Maree Baker	1–6–06	30–9–06
CRDC190C	Farm Health & Safety R&D Program (joint venture with RIRDC) (Commissioned)	Bruce Pyke	1–7–02	30–6–07
CRDC246	Wincott Inc – Women's Industry Network Cotton	Helen Dugdale	1–9–04	30–8–06
CRDC258	Australian Cotton Comparative Analysis 2004 – Boyce Chartered Accountants (Additional funds for 05–06 – Contingency)	David Newnham	1–7–04	7–11–05
CRDC268	Analysis of Benefits–Costs to Cotton Industry of Change in Classification of Cotton Gin Trash (Contingency)	Ingrid Christiansen	20–6–05	8–7–05
CRDC273	Sustainable Farm Families Project (joint venture with RIRDC – Contingency)	Bruce Pyke	1–7–05	30–6–07
CRDC275	Cooperative Venture for Capacity Building (RIRDC – Contingency)	Bruce Pyke	1–7–05	30–6–07
CRDC277	DAFF – Industry Partnerships Corporate Governance for Rural Women Course 2006 (Contingency)	David Burg	1–1–06	30–6–06
CRDC279	Australian Rural Leadership Program (ARLP) Publication "Decade of Visions" (Contingency)	Peter Horvat	1–1–06	30–6–06
CRDC281	2006 DAFF Science & Innovation Awards for Young People in Agriculture, Fisheries & Forestry (Contingency)	Kylie Paulsen	1–3–06	30–11–06

CRDC No.	Project Title	Researcher	Start Date	Cease Date
CRDC282	Travel: Ralph Schulze – 28th International Cotton Conference, Bremen (Contingency)	Ralph Schulze	17–3–06	25–3–06
CRDC284	Envirodirectory 2006 (Contingency)	Bruce Pyke	1–1–06	30–6–06
CRDC285	ACGRA Workshop to Prioritise R&D, June 2006 (Commissioned)	Greg Kauter	1–6–06	30–6–06
CRDC286	Spray Drift Workshop, Brigalow-Jimbour Floodplains (Contingency)	Nevin Olm	3–5–06	30–6–06
CRDC287	ACGRA 13th Australian Cotton Conference (Contingency)	Greg Kauter	1–6–06	31–8–06
CRDC288	Sponsorship of Postgrads to attend 13th Australian Cotton Conference, August 2006 (Contingency)	Bruce Pyke	1–6–06	30–8–08
CRDC289	Support for Workshop to develop Water Use Forecasting Tool Prototype (Contingency)	Helen Fairweather	1–6–06	30–6–06
CRDC290	Support for BMP Review Meeting, 12-13 June 2006 (EMS Pathways funding)	Chaseley Ross	1–6–06	30–6–06
CSE111	Travel: Ray Akhurst – 5th Pacific Rim Conf on Biotech, Canada	Ray Akhurst	26–10–05	14–11–05
CSE114	Travel: Sharon Downes – "Monitoring and Managing Bt-resistance: The challenges for the next decade" Forum, China in August 2006 (Contingency)	Sharon Downes	1–6–06	8–9–06
CSP173	ACRI Network & Computing Support	Tony Pfeiffer	1–7–05	30–6–06
CSP174	Travel: Brian Duggan – Weslaco and Beaumont Texas, USA	Brian Duggan	10–7–05	16–7–05
CSP178	Travel: Warwick Stiller – 13th Australasian Plant Breeding Conference, NZ	Warwick Stiller	17–4–06	25–4–06
DAN183	Travel: Julie O'Halloran – 2006 Cotton Beltwide Conference, USA	Julie O'Halloran	1–1–06	16–1–06
DAQ136	Travel: David Hamilton – 2006 Cotton Beltwide Conference, San Antonio	David Hamilton	1–1–06	31–1–06
NEC12	Travel: David Wigginton – Irrigation International Conference, USA (Contingency)	David Wigginton	2–11–05	16–11–05
RIR9	Australian Rural Leadership Program – Course 12	Steve Clark	1–7–04	30–11–06
RIR10	Australian Rural Leadership Program – Course 13	Steve Clark	1–7–05	30–11–07

CRDC No.	Project Title	Researcher	Start Date	Cease Date
UniSA01	Travel: Geoff Kuehne – Three Conferences inc. 3rd Int. Symposium on Integrated Water Resources Mgt, Germany in October 2006 (Contingency)	Geoff Kuehne	1–6–06	21–10–06
UQ38	Travel: Joy Conroy – Australasian Soilborne Diseases Symposium, Queenstown in September 2006 (Contingency)	Joy Conroy	1–6–06	7–9–06
UQ39	Travel: Jennifer Whan – Australasian Soilborne Diseases Symposium, Queenstown in September 2006 (Contingency)	Jennifer Whan	1–6–06	13–9–06
UQ40	Travel: Andrew Hewitt – Field Study with USDA on Spray Penetration & Deposition in Cotton Canopies, Texas in August 2006 (Contingency)	Andrew Hewitt	1–6–06	12–8–06
US75	Travel: Ivan Kennedy – Pacifichem 2005 Symposium, Honolulu	Ivan Kennedy	15–12–05	20–12–05
VDPI001	Support for the Australian Agricultural & Natural Resources Online (Contingency)	Philip Jones	1–7–05	30–6–06
Program 1 Total Cost				**$1,478,697**

Program 2 – Integrated NRM				
AAW6	BMP Manual Enhancement (Commissioned)	Allan Williams	17–1–06	30–6–06
ANU7C	Development of a decision support system for water allocation in the Gwydir and Namoi valleys	Rebecca Letcher	1–9–02	31–8–05
ANU8C	Postgraduate: Karen Ivkovic – Development of a decision support system for water allocation in the Gwydir and Namoi Valleys (in conjunction with ANU7C)	Karen Ivkovic	1–9–02	30–9–06
CRC47C	Quantifying deep drainage using lysimetry	Anthony Ringrose-Voase	1–1–03	30–6–06
CRC57C	Postgraduate: Leah MacKinnon – Insectivorous bats, irrigated cotton, indigenous vegetation remnants and intensive production landscapes (continues from US66C)	Leah MacKinnon	1–1–04	30–6–06
CRC61	Development of a field method for measuring deep drainage potential	Alex McBratney	1–7–04	30–6–06
CRC69	Rhizosphere biological functions as influenced by GM cotton (was CLW3C)	Oliver Knox	1–7–02	30–6–06

CRDC No.	Project Title	Researcher	Start Date	Cease Date
CRC70	Postgraduate: Susan Lutton – Aquatic biodiversity and the ecological value of ring-tank water storages on cotton farms (was FCRC1C)	Susan Lutton	11–10–04	11–3–08
CRC95	Soil R&D Review & Workshop (Commissioned)	Helen Dugdale	1–7–05	30–6–06
CRC96	Deep Drainage under Irrigated Cotton – Surface and Groundwater Implications (Commissioned)	Des McGarry	1–7–05	30–6–08
CRC99	Surface water groundwater interconnectivity investigation – Upper Namoi, NSW (Commissioned)	Ian Acworth	1–7–05	30–6–08
CRC100	Groundwater modelling projects – scoping studies NSW (Commissioned)	Noel Merrick	1–11–05	30–6–06
CRC105	Pesticide Remediation: Assessing application and integration with on-farm storage systems (Commissioned)	Angus Crossan	1–7–05	30–6–09
CRC106	Advancing environmental values in cotton catchments using risk assessment (Commissioned)	Angus Crossan	1–7–05	30–6–08
CRC110	Postgraduate: Rhiannon Smith – Benefits of establishing and managing native vegetation on cotton farms in the Namoi Catchment (Contingency)	Rhiannon Smith	1–4–06	31–3–09
CRC116	Groundwater modelling projects – scoping studies QLD (Commissioned)	Noel Merrick	1–11–05	30–6–06
CRDC267	Soil Health Issues Survey, June-August 2005 (Contingency)	Gus Shaw	1–6–05	31–7–05
CRDC276	Review of Australian Cotton Industry BMP Audit Program (EMS Pathways funding)	Lana Shoesmith	12–12–05	28–2–06
CRDC280	Evaluation of the Australian Cotton Industry EMS National Pilot Project (Heritage Trust Grant with CA)	Ingrid Christiansen	19–1–06	28–2–06
GCRC4C	Reducing losses of nitrogen from cotton rotation systems	Peter Grace	1–7–03	30–6–06
NEC10	Precision placement of irrigation water with LEPA for Centre Pivots and Lateral Moves	Joseph Foley	1–7–04	30–6–06
US62C	Postgraduate: Sam Buchanan – Hydrological impacts of irrigation in the Bourke district	Sam Buchanan	1–1–02	31–7–05
Program 2 Total Cost				**$791,757**

CRDC No.	Project Title	Researcher	Start Date	Cease Date
Program 3 – Crop Protection				
CRC30C	Postgraduate: Ingrid Rencken – Role of native vegetation in harboring beneficial insects and reducing insect pest damage in cotton	Ingrid Rencken	1–1–02	31–7–06
CRC72	Ecology of Helicoverpa in relation to transgenic cotton and the efficiency of refuge crops	Geoffrey Baker	1–7–03	30–6–06
CRC73	UNE37 – Molecular factors determining Thielaviopsis basicola-cotton interactions leading to Black Root Rot disease	Lily Pereg-Gerk	1–7–04	30–6–07
CRC74	Mirid Predation	Mary Whitehouse	1–7–05	30–6–07
CRC75	Trichogramma incidence in cotton & grains growing regions of Australia – Consequences for Helicoverpa mgt	Kirsten Scott	1–7–05	30–6–06
CRC76	Tracking *H.armigera* migration, and the accumulation of insecticide resistance	Kirsten Scott	1–7–05	30–6–06
CRC77	Improving management of summer weeds in dryland cropping systems with cotton	Hanwen Wu	1–7–05	30–6–08
CRC78	Postgraduate: Jason Moulynox – Survival of the soil-borne fungal pathogen *Thielaviopsis basicola* in association with cotton and other plants	Jason Moulynox	1–8–05	1–8–08
CRC94	Mortality of *Helicoverpa* in Bollgard II cotton fields and implications for Bt resistance management (Commissioned)	Sharon Downes	1–7–05	30–6–08
CRC111	Postgraduate: James Hereward – Is the source of mirids in cotton derived from local dispersal or long distance migration?	James Hereward	1–3–06	28–2–09
CSE108C	Genetics of Bt resistance in H. armigera: Resistance to Cry2Ab	Rod Mahon	1–7–03	30–6–06
CSE109	Fitness and mechanism of resistance to Cry2Ab in Helicoverpa armigera	Rod Mahon	1–7–04	30–6–07
CSE112	Monitoring for resistance to transgenic cotton	Sharon Downes	1–7–05	30–6–08
CSE113	Release and post-release monitoring and follow up release of *Erectmocerus hayati* in cotton production areas	Paul de Barro	1–7–05	30–6–07
CSP156C	The potential for native Fusarium to give rise to new cotton field pathogens	Bo Wang	1–1–04	31–12–06

CRDC No.	Project Title	Researcher	Start Date	Cease Date
CSP162C	Damage syndromes, economic thresholds & tolerance of cotton green mirids	Brian Duggan	1–7–03	30–6–06
CSP165	Aphids – control, ecology and CBT resistance	Lewis Wilson	1–7–04	30–6–07
DAN160	Impact and Role of Novel insecticides in Integrated Pest Management	Viliami Heimoana	1–7–02	30–9–06
DAN174C	Expanding WEEDpak: developing integrated weed management packages for the cotton farming systems	Graham Charles	1–7–03	30–6–06
DAN176C	Severity factors in Fusarium wilt of cotton	Chris Anderson	1–7–03	30–6–06
DAN177	Diseases of Cotton VIII	David Nehl	1–7–04	30–6–07
DAN184	Resistance management of aphids and mites in cotton	Grant Herron	1–7–05	30–6–08
DAN185	*Helicoverpa* spp. Insecticide Resistance: Monitoring, Mechanisms and Management	Louise Rossiter	1–7–05	30–6–08
DAN186	Insecticide resistance management in B-biotype Bemisia tabaci II	Robin Gunning	1–7–05	30–6–08
DAN187	Biochemical Resistance Mechanisms in *Helicoverpa* to *Bacillus thuringiensis* delta endotoxins II	Robin Gunning	1–7–05	30–6–08
DAN188	Severity factors in black root rot of cotton and new control measures	Susanne Driessen	1–7–05	30–6–08
DAQ130	Management of Fusarium wilt of cotton	Joe Kochman	1–7–04	30–6–07
DAQ131	Improved understanding of the damage, ecology and management of mirids and stinkbugs in Bollgard II	Moazzem Khan	1–7–04	30–6–07
DAQ133	Calibration and application of pupae detection dog	Greg Horrocks	1–11–04	30–6–07
DAQ134	Postgraduate: Jamie Hopkinson – Managing cotton aphids with parasitoids	Jamie Hopkinson	1–7–05	30–6–08
UQ36	Postgraduate: Joy Conroy – Investigating the roles of toxins and pathogenicity factors of Fusarium oxysporum f.sp. vasinfectum	Joy Conroy	14–2–05	13–2–08
UQ37	Postgraduate: Jennifer Whan – Investigation of the effects of Silicon application on the resistance of cotton to Fusarium oxysporum f.sp. Vasinfectum	Jennifer Whan	1–7–05	30–6–08
Program 3 Total Cost				$3,316,613

CRDC No.	Project Title	Researcher	Start Date	Cease Date
Program 4 – Farming Systems				
CRC52C	Nutritional constraints to efficient cotton production	Ian Rochester	1–7–03	30–6–06
CRC56C	Postgraduate: Kylie Dodd – The Impact of Sodicity on Cotton Cropping Systems	Kylie Dodd	15–9–03	15–9–06
CRC71	Microbial Biodiversity for Soil Health	David Midgley	1–1–06	30–6–08
CRC79	Water relations of the cotton plant (CSP – was CRDC158C)	James Neilsen	1–1–02	30–6–06
CRC80	Cotton crop management for improved fibre quality (was CSP166)	Michael Bange	1–7–04	30–6–07
CRC81	Facilitating adoption of IPM in northern region broadacre farming systems (was DAQ132)	Melina Miles	1–7–04	30–6–07
CRC82	Development of measures of soil health (was US64C)	Peter McGee	1–1–03	31–12–05
CRC83	Postgraduate: Stella Loke – Diversity of VAM fungi in soil health (was US65C)	Stella Loke	1–1–03	31–12–06
CRC84	Postgraduate: Lisa Lee – Environmental and Economic Impact of Water Scarcity and Market Reform on the Mooki Basin (was US72)	Lisa Lee	1–1–05	31–12–07
CRC85	Postgraduate: Nicola Cottee – Development of a method to determine thermotolerance in cotton cultivars (was US73)	Nicola Cottee	14–3–05	14–3–08
CRC86	Maintaining profitability and soil quality in cotton farming systems II	Nilantha Hulugalle	1–7–05	30–6–08
CRC87	Advancing water management in the Cotton Industry	Various Researchers	1–5–06	30–6–08
CRC88	Integrated Cotton Farming Systems for CQ	Richard Sequeira–Paul Grundy	1–7–05	30–6–08
CRC89	Supporting IPM for Future Cotton Systems	Lewis Wilson	1–7–05	30–6–08
CRC90	Postdoc: Rose Roche – Physiological Basis for Cotton Yields – Plant Configuration	Rose Roche	1–9–05	30–6–08
CRC113	Postgraduate: Juan Wang – Subsoil nutrient management and stratification in cotton–grain rotations	Juan Wang	1–1–06	31–12–08
CRDC272	Farming Systems Update Meeting Series (Commissioned)	Helen Dugdale	1–7–05	30–6–06
CSP161C	Physiology of high retention cotton crops	Steve Yeates	1–7–03	30–6–06

CRDC No.	Project Title	Researcher	Start Date	Cease Date
CSP175	CSIRO Field Experiments at ACRI	Greg Constable	1–7–05	30–6–06
DAN179	IPM in Bollgard cotton – New tools and strategies: A farming systems approach	Robert Mensah	1–7–04	30–6–07
DAN189	Operational Costs for Cotton Experiments	Tony Meppem	1–7–05	30–6–06
DAQ113C	Postgraduate – Amanda Cleary: The effect of cereal stubble on Helicoverpa activity in early season cotton (Contingency – Additional funds in 05–06)	Amanda Cleary	1–8–01	30–6–06
DAQ127C	Managing Bollgard II cotton farming systems in southern Queensland	Brad Scholz	1–7–03	30–6–06
LWA2C	National Program for Sustainable Irrigation (NPSI) project (Contingency)	Murray Chapman	1–7–03	30–6–06
NEC8C	Postgraduate: Simon White – Partial root zone drying and regulated deficit irrigation for cotton using large mobile irrigation schemes	Simon White	1–9–02	31–8–05
NEC11	Postdoc: Simon White – Optimised irrigation scheduling with the use of continuous 'real time' plant monitoring sensors (PMS)	Simon White	1–9–05	30–8–08
UNE39	Postgraduate: Subhadip Ghosh – Effect of organic amendments on soil quality and profitability in cotton farming systems (Operating funds)	Subhadip Ghosh	1–8–04	30–6–07
Program 4 Total Cost				**$2,357,679**

Program 5 – Breeding & Biotechnology				
CottTech	CottTech Unincorporated Joint Venture	Lionel Henderson	1–9–05	31–8–08
CRC43C	Postgraduate: Derek Collinge – Gene silencing technologies to control Helicoverpa armigera.	Derek Collinge	1–7–03	30–6–06
CRDC278	Review of Cotton Plant Fibre Projects (Workshops budget)	David Stalker	28–12–05	10–3–06
CRDC283	2006 Plant Variety Trials (Contractors budget)	Jodi McLean	1–2–06	31–7–06
CSP146C	Postgraduate: Adriane Machado – Gene discovery in cotton fibre initiation and development by comparing cotton lintless mutants to wild type on cotton ovule cDNA microarrays (IP)	Adriane Machado	1–7–02	7–10–05
CSP159C	Breeding improved cotton varieties	Greg Constable	1–7–03	30–6–06

CRDC No.	Project Title	Researcher	Start Date	Cease Date
CSP167	Cotton Biotechnology: Core Project	Danny Llewellyn	1–7–04	30–6–07
CSP168	Unravelling the molecular basis for cotton fibre quality	Todd Collins	1–7–04	30–6–07
CSP169	Development of cottonseed oils with improved nutritional and functional properties	Qing Liu	1–7–04	31–12–06
CSP170	Capital Item: Uster HVI	Greg Constable	1–7–04	30–6–07
CSP176	CSIRO Plant Breeding Fibre Quality Laboratory	Greg Constable	1–7–05	30–6–06
CSP177	Postdoc: Cotton Fibre Improvement by Silencing Fuzz Fibre Development	Adriane Machado	1–10–05	30–9–08
UA8CA	Postgraduate: Sven Delaney – Development of gene promoters for cotton fibre development (Contingency – Additional stipend)	Sven Delaney	12–2–01	26–9–04
UA11C	Postgraduate: Damien Lightfoot – Fibre improvement through modulation of transitions in cotton development	Damien Lightfoot	18–3–02	31–3–06
UA12C	Postgraduate: John Humphries – Analysis of TTG1 homologues in cotton for roles in fibre initiation	John Humphries	18–3–02	31–3–06
UA13	Evaluation of transgenic cotton with altered fibre traits	Sharon Orford	1–7–04	30–6–06
UA16	Honours: Functional Analysis of Cotton Transcription Factors	Joanna Sundstrom	6–2–05	30–11–05
Program 5 Total Cost				**$1,945,199**

Program 6 – Value Chain				
CRC109	Scoping Study – New ginning technology	Stuart Gordon	1–1–06	30–6–06
CRDC251	EMS Pathways Project	Allan Williams	1–6–04	30–9–07
CRDC274	Business Case – Modified Cotton Oil Characteristics (Commissioned)	Qing Liu	1–7–05	30–6–07
CTFT7C	Interlaboratory trials for fibre maturity reference samples	Geoffrey Naylor	1–7–03	30–6–06
CTFT9	Improved quality of ginned Australian cotton: Development of new gin machinery	Stuart Gordon	1–7–04	30–6–06
CRC91	Commercial Preparation of SiroMat	Stuart Gordon	1–7–05	30–6–07
CTFT14	Cottonscan for Rapid Measurement of Fibre Maturity and Fineness	Geoff Naylor	1–7–05	30–6–07
Program 6 Total Cost				**$698,123**
TOTAL PROJECT FUNDING for 2005–06				**$10,634,924**

APPENDIX THREE

CRDC PUBLICATIONS AND ACTIVITIES

Corporate publications

Annual Report 2004–2005

Annual Operating Plan 2006–2007

(both published on crdc.com.au)

Magazines

Four editions of CRDC *SPOTLIGHT* magazine

Bi-monthly Research Review in *The Australian Cottongrower*

CRDC section in *The Cotton Yearbook*

Publications funded or contributed to by CRDC

Australian Cotton Comparative Analysis: 2005 Crop Interim Report

Australian Cotton Comparative Analysis: 2005 Crop (full report)

Design Principles for Healthy Waterways on Cotton Farms

Roundup Ready® Report 2005

Bollgard II® Report 2005

Envirodirectory 2006

Insecticide Resistance Management Strategy Cards

Managing riparian lands in the cotton industry

Soil Biology Research Review

Soil Health Issues for Australian Cotton Production

Value of Research Investment relating to the Waste Classification of Cotton Gin Trash

Media Releases

(all published on www.crdc.com.au.)

2005

16 August	CRDC Announces $10.8 million investment in Cotton R&D
22 August	Greg Kauter Appointed as Executive Officer of ACGRA
29 August	Focus on Field to Fabric – New Cotton Industry Training Program Developed
7 September	Cotton Industry R&D Rewarded – Cotton Breeding Program Wins Prestigious Reward for Rural Innovation
16 September	CRDC Launches Cotton Life Snapshot Competition
4 October	New Directors for CRDC Board
5 October	CottTech – a new face in cotton research
7 October	CRDC Recruits new Program Manager
10 October	Cotton Comparative Analysis Published
17 October	Legumes Boost Cotton Profits
4 November	CRDC Looks Back on Successful Year for Cotton Industry
22 November	Soil Health Survey Reveals Research Priorities
29 November	Increased Operating Profit But Margins Still Tight for Cotton Farmers
1 December	Farm Family Health and Safety Workshops to take place in cotton regions
7 December	Farming Systems Forum Explores Precision Decisions in Cotton Production
9 December	R&D saves Cotton Ginners $1.2 billion

2006

18 January	Dalby Families sign up for Health and Safety Workshops
23 February	Ginning Workshop
3 March	Soil Biology Research Review
April	CRDC donates science books to local Library
April	Wee Waa hosts Wincott Information Day
5 May	CRDC Annual Report – Silver Medal
5 May	Applications Open – Australian Rural Leadership Program
29 May	Moree Trade Show
29 May	Snapshot Competition Winners Announced.

OTHER ACTIVITIES FUNDED OR CONTRIBUTED TO BY CRDC

Joint R&D Corporations Rewards from Innovation: World's Best Food and Fibre Dinner – September 2005

CRC Strategic Planning Workshop – January 2006

CRDC Strategic Review – February 2006

Postgraduate tour – April 2006

CCA Extension Priorities Workshop – May 2006

Australian Cotton Trade Show – May 2006

Cotton industry BMP Workshop – June 2006

ACGRA Water, Nutrition and Extension Workshops – June 2006

RESEARCH REVIEWS

Soil Research Review – October 2005

Fibre Quality Review – March 2006

Bt Resistance Forum – March 2006

WORKSHOPS, PRESENTATIONS, LAUNCHES AND MEETINGS

2005

Cooperative Venture for Capacity Building (CVCB) Management Committee – July, Sydney

Cotton Collective – August, Narrabri

Wincott AGM – August, Narrabri

NPSI Management Committee – August, Canberra

Soil Health meetings – September, Emerald and Theodore

Soil Research Meeting – October, Sydney

Cooperative Venture for Capacity Building (CVCB) Management Committee –October, Brisbane

Farm Health & Safety Management Committee – November, Canberra

Wincott/Bayer Information Day – November, Dalby & Brisbane

Farming Systems Forum: Precision Agriculture– November, Goondiwindi

2006

NPSI Management Committee – February, Adelaide

Strategic Planning meeting with ACGRA and Industry – February, Canberra

Sustainable Farming Families, Health Workshops – February, Wee Waa & Dalby

TIMS Committee Review – February, Narrabri

Cooperative Venture for Capacity Building (CVCB) Management Committee –February, Melbourne

Ginning Workshop with Aust Cotton Ginners Association – February, Narrabri

RDC NRM Working Group – March, Canberra

Wee Waa High School tour of ACRI careers day – March, Narrabri

Wincott Information Day – April, Wee Waa

Meeting with OGTR, APVMA & DEH – April, Canberra

Cotton Consultants Australia Executive – April, Narrabri

Hon Sussan Ley's visit – May, Narrabri

Rotary Science Challenge – June, Narrabri

Meeting with UQ Plant Pathology group – June, Brisbane

Silverleaf Whitefly Workshop – June, Toowoomba

FINAL PROJECT REPORTS RECEIVED

Project Title	Researcher
Sustainable natural resource management for the Australian Cotton Industry using the Best Management Practices Manual (CRDC Component) (was AAW1C)	Mr Alan Williams
Development of a decision support system for water allocation in the Gwydir and Namoi valleys	Dr Rebecca Letcher
IPM Training Coordinator	Mr Mark Hickman
Managing Helicoverpa spp. on cotton with semiochemicals	Dr Chris Moore & Dr Robert Mensah
Understanding salinity threat: Phase IV Interpretation/ Extension	Dr John Triantafilis
Maintaining profitability and soil quality in cotton farming systems	Nilantha Hulugalle
Optimising field and farm scale water use efficiency for cotton farming systems	Dr Phil Goyne
Cotton Industry Development Officer – Griffith	Mr Scott Vaessen
Cotton Industry Development Officer – Gwydir	Ms Julie O'Halloran
Development of measures of soil health	Dr Peter McGee & Dr David Midgley
Travel: Gary Fitt – 63rd Plenary Meeting of the International Cotton Advisory Committee (ICAC) Mumbai November 2004	Dr Gary Fitt

Project Title	Researcher
Australian Cotton Comparative Analysis 2004, Boyce Chartered Accountants	Mr David Newnham
Sponsorship of 2004-05 Summer Scholarships – M Barnett & Chris Kilby	Mr Mark Barnett & Mr Chris Kilby
Travel: David McKenzie – Field Workshop, France, late May 2005	Dr David McKenzie
CCA Qualitative Surveys including 2004–05 Bollgard & Roundup Ready Performance Surveys	Ms Jon-Maree Baker
Travel: David Nehl – Plant Pathology Research Visit to USA	Dr David Nehl
Travel: Bill Tyrwhitt – Plant Pathology Research Visit to USA	Mr Bill Tyrwhitt
Soil Health Issues Survey, June-August 2005	Mr Gus Shaw
Analysis of Benefits/Costs to Cotton Industry of Change in Classification of Cotton Gin Trash	Ms Ingrid Christiansen
Monitoring Bt resistance	Dr Sharon Downes
The impact of Area Wide Management (AWM) on beneficial Anthropod and Helicoverpa populations	Dr Martin Dillon
Determination of factors influencing sticky cotton in Emerald	Dr Paul de Barro
CSIRO Plant Breeding Fibre Quality Laboratory	Dr Greg Constable
CSIRO Field Experiments at ACRI	Dr Greg Constable
Development of a unigene set of cotton clones for general microarray analysis of gene expression in cotton plants	Dr Yingru Wu
Incorporating aphids, insecticides and early season plant compensation in Integrated Pest Management (IPM)	Dr Lewis Wilson
Isolation of Novel Cotton Promotors to drive the Robust Expression of useful Genes in Transgenic Cotton	Dr Danny Llewellyn & Dr Ranamalie Amarasinghe
Support development and independent evaluation of cotton management packages	Mr Darren Linsley
ACRI Computing Support	Mr Tony Pfeiffer
Delivering science to Agribusiness – novel decision support tools	Dr Mike Bange
Capital Item: Lummus Laboratory Gin	Dr Greg Constable
Travel: Greg Constable – ACSA meeting in Jakarta	Dr Greg Constable
Instrumentation for Cotton Fineness and Maturity measurement	Dr Geoff Naylor
Standardisation of Classing	Dr Rene van der Sluijs
Travel: Stuart Gordon – ACSA Export Market Development Tour, Indonesia	Dr Stuart Gordon
Managing Black Root Rot of Cotton	Dr Om Jhorar
Diseases of Cotton VII	Dr David Nehl
Impact and Role of Novel insecticides in Integrated Pest Management	Mr Viliami Heimoana
Insecticide resistance management in B-biotype *Bemisia tabaci*	Dr Robin Gunning
Insecticide Resistance Management in cotton aphid (*Aphis gossypii*) and cotton mite (*Tetranychus urtice*)	Dr Grant Herron

Project Title	Researcher
Operational Costs for Cotton Experiments	Mr Tony Meppem
Cotton Industry Development Officer – Lower Namoi	Mrs Annie Johnson
Biochemical mechanisms of resistance to *Bacillus thuringiensis* endotoxins in Helicoverpa armigera	Dr Robin Gunning
Insecticide resistance in Helicoverpa spp. and the role of IPM/ Area Wide Management in Resistance Management	Dr Louise Rossiter
Reducing weed control costs by better understanding the biology and ecology of problem weeds	Dr Steve Johnson
Travel: Chris Anderson – Fusarium 2005 Workshop, Kansas USA	Mr Chris Anderson
New biopesticides against emerging sucking pests	Dr Caroline Hauxwell
Cotton Industry Development Extension Officer – Border Rivers	Ms Rebecca Smith
Cotton Industry Development Extension Officer – Dirranbandi & St. George	Mr Steve Ginns
Area-wide monitoring and cultural control of key cotton pests in central Queensland	Dr Richard Sequeira
Development of novel pest management options for cotton in central Queensland	Dr Paul Grundy
Best weed management strategies for dryland cropping systems with cotton	Dr Hanwen Wu
Heliothis egg collections for resistance testing from the Darling Downs and South Burnett in southern QLD	Mr Hugh Brier
Extension agronomy for cotton production in CQ – Emerald IDO	Mr Doug Sands
Extension and Development to support the adoption of centre pivots and lateral moves in the Australian cotton Industry	Mr Joseph Foley
Australian Rural Leadership Program – Course 10 Graduate's Report	Mr James Houlahan
Travel: Damien Lightfoot – 2005 Genetics Society of Australasia Conference, New Zealand	Mr Damien Lightfoot
Travel: John Humphries – 2005 Genetics Society of Australasia Conference, New Zealand	Mr John Humphries
Post-Doc: Dr A Crossan – Management of risk for chemicals used in cotton production	Dr Angus Crossan
Electrical imaging of furrow irrigation	Dr Bryce Kelly

APPENDIX FOUR

ACRONYMS AND TERMINOLOGY

CRDC aims to minimise the use of acronyms or technical terms, or to explain their meaning in context. The following is a list of acronyms and technical terms used in the cotton industry that may appear in this publication

AAAA	Aerial Agricultural Association of Australia
ABARE	Australian Bureau of Agricultural and Resource Economics
ACC	Australian Cotton Centre
ACGRA	Australian Cotton Growers' Research Association
ACIC	Australian Cotton Industry Council
ACIPA	Australian Centre for Intellectual Property in Agriculture
ACCRC	Australian Cotton Cooperative Research Centre (also Cotton CRC)
ACRI	Australian Cotton Research Institute
ANAO	Australian National Audit Office
APVMA	Australian Pesticides and Veterinary Medicines Authority
ARLP	Australian Rural Leadership Program
ARRIP	Australian Agricultural Research in Progress database
AWAF	Department of Agriculture and Food, Western Australia
AWM	Area Wide Management
Bollgard II ®	Cotton varieties contain two genes resistant to *Helicoverpa* spp.
BMP	Best Management Practice
BRS	Bureau of Rural Sciences
Bt	*Bacillus thuringiensis* (crystal protein gene expressed in Ingard® and Bollgard II® cotton varieties)
CA	Cotton Australia
CAC Act	*Commonwealth Authorities and Companies Act 1997*
CCA	Cotton Consultants Australia Inc.

Cotton CRC	Australian Cotton Cooperative Research Centre
CCC CRC	Cotton Catchments Communities Cooperative Research Centre
CMA	Catchment Management Authority
CRC	Cooperative Research Centre
Corporation, the	Cotton Research and Development Corporation
CRDC	Cotton Research and Development Corporation
CSD	Cotton Seed Distributors Ltd (a grower-owned cooperative)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Department, the	refers to the Australian Government Department of Agriculture, Fisheries and Forestry
DIPNR	Department of Infrastructure, Planning and Natural Resources, New South Wales (now the Department of Natural Resources)
DNR&W	Department of Natural Resources and Water, Queensland
DNR	Department of Natural Resources, New South Wales
DPI	Department of Primary Industries, New South Wales
DOFA	Australian Government Department of Finance and Administration
ESD	Ecologically Sustainable Development
EPA	Environmental Protection Agency, New South Wales (now the Department of Environment and Heritage)
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
GMAC	Genetic Manipulation Advisory Committee
GOA	Groundrig Operators Association
GRDC	Grains Research and Development Corporation
Helicoverpa spp.	Cotton's major insect pests (*H. armigera* and *H. punctigera*)
Heliothis	Insect pest, more properly known as *Helicoverpa* spp. (*H. armigera* and *H. punctigera*)
ICAC	International Cotton Advisory Committee
OGTR	Office of the Gene Technology Regulator
Ingard®	Cotton varieties containing one *Bt* gene resistant to *Helicoverpa* spp. (superceded by Bollgard II® species with two genes of resistance)
IP	Intellectual Property
IPM	Integrated Pest Management

IWM	Integrated Weed Management
LWA	Land and Water Australia
MDBC	Murray-Darling Basin Commission
MLA	Meat and Livestock Australia
MP	Member of Parliament
NFF	National Farmers' Federation
NHT	Natural Heritage Trust
NPSI	National Program for Sustainable Irrigation
NRM	Natural Resource Management
NSW DPI	Department of Primary Industries, New South Wales
NSW DNR	Department of Natural Resources, New South Wales
OGTR	Office of the Gene Technology Regulator
PIERD Act	*Primary Industries and Energy Research and Development Act 1989*
Pima cotton	*Gossypium barbardense*. Related to Egyptian cotton, having extra long and fine staples. Limited Australian production in the Darling region.
QDPI&F	Department of Primary Industries and Fisheries, Queensland
QNRM&W	Department of Natural Resources and Water, Queensland
RIRDC	Rural Industries Research and Development Corporation
RRDCC	Rural Research and Development Chairs' Committee
TIMS	Transgenic and Insect Management Strategy Committee
TRC	Technology Resource Centre (at the Australian Cotton Research Institute)
'Upland' cotton	*Gossypium hirsutum*. Comprises the vast majority of the Australian cotton crop

APPENDIX FIVE

LEGISLATIVE COMPLIANCE INDEX

Commonwealth Authorities and Companies Act 1997, S ection 9

A. Report of operations

Preliminary	
Exemptions from requirements	nil
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Overview	
Standards of presentation	all pages
Obtaining information from subsidiaries	nil
General information	
Enabling legislation	139
Responsible Minister	141
Organisational structure	144
Review of operations and future prospects	
Statutory object and functions	139–140
Corporate plan	143
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Efficiency and effectiveness of operations	48–127
Links between outcomes, strategies and principal outputs	32–33
Factors influencing performance	2–7, 21–22,29–30, 48–127
Significant events	148
Operational and financial results	2–7, 18–23, 48–127, 153–179
Developments since the end of the financial year	2–7, 22
Judicial decisions and reviews (as per ROO Schedule)	nil
Ministerial directions	nil
Specific information	
Particulars of Directors	130–138
Audit Committee	136
Statement of Corporate governance practices	28, 138
Indemnities and insurance premiums	138
Miscellaneous	
Reporting obligations – enabling and other legislation	48–127, 136–7, 139, 143, 147–148
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Financial statements	153–179

Primary Industries and Energy Research and Development Act, Section 28

Annual reporting requirements

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Ecologically sustainable development	148
Revisions to Principal Plan 2003–2008	nil
Revisions to Annual Operational Plan	nil
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Formation of a company	nil
Acquisitions and dispositions of real property	nil
Contribution to achievement of Corporate objectives	48–127
Implementation of Annual Operational Plan	11–17, 37–43, 48–127
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Sources and expenditure of funds	18–23, 153–179
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Other reporting requirements	
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Government R&D priorities attributed to each R&D Program	36
Funding of consultation costs to peak industry bodies	149
Other legislative reporting requirements	
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Ecologically sustainable development (*Environment Protection and Biodiversity Conservation Act*)	149
Fraud control	144

APPENDIX SIX

SUBJECT INDEX