Australian Government

Cotton Research and Development Corporation




COTTON RESEARCH AND DEVELOPMENT CORPORATION
■ ANNUAL REPORT **2003–2004**

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A number of photographs on the cover and throughout the contents were entrants in the CRDC cotton industry photographic competition. CRDC acknowledges their use and thanks the talented photographers.

ISSN 1039-3544

ISBN 1 876354 97 6

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Designed by Meta Marketing/Spincreative 3133

Printed by Paragon Australasia Group, Canberra

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1 October 2004

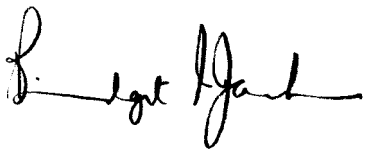
Senator the Hon. Judith Troeth
Parliamentary Secretary to the Minister for
Agriculture, Fisheries and Forestry
Parliament House
CANBERRA ACT 2600

Dear Senator Troeth

It is with pleasure I submit the Corporation's Annual Report 2003–2004, prepared in accordance with the provisions of section 28 of the *Primary Industries and Energy Research and Development Act 1989*, and of part 1, section 4 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 13 August 2004.

Yours sincerely



Bridget Jackson
Chair

TABLE OF CONTENTS

Letter of Transmittal iii

The year's highlights 1

About CRDC

Vision; Mission; Outcome 8

Who we are; What we do; Our corporate standards 11

Our operating environment 12

Our strategic elements 14

Report by the Chair and Executive Director 16

Stakeholder research priorities 19

Addressing Australian Government Research Priorities 20

Financial Analysis 35

Report of Operations

Section one: Research, Development and Extension

One: People and Knowledge 40

Two: Sustainable Natural Resource Management 50

Three: Crop Protection 59

Four: Farming Systems 67

Five: Plant Breeding and Biotechnology 75

Six: Value Chain 79

Section two: Corporate 83

Section three: Financial Statements 97

Appendices

One: Selection Committee Report 126

Two: Research and Development Portfolio 127

Three: Publications and Activities 137

Four: Acronyms and Terminology 140

Five: Compliance Index 142

Six: Subject Index 144

FIGURES

Revenue & Expenditure 1991-2005	36
Revenue by source 2003-2005	36
Revenue by source 2002-2003	36
Research Expenditure by Program 2003-04	37
Expenditure by Output 2003-04	38
CRDC funded Post-graduate projects commenced 1996 to 2004	42
Cotton IPM Short Course – Cumulative Number of Attendees and Numbers receiving Statements of Attainment*	44
Adoption of Safe Work Procedures over the five years to 2004	46
Safe Work Procedures Adopted Last Season: BMP Audited versus Non BMP Audited Growers	47
Pre-season Communication	51
Monitoring of Weather Conditions during Pesticide Applications	52
Monitoring of Weather Conditions during Pesticide Applications	52
Improvements in Pesticide Storage Facility – all growers	53
Features of Pesticide Storage Facility in the 2003-04 Season – BMP Audited versus Non BMP Audited Growers	53
Percentage of River Water Samples with Herbicide Detected	56
Industry average insecticide plus miticide use on conventional, INGARD® and Bollgard® II cotton expressed in kilograms of active ingredient per hectare.	60
Use of Integrated Pest Management	61
Silverleaf Whitefly population development for Central Highlands showing a major decline in numbers in 2002–03 as a result of improved management and communication	61
Changing farm hygiene practices over the five years to 2004	62
Herbicide use in cotton	63

THE YEAR'S HIGHLIGHTS

CORPORATE

- The first year of CRDC's *Strategic Plan 2003-2008*, saw the implementation of a significantly changed program structure and Triple Bottom Line reporting *See pages 40 to 82 (Report on R&D program)*
- CRDC's Board of Directors undertook a comprehensive review of their performance as part of the corporation's 'continuous improvement in corporate governance' program.
- The appointment of a new Executive Director, Mr Bruce Finney, marks the first change in this position since the corporation's inception in 1990. Mr Finney takes up the position in September 2004, on the retirement of Mr Ralph Schulzé.

THE YEAR'S HIGHLIGHTS

RESEARCH

The Environmental Output ■

Sustainable Production Systems and Catchments

- An independent environmental audit of the cotton industry found a strong research, development and extension program underpins the wide range of improvements in cotton industry operations and environmental management practices, with the most significant and far-reaching environmental improvements implemented over the last five years.
- A major decision support emphasis on water use efficiency saw the release of an innovative software package, HydroLOGIC, and the funding and coordination of WATERpak, a comprehensive science-based resource package on irrigation management.
- An external review of the cotton industry environmental management system, Best Management Practices, found significant improvement in management practices had occurred across all components covered by the BMP manual and associated audit process over the past five years.
- Professor Hugh Possingham, of the Wentworth Group, launched a review of biodiversity research in the Australian cotton industry, commissioned by CRDC and the Cotton CRC, at the Ecological Society Conference in 2003. It will provide a sound basis for future research in this area, including the integration of biodiversity issues into Best Management Practices.

Environmental Objectives	Major Targets	Progress
Industry-wide adoption of improved integrated insect pest management systems	A 50 per cent reduction in 2004 quantities of insecticide used by 2008	Based on the annual *Market Audit of Cotton Crop Production Products* produced by Cotton Consultants Australia, the average quantity of insecticide and miticide applied in 2003-04 to: ■ conventional cotton was 4.5 kg of active ingredient per ha: a 23.7 per cent reduction on the five-year average for 1998–99 to 2002–03. ■ INGARD cotton was 1.98 kg: 56 per cent less than conventional cotton ■ Bollgard II cotton was 0.46 kg: 90 per cent less than conventional cotton

Environmental Objectives	Major Targets	Progress
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	Based on the annual Market Audit of Cotton Crop Production Products produced by Cotton Consultants Australia, herbicide use has levelled out at approximately 2.5 kg of active ingredient per hectare, averaged over the past two seasons. – a decline of some 45 per cent from 2000–01. It is expected that this level will remain constant unless the area of Roundup Ready cotton planting increases significantly from the current 40 per cent of the crop Since 2000-01 (the season Roundup Ready cotton was introduced to the cotton industry) two of the main residual cotton herbicides, fluometuron and prometryne, have been on the decline in water quality samples monitored by the NSW Department of Infrastructure, Planning and Natural Resources. Water samples from the Macintyre, Gwydir, Namoi and Macquarie Rivers, measured in 2002–03 showed a 73 per cent reduction in Fluometuron and a 50 per cent reduction in the detection of prometryne compared to 2000–01.
Increased adoption of BMP that meets legal requirements, industry benchmarks and catchment scale targets	80 per cent of cotton production audited against BMP Minimum Certification Standards by 2007	BMP minimum standards were introduced in June 2004. Data on audits against minimum standards will not be available until 2005. (Audits against the current BMP manual show over 300 cotton growers or 25 per cent of total growers on farms representing nearly 50 per cent of cotton area have been audited. If average production from those farms is assumed, almost 50 per cent of cotton production has been audited against BMP).
Improved Water Use Efficiency	A 20 per cent improvement in farm WUE against the 2004 median by 2008 (measured in bales per ML)	Data from the 2003-04 season will be available in late 2004

The Economic Output ■

Profitability and international competitiveness

- A review of the Plant Breeding and Biotechnology program by three international experts confirmed the CSIRO cotton breeding program as one of the most successful of its type in the world and allowed a fine-tuning of research and the commitment of greater funds for a tight, focused program in 2004–05.

- Fourteen new CSIRO-bred cotton varieties, developed with CRDC funding support, were released in 2004, providing many new features, such as improved fibre quality, disease tolerance, growth habit, maturity and regional adaptability. Royalties from CSIRO varieties provided over eight per cent of corporation funds in 2003–04.

- A major focus on achieving high quality Australian cotton fibre competing at the top end of the global market saw the start of a major 'Field to Fabric' initiative in 2003–04 with:
  - five pilot field trial sites established to define 'best bet' agronomic management for high quality fibre.
  - work beginning to extend the cotton industry's Best Management Practices program throughout the whole value chain, opening possibilities for 'clean and green' niche marketing.

Economic Objectives	Principal Targets	Progress Towards Targets 2003–04
Improved yield (through improved management and breeding of higher yielding, disease, insect and herbicide tolerant cotton varieties)	A 10 per cent improvement in cotton yield per ha (2 per cent annual or 10 per cent over 5 years).	Data will be available in late 2004
Improved cotton fibre quality that meets market and spinner needs	Evidence of continuous improvement in 5 key parameters measured in spinning mill benchmark surveys by 2007 Evidence that prices for Australian cotton remain above those for competitive cotton growths	The CSIRO Textile and Fibre Technology Cotton Mill Benchmark survey conducted in 2003 asked cotton millers in South East Asia to comment on 15 fibre characteristics of Australian cotton. The results have been reported to the industry and a number: short fibre content, neps, micronaire, dye ability and contamination have been highlighted for additional R&D focus and to drive continuous improvement. Further mill surveys are anticipated in 2005 and 2007. Cotton Outlook A Index quotations for Australian cotton throughout 2003-04 have been close to Californian Acala SJV price quotes – the top of the upland type cotton range.
Increased profitability with better whole farm management and innovative precision agricultural systems	Evidence that profit margins are improving over time (2003 to 2008 annual and trends over time).	The 2003 BOYCE Cotton Comparative Analysis report shows that, over the last 5 years, the top 20 per cent of cotton growers produced 1.28 bales per ha more cotton than the average grower at $65 per bale less cost per ha. The corporation anticipates that these trends can be used in conjunction with the BOYCE Annual Cotton Comparative Analysis to improve the performance and hence profitability of other growers.

The Social Output ■

Empowered People and Communities

- A reformulation of the unique National Cotton Extension Network in 2003 means network teams are fully supported in gaining new skills in extension methodology and the evaluation of cotton research and extension and concentrate on key areas related to sustainable cotton production: farming systems, weeds and diseases, insect management, the environment and water.
- A CRDC-funded Integrated Pest Management Short Course achieved improved grower adoption of Integrated Pest Management principles and practices throughout cotton growing regions and allowed growers to opt for formal certification.
- A scoping study commissioned by CRDC has provided guidance on developing better socio-economic indicators for the cotton industry – a sound basis for extending work in 2004–05 to establish improved indicators for the impact of research and cotton production in regional centres.

Social Objectives	Major Targets	Progress Towards Targets 2003–04
Improved skills and qualifications of people at all levels of the industry	Between 2003 and 2008: ■ At least 15 new Post Graduates working in areas of high priority future need ■ At least 10 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	78 people in 7 locations completed the CRDC-funded Integrated Pest Management short course. Seven of these (11.5 per cent) were women. Total number since the course began in 2001 is 169, of whom 25 were women. As of September 2003, a total of 400 cotton growers had completed the Farmsafe Managing Cotton Farm Safety Course using a CRDC-funded manual as course material, with some 20 people completing the course each month in 2003–04. Due to drought-related income reductions for CRDC: of 23 post graduate scholarships, only one began in 2003–04; of four post doctoral positions, none began in 2003–04; however, CRDC provided skills training during a post graduate visit to the cotton industry

Social Objectives	Major Targets	Progress Towards Targets 2003–04
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 10 per cent reduction in cotton farm related injuries ■ Improved industry economic viability	In 2003-04 CRDC commissioned a *Scoping Study on Socio-economic Indicators for the Cotton Industry*. In 2004-05 the corporation will commission projects to establish improved socio-economic indicators for measuring the impact of research and cotton production in regional centres.
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	Evaluations conducted in 2003-04 include: ■ Knowledge management in Cotton and Grain Irrigation ■ Industry perceptions on management issues associated with Bollgard II cotton. ■ Evaluation of local industry thoughts on managing silverleaf whitefly IN: Management of silverleaf whitefly in central Queensland 2001-2003. ■ Evaluation of a field day on Fusarium wilt management ■ Soil management extension technical training and development

ABOUT CRDC

OUR VISION

A globally responsible cotton industry

CRDC Board of Directors
Jeff Bidstrup, Graeme Hamilton, Dick Browne, Kathryn Adams, TJ Higgins, Bridget Jackson (Chair), Ralph Schulzé, Neil Forrester and Adam Kay

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

A holistic, integrated and systematic approach to research and development

CRDC research management team
Jodi McLean, team leader Bruce Pyke, Rachel Holloway, Helen Dugdale and Greg Kauter

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 by initiating projects
- 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

- Federal and state government agencies
- Cotton growers
- CSIRO
- Universities
- The Australian Cotton Cooperative Research Centre
- Other Cooperative Research Centres
- Rural R&D 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 industry, represented by the Australian Cotton Growers' Research Association

WHO WE ARE

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

WHAT WE DO

CRDC invests in and manages a broad-ranging 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 and enthusiastically involved in the dissemination of their research results, working with CRDC and the CRDC-supported National Cotton Extension Team.

OUR CORPORATE STANDARDS

Under the CRDC Statement of Principles, the directors and staff:

- 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 meeting all statutory obligations and accountability requirements in a comprehensive and timely manner.

OUR OPERATING ENVIRONMENT

The Australian cotton industry is not a large one in numbers of participants and physical spread but it makes a significant contribution to Australian exports. Australian cotton is worth $1.8 billion dollars to the national economy in normal production years and the industry and related enterprises employ an estimated 10,000 people on a sustainable and successful footing. On a global scale Australia normally grows only about three per cent of the world's cotton but is the third largest exporter of cotton in the world.

Australians are the greatest consumers of cotton products in the world, with cotton's 'breathability' making it a natural choice in the Australian climate. On the other hand, although the Australian cotton industry has made enormous and scientifically documented advances in natural resource use and management in recent years, communicating these achievements and changing some perceptions of the cotton industry in the wider community remains a challenge.

Seventy per cent of Australia's cotton is grown in New South Wales, with the remainder grown in Queensland. There are some 1200 cotton farmers, representing 450 to 500 farming enterprises. Today's cotton farms are typically 500 to 2000 hectares, highly mechanised, capital intensive, technologically sophisticated and require high levels of management expertise. Up to twenty per cent of the crop is now dryland cotton, grown using only natural rainfall, although this figure varies according to seasonal conditions.

Over the past decade, the Australian cotton industry has achieved a 126 per cent increase in production while the acreage devoted to cotton has increased by only 50 per cent. Australian cotton's dollar return per megalitre is higher than most crops including oats, wheat, barley, lucerne and canola, explaining why many farmers with a water allocation choose to grow cotton. The average yield for irrigated Australian cotton is 1600 kilograms per hectare: the highest in the world. These figures can almost entirely be attributed to improved cotton breeding and better crop management systems, which have been achieved with a reduced impact on the environment.

Australian cotton is grown in a relatively compact and contiguous part of the country. This delivers a number of efficiencies but also makes the industry relatively more susceptible to drought than, for example, grain crops grown in more diverse areas throughout the country, with major cotton regions often coming under the same weather pattern. Drought or marginal conditions prevailed over most, but not all, of the 'cotton belt' in the 2003–04 season.

The gap between income and expenses is continually narrowing for Australian cotton growers, who face ever-increasing costs in many areas of production such as machinery (imported and thus sensitive to the rising value of the dollar) and water and freight costs. This makes the efficiency contributions from CRDC's research and development program – efficiencies such as improved water use efficiency, lower chemical use and higher yield from improved varieties – vitally important to the continued economic sustainability of the industry

Cotton's excellent economic record and contribution has suffered a setback in the past two seasons because of the prolonged drought and the effects will be felt for the next two to three seasons. Increased efficiencies delivered by CRDC funded and coordinated research in 2003–04 and planned for 2004–05 will aid that recovery, particularly as the corporation's *Field to Fabric Initiative* gathers momentum. In addition, the increased use of ever-improving Bollgard® II and Roundup Ready® varieties will continue to reduce the cost of insecticide and herbicide inputs to the crop, delivering economic, environmental and health dividends.

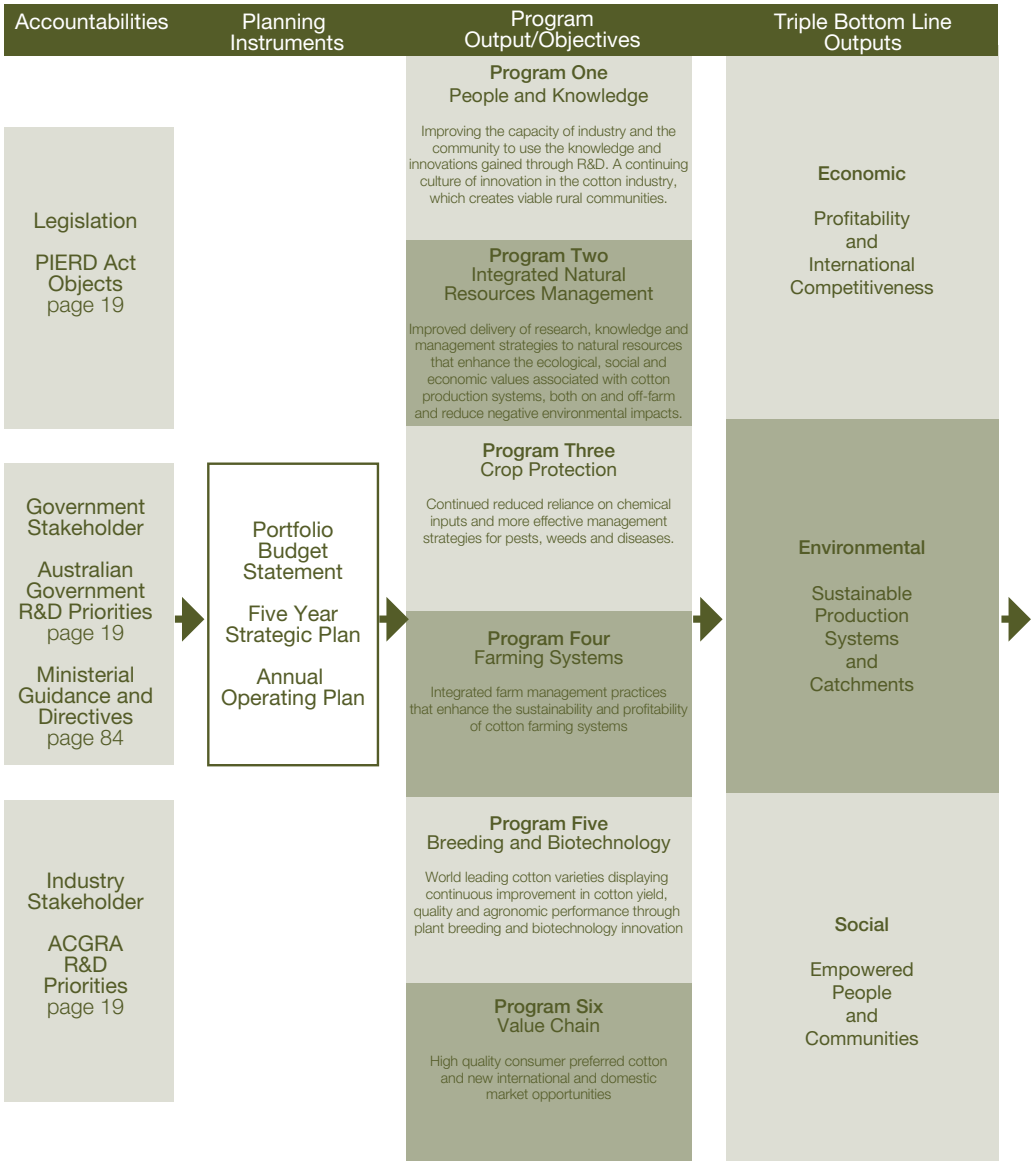
THE 2004 HARVEST

Despite some earlier concerns that the seasons conditions may cause problems with colour, fibre immaturity and neppiness (short, tangled fibres) in some regions, the quality of cotton has been good, with a significantly lower proportion falling into the discounted over-mature category than in the preceding drought-affected season. One notable feature of the season was that dryland crops (grown using only natural rainfall) in parts of the Darling Downs and the north-western slopes of New South Wales received excellent and timely rainfall, resulting in high yields and unprecedented quality premiums for a number of growers.

Indications are that the 2004 cotton harvest should reach approximately 1.5 million bales, exceeding the 1.25 million bale forecast used as the basis of CRDC's 2003–04 budget. Even with this revised figure, 2004 will see Australia's smallest crop since the late 1980s, which means we will be unable to fulfill demand and risk losing some traditional key markets. This comes at a particularly unfortunate time for Australian cotton, with the United States and Brazil aggressively targeting those markets.

OUR STRATEGIC ELEMENTS

Outputs and Outcome Framework



Outputs and Outcome Framework

Triple Bottom Line Objectives	Key Targets	OUTCOME
Evidence that tools and knowledge products are contributing to: Employment of people in R&D Improved relative economic returns of cotton crops Increased returns per mega litre 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 evidenced 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 indications such as salinity, water quality and biodiversity Benchmarked soil health and improved nutrient recovery Published refereed science on environmental impacts of new transgenic technology Benchmarked greenhouse gas emission, energy use and climate change impacts	A 50% reduction in 2004 quantities of insecticide used by 2008 A 20% reduction in 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 Scholarship 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 protective stewardship of transgenic and conventional technology Collaborative links and partnerships established to improve knowledge exchange into end out of 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 needs At least 10 new Post-doctoral positions in tareas 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 through: A reduction in cotton industry's environmental footprint (e.g. 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	

THE YEAR IN REVIEW

BY THE CHAIR AND EXECUTIVE DIRECTOR

Cotton production of some 1.5 million bales from the 2004 harvest was less than half the average production of the five years preceding the drought, causing a significant reduction in CRDC's levy income and matching Australian Government contributions.

Despite these unfavourable circumstances, CRDC was able to maintain most key research programs. The continued need to reassess and cut back funding to many projects has been a challenge to the research community and to our staff and we are pleased to report that these challenges have been met with good heart and innovative thinking. Despite all these efforts, reserves have been further depleted and will continue to be run down in the coming year.

2003–04 was the first year of operation under our new strategic plan, in which eleven programs were reduced to six to enable a more holistic and integrated approach to research and development. An independent evaluation of the cotton industry's research-driven Best Management Practices (BMP) program, coupled with a second Environmental Audit of the industry, revealed that practices have improved measurably throughout the industry with the greatest gains achieved in the last five years.

More improvements can be achieved through the BMP program and work has begun to extend BMP through the full production to market chain to provide a complete environmental management system. This process will be greatly assisted by additional funding from the Australian Government's *Pathways to EMS* Program.

Other projects undertaken in the natural resource management area include the development of a Land and Water Module for BMP, a review of biodiversity research in the cotton industry by the University of New England and collaboration with the National Program for Sustainable Irrigation. An increasing amount of natural resource management work is carried out by the Australian Cotton Cooperative Research Centre and CRDC plans to invest considerable funds in this area through the proposed Cotton Community Catchments CRC, which is the subject of the current round of CRC bids.

The Corporation's investment into breeding and biotechnology continues to produce better yields and quality – and to achieve more effective integrated pest management (IPM) and integrated weed management. Investment into crop protection also continues to be an important part of the Corporation's portfolio. As IPM has become mainstream, and as genetically modified Bollgard® varieties take up a greater proportion of the crop area, the use of traditional pesticides has declined dramatically. This, together with the use of softer chemicals and the need to maintain the efficacy of Bollgard II cotton varieties by monitoring any possible *Helicoverpa* (Heliothis) resistance, means that pest research remains vital.

Integrated weed management is also evolving rapidly as Roundup Ready® varieties (which are tolerant of glyphosate herbicide sprays) come on stream. Research into Fusarium wilt remains a major investment for the corporation, but results on both the breeding and management front are beginning to look promising.

The Corporation funded an external review of its plant breeding and biotechnology research early in the new year and its recommendations have been acted upon in the 2004–05 research program. Fourteen new CSIRO-bred varieties were released for the 2004-05 season, exhibiting a range of enhanced yield, fibre quality and crop protection characteristics. Concomitant with the release of genetically modified varieties comes the need to change and improve farming systems constantly. An equal proportion of funding was allocated to farming systems research as to breeding and biotechnology.

Facing the possible loss of some of our markets as the result of the downturn in production, producers and marketers consider that it is imperative that we remain globally competitive in the premium end of the market. As a result, preliminary work during 2003–04 will see investment in research in the value chain considerably stepped up in the coming year. CRDC is already working in cooperation with the cotton industry peak body, the Australian Cotton Industry Council, and CSIRO to devise better ways of preserving and enhancing fibre quality throughout processing. This work will have linkages not only to the *Pathways to EMS* Program, but also to plant breeding and improvements to the measurement of fibre quality.

Major areas of investment that have suffered cutbacks as a result of the drought are preliminary cotton research in northern Australia, where there is still no commercial production and, secondly, in the decision not to fill two vacant trainee Industry Development Officer positions prior to a comprehensive review of extension activities, which is planned for the coming year.

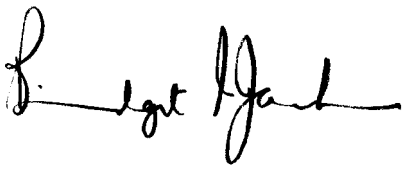
The financial constraints on the Corporation as a result of the poor seasons are exacerbated by the declining contributions to R&D by our traditional research partners, in particular the state departments of primary industries: a challenge we will be attempting to address in the coming year. One of the most effective ways of so doing is to collaborate effectively with kindred organisations such as other Rural Research and Development Corporations. For example, almost all cotton farmers also grow grains and we have five joint investments with the Grains Research and Development Corporation. It is especially pleasing that GRDC has recognised the synergies between cotton and grains by becoming a partner in the current bid for a Cotton Catchment Communities CRC.

Collaboration is particularly important when we look at natural resource management where cotton may be only one of many farming enterprises in a mixed farming and pastoral

environment. This has seen collaborative work with a number of organisations such as Land and Water Australia, the Rural Industries Research and Development Corporation and the CRC for Irrigation Futures. CRDC will seek opportunities to continue and further extend this collaboration, particularly with the Catchment Management Authorities, soon to be established.

CRDC Directors carried out an extensive self-assessment of board activities during the year, and the corporation is currently acting upon the recommendations that came out of the review. Most policies have been reviewed and a comprehensive OH&S system implemented. This will be followed by an external review of board operations in the forthcoming year. The Board is pleased to advise that it has appointed Bruce Finney as the Executive Director. Mr Finney takes up the position in September 2004.

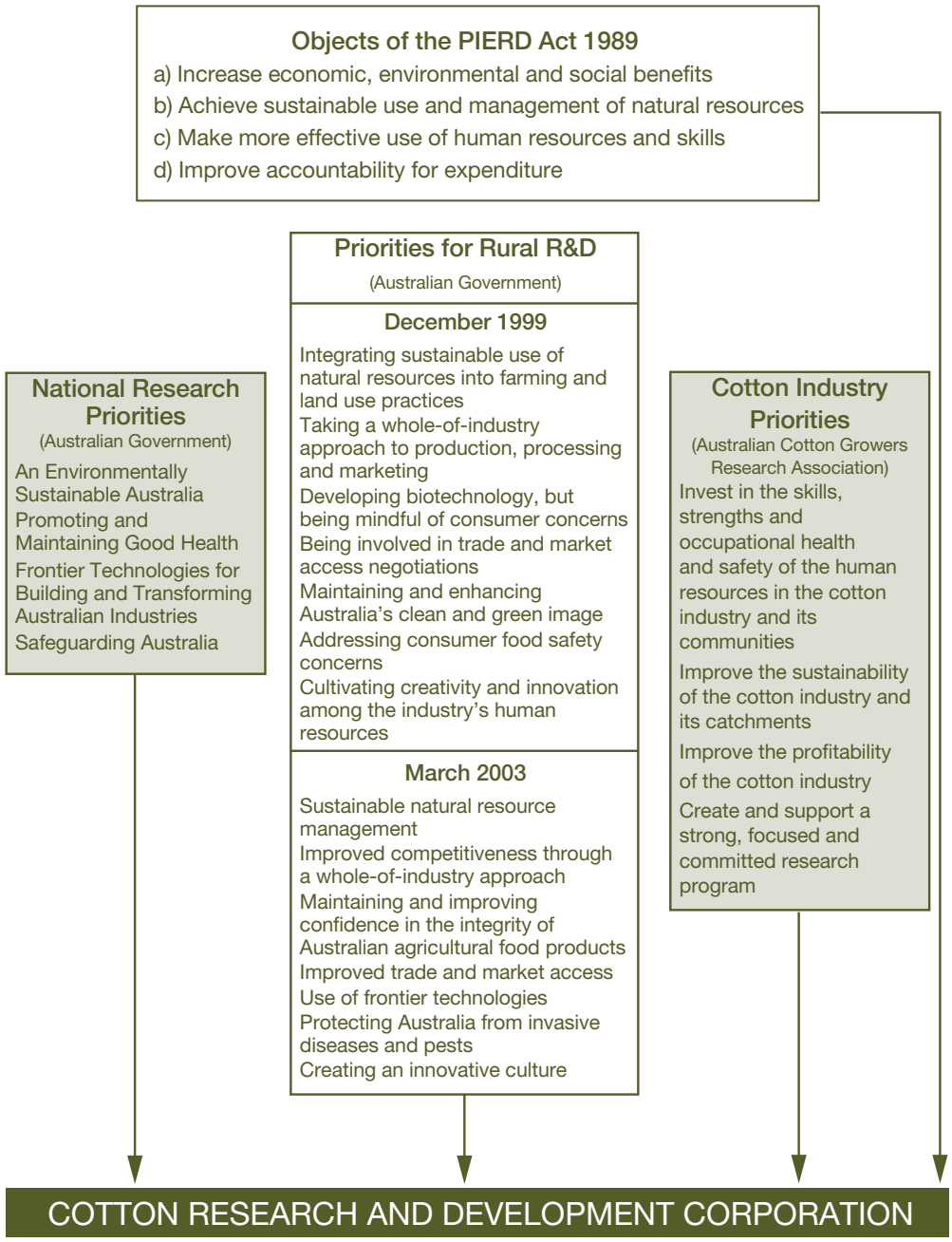
Bridget Jackson
Chair



Ralph Schulzé
Executive Director

Retiring Executive Director, Ralph Schulzé and CRDC Chair, Bridget Jackson with incoming Executive Director, Bruce Finney and Vice–Chair, Dick Browne.

STAKEHOLDER RESEARCH PRIORITIES



ADDRESSING AUSTRALIAN GOVERNMENT RESEARCH PRIORITIES

Background

The release of National Research Priorities (NRPs) by the Prime Minister in December 2002 added another layer of accountability to the corporation's research and development activities and was integral to planning of the *Strategic Plan 2003–2008 and Annual Operating Plan 2003–2004*.

The CRDC *Annual Operating Plan 2003–2004* was formulated to take account of the Australian Government's revised priorities for rural research and development, which are consistent with the NRPs. These priorities were conveyed to CRDC on 19 March 2003 by Senator the Hon. Judith Troeth, Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry.

In cases where the rural research and development priorities are very similar to a rural research and development priority they are reported together.

NATIONAL:
AN ENVIRONMENTALLY SUSTAINABLE AUSTRALIA

Applicable Priority Goals

- Water – a critical resource
- Transforming existing industries
- Overcoming soil loss, salinity and acidity
- Sustainable use of Australia's biodiversity
- Responding to climate change and variability

RURAL:
SUSTAINABLE NATURAL RESOURCE MANAGEMENT

CRDC programs and strategies addressing these priorities

- Program 2 – Integrated Natural Resource Management: Strategies 1-5
- Program 4 – Farming Systems: Strategies 1-3
- Program 5 – Plant Breeding and Biotechnology: Strategy 4

CRDC Strategic Plan Objectives	Progress towards Measures of Success?
Industry-wide adoption of improved integrated insect pest management systems Industry-wide adoption of improved integrated weed management systems Increased adoption of BMP that meets legal requirements, industry benchmarks and catchment scale targets Improved Water Use Efficiency	✓ Increased adoption and broader environmental coverage of the Cotton BMP program ✓ An evaluation of environmental management systems as a farm and natural resource management tool ✓ 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 ✓ Publication of refereed environmental impact research in scientific journals related to new transgenic traits ✓ Benchmarked greenhouse gas emission and potential climate change impacts

Overview

A major and integral objective of the corporation's research and development in recent years has been to improve the cotton industry's environmental performance, with this objective reinforced in the CRDC *Strategic Plan 2003–2008*. CRDC has moved to a triple bottom line of reporting to better identify environmental, economic and social outcomes and adopted ten principal targets for these three categories in May 2004 to enhance reporting accountability.

An independent environmental audit of the cotton industry (found at www.crdc.com.au), commissioned by CRDC and conducted in 2003, commented that:

"The Australian cotton industry has been subject to intensive environmental scrutiny, which, in part, was triggered by events such as fish kills from pesticides and, about five years ago, pesticide residues found in beef exports. There are ongoing concerns with the intensive use of pesticides and perceived high water use. As a result of these incidents and concerns, the cotton industry has developed and implemented a wide range of improvements in its operations and environmental management practices. These improvements have been implemented over the twelve years since the inaugural environmental audit in 1991; however, the most significant and far-reaching environmental improvements have been implemented over the last five years."

The report identified a strong research, extension and development program as a major factor which:

"…resulted in identification of environmental issues and introduction of improved management practices in pesticide use, pest management, water use, vegetation and land management, waste recycling and disposal, wildlife management and biodiversity."

The audit made a number of recommendations for further improvements, particularly in the areas of water management, pest management and pesticide use, waste management and Occupational Health & Safety. CRDC is coordinating an industry-wide action plan that addresses all the audit's recommendations and will be released in late 2004.

The environmental contribution of Best Management Practices

CRDC has been the major contributor to the development of the cotton industry's environmental management system, Best Management Practices (BMP), and commissioned an independent review of the program in early 2004, as part of an Australian Government National Heritage Trust project.

The review identified significant, positive change in all the areas of farm management covered by the BMP manual over the last five years, with the independent auditing system developed by CRDC as the major factor influencing recognition by external stakeholders of BMP as a valid, effective and measurable environmental management system. The audit program, formerly administered by the corporation, was integrated into Cotton Australia's implementation program in mid-2004. This will provide growers with a cost-effective and integrated system for becoming fully BMP-compliant and maintaining that status over time.

Uptake of the BMP program, as measured by audited cotton farms, slowed in 2003–04. Although the drought placed considerable pressure on growers during that period, the evaluation of the BMP program identified a number of other contributing factors and made several recommendations to improve uptake. All of the recommendations have been acted upon by CRDC and Cotton Australia.

As a further component of the National Heritage Trust project, CRDC, in collaboration with Cotton Australia, contributed to the development of a land and water management module for BMP, which was trialled in three cotton valleys in the 2003–04 growing season and will be released to the entire industry during 2004–05. The trial implementation was achieved by an

effective partnership between Cotton Australia, CRDC and members of the National Cotton Extension Network. It should also be mentioned that funding under the Australian Government *EMS Pilot Project* has allowed a more rapid broadening of the scope of BMP on-farm through the Land and Water module.

A joint project with the Murray Darling Basin Commission, under their Environmental Stewardship program *Natural Resource Management Project for the Australian Cotton Industry* will further contribute to the development of a natural resource management module for BMP, including the land and water module.

Biodiversity in cotton regions

CRDC and the Australian Cotton CRC commissioned a review of biodiversity in cotton growing regions (available at www.crdc.com.au), which was launched by Professor Hugh Possingham, of the Wentworth Group, at the Ecological Society Conference in late 2003. The corporation will follow up on its recommendations with various government agencies and other rural industries and seek to incorporate other sources of research and information in deciding how to further develop its work in this area, including integrating biodiversity issues into BMP.

During 2003–04, CRDC funded research into a number of biodiversity issues such as the biology and activity of insectivorous bats, irrigated cotton, indigenous vegetation remnants and intensive production landscapes. A new project will study the aquatic biodiversity and ecological value of ring-tank water storages in 2004–05.

The cotton industry is developing a greater understanding of functional biodiversity through the adoption of integrated pest management. Conservation and utilisation of beneficial insects is a high priority with both conventional and transgenic cotton and has played a significant role in reducing the use of pesticides within the industry. The industry has made great advances in recent years in the adoption of Integrated Pest Management, made possible through CRDC investments in research and extension. These investments have supported the introduction and management of *Helicoverpa*-resistant transgenic cotton, improved knowledge of the impact of new generation insecticides on the survival of beneficial insects and improved grower adoption of Integrated Pest Management principles and practices through a CRDC-funded Integrated Pest Management short course.

Reduced insecticide spraying of Bollgard® II crops targeted at *Helicoverpa*, is likely to be accompanied by some changes in the timing and intensity of infestations of previously minor pests such as mirids, aphids, mites and Silverleaf Whitefly. Consequently, CRDC has increased the level of funding for management of these pests for the 2004–05 year, to ensure the continued viability of Integrated Pest Management systems in Bollgard II.

Efficient use of water

The development of a comprehensive new irrigation management resource, WATERpak, during 2003–04, co-funded by CRDC and the Australian Cotton CRC, will assist cotton farmers to understand and manage their irrigation systems better. The release of an innovate software package, HydroLOGIC, developed with CRDC funding support, enables cotton farmers to fine-tune water use, time their next irrigation and forecast final yield potential.

CRDC remained a contributing partner to the National Program for Sustainable Irrigation in 2003–04. In 2004–05, this project will move to phase two, expanding on a range of improvements to the delivery of information and tools for improved water use efficiency.

CRDC, together with Land and Water Australia, the Australian Cotton CRC, the NSW Department of Infrastructure, Planning and Natural Resources and the Queensland Department of Natural Resources and Mines, developed *Managing Riparian Lands in the Cotton Industry*, a comprehensive new guide that will assist cotton

farmers to safeguard and improve the health of rivers and associated waterways on their farms. The guide was released in November 2003 and widely disseminated through the Australian Cotton Extension Network. Its applicability extends beyond cotton farming systems, providing a wider environmental benefit.

Assessing and managing salinity and sodicity

CRDC invested $1.2 million over the nine years prior to 2003–04 on mapping salinity risks in cotton growing areas, using 7,500 data points in seven cotton-growing districts across five valleys. While this research showed that there is generally low salinity risk in cotton growing areas, it identified those areas where problems have occurred, are occurring and may occur in the future and confirmed that there is no room for complacency on this important national issue.

CRDC co-funded, with Land and Water Australia, the Murray Darling Basin Commission and the Grains Research and Development Corporation, a scoping project "Understanding Deep Drainage for Better Catchment Planning". As a consequence, CRDC began funding a project in 2003–04 to determine how much deep drainage is occurring under irrigated cotton crops. An improved capacity to measure deep drainage is necessary in order to maintain a sustainable balance between running the risk of increasing the salinity of groundwater tables and the leaching of harmful salts out of the soil profile. This research continues in 2004–05, along with associated new projects that seek to develop more simpler measurement techniques.

The corporation will fund development of a web-based Geographic Information System that will provide a holistic knowledge resource by integrating available salinity and soils data established through previous CRDC-funded research projects.

Sodic soils contain other sodium compounds that, unlike salt, are not transportable off-farm but cause soil quality-related problems in growing the crop. Sodicity is currently regarded as a greater problem than salinity in the cotton industry. Research in 2003–04 focused on studying the impact of sodicity on cotton cropping systems and characterising the structural stability and form of sodic soils used for cotton production.

NATIONAL:
PROMOTING AND MAINTAINING GOOD HEALTH

Applicable Priority Goal

Preventative Healthcare

RURAL:
MAINTAINING AND IMPROVING CONFIDENCE IN THE INTEGRITY OF AUSTRALIAN AGRICULTURAL, FOOD, FISH AND FORESTRY PRODUCTS

CRDC programs and strategies addressing these priorities

Program 1 – People and Knowledge: Strategy 6
Program 3 – Crop Protection: Strategies 1and 2
Program 5 – Breeding and biotechnology: Strategies 1 to 3
Program 6 – Value Chain: Strategies 3 and 4

CRDC Strategic Plan Objectives	Progress towards Measures of Success?
To ….develop new international and domestic market opportunities (through enhancing traits such as nutritionally improved cottonseed oil) Healthy and resilient communities in cotton producing regions	✓ Release of varieties with appropriate … seed characteristics ✓ See NRP 1 (above). ? The OH&S performance of industry workplaces is improving (Figures not yet available for 2003–04)

Overview

Cotton is a fibre crop, with oil as the only by-product for human consumption and its low value compared with the production of cotton lint means it is not a high priority for the corporation. CRDC-funded research into healthier cotton seed oil delivered plants with higher oleic and stearic acid content in 2003–04. It became apparent that a small amount of research remains to enable the already developed technology to move to potential commercialisation and this will be funded in 2004–05; however, commercial interest is likely to be dictated by public acceptance of genetically modified oils.

Growing cotton in a safe and prosperous community environment

The cotton industry was the first agricultural Australian industry to implement an industry-wide environmental management system: the Best Management Practices program. Its coming extension into the entire production chain and the land and water module that is to be added in the coming year can give the wider Australian community confidence that the industry, backed by CRDC-funded research, seeks to produce and process the crop in an environmentally aware manner. In particular, the reduction in pesticide use and the better application of pesticides to contain spray drift has delivered community health benefits. For further detail and measurements, see the environmental National Research Priority above.

The corporation commissioned a scoping study on socio-economic indicators for the cotton industry, released in July 2003. Based on this research, work will be extended in 2004–05 to gain an understanding of the industry's impact on the social and economic fabric of the communities it supports.

Growing cotton in a safe on-farm environment

The cotton industry is well ahead of many other rural industries in implementing improved occupational farm health and safety and Farmsafe Australia is using the *Managing Cotton Farm Safety* manual developed by CRDC prior to 2003–04 in OH&S courses in NSW and Queensland.

CRDC had no new initiatives in 2003–04 specifically addressing OH&S, but continues to contribute to the joint venture Farm Health and Safety R&D program, managed by the Rural Industry Research and Development Corporation and involving most of the Rural Research and Development Corporations. In addition, the ongoing implementation of Best Management Practices on farms ensures improvements in issues such as safe handling of chemicals.

NATIONAL:
FRONTIER TECHNOLOGIES FOR BUILDING AND TRANSFORMING AUSTRALIAN INDUSTRIES

Applicable priority goals

Frontier technologies and new industries
Advanced materials

RURAL:
USE OF FRONTIER TECHNOLOGIES

CRDC programs and strategies addressing these priorities

Program 3: Strategy 5
Program 4: Strategies 4 and 5
Program 5: Strategies 2 and 3

CRDC Strategic Plan Objectives	Progress towards Measures of Success?
World-leading cotton varieties displaying continuous improvement in cotton yield, quality and agronomic performance through plant breeding and biotechnology innovation Improved integrated management of major pests, weeds and diseases … and responsible management of transgenic technology	✓ Evidence that CRDC's biotechnology investments are delivering industry or community benefits ✓ Evidence of the reduced time to introduce genes into cotton varieties ✓ Continued fundamental research on cotton agronomy and explore the interactions of different components for both conventional and transgenic varieties ✓ Ensure the benefits of transgenic crop technology are maximised through responsible management based on sound scientific risk assessment ✓ Market reports on the demand for Australian cotton lint and seeds ? Release of varieties with appropriate … seed characteristics. (Necessary biotechnology aims achieved, commercialisation opportunities to be explored in 2004–05. See NRP 2)

Overview

These priorities are of great importance to the Australian cotton industry, which remains the only major agricultural industry in Australia using commercial applications of biotechnology. 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 greatly slow any decline in profitability for cotton farmers in the face of an ever-narrowing gap between costs and income.

Glyphosate herbicide-resistant cotton using Roundup Ready® technology has given cotton farmers a new tool to help manage weeds more efficiently, at less cost and with the use of less residual herbicide.

A landmark year for transgenic cotton

The 2003–04 season marked the last year in which growers could plant single resistance gene INGARD® varieties. Bollgard II varieties containing two genes of resistance to *Helicoverpa* spp. will entirely replace INGARD in the 2004–05 season. The industry's careful management of INGARD to avoid the development of resistance has facilitated this changeover. CRDC anticipates Bollgard II varieties, some also containing Roundup Ready technology, will comprise some 70 per cent of the crop in the coming season.

CRC engaged three leading international scientists to undertake a major review of CRDC's Plant Breeding and Biotechnology Program in early 2004 to ascertain progress with existing research, any apparent gaps in knowledge or directions and areas where future direction could be warranted and productive. Panel member Dr Lloyd May is from the University of Georgia, with a research focus on producer, yarn and textile manufacturer needs in the global economy. He commented that:

"The [CRDC-funded, CSIRO] Plant Breeding Program is probably the best in the world in cotton and there's certainly nothing to compare with it in scope and, on the biotech side, again you are amongst the world leaders."

Following recommendations from the review panel, the corporation has fine-tuned research in this area for 2004–05 and increased overall funding. Some projects have finished early, but CRDC will continue to invest in a new, enabling biotechnology program as well as several targeted initiatives, especially in the area of fibre development.

NATIONAL:
SAFEGUARDING AUSTRALIA

Applicable Priority Goal

Protecting Australia from invasive diseases and pests

RURAL:
PROTECTING AUSTRALIA FROM INVASIVE DISEASES AND PESTS

CRDC program and strategies addressing these priorities

Program 3 – Crop Protection: Strategies 1 to 5

CRDC Strategic Plan Objectives	Progress towards Measures of Success?
This aspect is covered under the broader objective of: Improved integrated management of major pests, weeds and diseases…	✓ Reduced distribution, presence and impact of diseases ✓ Monitor resistance levels with an aim to either avoid or keep resistance levels in pests and weeds at manageable levels ✓ Transgenic crop surveys and reports on performance, management and risk assessment

Overview

The 2003–04 cotton growing season was marked by very high *Helicoverpa punctigera* infestations, extending well beyond its normal geographic boundaries and duration. On the other hand, the conditions were less favourable for the spread of a major problem for the cotton industry: the fungal disease, Fusarium wilt (*Fusarium oxysporum* f.sp. *vasinfectum*).

Insect pests

The cotton industry has experienced the impact of an invasive pest, the Silverleaf Whitefly, thought to have been introduced to Australia some eleven years ago. Research into Silverleaf Whitefly in collaboration with the Grains Research and Development Corporation and Horticulture Australia Ltd has been very successful. CRDC investments in Central Queensland cotton growing areas in 2003–04 allowed Silverleaf Whitefly populations to be well-managed compared to the major outbreak season of 2001–02. This was achieved through a combination of area-wide monitoring and management, the introduction of pest-specific insecticides, careful monitoring and management of resistance to insecticides and the development of good extension information and cross-industry communication

In other cotton growing areas, Silverleaf Whitefly populations are being carefully monitored as part of a research program. Some increase in populations was noted in the 2003–04 season in southern Queensland and northern New South Wales, highlighting the need for the corporation to continue investing funds in monitoring this pest.

The presence of Silverleaf Whitefly overseas has been associated with the increased prevalence of various viral diseases. CRDC proposes to explore with Horticulture Australia the need to further examine and monitor potential risks; particularly for the Gemini virus, which could enter northern Australia and potentially have a serious impact on cotton and horticulture crops.

Diseases

The cotton industry has not yet faced threats from imported diseases; however, Fusarium wilt is an example of a disease that has evolved within Australia and is now one of the major threats to the industry. Collaborative research with the CRC for Tropical Plant Protection in 2003–04 has developed a molecular diagnostic tool to detect the pathogenic strains of Fusarium wilt affecting cotton. This tool appears to be highly sensitive and offers great potential for use in monitoring the disease in the future. New research in 2004–05 will seek to validate this diagnostic tool for research and industry use.

Developing a biosecurity plan

CRDC continues to collect a levy for the industry's contribution to Plant Health Australia. Development of a biosecurity plan for cotton, involving the Australian Cotton Growers' Research Association, CRDC cotton researchers and Plant Health Australia commenced in May 2004, with completion expected in 2005.

RURAL:
IMPROVING COMPETITIVENESS THROUGH A WHOLE OF INDUSTRY APPROACH, *AND* IMPROVED TRADE AND MARKET ACCESS

CRDC program and strategies addressing these priorities

Program 5: Strategy 4
Program 6: Strategies 1 and 5

CRDC Strategic Plan Objectives	Progress towards Measures of Success?
Improved cotton fibre quality that meets market and spinner needs	✓ Evidence that new cotton varieties are increasing yields and potential returns to the industry
Improved yield (through improved management and breeding of higher yielding, disease, insect and herbicide tolerant cotton varieties)	✓ Evidence that Australian cotton varieties are meeting the needs of our major textile and oilseed markets ✓ Market reports on the demand for Australian cotton lint and seed
Increased profitability with better whole farm management and innovative precision agricultural systems	✓ Release of varieties with appropriate fibre and seed characteristics ✓ Evidence of improved practices that preserve fibre quality. Extension of the cotton BMP program to post-farm gate issues ✓ Improved ginning practice measured by ginning data ✓ Proportion of the crop objectively measured by HVI increased. Release of new fibre measurement technology ✓ Number of unsold stocks accumulated and increased relative premium of Australian cotton, compared to competitors. Demonstration of value-added developments in Australia

Overview

CRDC is fortunate to serve an industry that has a closely integrated structure, with all organisations represented on the Australian Cotton Industry Council. This structure facilitates whole-of-industry action and the benefits were particularly evident in 2003–04, with an industry-wide commitment to marketing the best possible product.

Improving fibre quality

CRDC developed a major Field to Fabric Initiative in 2003–04 to improve Australian cotton quality. The first component commenced in the 2003–04 season, with five pilot field trial sites, each concentrating on two or three elite CSIRO Bollgard® II cultivars and trialling fibre quality-related 'best bet' agronomic practices. The corporation will be seeking to move the program to an international commercial level.

Following extensive consultation with cotton growers and post-farm gate sectors of the cotton industry, CRDC and the Australian Cotton Industry Council (ACIC) were successful in obtaining a significant Australian Government *Pathways to Industry EMS* grant in April 2004. This will help to extend the BMP program through the whole production chain to ensure optimum fibre quality and to explore the potential to exploit those environmental management credentials for 'clean and green' niche marketing. This work comprises the second component of the Field to Fabric Initiative.

CRDC investment in plant breeding to improve fibre quality is also helping to ensure Australian cotton is preferred in the marketplace and that it avoids quality discounts and attracts premiums. Fourteen new CSIRO cotton varieties were launched in May 2004, in time for the 2004 planting season. Encompassing Bollgard® II, Bollgard Roundup Ready®, Roundup Ready® and conventionally bred varieties, they contain many new features, including improved fibre quality, disease resistance, growth habit, maturity and regional adaptability. CRDC receives 20 per cent of the royalties from sale of CSIRO-bred varieties which, in turn, funds further research and development and contributed over eight per cent of the corporation's research and development funds in 2003–04.

CRDC's Farming Systems program will also play its part in delivering high quality fibre, with a new project to optimise agronomic management for improved yield and fibre quality. CRDC continues to invest in research to improve ginning equipment to reduce mechanical damage to fibre during the ginning process; again ensuring fibre quality is maintained throughout processing.

RURAL:
CREATING AN INNOVATIVE CULTURE

CRDC program and strategies addressing this priority

Program 1: Strategies 1 to 5; 7

CRDC Strategic Plan Objectives	Progress towards Measures of Success?
Improving 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.	✓ Evaluation of outcomes of activities conducted by the extension team ✓ Evidence of improved skills and qualifications of researchers, extension and technical personnel, administrators, consultants and growers ✓ Women in key industry roles
Adoption of research outcomes leading to improved and more sustainable management practices	✓ Evidence that the use of decision support systems is leading to the adoption of research outcomes and improved practices ✓ Evidence that the use of information packages and tools is leading to the adoption of research outcomes and improved practices ✓ Implementation of outcomes in partnership with a variety of research and development providers

Overview

The cotton industry has a record of innovation and rapid adoption of research outcomes that is unparalleled in Australian agriculture. Australian cotton farmers act cooperatively, sharing information and technological improvements. This is facilitated by the National Cotton Extension Network, which receives major funding and organisational support from the corporation and enters 2004–05 in a position of strength following a restructure of its coordination and activities in 2003–04.

As part of its program of continuous improvement, CRDC will conduct a major review of extension and education programs in 2004–05, in conjunction with the Australian Cotton CRC. The review will focus on ensuring innovative research outcomes are delivered in an equally innovative manner.

Fostering today's and tomorrow's researchers

While CRDC was funding a total of 23 post-graduate scholarships as at 30 June 2004, only one of these projects was commenced

in 2003–04 due to drought-related reductions in CRDC income. Despite this unwelcome constraint, CRDC seeks to foster these students to ensure a reservoir of scientists with advanced knowledge and skills and paid for a contingent of 18 of them, from six universities in four states, to visit the Namoi Valley on a familisarisation tour of the cotton industry, providing them not only with an overview of the cotton industry and where their research fits but also training in plain English speaking and writing so they are able to convey the relevance and benefit of their research projects to the cotton industry.

The 2003–04 year fell between major industry research conferences (the Australian Cotton Research Conference is held biennially and the World Cotton Research Conference was held in Capetown, South Africa, in March 2003) and this, coupled with the drought, saw a reduced number of scientist travel and exchange requests funded as well as conferences supported. Eight researchers received travel grants from CRDC in 2003–04.

CRDC continued to fund the Women in Cotton Network, Wincott, in 2003–04 and expects to continue support at a reduced level in 2004–05 as the organisation becomes self-supporting through wider membership. The network caters for all levels of knowledge and confidence, from women who wish to increase their knowledge of cotton growing and the cotton industry through to women who may wish to undertake a broader role within the industry or in the wider agricultural sector. Wincott held a number of workshops and field days in 2003–04, as well as a skills development course. In addition to funding, the corporation provides logistical support and advice for Wincott activities.

Extending research outcomes through decision support tools

The 2003–04 year saw a major decision support emphasis on water use. The release of an innovate software package, HydroLOGIC, enables cotton farmers to fine-tune water use, time their next irrigation and forecast final yield potential. 2004–05 will see an increased emphasis on training growers and cotton consultants in the optimal use of this new tool.

CRDC co-funded with the Australian Cotton CRC and coordinated development during 2003–04 of WATERpak, a resource package on irrigation management in cotton with a major focus on further improvements in water use efficiency. WATERpak brings together the very latest research and extension knowledge. A draft version was distributed in May 2004 to key cotton farmers, consultants and other industry personnel for user feedback. It was then fine-tuned and released in August 2004 in both CD Rom and hard copy versions. The 2004–05 year should see release of a ‘glove box guide’ version so WATERpak can be used in the field, again aiding the industry to implement best practice water use methods.

The Australian Cotton CRC released a new, fully searchable edition of its integrated CD Rom containing a number of decision support tools developed with CRDC funding support.

A decision support business plan, begun in 2003–04, should lead to further opportunities to develop innovative tools using improved wireless and mobile internet access technologies. This will exploit the high level of use of such technologies that exists in the cotton industry.

FINANCIAL ANALYSIS

REVENUE

CRDC's revenue is drawn from two main sources.

Cotton farmers pay a levy of $2.25 for each 227kg bale of cotton. This is matched by the Australian Government up to a maximum value of 0.5 per cent of the gross value of production, or up to 50 per cent of expenditure, whichever is the lesser.

The reduced crop sizes from the 2003 and 2004 harvests have meant lower levies and thus lower matching government contributions; however, the 2002–03 crop size of 1.7 million bales – some 200,000 bales above expectations – provided a welcome increase in levy revenue from this crop. Combined with the estimated 55 per cent of 2003–04 crop levies received before 30 June 2004, this provided CRDC with levy revenue in line with expectations. The *Primary Industries and Energy Research and Development Act* trigger limiting government contributions to 0.5 per cent of gross value of production was activated in the 2003–04 year, capping contributions at $4.765 million.

CRDC also receives royalties on the domestic and international sale of planting seed and technology access fees for varieties developed through the CSIRO cotton breeding program. The anticipated increase in Bollgard® II and Roundup Ready® planting will continue to generate higher royalty returns for CRDC. Royalties of over $0.82 million in the 2003–04 year represented more than eight per cent of total revenue, compared with four per cent for 2002–03. We can expect up to seventy per cent of the Australian cotton crop to be genetically modified in the coming season because of the good performance of Bollgard II varieties, with two genes of resistance to *Helicoverpa* spp. in trials this year and the continuing advantages of the Roundup Ready technology. This should see an increase in royalty income, tempered only by the uncertain outlook for the season.

CRDC's fourth source of income is interest on invested reserves. It has been CRDC policy to carry working reserves equal to approximately 70 per cent of annual expenditure. These reserves are used to supplement the corporation's income where necessary. Due to the continuing impact of the drought on corporation income, reserves were drawn on in the financial year and will be drawn on again in the 2004–05 year in order to maintain the critical mass of the research effort. In 2003–04 income from interest was $0.82 million. This was also eight per cent of total revenue, up from five per cent in the previous year.

In summary, the combined contribution of industry levies and Australian Government contributions fell from 89 per cent of total revenue in 2002–03 to 74 per cent in 2003–04, making other sources of revenue more significant. The other distinctive feature is a rise in refunds from research projects from two per cent in 2002–03 to seven per cent in 2003–04; however, this figure is an aberration caused by a number of factors such as a planned major project that did not proceed and does not represent a trend.

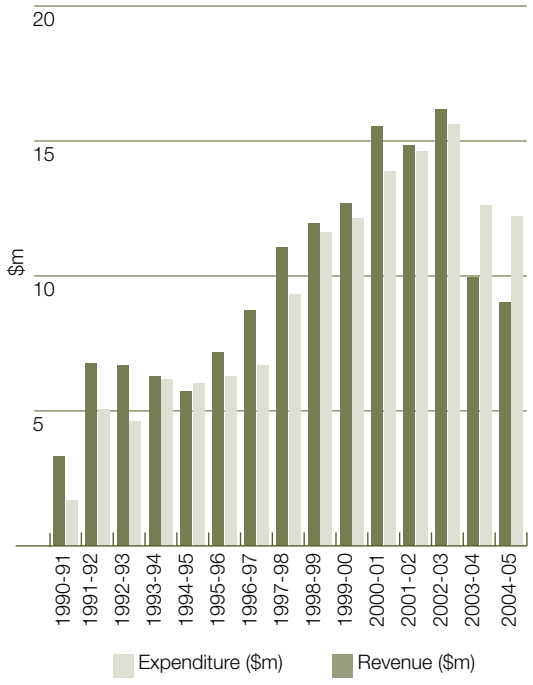
Financial position

Financial assets fell from $16 million at 30 June 2003 to $13.45 million at 30 June 2004: a 16 per cent drop that reflects the drought-related fall in income and the need to draw down on cash reserves to fund the deficit for the year.

The coming year

Prospects for the 2005 harvest remain uncertain. There has been little rain in the lead-up to planting and cotton prices are depressed. In particular, this combination of factors will almost certainly affect the level of dryland cotton planting as dryland growers weigh up their options and choose other crops. Should seasonal conditions and prices improve, it is possible that production may reach earlier expectations of 2.5 million bales, although this is now looking optimistic. For reasons of financial prudence, CRDC is using a two million bale forecast as the basis of its planning.

FIGURE ■ Revenue & Expenditure 1991-2005



2004-05 shows budgeted revenue and expenditure

FIGURE ■ Revenue by source 2003-04

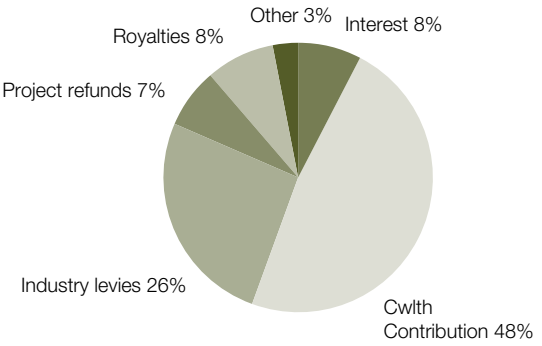
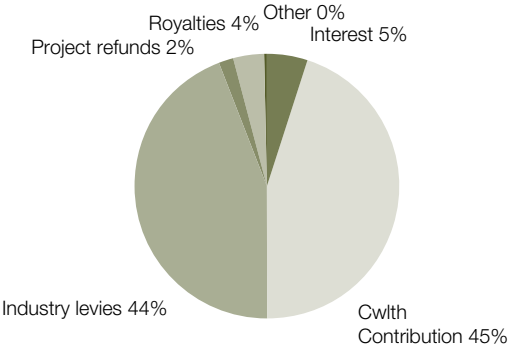


FIGURE ■ Revenue by source 2002-2003



Expenditure

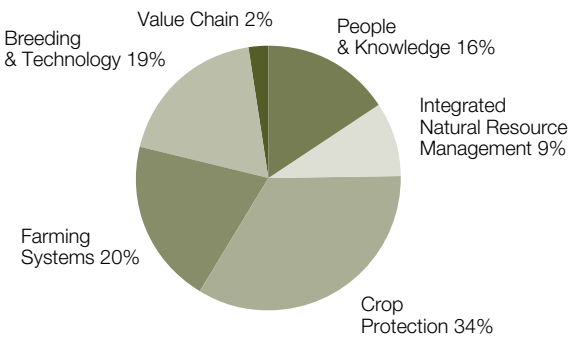
Total 2003–04 expenditure of $12.6 million was $3m below the 2002–03 figure of $15.6m, demonstrating the need for CRDC's balancing act in maintaining key research and researchers whilst remaining financially responsible in the face of reduced revenue.

Section one of the following Report of Operations demonstrates that CRDC was able to make good progress towards its new Strategic Plan Outputs operating within these financial constraints. This is the first year of reporting on the newly structured plan that reduced eleven programs to six.

Research Expenditure by Program 2003-04

1. People and Knowledge	2. Integrated Natural Resource Management	3. Crop Protection	4. Farming Systems	5. Plant Breeding and Biotechnology	6. Value Chain
$1,676,184	$972,226	$3,626,852	$2,152,562	$2,008,873	$258,284

FIGURE ■ Research Expenditure by Program 2003-04



TRIPLE BOTTOM LINE OUTCOME AND OUTPUTS

Cotton Research and Development Corporation

Outcome

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

Total Budgeted Revenue:	$8,331,000
Total Actual Revenue:	$9,935,221
Total Budgeted Cost of Outputs:	$12,819,111
Total Actual Cost of Outputs:	$12,617,714

Output 1: Economic

Profitability and international competitiveness

Budgeted Cost:	$5,307,351
Total Actual Cost:	$5,249,679

Output 2: Environmental

Sustainable production systems and catchments

Budgeted Cost:	$4,682,125
Total Actual Cost:	$4,604,916

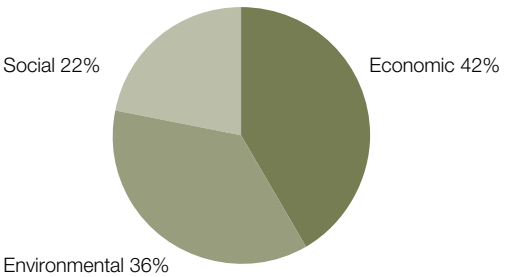
Output 1: Economic

Profitability and international competitiveness

Budgeted Cost:	$5,307,351
Total Actual Cost:	$5,249,679

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 contribute to one or more of the three Outputs. Total research expenditure for each Output is then calculated, with the remaining expenditure attributed to the Outputs on a pro-rata basis.

FIGURE ■ Expenditure by Output 2003-04



REPORT OF OPERATIONS

SECTION ONE: RESEARCH, DEVELOPMENT AND EXTENSION

PROGRAM ONE: PEOPLE AND KNOWLEDGE

Number of projects in Program One: 37
Program expenditure: $1,676,184

Objective

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.

Overview

Despite only some 1200 cotton growers in Australia, cotton has become Australia's fourth largest agricultural export (in years not affected by drought), A continually improving culture of innovation and increased skill levels in scientists, advisers and growers has been a vital factor in this success.

This program remains a high priority for CRDC; however, the reduction in corporation income brought about by drought forced proportional funding cuts to this program in 2003–04 and meant fewer researcher travel grants or exchanges, fewer new post-graduate scholarships, two trainee Industry Development Officer positions left vacant and, for the first time, no new funding for a position in the Australian Rural Leadership Program.

A scoping study commissioned by CRDC will provide a sound basis for extending work in 2004–05 to establish improved socio-economic indicators for measuring the impact of research and cotton production in regional centres.

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

The unique National Cotton Extension Network plays a large role in the early adoption of research outcomes.

The Australian cotton industry receives a distinct international competitive advantage from early adoption of research outcomes. CRDC, along with the Australian Cotton Cooperative Research Centre (Cotton CRC), plays a major role in funding and coordinating a National Cotton Extension Network. The Cotton CRC manages the network, with CRDC senior program staff actively involved through the CRC management committee and the extension network coordinating group. Of the nine regionally-based Industry Development Officers in the network, CRDC funds 7.3 full time equivalent positions.

Two specialist positions with national cotton extension roles – the Integrated Pest Management Training Coordinator and Cotton Extension and Evaluation Specialist – are funded by CRDC through the Cotton CRC.

Other positions such as irrigation and water use efficiency officers are provided by CRC partners such as the Queensland Department of Primary Industries and Fisheries and the New South Wales Department of Primary Industries.

As part of a program of continuous improvement, a review and reformulation of network coordination in 2003 strengthened the focus team structure to enable better extension of research outcomes on a discipline basis. Focus teams now concentrate on key areas related to sustainable cotton production: farming systems, weeds and diseases, insect management, the environment and water.

The role of the National Coordinator is now focused on ensuring network members are fully supported in gaining new skills in extension methodology and the evaluation of cotton research and extension. The siting of network members in regional communities where they deal on a daily basis with the interaction between local communities and the cotton industry is an added strength. Information gathered and evaluated by the network will have the added benefit of assisting CRDC to measure its own performance. With CRDC moving to triple bottom line reporting, the extension network will play an increasing role in the identification and measurement of local socio-economic factors related to cotton production.

The Five Year Review of the Cotton CRC was conducted in mid-2004; CRDC is a core partner in the CRC, funds over five million dollars of CRC research and works closely with the CRC on a daily basis. The review found the National Cotton Extension Network to be:

"most impressive, quite unique and must be applauded. The value of this knowledge gateway to and from the industry makes it possible to capture the fruits of the CRC and couple it with the progressive and innovative nature of the industry. One example of the ability of this program to respond to immediate needs of the cotton industry was the control of the whitefly outbreak in 2001."

"The primary strength of this [CRDC and Cotton CRC-funded extension] program that results in significant success is that the program is well managed and adequately resourced to deliver high quality information to the public through one gateway using a multi-media approach."

Five Year Review of the Australian Cotton Cooperative Research Centre

CRDC and the Cotton CRC will undertake a major review of extension, education and training in early 2005 to develop more integrated programs that take into account the many changes affecting cotton growing such as:

- The rapid adoption of insect resistant and herbicide-tolerant transgenic crops
- The development of natural resource management through regional Catchment Management Authorities
- The impact of water reform on irrigators
- The industry's development and increasing adoption of its environmental management system, Best Management Practices
- Rapid changes in, and improved access to, information technology
- The need to ensure continual improvement in benefit:cost efficiency in production and the management of natural resources
- Increased scope for collaborative programs with other rural research and development corporations and CRCs.

The direction and scope of the review will be determined by the outcome of the current application for a CRC for Cotton Catchment Communities.

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

While CRDC funded a total of 23 post-graduate scholarships in 2003–04 for students undertaking scientific research relating either to cotton or to broader environmental issues, only one of these projects commenced in that year, due to drought-related reductions in CRDC income. Despite this unwelcome constraint, CRDC seeks to foster these students to ensure a reservoir of scientists with advanced knowledge and skills and hosted a contingent of 18, from six universities in four states, to visit the Namoi Valley on a familiarisation tour of the cotton industry. Their visit providing them with an overview of the cotton industry and where their research fits, as well as training in plain English speaking and writing so they are able to convey the relevance and benefit of their research projects.

Looking to future participation in the cotton industry, CRDC once again contributed to a Rotary-sponsored visit by north west New South Wales school students. During their visit they learned of the many careers associated with the industry, ranging from research through to supporting businesses servicing and selling to cotton farmers.

"Finally I know where my research really fits in. Problems seem more real when told in person rather than in a journal."

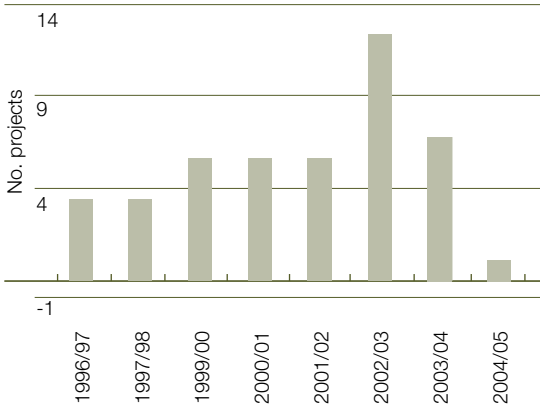
"I thought I already knew a fair bit about the cotton industry but realised how little I knew. It was excellent to get all angles from growers, researchers, Cotton Seed Distributors Ltd, textiles etc."

CRDC post-graduate students on the CRDC industry familiarisation visit

Cotton growers complete a CRDC – sponsored Integrated Pest Management Course.

Cotton CRC CEO, Guy Roth, with visting post graduate students.

FIGURE ■ CRDC funded Post-graduate projects commenced 1996 to 2004



North West NSW school students learnt of career opportunities in the cotton industry.

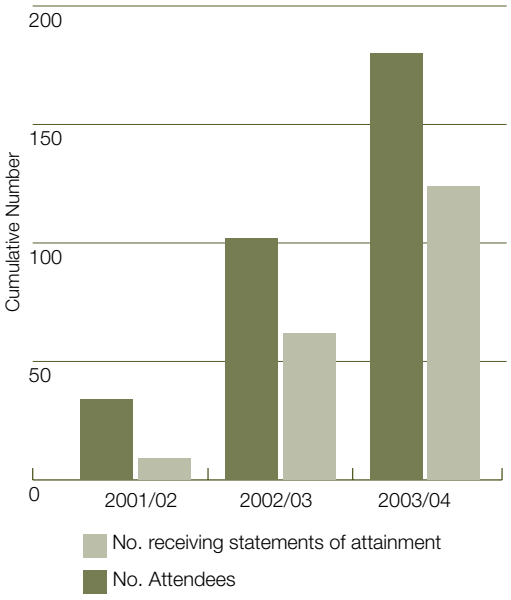
Strategy: A continually improving culture of innovation and increased skill level in scientists, advisers and growers

The 2003–04 year fell between major industry conferences: the Australian Cotton Conference is held biennially, with a conference falling in August 2004, and the World Cotton Research Conference is held four-yearly with the last held in March 2003. This, coupled with the drought, saw a reduced number of scientist travel and exchange projects, with a total of eight researchers receiving travel grants.

The corporation seized the opportunity of the review of its Plant Breeding and Biotechnology Program by arranging for the international experts, Dr Robert Wright, Dr Lloyd May and Mr Rob Jarvis, who conducted the review, also to give seminars for CRDC-funded researchers in Canberra, Adelaide and Narrabri.

A CRDC-funded Integrated Pest Management Short Course achieved improved grower adoption of Integrated Pest Management principles and practices, with 78 participants in courses run at Emerald, St George, Dirranbandi, Goondiwindi, Narrabri, Trangie and Hillston in 2003–04. Participants have the option of assessment for a formal certificate of attainment from either Dalby or Murrumbidgee Agricultural College.

FIGURE ■ Cotton IPM Short Course – Cumulative Number of Attendees and Numbers receiving Statements of Attainment*



*Estimated for 2003-04 based on 2002-03 attainment level

Strategy: Foster the development of opportunities for women in the cotton industry

CRDC continued to fund the Women in Cotton Network, Wincott, in 2003–04 and expects to continue support at a reduced level in 2004–05 as the organisation becomes self-supporting through wider membership. The network caters for all levels of knowledge and confidence, from women who wish to increase their knowledge of cotton growing and the cotton industry through to women who may wish to undertake a broader role within the industry or in the wider agricultural sector. Wincott held a number of workshops and field days in 2003–04, as well as a skills development course. In addition to funding, CRDC provides logistical support and advice for Wincott activities.

Wincott developed a Starter Kit during 2003–04 that gives an excellent overview of the industry structure, research and production information and provides links to existing industry resources.

The kit, developed to aid women in the industry, is being used by a number of industry personnel as a resource for new growers entering the cotton industry, regardless of gender.

Women represented 11.5 per cent of participants in the Integrated Pest Management Short Course in 2003–04, down from the 14 per cent overall figure for women since the course began in 2001. It is unclear whether this level of participation is proportionate to their participation in the industry; however, the CRDC-funded organisation, Women in Cotton (Wincott), will encourage more women to participate in this course during the coming season.

Within the corporation itself, women fill nine of the twelve positions, including three of the five research program management positions. CRDC supports these staff members in upgrading their skills and developing their careers, including participation in the Wincott skills development course.

Strategies:

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

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

The 2003–04 year saw a major decision support emphasis on water use. The release of an innovate software package, HydroLOGIC, enables cotton farmers to fine-tune water use, time their next irrigation and forecast final yield potential. 2004–05 will see an increased emphasis on training growers and cotton consultants in the optimal use of this new tool.

"As a farmer I would not commence an irrigation without first running HydroLOGIC. I regard it as the most valuable tool on the farm."

Evan Cleland – cotton farmer, Goondiwindi

CRDC co-funded and coordinated development of WATERpak, a resource package on irrigation management in cotton with a major focus on further improvements in water use efficiency. A draft version of WATERpak was distributed in May 2004 to key cotton farmers, consultants and other industry personnel for user feedback. It was released in August 2004 in both CD Rom and hard copy versions. The 2004–05 year should also see the release of a WATERpak 'glove box guide' for use in the field.

Deputy Prime Minister, the Hon. John Anderson MP, launched WATERpak on the banks of the Namoi River at Narrabri.

The Cotton CRC released a new, searchable edition of its integrated CD Rom containing a number of decision support tools developed by CRDC or with CRDC funding support. It contains SPRAYpak, ENTOpak, NUTRIpak, SOILpak, *the Australian Dryland Production Guide, Cotton Production during Drought, Integrated Disease Management Guidelines for Cotton,* WEEDpak and *Managing Riparian Lands in the Cotton Industry*.

A decision support business plan, begun in 2003–04, should lead to further opportunities to develop innovative tools using improved wireless and mobile internet access technologies. This level of technology is feasible because the vast majority of cotton farmers and consultants have a strong record of using such technologies.

"I was interested in using the WATERpak CD for preparing land and water management plans. I think that the CD will be a useful source of base information for such plans and will also assist farmers and consultants to assess water use efficiency at various scales across their farms."

Jane Rigg – cotton grower, St George

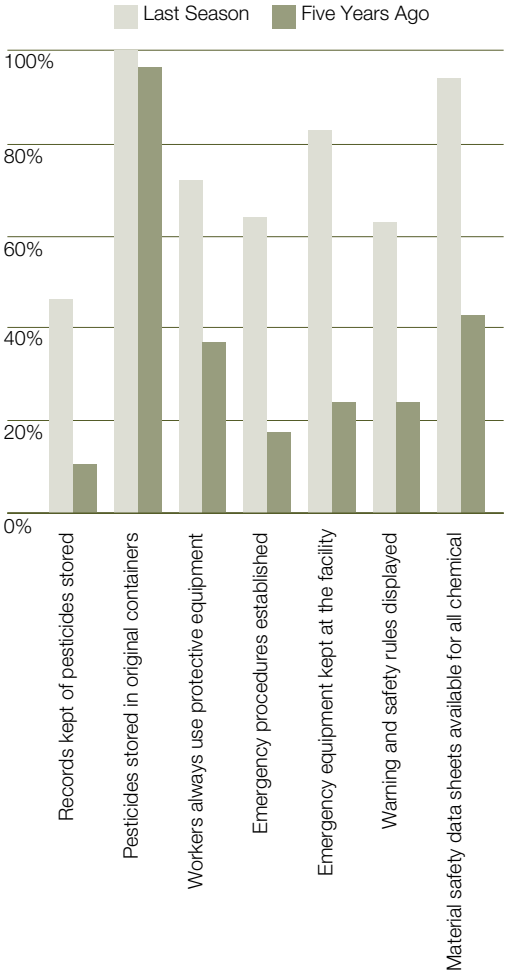
Strategy: Promote safe, healthy workplaces through the adoption of appropriate Occupational Health and Safety work practices

CRDC had no new initiatives in 2003–04 specifically addressing occupational health and safety, but continues to contribute to the joint venture Farm Health and Safety R&D program, managed by the Rural Industry Research and Development Corporation and involving most of the Rural Research and Development Corporations. In addition, the ongoing implementation of Best Management Practices on farms ensures improvements in issues such as the safe handling and storage of chemicals.

Farmsafe Australia is using the *Managing Cotton Farm Safety* manual developed by CRDC in cotton growing occupational health and safety courses in NSW and Queensland. In NSW, 406 cotton business have undertaken the course and in Queensland, 110. Participation has slowed since October 2003 when Federal-State Rural Adjustment Scheme Farmbiz funding ceased; since that time some 20 people have completed the course each month. A total of 138 cotton growers completed the Workcover Cotton Small Business Premium Discount Scheme, entitling them to a discount on their workers compensation premiums.

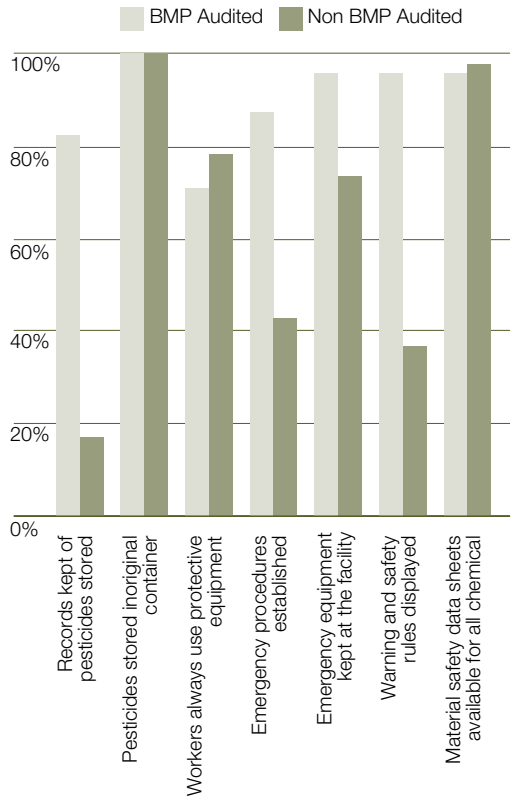
CRDC will encourage more cotton growers to undertake the Farmsafe course regardless of the removal of subsidies, as farm safety is clearly an integral part of a properly managed cotton growing business as well as important to observance of Best Management Practices.

FIGURE ■ Adoption of Safe Work Procedures over the five years to 2004



Source: Macarthur Consulting *Evaluation of the Australian Cotton Industry Best Management Practices Program,* 2004

FIGURE ■ Safe Work Procedures Adopted Last Season: BMP Audited versus Non BMP Audited Growers



Source: Macarthur Consulting *Evaluation of the Australian Cotton Industry Best Management Practices Program,* 2004

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

In 2003–04, CRDC had collaborative programs involving a range of different partners for co-investment or collaborative activities. These included, first and foremost, the Cotton CRC, through a core partnership in the CRC with a $5.2 million investment in the CRC program and joint coordination of the cotton extension network, and also:

Cotton Industry organisations:

- Cotton Australia: BMP development and evaluation;
- Australian Cotton Growers' Research Association: reporting on CRDC R&D program, Cotton Conference 2004 program development; review of the CRDC Biotechnology and Breeding Program
- Cotton shippers and ginners: *Pathways to Industry EMS* program development, gin trash waste categorisation study;
- Australian Cotton Industry Council: *Pathways to Industry EMS* program development
- Cotton Consultants Association: pesticide use survey; Integrated Pest Management survey; INGARD, Bollgard II and Roundup Ready performance surveys.

Other funding bodies:

- Grains Research and Development Corporation: five joint projects or co-investments;
- Rural Industries Research and Development Corporation: Farm Health & Safety Joint Venture;
- Murray–Darling Basin Commission: Watermark ESP project involving the cotton, rice, dairy and wine industries;
- Horticulture Australia Ltd: Silverleaf whitefly annual workshop;
- Land and Water Australia: contribution to the National Program for Sustainable Irrigation;
- CRC for Australian Weed Management: weed management strategies for dryland cropping systems with cotton.

Other organisations:

- BOYCE chartered accountants: Cotton Comparative Analysis 2002 and 2003;
- Monsanto Ltd: development of extension material for the management of INGARD® and Bollgard® cotton;
- AVCARE: co-investment in *Helicoverpa* egg collections for resistance monitoring for insecticides used in cotton, grains and horticulture and for *Bacillus thuringiensis*.

Progress on Measures of Success *(CRDC Strategic Plan 2003–2008)*

Evaluation of outcomes of activities conducted by the extension team

- Five evaluations conducted by the National Cotton Extension Network:
  - Knowledge management in Cotton and Grain Irrigation
  - Industry perceptions on management issues associated with Bollgard II cotton
  - Evaluation of local industry thoughts on managing Silverleaf Whitefly IN: *Management of Silverleaf Whitefly in central Queensland* 2001–2003
  - Evaluation of a field day on Fusarium wilt management
  - Soil management extension technical training and development

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

- 78 people in 7 locations completed CRDC-funded Integrated Pest Management short course. Seven of these (11.5 per cent) were women. Total number since the course began in 2001 is 169, of whom 25 were women.

- As of September 2003, 400 cotton growers had done the Farmsafe *Managing Cotton Farm Safety* Course, using the CRDC-funded manual as course material.
- Due to drought-related income reductions for CRDC: of 23 post graduate scholarships, only one began in 2003–04; of four post doctoral positions, none began in 2003–04; however, CRDC provided skills training during a post graduate visit to the cotton industry
- CRDC-funded Wincott (Women in Cotton) organised field days and seminars.

Women in key industry roles

- Ms Christine Campbell is Chair of the Australian Cotton Industry Council (and director of Cotton Australia); Ms Bridget Jackson is Chair of CRDC and Ms Kathryn Adams a director; Mrs Joanne Grainger is a director of Cotton Australia.
- Ms Bobbie Brazil, a former director of CRDC, is now Chair of CRDC research partner, Land and Water Australia.
- Eight of the 14 National Cotton Extension Network positions funded by CRDC are held by women.
- CRDC-funded Wincott (Women in Cotton) organises leadership skills courses for women seeking a wider role in the industry or in agriculture in general.

The use of decision support systems is leading to the adoption of research outcomes and improved practices and The use of information packages and tools is leading to the adoption of research outcomes and improved practices

- The latest survey of growers and consultants was undertaken in March 2002 by CRDC and the Cotton CRC (found at http://cotton.pi.csiro.au). It demonstrated that the information resources provided by the two organisations are highly valued by industry and the majority of them are utilised. Approximately 90 per cent of respondents indicated that they have and utilise these resources; however, it found that there is scope to increase the awareness and use of the resources across the industry. CRDC will seek to utilise the skills of the National Cotton Extension Network to encourage growers and consultants to use these tools and to train them in their use.

The OH&S performance of industry workplaces is improving

- Figures not yet available for 2003–04 but Farmsafe Australia used the *Managing Cotton Farm Safety* manual developed by CRDC in OH&S courses in NSW and Queensland for a total of 516 participants to date. Participation slowed to some 20 per month in 2003–04 after the cessation of Federal-State Rural Adjustment Scheme Farmbiz funding.
- CRDC continues to co-fund the Farm Health and Safety joint venture with other Rural Research and Development Corporations.

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

- In 2003–04 CRDC had effective partnerships with five cotton industry organisations, six other research funding bodies, and five other organisations in projects that addressed CRDC's Outputs and Outcome

PROGRAM TWO: INTEGRATED NATURAL RESOURCE MANAGEMENT

Number of projects in Program Two: 23
Program expenditure: $972,226

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.

Overview

Improving the cotton industry's environmental performance has been a major and integral objective of CRDC's research and development program in recent years. This objective is further reinforced in the CRDC *Strategic Plan 2003-2008*, with a move to triple bottom line reporting to better identify environmental, economic and social outcomes.

An independent environmental audit of the cotton industry (found at www.crdc.com.au), commissioned by CRDC and conducted in 2003, commented that:

"The Australian cotton industry has been subject to intensive environmental scrutiny, which, in part, was triggered by events such as fish kills from pesticides and, about five years ago, pesticide residues found in beef exports. There are ongoing concerns with the intensive use of pesticides and perceived high water use. As a result of these incidents and concerns, the cotton industry has developed and implemented a wide range of improvements in its operations and environmental management practices. These improvements have been implemented over the twelve years since the inaugural environmental audit in 1991; however, the most significant and far-reaching environmental improvements have been implemented over the last five years."

The report identified a strong research, extension and development program as a major factor which:

"…resulted in identification of environmental issues and introduction of improved management practices in pesticide use, pest management, water use, vegetation and land management, waste recycling and disposal, wildlife management and biodiversity."

The audit made a number of recommendations for further improvements, particularly in the areas of water management, pest management and pesticide use, waste management and Occupational Health & Safety. CRDC is coordinating an industry-wide action plan, which addresses all the audit's recommendations and will be released in late 2004.

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

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

The cotton industry's environmental management system, Best Management Practices (BMP), was the first such industry-wide program introduced in an Australian agricultural industry. The corporation has been the major contributor to, and financial supporter of, its development: particularly the BMP manual and auditing system.

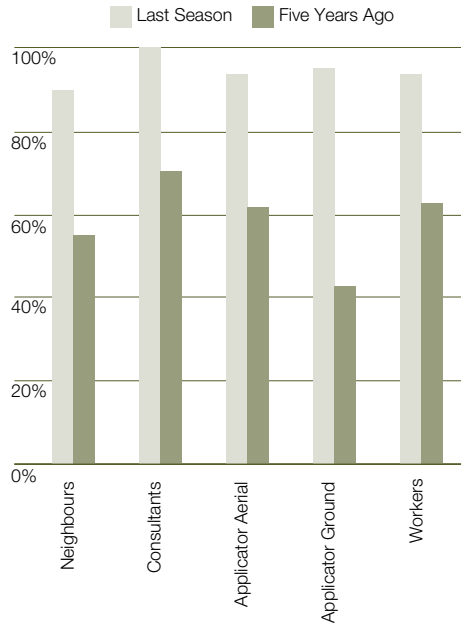
BMP was reviewed in early 2004, as part of an Australian Government National Heritage Trust project, jointly administered by CRDC and Cotton Australia.

The findings of the evaluation of the BMP program supported those of the Second Environmental Audit of the Cotton Industry by GHD Pty Ltd in finding significant improvement in management practices had occurred across all components covered by the BMP manual and associated audit process over the past five years. A number of these improvements are demonstrated in the accompanying graphs from the evaluation.

"BMP, directly and/or indirectly, has allowed cotton growers to feel proud of their profession. Cotton growers too are being recognised by outsiders as being environmentally and socially responsible."

Evaluation of the Australian Cotton Industry Best Management Practices Program Macarthur Agribusiness, 2004

FIGURE ■ Pre-season Communication



Source: Macarthur Consulting *Evaluation of the Australian Cotton Industry Best Management Practices Program,* 2004

FIGURE Monitoring of Weather Conditions during Pesticide Applications

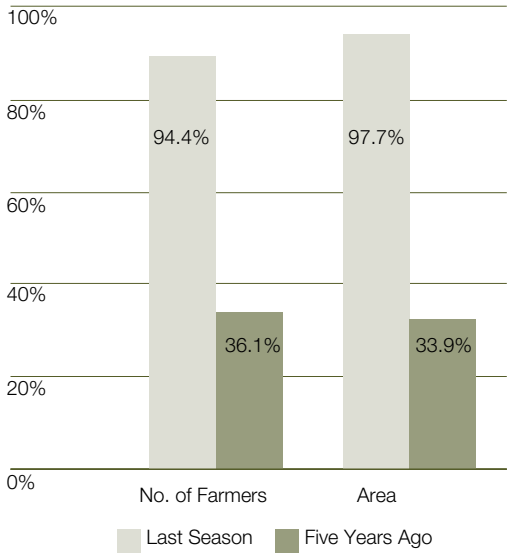


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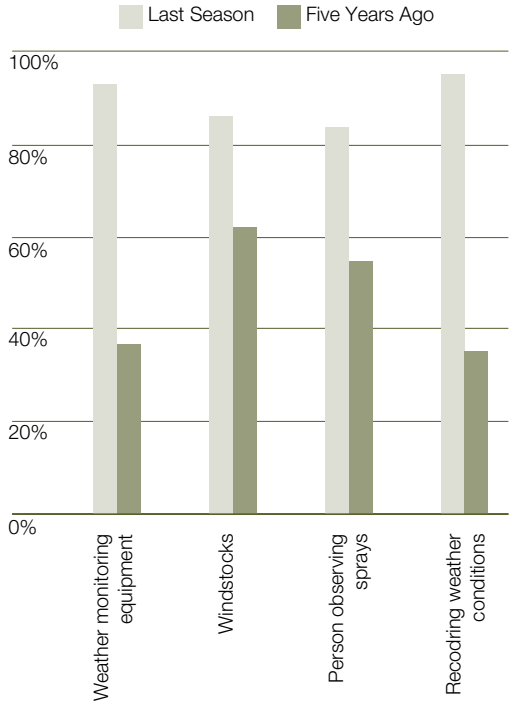
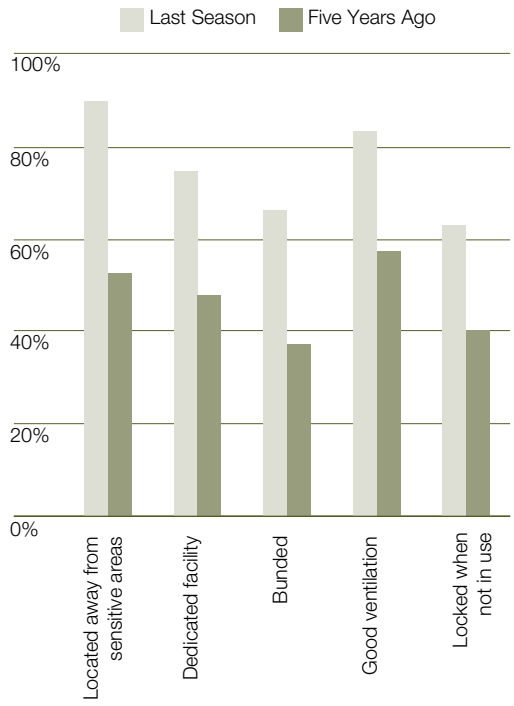
FIGURE Monitoring of Weather Conditions during Pesticide Applications



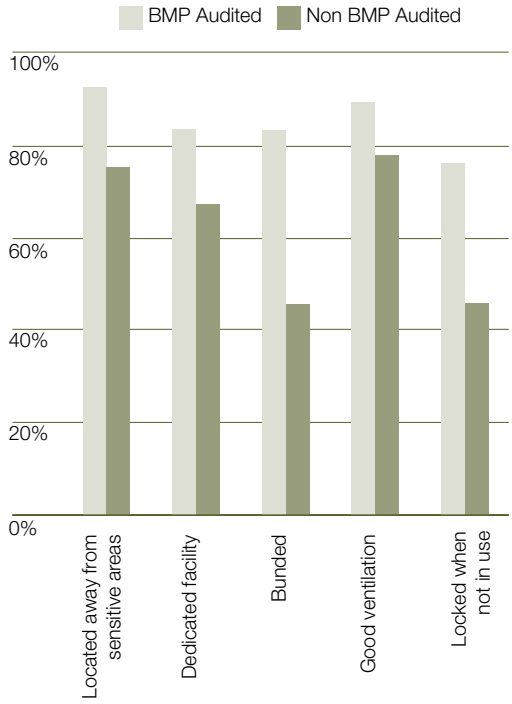
Source: Macarthur Consulting *Evaluation of the Australian Cotton Industry Best Management Practices Program,* 2004

FIGURE ■ Improvements in Pesticide Storage Facility – all growers



Source: Macarthur Consulting *Evaluation of the Australian Cotton Industry Best Management Practices Program,* 2004

FIGURE ■ Features of Pesticide Storage Facility in the 2003-04 Season – BMP Audited versus Non BMP Audited Growers



Source: Macarthur Consulting *Evaluation of the Australian Cotton Industry Best Management Practices Program,* 2004

Implementing an environmental management system does not, of itself, guarantee improvement in environmental performance. Recognising that it is vital to measure natural resource management outcomes at both farm and catchment scale, associated with an environmental management system, CRDC is co-investing in the "Watermark Project" with the Murray–Darling Basin Commission to help evaluate how desired natural resource outcomes can best be achieved through adoption of environmental management systems.

In the first half of 2004, management of the audit system passed from CRDC to cotton's peak grower body, Cotton Australia, with CRDC

continuing to fund and oversee development of further components of the BMP program. Uptake of the program, as measured by audited cotton farms, slowed during the reporting period. Although the drought placed considerable pressure on growers in 2003–04, the evaluation of the BMP program identified a number of other contributing factors and made several recommendations to improve uptake. All of the recommendations have been acted upon by CRDC and Cotton Australia.

The reporting year saw some significant developments for BMP. A new Land and Water module was trialled in three cotton growing valleys in the 2003–04 growing season and will be released to the entire industry during 2004–05. The trial implementation was achieved by an effective partnership between Cotton Australia, CRDC and members of the National Cotton Extension Network.

Funding under the Australian Government *EMS Pilot Project* has allowed a more rapid broadening of the scope of BMP on-farm through the Land and Water module. The extension of BMP principles throughout the entire production chain, with support from the *Pathways to Industry EMS* program has the potential to open up exciting new marketing possibilities for Australian cotton and is reported more fully in Program 6: Value Chain.

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

One of the breakdown products from nitrogen fertilisers, nitrous oxide, is believed to be the main contributor to greenhouse gas emissions from irrigated agriculture but little is understood about its production under Australian conditions. CRDC, in collaboration with the CRC for Greenhouse Accounting, the Australian Greenhouse Office and the Cotton CRC, commissioned a research project in 2003 to derive more reliable estimates of nitrous oxide from nitrogen fertiliser applied to typical cotton soils (cracking grey alkaline soils).

The initiation of the project coincided with an opportunity to gain access to some state-of-the-art gas sampling equipment from the Institute for Meteorology and Climate Research in Germany. The Australian Greenhouse Office contributed to the cost of bringing this equipment back to Australia for the 2003–04 season. This allowed continuous automated real time analysis of greenhouse emissions (carbon dioxide, methane and nitrous oxide) from irrigated cotton growing systems, the first time such detailed analysis of cotton production and greenhouse gas has been attempted anywhere in the world. This equipment is not available for the 2004–05 season but further investment from CRDC and the Australian Greenhouse Office will allow the construction of a duplicate set of measuring equipment for use in Australia.

Strategy: 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

Professor Hugh Possingham, of the Wentworth Group, launched a CRDC and Cotton CRC-commissioned review of biodiversity research in the Australian cotton industry at the Ecological Society Conference in 2003. The corporation will follow up on its recommendations with various government agencies and other rural industries and seek to incorporate other sources of research and information in deciding how to further develop its work in this area, including integrating biodiversity issues into BMP.

The cotton industry is developing a greater understanding of functional biodiversity through the adoption of integrated pest management. Conservation and utilisation of beneficial insects is a high priority with both conventional and transgenic cotton and has played a significant role in reducing the use of pesticides within the industry. The industry has made great advances in recent years in the adoption of Integrated Pest Management, made possible through CRDC investments in research and extension. These investments have supported the introduction and management of *Helicoverpa*-resistant transgenic cotton, improved knowledge of the impact of new generation insecticides on the survival of beneficial insects and improved grower adoption of Integrated Pest Management principles and practices, achieved through the CRDC-funded Integrated Pest Management Short Course.

Reduced insecticide spraying of Bollgard II crops, targeted at *Helicoverpa*, is likely to be accompanied by some changes in the timing and intensity of infestations of previously minor pests such as mirids, aphids, mites and Silverleaf Whitefly. Consequently, CRDC has increased the level of funding for management of these pests for the 2004–05 year, to ensure the continued viability of Integrated Pest Management systems in Bollgard II.

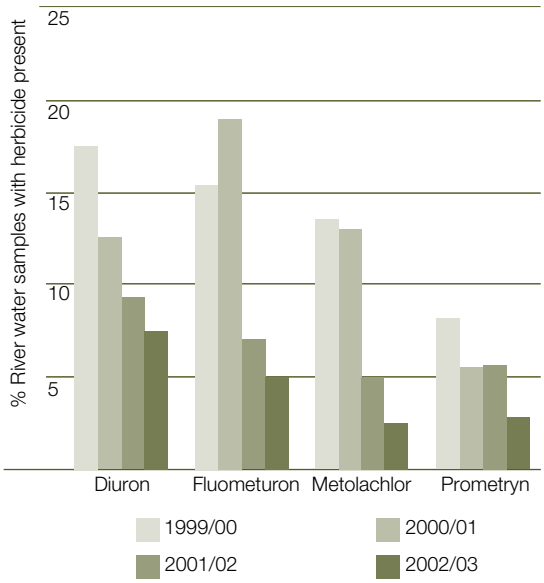
As an important part of achieving the corporation's environmental outcome, CRDC, together with Land and Water Australia, the Cotton CRC, the NSW Department of Infrastructure, Planning and Natural Resources and the Queensland Department of Natural Resources and Mines, developed *Managing Riparian Lands in the Cotton Industry*, a new guide that will assist cotton farmers to safeguard and improve the health of rivers and associated waterways on their farms. It brings together scientific findings, tools and techniques to better manage these economically and environmentally important but fragile areas and contains case studies and guidance relating to both irrigated and dryland cotton systems. The guide was released in November 2003 and has been widely disseminated through the National Cotton Extension Network. Many of its management approaches can also be applied to riparian lands where other field crops are grown, providing wider environmental benefits.

Deep drainage of water beyond the cotton root zone has possible implications for salinity, groundwater quality and water use efficiency. A number of projects in 2003–04 sought to identify and better manage deep drainage. Progress was slower than expected because of the complexity of measuring deep drainage accurately; however, CRDC is co-funding new lysimetry measuring equipment, which is being installed in time for the 2004–05 cotton season. This will complete a network of lysimeters in the northern Darling Basin, enabling more complete measurement of deep drainage under irrigated cotton systems. It will also allow the testing of less complex methods for measuring deep drainage that could be used more readily on-farm by growers.

Since 1990, the New South Wales Department of Infrastructure Planning and Natural Resources (formerly the Department of Land and Water Conservation), with funding support from irrigators in north-western NSW, 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 predominantly by cotton growers as contaminants of these rivers. The figure below shows how the percentage of water samples containing four of the most common "cotton" herbicides contaminants has declined in these rivers over the preceding four seasons. These declines in herbicide contamination correlate with the significant reductions in residual herbicide use per hectare brought about by planting of Roundup Ready® cotton since 2000-01, but particularly in 2002-03 and the drought which saw a reduction in the area of cotton planted in 2002-03.

FIGURE ■ Percentage of River Water Samples with Herbicide Detected



(Based on data from NSW Department of Infrastructure, Planning and Natural Resources)

Of even greater significance are the program's results for the insecticide, endosulfan. For many years this compound was one that caused most concern as a river pollutant because of its potential toxicity for aquatic organisms. Until the late 1990s, endosulfan was the most frequently detected pesticide in rivers in north western New South Wales and its presence was due primarily to its use in cotton. In 2002–03 no endosulfan was detected in three of the four rivers monitored. These major changes are directly correlated with changes to label requirements for cotton, the adoption of BMP and Integrated Pest Management in the cotton industry and plantings of insect-tolerant transgenic cotton.

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

The 2003–04 cotton growing season saw the general release of CSIRO Bollgard II cotton varieties, developed with CRDC funding support and containing two genes of resistance to *Helicoverpa* spp. It also marked the final year for INGARD single resistance gene varieties, which had been used for eight seasons. Not only is there a scientific and agronomic imperative to understand the consequences of biotechnology, it is quite clear that the wider community expects careful use and monitoring of such technologies. Relatively little is understood about the impacts of transgenic crops on soil biology; consequently, CRDC funded a project to identify any such impacts. While the project identified some changes in soil biological processes, it is unclear whether these changes are positive or negative and CRDC is committing further funding to these investigations in 2004–05.

Progress on Measures of Success *(CRDC Strategic Plan 2003–2008)*

Increased adoption and broader environmental coverage of the Cotton BMP program

- A Land and Water module was developed and trialled in three cotton growing valleys in the 2003–04 growing season
- Uptake of the BMP program, as measured by audited cotton farms, slowed during the reporting period. The evaluation of the BMP program identified a number of contributing factors other than drought. All of the recommendations have been acted upon by CRDC and Cotton Australia.
- CRDC handed over responsibility for the BMP auditing process to Cotton Australia to become part of the implementation program. This will provide growers with a more cost-effective and integrated system for becoming fully BMP-compliant and maintaining that status over time.
- Work began to extend BMP through the whole production chain, including the environmental impact of post-farm gate processing.

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

- A review of the BMP program in early 2004, as part of an Australian Government National Heritage Trust project jointly administered by CRDC and Cotton Australia, found significant improvement in management practices covered by the BMP manual and audit process.
- the Second Environmental Audit of the Cotton Industry by GHD Pty Ltd also found significant improvement in the industry's environmental improvement and named BMP as a principal factor.
- The "Watermark Project" with the Murray–Darling Basin Commission to help evaluate how desired natural resource outcomes can be achieved through adoption of environmental management systems.

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

- A commissioned review of biodiversity research in the Australian cotton industry was released in late 2003. CRDC will follow up on its recommendations with various government agencies and other rural industries and seek to incorporate other sources of research and information in deciding how to further develop its work in this area, including integrating biodiversity issues into BMP.
- Integrated Pest Management, made possible through CRDC investments in research and extension has supported the introduction and management of *Helicoverpa*-resistant transgenic cotton, improved knowledge of the impact of new generation insecticides on the survival of beneficial insects and improved grower adoption of Integrated Pest Management principles and practices, achieved through the CRDC-funded Integrated Pest Management Short Course.
- A new guide, *Managing Riparian Lands in the Cotton Industry*, was released and widely disseminated. It will assist cotton farmers (and other farmers) to safeguard and improve the health of rivers and associated waterways on their farms.
- Deep drainage of water beyond the cotton root zone has possible implications for salinity, groundwater quality and water use efficiency. Progress on relevant projects in 2003–04 was slower than expected because of the complexity of measuring deep drainage accurately; however, CRDC investments in 2004–05 will see research capacity in this area expand significantly.
- CRDC co-funded, or undertook collaborative research, with a number of other organisations in areas such as cotton/grains systems sustainability, achieving measurability and accountability in environmental management, sustainable irrigation and weed management strategies.

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

- Examples of papers detailing research findings that arose from CRDC-funded research and development and fed through to research priorities in the CRDC Strategic Plan 2003–2008 and, thus, 2003–04, are:

  Fitt, G.P. and Wilson L.J. 2002. Non-Target Effects of Bt-Cotton: A Case Study from Australia. In "Biotechnology of *Bacillus thuringiensis* and its Environmental Impact: Proceedings of the 4th Pacific Rim Conference", Akhurst, R.J., Beard, C.E., Hughes, P.A. (eds). CSIRO, Canberra. pp. 175–182.

  Fitt, G. P. and Wilson, L. J. (2000) Genetic engineering in IPM: Case study – Bt plants. In: Kennedy, G.G. and Sutton, T.B. 1999. Emerging Technologies in Integrated Pest Management: Concepts, Research and Implementation. APS Press, St. Paul.

  Wilson, L.J., Fitt, G.P. and Mensah, R.K. (1998) INGARD Cotton – its role in cotton IPM. Proceeding of the Sixth Australian Applied Entomological Research Conference, University of Queensland 1998, Volume 1, pp 267–276.

Benchmarked greenhouse gas emission and potential climate change impacts

- CRDC jointly funded a project to investigate and understand the production of greenhouse gases such as nitrous oxide in cotton and cotton-rotation systems and will commit more resources to this project in 2004–05.

PROGRAM THREE: CROP PROTECTION

Number of projects in Program Three: 48
Program expenditure: $3,626,562

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

Overview

The 2003–04 cotton growing season was characterised by very high *Helicoverpa punctigera* infestations, extending well beyond its normal geographic boundaries and duration. On the other hand, the conditions were less favourable for the spread of the fungal disease, Fusarium wilt.

A practical demonstration of integrated pest management as an Assasin Bug eviscerates a *Helicoverpa* larva.

Strategies: Improve integrated non-chemical and chemical management of insect and mite pests;

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

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

Reducing the use of insecticides is a key corporation strategic Output and the cotton industry has made significant progress over the past five years. The 2003–04 season saw, in summary, two successes in biotechnology and Integrated Pest Management and one continuing threat: the expanded presence of Silverleaf Whitefly.

The Australian cotton industry was the first agricultural industry in this country to move successfully to the commercial use of biotechnology. The season marked the first commercial release of CSIRO-bred Bollgard II varieties, with two *Bacillus thuringiensis* (Bt) genes for resistance to *Helicoverpa* spp. (and the last year for INGARD varieties with a single gene of resistance). Varieties with Bollgard II, INGARD or Roundup Ready varieties, or a combination of these, accounted for some 54 per cent of the total crop. In the face of heavy *Helicoverpa*

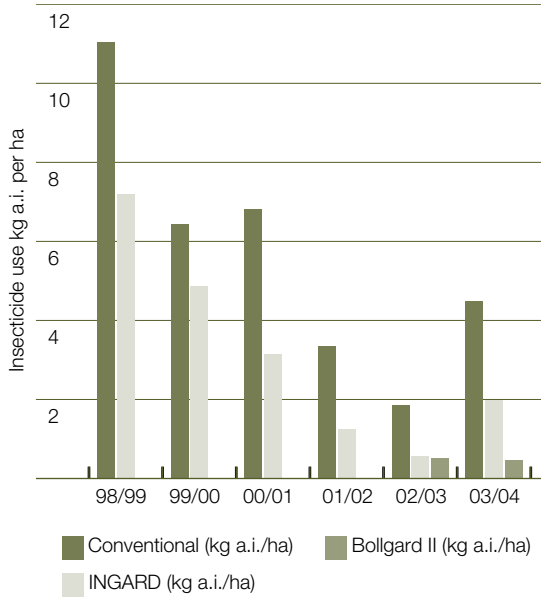
activity in its first season of commercial use, the improved efficacy of the Bollgard II technology was clearly demonstrated by a significantly reduced need for insecticides compared to INGARD and conventional cotton varieties.

The single gene INGARD technology was grown for eight seasons: several seasons longer than was initially anticipated. Consequently, CRDC made proactive resistance management of the technology a major research and extension focus and has invested considerable funds into monitoring resistance over the past decade. No detectable field resistance to the *Cry1Ac* Bt gene was found in any season, testament to the effectiveness of the conservative approach taken. This is particularly important because one of the resistance genes in Bollgard II is the existing *Cry1Ac* technology. The additional Bt gene in Bollgard II *(Cry2Ab)* theoretically delivers a more robust technology against the development of resistance in *Helicoverpa* spp., thus allowing a larger area to be planted than was possible with single gene INGARD.

Bollgard II holds the promise of building on the measurable economic and environmental benefits already delivered to the industry by Bt technology. Nevertheless, CRDC continues to invest significant funds to both monitoring for Bt resistance in the field and understanding mechanisms of any resistance genes that are identified in the laboratory.

CRDC-funded research discovered a resistance gene in *Helicoverpa armigera* to the *Cry2Ab* Bt toxin in Bollgard II varieties in the 2003–04 season. The detection of this gene in field populations of *H. armigera* was unexpected, because there has been no known previous exposure of the pest to this Bt toxin. Preliminary work suggests that this resistance gene may be at higher frequency than has been assumed from resistance management models, indicating that the management of resistance in *H. armigera* to Bollgard II requires significant additional research and must be a major focus for management in the future. CRDC has responded by directing additional funds to this issue in 2004–05.

FIGURE ■ Industry average insecticide plus miticide use on conventional, INGARD® and Bollgard® II cotton expressed in kilograms of active ingredient per hectare.

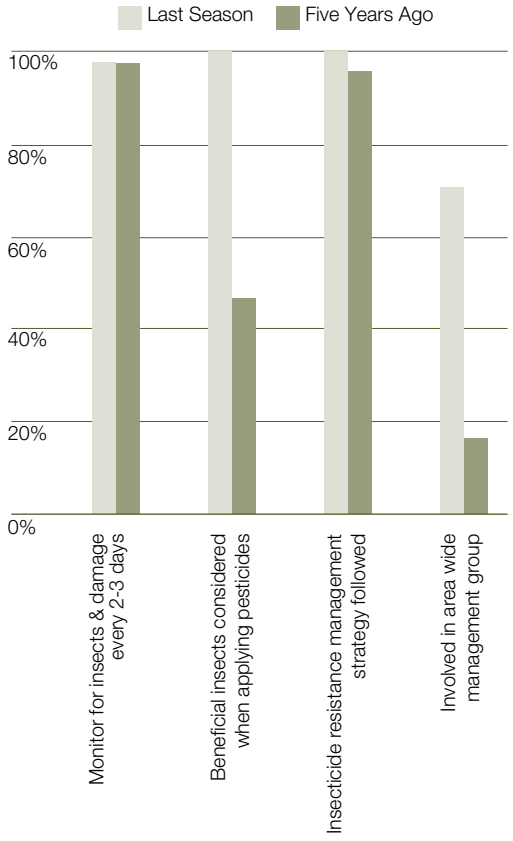


Source: Estimated from CCA Market Audit Survey 2004 data.

The industry has made great advances in recent years in the adoption of Integrated Pest Management, made possible by CRDC investments in research and extension that have supported:

- the introduction and management of INGARD and Bollgard II cotton;
- improved knowledge of the impact of new generation insecticides on the survival of beneficial insects, a key component of cotton Integrated Pest Management systems for both conventional and Bt cotton;
- improved grower adoption of Integrated Pest Management principles and practices, achieved through the CRDC-funded Integrated Pest Management Short Course.

FIGURE ■ Use of Integrated Pest Management



Source: Macarthur Consulting *Evaluation of the Australian Cotton Industry Best Management Practices Program,* 2004

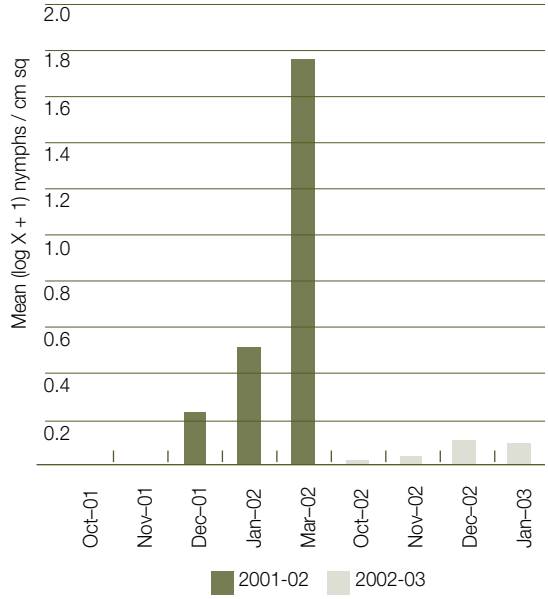
Reduced insecticide spraying of Bollgard II crops, targeted at *Helicoverpa* spp. is likely to be accompanied by some changes in the timing and intensity of infestations of previously minor pests such as mirids, aphids, mites and Silverleaf Whitefly. Consequently, CRDC has increased the level of funding for management of these pests for the 2004–05 year, to ensure the continued viability of Integrated Pest Management systems in Bollgard II.

The imported pest, Silverleaf Whitefly, remains a significant pest in Central Queensland, where it requires careful management to avoid over-use of insecticides and potential damage to cotton fibre quality and marketability. CRDC investments in Central Queensland cotton growing areas in 2003–04 allowed Silverleaf Whitefly populations to be well-managed compared to the major outbreak season of 2001-02, achieved through:

- Area-wide monitoring and management
- The introduction of pest-specific insecticides
- Careful monitoring and management of resistance to insecticides
- The development of good extension information and cross-industry communication

Silverleaf Whitefly populations are being carefully monitored in other cotton growing areas as part of a research program. Some increase in populations was noted in the 2003–04 season in southern Queensland and northern New South Wales, highlighting the need for CRDC to continue investing funds in monitoring this pest.

FIGURE ■ Silverleaf Whitefly population development for Central Highlands showing a major decline in numbers in 2002–03 as a result of improved management and communication

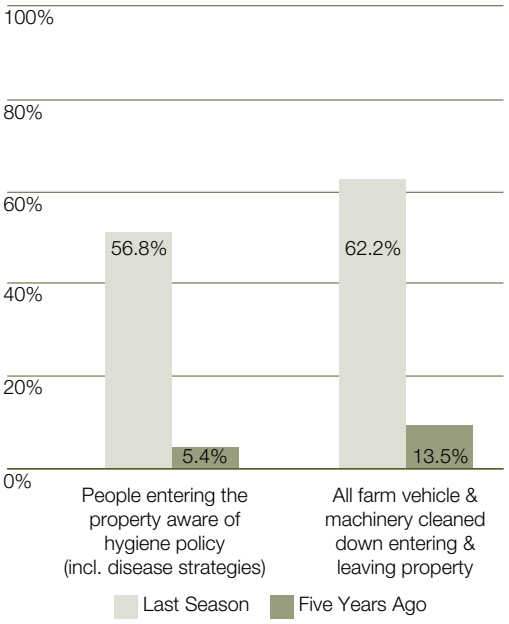


Source: 2001-02 data from Paul DeBarro CSIRO, 2002-03 data from Queensland Department of Primary Industries Entomology team, Emerald

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

Two soil-borne diseases remain particular threats in cotton: Fusarium wilt and Black Root Rot. Good progress is being made with Fusarium wilt through the breeding program, but this is a medium to long term solution. 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 ■ Changing farm hygiene practices over the five years to 2004



Source: Macarthur Consulting *Evaluation of the Australian Cotton Industry Best Management Practices Program,* 2004

Collaborative research with the CRC for Tropical Plant Protection has developed a molecular diagnostic tool to detect the pathogenic strains of Fusarium wilt affecting cotton. This tool appears to be highly sensitive and offers great potential for use in monitoring the disease in the future. New research in 2004–05 will seek to validate this diagnostic tool for research and commercial use. In addition, improvements to management within the farming system could offer opportunities to reduce the impact of the disease further and CRDC will fund new research in this area.

CRDC-funded research found that a number of the popular rotation crops used in cotton farming systems can increase the level of cotton Fusarium wilt pathogen in the soil under certain circumstances. The corporation is addressing this issue through research directed at Integrated Disease Management, combining the best available varieties with the best available agronomic knowledge.

Black Root Rot has continued to spread and is now found on most cotton farms. Although it does not have the same dramatic impact on production as does Fusarium, it predisposes the crop to increased weed and insect infestations and delayed maturity. This is a particular problem for southern areas with shorter growing seasons.

Research in 2003–04 focused on developing agronomic management strategies to avoid infection by the pathogen. Industry assessment of some of the management techniques emerging from this research is that they are unlikely to be practical, so research in 2004–05 will focus on understanding the pathogen and developing improved management options to reduce the incidence and impact of the disease. Some of this refocused research will explore potential new options, such as later planting, that are more practical with Bollgard II cotton varieties.

Strategy: Improve integrated non-chemical and chemical management of weeds

Improvements such as minimum tillage, permanent bed systems and the introduction of herbicide-tolerant Roundup Ready cotton varieties have encouraged changes in the weed spectrum that cotton farmers have to deal with. The research program in 2003–04 focused on the development of Integrated Weed Management systems to deal with:

- Problem weeds such as Flax-Leaf Fleabane and Bladder Ketmia
- Effective management of Roundup Ready cotton
- Weed management in dryland cotton farming systems

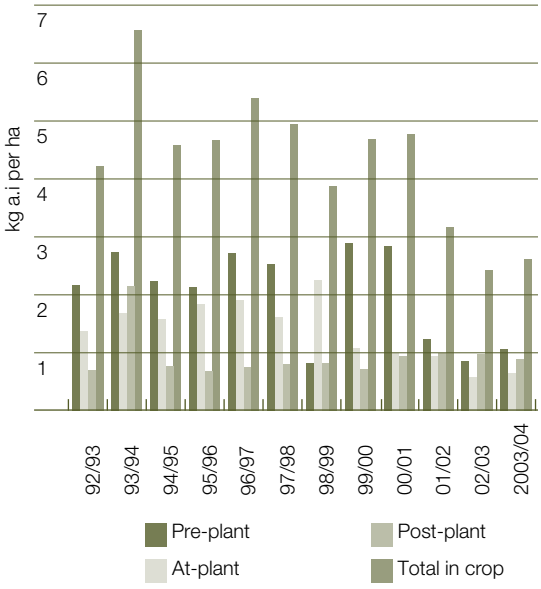
Two new research projects were funded in 2003–04 to add further components to WEEDpak and provide a more detailed understanding of the biology and ecology of key weed species. These projects are on track and should deliver their planned outputs in late 2005.

The 2003–04 season was one of the worst on record for herbicide damage to cotton and other crops and sensitive vegetation. This appears to have been, in large part, due to difficulties in controlling fallow weeds in preparation for sowing of summer dryland crops. CRDC is working with the Grains Research and Development Corporation to develop improved information that can be made available to users of these herbicides at the point-of-sale.

The figure below shows within-crop herbicide use in kilograms of active ingredient per hectare over the last five seasons. Seasonal herbicide use patterns in 1999–2000 and 2000–2001 were similar and typical of the pre-Roundup Ready era in cotton weed management.

A significant change to this pattern of herbicide use commenced in 2001–02 and has continued into 2003–04. This change coincides with the first three seasons of significant planting of Roundup Ready cotton varieties. A large reduction in the use of pre-planting (predominantly residual herbicides) has occurred as the result of the introduction of this technology. While there has been a corresponding increase in the use of the contact herbicide glyphosate associated with Roundup Ready varieties being planted, the total quantity of herbicide active ingredient used in 2003–04 was 2.61 kilograms per hectare, or 45 per cent less than in 2000–01 (the last season before it was introduced).

FIGURE ■ Herbicide use in cotton



Source: Cotton Consultants Australia Market Audit of Cotton Crop Production Products 2003–04

Conventionally bred and genetically modified Roundup Ready commercial crops became available in limited quantities in the year 2000. In the past four seasons, there has been an increase in the area of Roundup Ready cotton planted from less than five per cent of the cotton area in 2000–01 to 44 per cent in 2003–04.

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, or 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 but without relying on any one method completely (eg. using herbicides from different modes of action, strategic cultivation, hand chipping, rotation crops)
- To reduce the size of the weed seed bank
- To improve system sustainability by reducing reliance on use of prophylactic use of residual herbicides

The weed management resource WEEDpak, introduced in 2002, continued to be central to weed management extension efforts by the National Cotton Extension Network in 2003–04. WEEDpak has been compiled to be the most complete guide to the principles of IWM yet available to the cotton industry.

Progress on Measures of Success *(CRDC Strategic Plan 2003–2008)*

Evaluations on the adoption and outcomes of integrated practices, products and technologies.

Relevant evaluations conducted by the CRDC-funded National Cotton Extension Network:

- Industry perceptions on management issues associated with Bollgard II cotton
- Evaluation of local industry thoughts on managing Silverleaf Whitefly IN: *Management of Silverleaf Whitefly in central Queensland* 2001–2003
- Evaluation of a field day on Fusarium wilt management

Reduced distribution, presence and impact of diseases

Fusarium wilt and Black Root Rot remain particular threats in cotton; however:

- the CRDC-funded CSIRO breeding program is providing a medium to long term solution, with the 2004 commercial release of a new variety with high resistance to Fusarium wilt, and a Bollgard II Roundup Ready variety with Fusarium wilt and Verticillium wilt resistance.
- in the shorter term, there has been widespread adoption of improved farm hygiene practices to slow the spread of Fusarium, based on the development of a Farm Hygiene BMP module and extension activities supported by CRDC.
- a highly sensitive molecular diagnostic tool to detect the pathogenic strains of Fusarium wilt affecting cotton was developed in 2003–04.
- agronomic management strategies developed in 2003–04 received a mixed industry reception; research in 2004–05 will focus on improved management options.

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

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

Helicoverpa armigera

- No changes detected to resistance to any conventional chemicals or mixed cry toxin foliar Bt sprays. Further monitoring of these pesticides is planned for 2004–05.
- Detection of a resistance gene to the Bollgard *Cry2Ab* toxin and further evidence that more than one resistance mechanism exists in the field to the *Cry1ac* Bt toxin.

Aphids

- No major changes in resistance to existing insecticides

Mites

- Confirmation of mite resistance to some older synthetic pyrethroid and organophosphate products.

Silverleaf Whitefly

- Confirmation that this introduced pest can develop resistance rapidly to all currently available insecticides. This knowledge now underpins resistance management strategies in central Queensland.

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

- A. Swanepoel, ed. Proceedings of the World Cotton Research Conference–3: 2003.
  - B. A. Pyke. The performance of Bt transgenic (INGARD®) cotton in Australia over six seasons.
  - G.P. Fitt. Implementation and impact of transgenic Bt cottons in Australia.
  - L.J. Wilson, R.K. Mensah and G.P. Fitt. Implementing IPM in Australian cotton.
- The INGARD performance report for the 2003–04 season will be available in late 2004.
- The Australian Cotton Growers' Research Association's Transgenic and Insect Management Strategy Committee, which has several meetings a year convened by CRDC, has a Bt technical panel involving researchers working on monitoring resistance and understanding the underlying mechanisms involved in resistance. The panel reports back to TIMS, providing advice on known risk of development of resistance in *Helicoverpa* spp. to Bt crops.

PROGRAM FOUR: FARMING SYSTEMS

Number of projects in Program Four: 30
Program expenditure: $2,152,852

Objective

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

Overview

The Australian cotton industry has to cope with drought and associated water shortages on a regular basis. This has meant that Australian growers, supported by high quality research, have become among the most efficient producers of cotton per megalitre of water. The 2003–04 cotton crop was all about water or, rather, its lack. It was characterised by particularly low stored-water allocations, combined with limited rainfall leading up to planting. This resulted in the smallest area planted to cotton for 15 years, with a better than expected yield due only to rainfall during the season.

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

The season's water shortages sharpened the focus on efficient irrigation, both for growers and for CRDC's research, development and extension effort. On average, some 20 per cent of the Australian cotton area is grown using only natural rainfall; consequently, there is a wealth of expertise in dryland strategies for maximising yield in the face of limited rainfall. Increasingly, irrigated farmers are adopting these agronomic practices so as to maximise the benefit from natural rainfall as an adjunct to irrigation. Demand for CRDC's successful publication, Cotton Production in Drought, during the season was quickly met with an urgent reprint.

A Queensland Water Use Efficiency Initiative, funded by the Queensland Department of Natural Resources and Mines and coordinated through the Cotton CRC, achieved considerable success and demonstrated the potential gains through such measures. Some of the excellent outcomes (Coutts, J.R. & Bell, K. Final Report: Evaluation of the RWUEI Adoption Program, Prepared for Queensland Department of Natural Resources and Mines, 2003) were:

- 72 per cent of cotton respondents to an end-of-project survey indicated that they had changed practices as a result of the initiative;

- Estimated improvement in water use efficiency by Queensland cotton growers was 11.3 per cent (estimated by industry extension coordinators) and 12.3 per cent (estimated by grower respondents to the survey). It is interesting to note that the differences between coordinator and grower estimates were much less for the cotton industry than for other industries in the program, where growers estimated much larger gains than did the coordinators;
- The evaluators estimated that the program had directly benefited the cotton industry in Queensland by between $57 and $62 million (the BDA Group in their Benefit Cost Evaluation of the Cotton CRC estimated $64 million);
- At 2.75 jobs per 1000 megalitres, the savings in the cotton industry in Queensland would be worth 187 jobs, drought and water reform notwithstanding.

A follow-up initiative will continue in Queensland in 2004–05 and CRDC and the New South Wales Department of Primary Industries are committing funds to improve extension and training activities in water management in New South Wales. Extension activities in both New South Wales and Queensland will be coordinated through the Water Focus Team within the National Cotton Extension Network.

Each year, CRDC holds a Farming Systems Forum on a major area of agronomic importance. These forums are well attended by growers, researchers, agronomic consultants and extension personnel and serve a valuable purpose in disseminating information, as well as identifying any research gaps. The season's circumstances dictated the subject of the 2003 forum: "Improving water management on cotton farms."

The key message from the forum was the need to effectively measure and quantify irrigation practices and where losses can occur (for example, through deep drainage beyond the root zone). The consensus of the forum was that the economic advantage of changed practices can only be achieved when losses can be measured objectively, providing both an agronomic way forward and engaging the wholehearted support of growers in achieving 'more crop per drop'. The corporation is addressing this need through a range of measures such as decision support tools and improved information resources, agronomic, physiological and plant breeding research.

The development and release of CRDC-supported WATERpak is reported in Program One. It has been designed as a technical resource package for all issues linked to irrigation and water management and an important reference source for the new BMP Land and Water module.

A new software package, HydroLOGIC, developed with CRDC funding support and released in September 2003, is the result of a team effort involving scientists and software developers from the CSIRO Cotton Research Unit, working at the Cotton CRC and supported by funding from CRDC.

Cotton farmers can use HydroLOGIC to fine-tune their water use, time their next irrigation and forecast final yield potential. HydroLOGIC can predict the number of total irrigations necessary, total water use, water use efficiency and estimated yield at least two or three months prior to harvest, giving growers time to alter their irrigation strategy to maximise yield. After cotton growers have used HydroLOGIC to explore different irrigation management scenarios, they can use their own knowledge of water costs and expected cotton prices to determine the best possible irrigation management plan for the season.

HydroLOGIC employs OZCOT, a cotton crop simulation model also developed by CSIRO Plant Industry and based on research on how cotton grows and develops in response to its environment. OZCOT is updated continually to embody the latest expert knowledge gained from cotton research. Like other decision support tools that have received CRDC funding, HydroLOGIC is provided free to Australian cotton

growers and consultants by the Cotton CRC and requires only a standard personal computer.

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 overhead irrigation methods such as lateral move and central pivot systems. In the past, these systems were written off as less efficient, because earlier systems were not properly designed and could not cope with the demands of cotton production. Following a scoping study on these methods in 2002, CRDC saw the need to provide updated information. Evidence is that modern systems can be designed to produce excellent cotton crops and are very water use-efficient, aiding in one of CRDC's major goals and helping the industry to further meet community expectations on water use.

In 2003–04, a project 'Extension and Development to Support Adoption of Centre Pivot and Lateral Move Irrigation in the Australian Cotton Industry' produced a range of improved information for the industry on these systems, using a number of delivery methods such as The Australian Cottongrower magazine, WATERpak, fact sheets and case studies for extension staff and training package materials. New research on central pivot systems and lateral move systems including infiltration in different soil types and different water delivery attachments will begin in 2004–05.

CRDC is a contributing partner to the National Program for Sustainable Irrigation (NPSI). During 2003–04, the cotton extension network conducted phase one of a NPSI-funded project "Knowledge Management in Cotton and Grain Irrigation" to document where growers get their information about water and what is lacking. In 2004–05, subject to approval by NPSI, this project will move to its second phase, expanding on a range of improvements to the delivery of information and tools for improved water use efficiency, using the information gathered in 2003–04. This will be further supported by the publication of WATERpak in manual, CD Rom and 'glove box' versions, the field validation of HydroLOGIC and the appointment of a new water use efficiency officer in northern New South Wales.

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

Strengthen our understanding of soil health and improve crop nutrition management

CRDC invested $1.2 million over the nine years prior to 2003–04 on mapping salinity risks in cotton growing areas, using 7,500 data points in seven cotton-growing districts across five valleys (details can be found at www.usyd.edu.au/su/agric/Salinity/intro.htm). While this research showed manageable salinity risk in cotton growing areas, it identified those areas where problems have occurred, are occurring and may occur in the future.

The corporation will fund development of a web-based Geographic Information System that will provide a holistic knowledge resource by integrating available salinity and soils data established through previous CRDC-funded research projects.

CRDC co-funded, with Land and Water Australia, the Murray–Darling Basin Commission and the Grains Research and Development Corporation, a scoping project "Understanding Deep Drainage for Better Catchment Planning". As a consequence, CRDC began funding a project in 2003–04 to determine how much deep drainage is occurring under irrigated cotton crops. An improved capacity to measure deep drainage is necessary in order to maintain a sustainable balance between running the risk of increasing the salinity of groundwater tables and the leaching of harmful salts out of the soil profile. This research continues in 2004–05, along with associated new projects that seek to develop more simple measurement techniques.

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, both as an issue of sustainability and because cotton is a crop that is particularly sensitive to sodic soils. In 2003–04, CRDC-funded research continued its focus on long-term farming system sites which investigate and compare a range of crop rotation, irrigation, and soil tillage practices for their impact on sodicity and long-term environmental sustainability and profitability.

The cotton industry has dealt with issues of soil structure and soil chemistry using solutions provided by previous CRDC-funded research. The emphasis now has become increasingly focused on improving knowledge and management of soil biology as part of the industry's wider commitment to the continuous improvement of its environmental performance. CRDC funded a number of projects in 2003–04 focused on further understanding soil biology and improving management for healthy soils.

Research has been conducted on the use of the winter-growing legume crop, vetch, grown in rotation with cotton over the past eight years. Including vetch into the cotton cropping system provides an environmentally friendly solution to reducing use of nitrogen fertiliser while improving soil fertility and enhancing cotton yields. This has the added benefit of reducing emissions of the greenhouse gas, nitrous 'oxide' and links into current research on this subject reported in Program One.

Over the course of the research experiments, the vetch-based systems have become more nitrogen fertile, requiring less nitrogen fertiliser, and have produced greater lint yields than comparable non-legume systems. Vetch has demonstrable soil health benefits, improving soil tilth, organic matter, structure and chemical fertility. While vetch cropping generates no cash flow in itself, economic benefits accrue from the nitrogen fixed and the improved condition of the soil. 10,000 hectares of vetch was sown in rotation with cotton in 2003–04.

Strategy: Continue fundamental research on cotton agronomy, growth and plant physiology for both conventional and transgenic varieties

When this strategy was devised for the CRDC Strategic Plan 2003 – 2008, it was not yet evident that the insecticide efficacy of the newly-introduced Bollgard II Bt varieties would less sensitive to agronomic management than the INGARD varieties that had been used for eight years. Consequently, some research within the Farming Systems program on the agronomic aspects of Bt transgenic cotton wound down to a substantial degree in 2003–04; however, the introduction of Bollgard II varieties may require further fine-tuning of crop nutrition and water management, which is the subject of ongoing research.

The previous two seasons indicated that there may be a trend to higher micronaire cotton, which means lower prices in the marketplace. High micronaire is a result of warmer seasons, higher fruit loads and inherently higher micronaire in some cotton varieties that have been bred for other, regionally necessary traits. There were some perceptions in the industry that this high micronaire was a result of cotton breeding; however, cotton quality in the 2003–04 season was high and micronaire was back in the normal range, confirming that results in the previous two years had largely been due to seasonal growing conditions.

The introduction of Bollgard II varieties offers growers greater potential to change practices such as planting dates, in order to reduce the risk of the crop maturing under conditions that lead to high micronaire (coarser fibre). This has provided impetus for the inclusion of a research project in 2004–05 to study the impact of agronomic management on fibre quality.

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

CRDC has continued to support production of the joint Cotton Comparative Analysis (available at www.crdc.com.au) with Boyce Chartered Accountants, helping cotton farmers to benchmark their own operations financially and understand the drivers of profitability in cotton production. As with most agricultural industries, cotton farmers are price takers on a global market and have suffered from declining terms of trade. Despite economic contributions by the CSIRO plant breeding program and improved crop management, the gap between costs and profits continues to narrow. In the face of these circumstances, CRDC sees its contribution as funding research and development to improve profitability through:

- Integrated Pest Management;
- Water management;
- The use of crop rotations to improve management of nutrients and diseases;
- Integration of transgenic technology into the farming system;
- Benchmarking the costs of production and profitability against those of the best-performing growers.

As reported under the respective programs, significant advances were made in all these areas in 2003–04. CRDC included a range of Integrated Pest Management projects into the Farming Systems program for the first time in 2003–04, as a number of them address broader farming systems insect management challenges such as crop rotation, trap cropping (that is, small areas of sacrificial crops that are attractive to certain pests), tillage practices, crop residue retention management and weed control.

Integrated Pest Management, discussed under Program Three, improves management of pests at the farm scale to reduce reliance on pesticides but many of the research projects under the Farming Systems program seek to increase the scale at which insect management can operate

by encouraging farmers to work together and achieve area-wide management of pests.

The cotton industry has been a rapid adopter of precision agricultural technology such as satellite guidance systems for farming operations like farm layout, bed preparation, planting and spraying, remote weather stations linked to home computers, yield monitoring equipment allowing improved precision management of fields. The development of precision agriculture technology has largely been in the hands of commercial providers and excellent progress has been made in this area without the need for substantial investment of CRDC funds. However, the corporation continues to monitor this area, seeking to identify any areas of market failure where intervention would be needed.

Progress on Measures of Success *(CRDC Strategic Plan 2003-2008)*

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

- Sound progress has been achieved through both the breeding program and improvements to production management. While it is difficult to measure improvements in a single year, long-term trend suggests at least a two per cent annual increase in yield and a breeding-related improvement of 11 per cent in water use efficiency, measured as 227 kilogram bales per megalitre.
- The Queensland Rural Water Use Efficiency Program for Cotton and Grains, coordinated through the Cotton CRC, was able to demonstrate significant improvements of 11.3 per cent between 2000 and 2003 in water use efficiency on Queensland cotton farms. Encouraged by this, CRDC is seeking to provide additional support for extension activities in New South Wales aiming to achieve similar results.

Improved economic returns to farmers

- Economic analyses of IPM systems over 1999–2003 shows an improvement in profitability where IPM has been adopted. Weeds agronomists indicate that adoption of glyphosate-tolerant cotton is allowing growers to improve profitability by reducing their residual herbicide requirements.

Adoption of integrated management options for salinity and sodicity

- Major projects began in 2003–04 to determine how much deep drainage is occurring on cotton farms and achieve a balance between running the risk of increasing the salinity of groundwater tables and the leaching of harmful salts out of the soil profile.

- In 2004–05, CRDC will fund development of a web-based Geographic Information System that will provide a holistic knowledge resource by integrating available salinity and soils data established through previous CRDC-funded research projects.
- In 2003–04, CRDC-funded research continued its focus on long-term farming system sites which investigate and compare a range of crop rotation, irrigation, and soil tillage practices for their impact on sodicity and long-term environmental sustainability and profitability.

Benchmark of soil health characteristics and improved crop nutrition

- Including vetch into the cotton cropping system provides an environmentally friendly solution to reducing use of nitrogen fertiliser while improving soil fertility and enhancing cotton yields.

Data on changed farming practices, including the economic, environmental or social benefits

- In 2003–04, Macarthur Agribusiness evaluated the cotton industry's Best Management Practices program. This report can be found at www.crdc.com.au and contains data and graphs showing continuous improvement over the last five years in all areas influenced by BMP; and concluding that BMP had been a catalyst or support for more rapid adoption of many changes to farming practices and processes, such as:
  - adoption of IPM (economic benefit: improved profitability; environmental benefit: reduced pesticide use; social benefit: reduced worker exposure to chemicals, reduced complaints to the NSW EPA);
  - improved communication on pesticide application with workers, consultants, contract applicators and neighbours;
  - improvements to farm hygiene leading to reduced opportunity for diseases to spread on and between farms.
  - Improvements in environmental performance are also detailed in the Second Environmental Audit of the Cotton Industry, also found at www.crdc.com.au.

Publication of fundamental cotton research related to crop physiology and cotton growth. Transfer of this knowledge into other research and extension projects

- Examples of papers detailing research findings that arose from CRDC-funded research and development and fed through to research priorities in the CRDC Strategic Plan 2003–2008 and, thus, 2003–04, are:

  Fitt, G.P. and Wilson L.J. 2002.
  Non-Target Effects of Bt-Cotton: A Case Study from Australia.
  In "Biotechnology of *Bacillus thuringiensis* and its Environmental Impact: Proceedings of the 4th Pacific Rim Conference", Akhurst, R.J., Beard, C.E., Hughes, P.A. (eds). CSIRO, Canberra. pp. 175–182.

  Fitt, G. P. and Wilson, L. J. (2000)
  Genetic engineering in IPM: Case study – Bt plants.
  In: Kennedy, G.G. and Sutton, T.B. 1999. Emerging Technologies in Integrated Pest Management: Concepts, Research and Implementation. APS Press, St. Paul.

  Wilson, L.J., Fitt, G.P. and Mensah, R.K. (1998)
  INGARD® Cotton – its role in cotton IPM.
  Proceeding of the Sixth Australian Applied Entomological Research Conference, University of Queensland 1998, Volume 1, pp 267–276.

PROGRAM FIVE: PLANT BREEDING AND BIOTECHNOLOGY

Number of projects in Program Five: 25
Program expenditure: $2,008,873

Objective

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

Overview

The CSIRO cotton breeding program is one of the most successful of its type in the world. By several measures it is an exceptional research program:

- A return of over $5 billion since 1973, with a benefit:cost ratio of 86 and internal rate of return of 34 per cent (Centre for International Economics, Return on Investment Analysis 2002 Centre for International Economics).
- CSIRO conventionally bred and transgenic varieties comprised 80 per cent of planting in Australia in 2003–04.
- Program Leader, Dr Greg Constable, was named 'Australia's Smartest Scientist' in The Bulletin Magazine Smart 100 edition in October 2003. The advisory panel for the Science category focused on the researcher's scientific quality, originality, innovation and community benefit.

CRDC engaged three leading international scientists to undertake a major review of CRDC's Plant Breeding and Biotechnology Program in early 2004 to ascertain progress with existing research, any apparent gaps in knowledge or directions and areas where future direction could be warranted and productive.

Dr Lloyd May of the University of Georgia, Mr Rob Jarvis, Regional Director of the Cotton Company of Zimbabwe and Dr Robert Wright of Texas Tech University were joined on the panel by Australian Cotton Growers' Research Association Chairman, Mr Glenn Fresser. In reporting their findings to the CRDC Board of Directors, panel members emphasised the immense benefits the Australian cotton industry gains from the integrated research program managed under the Australian Government's rural research and development corporation model.

The Plant Breeding and Biotechnology Review Panel, Dr Robert Wright, Mr Rob Jarvis, Dr Lloyd May and Mr Glen Fresser.

Following recommendations from the review panel, CRDC has fine-tuned research in this area for 2004–05 and increased the overall level of funding. Chief beneficiaries of the enhanced funding are Fusarium wilt resistance breeding and the capacity of the CSIRO breeding program to conduct its regional cotton variety testing. Some projects have finished early, but

CRDC will continue to invest in a new, enabling biotechnology program as well as several targeted initiatives, especially in the area of fibre development.

Enhanced funding for this program in the face of severe drought-induced budgetary constraints is testimony to the importance the corporation places on the role continuous improvement in the breeding program will play in keeping Australian cotton internationally competitive.

CRDC worked with seed companies to revise the Cotton Varietal Trial Protocol for 2003–04 to ensure commercial cotton variety trials achieve a set of minium acceptable standards. CRDC-approved trials have been conducted for eleven years, but some important changes implemented in 2003–04 meant growers can have increased confidence in commercial varietal trial booklet results.

CRDC conducts a final audit of published commercial variety trial results at the end of the season and reports on the results of the audits and each seed company's adherence to the protocol. Industry Development Officers of the Australian Cotton Extension Network serve as independent observers and make one field inspection of each trial and perform a second inspection if it is warranted. Seed companies now post their variety trial results on their websites, showing CRDC endorsement.

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

Fourteen new CSIRO-bred and CRDC-funded varieties, released in 2004, offer many new features, such as improved fibre quality, disease resistance, growth habit, maturity and regional adaptability. The new variety Sicot F-1 has a high tolerance to the major cotton disease, Fusarium wilt, and the Bollgard® II Roundup Ready® variety, Sicala 40BR offers not only Fusarium wilt tolerance but also, according to early results, the highest Verticillium wilt tolerance of all CSIRO commercial varieties.

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

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.

Glyphosate herbicide-resistant cotton using Roundup Ready technology has given cotton farmers a new tool to help manage weeds more efficiently, at less cost and with the use of less residual herbicide. New and improved Roundup Ready varieties were among the 14 new CSIRO-bred cotton varieties released in May 2004.

The 2003–04 season marked the last year in which growers could plant single *Helicoverpa* resistance gene INGARD varieties. Bollgard II varieties containing two genes of resistance to *Helicoverpa* spp. will entirely replace INGARD in the 2004–05 season. The industry's careful management of INGARD to avoid the development of resistance has facilitated this changeover. The Australian cotton industry will be the first cotton producing country in the world to make a complete switch from single to double Bt gene varieties.

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

Cotton biotechnology researchers face huge problems worldwide in inserting genes into elite cotton varieties and many have given up the attempt. Instead, breeders must insert the genes into cells from older, non-adapted US varieties and then turn those cells into plants, followed by several years of back-crossing to get rid of undesirable genes and develop a modern, commercially viable variety. Work continues within the biotechnology and plant breeding program to attempt to cross an elite variety with an older US Coker variety to see if it is possible to establish a variety with good agronomic performance and fibre qualities but still regenerable in tissue culture.

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 remained consistently one of the top two prices listed for the highest category of upland cotton on the Liverpool Cotton Outlook 'A' index during 2003–04, a stark demonstration that the CSIRO breeding program is meeting the international market. Marketed in the US under the Fibermax brand, CSIRO-bred varieties now hold a 15 per cent share of the US cotton seed market.

CRDC-funded research into healthier cotton seed oil delivered plants with higher oleic and stearic acid content in 2003–04. It became apparent that a small amount of research remains to enable the already developed technology to move to potential commercialisation and this will be funded in 2004–05; however, commercial interest is likely to be dictated by public acceptance of improved oils derived from genetically modified plants.

"The Plant Breeding Program is probably the best in the world in cotton and there's certainly nothing to compare with it in scope and, on the biotech side, again you are amongst the world leaders."

Dr Lloyd May
CRDC Plant Breeding and Biotechnology Review Panel Member

Progress on Measures of Success *(CRDC Strategic Plan 2003-2008)*

Evidence that new cotton varieties are increasing yields and potential returns to the industry

- 14 new varieties developed and released, with improved fibre quality, disease resistance, growth habit, maturity and regional adaptability. Specific yield data for 2003–04 not yet available.
- New varieties offer resistance to cotton diseases, Fusarium wilt and Verticillium wilt

Evidence that Australian cotton varieties are meeting the needs of our major textile and oilseed markets; and

Market reports on the demand for Australian cotton lint and seed

- Australian cotton remained consistently one of the top two prices listed for the highest category of upland cotton on the Liverpool Cotton Outlook 'A' index during 2003–04
- Biotechnology delivered cotton seed producing healthier oil with higher oleic and stearic acid content in 2003–04, which can, potentially, compete in the higher quality sector of the market; however, commercialisation will depend on community acceptance of genetically altered foodstuffs.

Evidence that new varieties can produce higher yields with lower inputs of chemicals and improved water use efficiency

- Based on the annual Market Audit of Cotton Crop Production Products produced by Cotton Consultants Australia, the average quantity of insecticide and miticide applied in 2003–04 to:
  - conventional cotton was 4.5 kg of active ingredient per hectare – a 23.7 per cent reduction on the five-year average for 1998–99 to 2002–03.
  - INGARD cotton was 1.98 kg per hectare – a 56 per cent reduction compared to conventional cotton.
  - Bollgard II cotton was 0.46 kg – a 90 per cent reduction compared to conventional cotton).v
- Water samples from the Macintyre, Gwydir, Namoi and Macquarie Rivers, measured in 2002-03 showed reductions in herbicide contamination: a 73 per cent reduction in Fluometuron and a 50 per cent reduction in prometryne compared to 2000-01 and no endosulfan detected in three of the four rivers.
- New CSIRO-bred cotton varieties have delivered 11 per cent more water use efficiency

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

- CRDC-commissioned a scoping study on socio-economic indicators for the cotton industry, released in July 2003. Based on this research, work will be extended in 2004–05 to gain an understanding of the industry's impact on the social and economic fabric of the communities it supports.
- Decrease in the use of insecticides and herbicides through insect and weed tolerant transgenic varieties delivered improved catchment-wide water quality and better community perceptions of the cotton industry

Evidence of the reduced time to introduce genes into cotton varieties

Cotton biotechnology researchers worldwide face huge problems in inserting genes into elite cotton varieties. Work continues within the biotechnology and plant breeding program to establish a variety with good agronomic performance and fibre qualities but still regenerable in tissue culture, but will not have a short term outcome.

PROGRAM SIX: VALUE CHAIN

Number of projects in Program Six: 5
Program expenditure: $258,284

Objective

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

Overview

Australian cotton competes at the premium end of the world market. It has achieved this through Australian 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 and with minimal 'country damage'. All of these success factors are underpinned by CRDC-funded research and a close working relationship with the Cotton CRC.

Lower production in 2003–04 because of drought meant that, for the second year running, Australian cotton could not meet the needs of its major customers. This, coupled with a major entry by the United States into the world market following the loss of much of its spinning industry and improving cotton quality from the United States and Brazil poses a threat in a number of Australia's traditional markets. This increased competition means Australia must be assiduous in ensuring the quality of its product continues to improve and meet customer requirements.

Strategy: 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

Investment in plant breeding to improve fibre quality is helping to ensure Australian cotton is preferred in the marketplace and that it avoids quality discounts and attracts premiums. Fourteen new CSIRO cotton varieties, developed with funding support from CRDC, were launched in May 2004, in time for the 2004 planting season. Encompassing Bollgard, Bollgard Roundup Ready, Roundup Ready and conventionally bred varieties, they contain many new features, including improved fibre quality, disease resistance, growth habit, maturity and regional adaptability.

Biotechnology delivered cotton seed producing healthier oil with higher oleic and stearic acid

content in 2003–04, which can, potentially, compete in the higher quality sector of the market. The project will receive further funding in 2004–05 to seek a commercial partner; however, commercialisation will almost certainly depend on community acceptance of genetically altered foodstuffs.

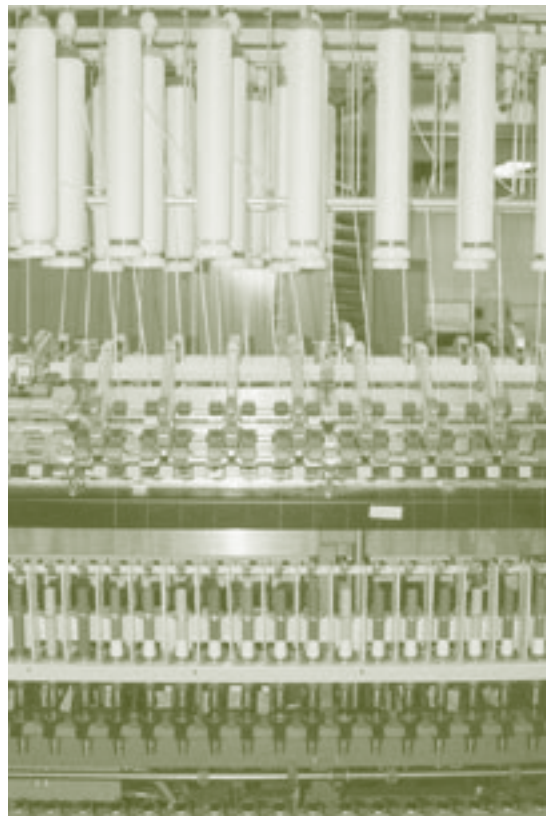
Strategies:

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

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

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 (short, 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. CSIRO researchers are examining the cotton fibre damage that occurs during lint cleaning in the gin, which means optimising lint cleaner settings: for example, the number of cleaners used, the feed rate, saw speed, combing ratios, number of grid bards, as well as feed bar and grid bar settings.

By measuring reduced fibre length and nep creation at different points of the lint cleaning process, the researchers have now identified two areas of the lint cleaner that appear to affect fibre quality. During 2003–04, the emphasis was on testing different methods of performing these functions to arrive at methods that do not affect fibre quality. Modifications showed promise, in cooperation with a commercial ginner, in being able to reduce neppiness and short fibre content but still retain the cleanliness of the cotton processed. The ultimate aim of the project is to arrive at lint cleaning models that meet industry needs and initiate design and manufacture of new prototypes for these currently less than satisfactory components of the lint cleaning process.



Differentiating between cotton fibre with uniform micronaire and that with varying micronaire would require an ability to distinguish between fineness and maturity in testing – an ability that does not exist at present. CRDC has funded research for some ten years on this subject, believing that a successful outcome will be a great gain for the Australian industry. CSIRO Textile and Fibre Technology, supported by CRDC funding, is developing equipment that can differentiate between maturity and fineness,

using both Sirolan-Laserscan and polarised light microscopy.

CSIRO has now developed an instrument, SiroMat, based around the automation of the older polarised light microscopy test for fibre maturity. Based on cell wall thickness, cotton fibres transmit different interference colours under crossed polar lenses. Researchers have demonstrated that these colours vary directly with the fibre maturity or degree of cell wall thickening, with mature fibres appearing yellow and immature fibres blue and orange. Ongoing work is aimed at improving calibration and building duplicate instruments for inter-laboratory trials.

An international Committee for Standardisation of Instrument Testing of Cotton (SCITC) is seeking to institute a single, agreed and scientifically valid measurement of fibre quality. CRDC has supported this concept for a number of years and is represented on the committee; however, indications are that international agreement on the process, how it is conducted and how disputes will be resolved will take a number of years to reach.

Strategies:

Promote agronomic and management practices, including the cotton BMP program, which preserve and protect optimal fibre quality characteristics

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

During 2003–04 CRDC developed a major Field to Fabric Initiative to improve Australian cotton quality. The first component commenced in the 2003–04 season, with five pilot field trial sites, each concentrating on two or three elite CSIRO Bollgard II cultivars with the involved growers implementing 'best bet' agronomic practices to achieve high quality fibre. The corporation will be seeking ways in which it can move the program to an international commercial level.

The second component of the Field to Fabric Initiative involves extending the BMP program through the whole production chain to ensure optimum fibre quality and to explore the potential to exploit those environmental management credentials to further distinguish Australian cotton in the marketplace. Following extensive consultation with cotton growers and post-farm gate sectors of the cotton industry, CRDC and the Australian Cotton Industry Council (ACIC) were successful in obtaining a significant Australian Government *Pathways to Industry EMS* grant in April 2004, which will assist in the extension of BMP throughout the value chain. The proposal's concept developed from consultation with farmers and the industry's post-farm gate sectors, culminating in a workshop organised by CRDC and held in Brisbane in early 2004, made possible by a grant under the National Heritage Trust.

Progress on Measures of Success *(CRDC Strategic Plan 2003-2008)*

Release of varieties with appropriate fibre and seed characteristics

- 14 new CSIRO-bred and CRDC-supported cotton varieties commercially released in May 2004 have enhanced characteristics that include fibre quality. In some regions fibre quality must, to some degree, be traded off against other characteristics that cope with circumstances such as hot growing conditions or heavy pest pressure and growers choose varieties based on their overall requirements.

Evidence of improved practices that preserve fibre quality. Extension of the Cotton BMP program to post-farm gate issues. Improved ginning practice measured by ginning data

- Research projects to reduce damage in the ginning process on track in 2003–04.
- Planning for extension of BMP to post-farm gate issues began in 2003–04, with the aid of an Australian Government *Pathways to Industry EMS* grant.
- CRDC participating in an international committee to agree on a single, validated international cotton classification system, with no agreement reached in 2003–04.
- The CSIRO TFT Cotton Mill Benchmark survey conducted in 2003 asked cotton millers in South East Asia to comment on 15 fibre characteristics of Australian cotton. The results have been reported to the industry and a number of issues such as short fibre content, neps (short, tangled fibres), micronaire, dyeability and contamination highlighted for additional R&D focus and to drive continuous improvement. Further mill surveys are anticipated in 2005 and 2007.

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

- Projects to distinguish between fibre fineness and maturity are on track, with SiroMat instrument to measure fibre maturity developed and ready to move to the next phase.

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 opens up opportunities for niche 'clean and green' marketing
- Biotechnology has delivered cotton seed producing healthier oil with higher oleic and stearic acid content in 2003–04, which can, potentially, compete in the higher quality sector of the market; however, commercialisation may depend on community acceptance of genetically altered foodstuffs.

REPORT OF OPERATIONS

SECTION TWO: CORPORATE

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 that 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, the heart of one of Australia's major cotton-growing areas, enables the corporation to develop and maintain important relationships with cotton growers, researchers, processors and members of the general community 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 Australian Cotton Cooperative Research Centre, of which CRDC is a core partner.

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.

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;
- preparing an Annual Operational Plan for each financial year;
- coordinating and funding R&D activities consistent with current planning documents;
- 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; and;
- facilitating the dissemination, adoption and commercialisation of research and development results in relation to the cotton industry.

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, the Hon. Warren Truss MP, through his Parliamentary Secretary, Senator the Hon. Judith Troeth.

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 and Approvals

CRDC did not receive any 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 2003–04, and thus this reporting year, marked the first 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 Outcome and the identification of necessary 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. Board members conducted a number of strategic reviews during the year:

November 2003:	Beyond Value Chain
February 2004:	Biotechnology BMP/EMS – the way forward
May 2004:	Natural Resource Management Targets and measures of adoption

Responsibility for the establishment and maintenance of appropriate ethical and financial management standards rests with the corporation's Audit Committee, in consultation with the board. It is the practice of the Chair to review the performance of directors during the year. A review of the board's performance in March 2004 covered:

- Roles and responsibilities
- Strategic directions
- Oversighting management: policy development, risk management and financial and operating reporting
- Board functioning: subcommittees and the effectiveness of meetings
- Communication with stakeholders.

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.

Board of Directors

The corporation has a nine-member board, of which six are 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 Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry has reappointed the Chair, Ms Bridget Jackson, for a further three year period, concluding in September 2007. The Government Member holds office at the Minister's pleasure and the Executive Director during the corporation's pleasure. Directors other than the Executive Director and the Government Director are appointed for a term not exceeding three years. As six new board appointments were made in 2002, there were no new appointments during the reporting year.

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 board keeps in close contact with the senior management of the corporation to ensure research projects are properly focused and meet contractual requirements. The directors are responsible for ensuring that the affairs of the corporation are properly managed and for setting strategic directions for the corporation to follow.

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.

Each Director is assigned a research program of key responsibility by the Board, based on the individual's expertise. Under this structure, directors review the project applications and reports for the each program of responsibility and make subsequent recommendations to the full board. Directors are also available to advise and work with research program coordinators and other staff to ensure effective management of corporation-funded research, development and extension activities.

Policies and procedures for directors seeking independent advice have been implemented. 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
Director, Cameron Agriculture Pty Ltd.

Ms Jackson was appointed in November 1999. She is a member of the Audit, Remuneration and Strategic Planning Committees and is the supporting director for People and Knowledge. She attended six board meetings, three Audit Committee meetings and one Remuneration Committee meeting.

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.

Vice-Chair: Richard Browne

Mr Browne was reappointed in November 2002 and is Chair of the Audit Committee and a member of the Remuneration Committee. He is the director responsible for Farming Systems and supporting director for Natural Resource Management. He attended five board meetings, three Audit Committee meetings and one Remuneration Committee meeting.

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 and a past Chair of the Australian Cotton Growers' Research Association for three terms. He was previously a member for the Cotton Research Council, the forerunner of the CRDC, and is currently a director of the Australian Cotton CRC, representing CRDC.

Government Director: Graeme Hamilton

PhD, DIC

Australian Chief Plant Protection Officer, Australian Government Department of Agriculture Fisheries and Forestry.

Dr Hamilton was appointed in May 2001 and is a member of the Strategic Planning, Remuneration and Intellectual Property Committees. He advises CRDC on government policy processes, public administration issues and strategic management and is the supporting director for Insect Management, Plant Breeding and Biotechnology and is the director responsible for Crop Protection. He attended five board meetings and one Remuneration Committee meeting.

Chair:
Bridget Jackson

Vice–Chair:
Richard Browne

Government Director:
Graeme Hamilton

Having begun professional life as a cotton entomologist, Dr Hamilton has worked with the horticulture and grains industries both here and overseas and now, as Chief Plant Protection Officer, provides a national focal point for all plant health issues.

Executive Director: Ralph Schulzé

HDA (Hons)

Mr Schulzé was a member of the board from 1990 to 2004 by virtue of his position as Executive Director. He was a member of the Audit Committee and responsible for Value Chain and supporting director for Plant Breeding and Biotechnology. He attended six board meetings and three Audit Committee meetings.

Mr Schulzé has been active in the Australian cotton industry for more than 40 years, and was a key participant in the development of the modern cotton landscape. He joined CRDC as its inaugural Executive Director in 1990 after a career as an agronomist and senior manager in government and the private sector and retired from the position at the end of August 2004.

Kathryn Adams

BSCAgr (Hons), LLM, M Env Stud, M Bus

Ms Adams was appointed in October 2002 and is a member of the Intellectual Property Committee and the Audit Committee. She is the director responsible for Natural Resource Management. She attended four board meetings and two Audit Committee meetings.

Ms Adams is a Senior Research Fellow with the Australian Centre for Intellectual Property in Agriculture at Griffith University, and a practicing arbitrator and mediator. Ms Adams has served on several Research and Development Corporations and has held a range of other senior executive position; she has particular expertise in environmental planning, research and development investment and management, business management, technology law and microbiology. Ms Adams is also on the Board of Plant Health Australia Pty Ltd.

Neil Forrester

BScAg (Hons), PhD

Research Director – Special Projects and New Markets, Delta and Pine Land, USA.

Dr Forrester was reappointed November 2002 and was a member of the Audit Committee until March 2003. He remains a member of the Intellectual Property Committee and is the director responsible for Crop Protection. He attended six board meetings (including one by telephone).

Executive Director: Ralph Schulzé

Kathryn Adams

Neil Forrester

Dr Forrester has extensive field and laboratory research and extension experience with Pest Management and Resistance Management issues in a broad range of field crops, specialising in cotton for the last 22 years. For the past five years he has specialised in a broad range of crop protection, transgenic technologies and molecular breeding techniques affecting cotton.

Dr Forrester was transferred to the USA at the start of the reporting year. The Board resolved to cap his travel costs to Australia at $2700 per meeting and to review the matter at the end of the year. The review, carried out by directors in March this year, determined that the benefits of maintaining Dr. Forrester's expertise and experience continued to outweigh the costs.

TJ Higgins

BScAg, MAgSc, PhD

Deputy Chief of Plant Industry at CSIRO

Dr Higgins was appointed in October 2002 and is Chair of the Intellectual Property Committee. He is the director responsible for Crop Protection and Plant Breeding and Biotechnology. He attended five board meetings.

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.

Adam Kay

BScAg, DipEd., Grad Cert Rural Science (Cotton Production)

General Manager, Cotton Seed Distributors Ltd.

Mr Kay was reappointed in November 2002 and is a member of the Intellectual Property, Strategic Planning and Audit Committees. He is the director responsible for People and Knowledge. He attended six board meetings and two Audit Committee meetings.

Mr Kay is experienced as an extension agronomist and business manager who, prior to his current position, spent 12 years based in the Macquarie Valley with the NSW Department of Primary Industries (then NSW Agriculture). He is a graduate of the Australian Institute of Company Directors and the Australian Rural Leadership Program (Course 2) and during the early 1990s was awarded a Churchill Scholarship to study cotton soil management.

TJ Higgins

Adam Kay

Appointments after the reporting year

No further appointments have been made to the board; however, Mr Bruce Finney joined the board in September 2004 by virtue of his appointment as Executive Director of CRDC.

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. 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.

Board Meetings

During the reporting year the board continued its policy of holding meetings away from the CRDC office in Narrabri whenever it was appropriate and practical. The board uses the opportunities presented by meetings to tour cotton-production areas, meet local growers and researchers and be updated on the varying research requirements throughout the industry. Meetings also present opportunities for directors' training and education regarding specific issues of relevance and to meet with representatives of the corporation's stakeholders.

The board held 6 meetings during 2003–04:

14 August, 2003	(Canberra, ACT)
5 November, 2003	(Geelong, Victoria)
7 February, 2004	(Dalby, Queensland)
18 February, 2004	(by teleconference)
30th/31st March 2004	(Narrabri, NSW)
25 May, 2004	(Moree, NSW)

Committees

During 2003–04 the board operated four committees: the Audit, Intellectual Property, Remuneration, and Strategic Planning Committees. The number of committee meetings is not a reflection of the workload. Much of the work of the sub-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 our financial transactions. The committee also provides "a forum for communication between the directors, the senior managers of the authority and the internal and external auditors of the authority."

It carries responsibility for identifying areas of significant business risk and stipulating the means of managing any such risk.

Richard Browne is Chair of the Audit committee. Membership also includes the corporation's Chair, Bridget Jackson, and two non-executive directors, Kathryn Adams and Adam Kay. The Executive Director Ralph Schulzé and the Business Manager Robin Logan attended the meetings as observers. The Committee met three times during the year; Bridget Jackson, Dick Browne and Ralph Schulzé attended three meetings, Kathryn Adams and Adam Kay attended two.

Intellectual Property Committee

The role of this committee is to review the corporation's Intellectual Property policy and make recommendations to the board for any updates. The committee is also responsible for making recommendations and reporting to the board on any Intellectual Property actions including commercialisation issues surrounding any of CRDC-funded research and development activities.

TJ Higgins chaired the committee, with membership also including non-executive directors, Kathryn Adams, Adam Kay, Neil Forrester and Graeme Hamilton, as well as Executive Director, Ralph Schulzé. The committee did not meet during the year, as Intellectual Property issues, including a review of corporation policy, were considered at board level.

Remuneration Committee

This committee consists of the Chair Ms Bridget Jackson, and two non-executive directors, Mr Richard Browne and Dr Graeme Hamilton. The Remuneration Committee advises the board on the Executive Director's remuneration and staff remuneration adjustments. The Committee held one meeting during the reporting year, attended by all members.

Strategic Planning Committee

The committee is normally responsible for conducting an annual review of the Strategic Plan and making any recommendations to the board for alterations.

The committee includes the Chair Ms Bridget Jackson, the Government Director Dr Graeme Hamilton and non-executive Director, Mr Adam Kay. Senior corporation management and the Communications Manager attend the committee's meetings. The Strategic Plan was in its first year of implementation, so no review occurred in 2003–04 as and the committee did not meet.

Key Issues in Corporate Performance

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 2003–2004 to Senator Troeth on the 29 April 2003 and the Strategic Plan 2003–2008 on 30 April 2003. Written advice of approval for both plans was received from Senator Troeth on 1 July 2003.

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.

As a small agency with the equivalent of 10.8 full-time employees, the corporation does not have a fraud investigation unit. 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 on page 11. It embodies the set of values underlying decisions, actions and relationships.

Staff

Staff 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 six full-time and six part-time employees as at 30 June, 2004.

Other staff during the reporting year

Research Program Manager, Guy Roth, resigned in August 2003 and was replaced by Greg Kauter in November 2003.

CORPORATION STRUCTURE

CRDC Board of Directors Chair: Bridget Jackson		
Executive Director Ralph Schulzé		
R&D Program Team	**Communications**	**Business and Administration Team**
Bruce Pyke Senior Research Program Manager	Elizabeth Tout Communications Manager	Robin Logan Business Manager
Greg Kauter Research Program Manager		Kara Taylor Research Project Manager
Helen Dugdale Research Program Coordinator *(Soils, Water, Farming Systems and Agronomy)*		Dianne Purcell Executive Assistant
Rachel Holloway Research Program Coordinator *(Best Management Practices and Environment)*		Karen Larsen Administrative Assistant
Jodi McLean Research Program Coordinator *(Diseases and Weeds, Plant Breeding and Biotechnology)*		Margaret Wheeler Administrative Assistant

Executive Director Ralph Schulzé with Communications Manager, Elizabeth Tout.

CRDC's administration team, Karen Larsen, Margaret Wheeler, Dianne Purcell and Kara Taylor with Business Manager Robin Logan

Appointments after the reporting year

Bruce Finney became Executive Director in September 2004 following the retirement of Ralph Schulzé from the position.

Training

During the reporting year the corporation spent $9,685.00 on training and recruitment. In addition, activities such directors' attendance at a Rural Research and Development Corporations workshop on "Understanding Financial Statements", 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. Specific training for individual staff members ranged from an Australian Institute of Company Director's course, through TAFE and university fee support to workshops related to specific duties.

Contractors and Consultants

The corporation employs consultants and contractors on a case-by-case needs basis, and after background checks to ensure proposed appointees have necessary skills and experience. During the reporting year the corporation spent $47,518 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
J&J Baker Ag Services	Administration of the Cotton Industry Best Management Practices Audit Office
Vic Edge	Program Coordination
Geoffrey Hutchinson	Information Technology support

Equal Employment Opportunity

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

Occupational Health and Safety

CRDC's Occupational Health and Safety (OH&S) Policy is that "everyone has a role to play in creating a safe workplace and in working together to keep it that way." The workplace culture is committed to OH&S and achieving best practice in OH&S with a focus on continual improvement. This is achieved through workplace inspections that are conducted during OH&S meetings held every two months. Due to the small staff numbers, there is no OH&S committee but rather all staff members (including senior management) are involved in the management of OH&S. The bi-monthly meetings provide a formal consultative forum to resolve and discuss health and safety issues and the physical conditions of the workplace.

CRDC provides the necessary resources to ensure that OH&S functions effectively. The targets set for the year were to reduce high incidence/severity risks and to ensure the safety of third parties on CRDC premises. Both of these were achieved through removal or control of risks, increased signage and the development of formalised workplace guidelines for staff.

CRDC Employee OH&S related training for the 2003–04 year included: OHS Risk Management for Supervisors and Managers (2 people), Incident Notification & Reporting (8 people), Manual Handling (9 people), Fire Extinguisher Training (10 people) and Compliance with CRDC's Visitor & Contractor Guidelines (8 people).

Environmental monitoring for the 2003–04 year included the introduction of regular servicing of air conditioning equipment, tagging of electrical equipment, service/upgrade of the internal lighting system and two separate internal auditing events.

CRDC had no incidents or injuries to report in 2003–04, as defined in Section 86 of the *Occupational Health and Safety (Commonwealth Employment) Act 1991*.

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 to use lack of full scientific certainty as a reason to postpone measure 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 (Integrated Natural Resource Management) designed to minimise environmental impacts.

The development and adoption of the Best Management Practices program is providing environmental benefits for the industry and the wider community. The corporation commissions Cotton Consultants Australia Inc. (CCA), the peak body for cotton field advisors and agronomists, to surveys its membership annually. Results for the 2003–04 season continue the downward trend in the use of pesticides on both genetically engineered and conventional cotton crops. This result is reported more fully elsewhere in this publication.

Commonwealth Disability Strategy

Corporation working conditions and procedures for employees and stakeholders are compliant with the Commonwealth Disability Strategy insofar as the small size, physical nature of the CRDC building and limited resources of the organisation make this possible. CRDC has reviewed accessibility issues recently and is undertaking a number of changes to enhance disability access for staff and visitors. During 2004–05, the corporation will formalise a Disability Action Plan as part of its program of continuous improvement.

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

The continuing drought was a major factor affecting the cotton industry and CRDC's work during the reporting period. Reduced water storage levels meant that cotton production was below half the average production for the five years preceding the drought, with a continued impact on CRDC's income from industry levies and matching Australian Government contributions. The Parliamentary Secretary was fully briefed on these and other CRDC matters by the Chair and Executive Director in April 2004.

Coinciding with the end of the reporting year, CRDC Chair, Ms Bridget Jackson, announced the appointment of Mr Bruce Finney as Executive Director from September 2004. Mr Finney replaces Mr Ralph Schulzé, who had been Executive Director of the corporation since its formation in 1990 and an important figure in

ensuring research and development has been a central factor in the Australian cotton industry's success.

Political Disclosures

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. The CRDC makes no payments to the Growers' Research Association except for the purposes of producing the proceedings of the biennial Australian Cotton Conference; however the 2004 conference was held after the reporting year (in August).

REPORT OF OPERATIONS

SECTION THREE: FINANCIAL STATEMENTS

COTTON RESEARCH & DEVELOPMENT CORPORATION

STATEMENT BY DIRECTORS AND CHIEF EXECUTIVE

In our opinion, the attached financial statements for the year ended 30 June 2004 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 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

Bridget Jackson
Chair

24th August, 2004

Richard (Dick) Browne
Deputy Chair

24th August, 2004

Ralph Schulzé
Executive Director

24th August, 2004

INDEPENDENT AUDIT REPORT

To the Minister for Agriculture, Fisheries and Forestry

Matters relating to the Electronic Presentation of the Audited Financial Report

This audit report relates to the financial statements published in both the annual report and on the website of the Cotton Research and Development Corporation for the year ended 30 June 2004. The Directors are responsible for the integrity of both the annual report and the web site.

The audit report refers only to the statements named below. It does not provide an opinion on any other information which may have been hyperlinked to/from the audited financial statements.

If the users of this report are concerned with the inherent risks arising from electronic data communications they are advised to refer to the hard copy of the audited financial statements in the Corporation's annual report.

Scope

The financial statements and directors' responsibility

The financial statements comprise:

- Statement by Directors and Chief Executive;
- Statements of Financial Performance, Financial Position and Cash Flows;
- 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 2004.

The Directors are responsible for the preparation and true and fair presentation of the financial statements in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*. This includes responsibility for the

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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 report is 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.

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 performance as represented by the statements of 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 report; 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 Australian professional ethical pronouncements.

Audit Opinion

In my opinion, the financial statements:

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

(ii) give a true and fair view, of the matters required by applicable Accounting Standards and other mandatory professional reporting requirements in Australia, and the Finance Minister's Orders, of the financial position of the Cotton Research and Development Corporation as at 30 June 2004, and of its performance and cash flows for the year then ended.

Australian National Audit Office

Willie Tan
Senior Director

Delegate of the Auditor-General
Canberra

24 August 2004

COTTON RESEARCH & DEVELOPMENT CORPORATION
STATEMENT OF FINANCIAL PERFORMANCE

for the year ended 30 June 2004

	Notes	**2004 $**	2003 $
REVENUE			
Revenues from ordinary activities			
Revenue from Government	5A	**4,765,000**	7,280,000
Goods and Services	5B	**-**	2,445
Interest	5C	**754,906**	802,389
Revenue from sale of assets	5D	**4,400**	-
Reversals of previous asset write-downs	5E	**27,192**	-
Industry Contributions	5F	**2,579,347**	7,136,220
Other Revenues	5G	**1,808,260**	952,079
Revenues from ordinary activities		**9,939,104**	16,173,133
EXPENSE			
Expenses from ordinary activities			
Employees	*6A*	**953,900**	*938,363*
Suppliers	6B	**264,185**	253,604
Grants	6C	**11,347,593**	14,400,602
Depreciation and amortisation	6D	**43,343**	29,471
Write-down of assets	6E	**8,693**	-
Value of assets sold	5D	**3,883**	
Expenses from ordinary activities		**12,621,597**	15,622,040
Operating deficit from ordinary activities		**(2,682,493)**	551,093
Net loss		**(2,682,493)**	551,093
Net credit to asset revaluation reserve	11	**26,861**	-
Total changes in equity other than those resulting from transactions with the Australian government as owner		**(2,655,632**)	551,093

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

COTTON RESEARCH & DEVELOPMENT CORPORATION
STATEMENT OF FINANCIAL POSITION

As at 30 June 2004

	Notes	2004 $	2003 $
ASSETS			
Financial Assets			
Cash	12B, 19	**2,109,553**	1,314,350
Deposits at Call	12B, 19	**8,830,462**	11,701,580
Receivables	7A, 19	**2,511,365**	3,067,092
Total financial assets		**13,451,380**	16,083,022
Non Financial Assets			
Land and buildings	8A	**330,000**	298,427
Infrastructure, plant and equipment	8B	**153,253**	156,541
Total non-financial assets		**483,253**	454,968
Total assets		**13,934,633**	16,537,990
LIABILITIES			
Provisions			
Employees	9A	**176,930**	192,102
Total provisions		**176,930**	192,102
Payables			
Suppliers	10A	**66,180**	11,245
Grants	10B	**59,790**	85,899
Other payables	10C	**58,226**	19,605
Total payables		**184,196**	116,749
Total liabilities		**361,126**	308,851
EQUITY			
Reserves	11	**26,861**	-
Accumulated surpluses	11	**13,546,647**	16,229,139
Total Equity		**13,573,508**	16,229,139
Current assets		**13,451,380**	15,583,022
Non-current assets		**483,253**	954,968
Current liabilities		**319,159**	236,489
Non-current liabilities		**41,967**	72,362

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

COTTON RESEARCH & DEVELOPMENT CORPORATION
STATEMENT OF CASH FLOWS

for the year ended 30 June 2004

	Notes	**2004 $**	2003 $
OPERATING ACTIVITIES			
Cash received			
Goods and Services		**194**	2,703
Commonwealth Contributions		**4,765,000**	7,368,784
Levies		**3,123,973**	6,703,876
Interest		**838,789**	703,150
GST recovered		**1,246,799**	1,020,694
Other		**1,874,437**	1,494,364
Total cash received		**11,849,192**	17,293,571
Cash used			
Employees		**(939,086)**	(699,104)
Suppliers		**(236,505)**	(263,814)
Grants		**(11,504,862**)	(16,228,454)
GST paid		**(1,240,404)**	
Total cash used		**(13,920,857)**	(17,191,372)
Net cash from operating activities	**12A**	**(2,071,665)**	102,199
INVESTING ACTIVITIES			
Cash received			
Proceeds from sale of plant and equipment		**4,400**	
Total cash received		**4,400**	
Cash used			
Purchase of property, plant and equipment		**(8,650**)	(51,564)
Total cash used		**(8,650)**	(51,564)
Net cash from investing activities		**(4,250)**	(51,564)
FINANCING ACTIVITIES			
Cash received		**-**	-
Cash used		**-**	-
Net cash from financing activities		**-**	-
Net increase in cash held		**(2,075,915)**	50,635
Cash at the beginning of the reporting period		**13,015,930**	12,965,295
Cash at the end of the reporting period	**12B**	**10,940,015**	13,015,930

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

COTTON RESEARCH & DEVELOPMENT CORPORATION
SCHEDULE OF COMMITMENTS

As at 30 June 2004

	Notes	**2004** **$**	2003 $
BY TYPE			
Capital Commitments		**-**	**-**
		-	**-**
OTHER COMMITMENTS			
Operating leases		**74,974**	37,533
Other commitments		**14,509,886**	21,751,721
Total other commitments		**14,584,860**	21,789,254
COMMITMENTS RECEIVABLE		**1,325,896**	1,980,841
Net Commitments		**13,258,963**	19,808,413
BY MATURITY			
Operating lease commitments			
One year or less		**39,426**	31,683
From one to five years		**35,548**	5,850

NB: Commitments are GST inclusive where relevant

Operating leases included are effectively non-cancellable and comprise of agreements for the provision of motor vehicles for senior executives.
As at 30 June 2004, other commitments comprise amounts payable under grants agreements in respect of which the recipient is yet to perform the services required or meet eligibility conditions.

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

COTTON RESEARCH AND DEVELOPMENT CORPORATION NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS

for the year ended 30 June 2004

Note 1: Summary of Significant Accounting Policies

Note 2: Adoption of Australian Equivalents to International Financial Reporting Standards from 2005-2006.

Note 3: Economic Dependency

Note 4: Events Occurring After Reporting Date

Note 5: Operating Revenues

Note 6: Operating Expenses

Note 7: Financial Assets

Note 8: Non-Financial Assets

Note 9: Provisions

Note 10: Payables

Note 11: Equity

Note 12: Cash Flow Reconciliation

Note 13: Contingent Liabilities and Assets

Note 14: Director Remuneration

Note 15: Related Party Disclosures

Note 16: Remuneration of Officers

Note 17: Remuneration of Auditors

Note 18: Average Staffing Levels

Note 19: Financial Instruments

Note 20: Reporting of Outcomes

Note 1: Summary of Significant Accounting Policies

1.1 Basis of Accounting

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 statements have been prepared in accordance with:

- Finance Minister's Orders (being the *Commonwealth Authorities and Companies Orders (Financial Statements for reporting periods ending on or after 30 June 2004)*);
- Australian Accounting Standards and Accounting Interpretations issued by the Australian Accounting Standards Board; and
- Consensus Views of the Urgent Issues Group.

The Cotton Research and Development Corporation's Statements of Financial Performance and Financial Position have been prepared on an accrual basis and are in accordance with historical cost convention, except for certain assets, which, as noted, are at valuation. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

Assets and liabilities are recognised in the corporation's Statements of Financial Position 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. Assets and liabilities arising under agreements equally proportionately unperformed are however not recognised unless required by an accounting standard. Liabilities and assets that are unrecognised are reported in the Schedule of Commitments and the Schedule of Contingencies (other than unquantifiable or remote contingencies, which are reported at Note 13).

Revenues and expenses are recognised in the corporation's Statements of Financial Performance when and only when the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

1.2 Changes in Accounting Policy

The accounting policies used in the preparation of these financial statements are consistent with those used in 2002-03.

Property, plant and equipment assets are being revalued progressively as explained in Note 1.12. Revaluations up to 30 June 2002 were done on a 'deprival' basis; since that date, revaluations have been done on a fair value basis. Revaluation increments and decrements in each year of transition to fair value that would otherwise be accounted for as revenue or expenses are taken directly to accumulated results in accordance with transitional provisions of AASB 1041 *Revaluation of Non-Current Assets*.

In 2002-03, the Finance Minister's Orders introduced an impairment test for non-current assets which were carried at cost and not subject to AAS10 *Recoverable Amount of Non-Current Assets*. In 2003-04 no assets were written down under this policy.

1.3 Revenue

The revenues described in this Note are revenues relating to the core operating activities of the corporation.

Revenue from the sale of goods is recognised upon the delivery of goods to customers.

Interest revenue is recognised on a time proportionate basis that takes into account the effective yield on the relevant asset.

Revenue from disposal of non-current assets is recognised when control of the asset has passed to the buyer.

Revenue from the rendering of a service is recognised by reference to the stage of completion of the contract to provide the service. The stage of completion is determined according to the proportion that costs incurred to date bear to the estimated total costs of the transaction.

Receivables for goods and services 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 judged to be less rather than more likely.

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.

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.

1.4 Employee Benefits

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

Liabilities for wages and salaries (including non-monetary benefits), annual leave and sick leave are measured at their nominal amounts. Other employee benefits expected to be settled within 12 months of the reporting date are also 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 2004. The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Superannuation
Employees of the corporation are members of the Public Sector Superannuation Scheme. The liability for their superannuation 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 cost to the Government of the superannuation entitlements of the corporation's employees.

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

1.5 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 benefits incidental to ownership of leased non-current assets. 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 present value of minimum lease payments at the beginning of the lease term and a liability recognised at the same time and for the same amount. The discount rate used is the interest rate implicit in the lease. Leased assets are amortised over the period of the lease. Lease payments are allocated between the principal component and the interest expense.

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

1.6 Borrowing Costs

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

1.7 Grants

Most grant agreements require the grantee to perform services, provide facilities or meet eligibility criteria. In these cases, the corporation recognises grant liabilities only to the extent that the services required have been performed or the eligibility criteria have been satisfied by the grantee.

In cases where grant agreements are made without conditions to be monitored, liabilities are recognised on signing the agreement.

1.8 Cash

Cash means notes and coins held and any deposits held with a bank or financial institution. Cash is recognised at its nominal amount. Interest is credited to revenue as it accrues.

1.9 Financial Liabilities

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).

1.10 Unrecognised Financial Liabilities

At the time of completion of the financial statements, there were no 2003-04 contingent liabilities of which it was aware.

1.11 Acquisition of Assets

Assets are recorded at cost on acquisition. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken.

1.12 Property (Land, Buildings and Infrastructure), Plant and Equipment

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

Revaluations
Basis
Land, buildings, infrastructure, plant and equipment are carried at valuation. Revaluations undertaken up to 30 June 2002 were done on a deprival basis; revaluations since that date are at fair value. This change in accounting policy is required by Australian Accounting Standard AASB 1041 *Revaluation of Non-Current Assets*. Valuations undertaken in any year are as at 30 June.

Fair and deprival 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

Assets that are surplus to requirement are measured at their net realisable value. At 30 June 2004 the corporation held no surplus assets. (30 June 2003: $0)

Assets that are surplus to requirement are measured at their net realisable value. At 30 June 2004 the corporation held no surplus assets. (30 June 2003: $0)

Frequency
Land, buildings, plant and equipment are revalued progressively in successive three-year cycles. All current cycles commenced on 1 July 2003.

The Finance Minister's Orders require that all property, plant and equipment assets be measured at up-to-date fair values from 30 June 2005 onwards. Assets were revalued as at 30th June, 2004, one year in advance of the progressive cycle, to assist with the transition and adoption of the International Financial Reporting Standards from 2005-06.

Conduct
All valuations are conducted by an independent qualified valuer.

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) and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate. Residual values are re-estimated for a change in prices only when assets are revalued.

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

	2004	2003
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 6D.

1.13 Impairment of Non-Current Assets

Non-current assets carried at up-to-date fair value at the reporting date are not subject to impairment testing.

1.14 Taxation

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

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.

1.15 Foreign Currency

The corporation conducts no transactions denominated in a foreign currency.

1.16 Insurance

The corporation has insured for risks through the Government's insurable risk managed fund, called 'Comcover'. Workers' compensation is insured through Comcare Australia.

Note 2: Adoption of Australian Equivalents to International Financial Reporting Standards from 2005-2006.

The Australian Accounting Standards Board has issued replacement Australian Accounting Standards to apply from 2005-06. The new standards are the Australian Equivalents to International Financial Reporting Standards (IFRSs) which are issued by the International Accounting Standards Board. The new standards cannot be adopted early. The standards being replaced are to be withdrawn with effect from 2005-06, but continue to apply in the meantime.

The purpose of issuing Australian Equivalents to IFRSs is to enable Australian entities reporting under the *Corporations Act 2001* to be able to more readily access overseas capital markets by preparing their financial reports according to accounting standards more widely used overseas.

For-profit entities complying fully with the Australian Equivalents will be able to make an explicit and unreserved statement of compliance with IFRSs and well as with the Australian Equivalents.

It is expected that the Finance Minister will continue to require compliance with the Accounting Standards issued by the AASB, including the Australian Equivalents to IFRSs, in his Orders for the Preparation of Authorities' financial statements for 2005-06 and beyond.

The Australian Equivalents contain certain additional provisions which will apply to not-for-profit entities, including the corporation. Some of these provisions are in conflict with the IFRSs and therefore the corporation will only be able to

assert compliance with the Australian Equivalents to the IFRSs.

Existing AASB standards that have no IFRS equivalent will continue to apply.

Accounting Standard AASB 1047 *Disclosing the Impact of Adopting Australian Equivalents to IFRSs* requires that the financial statements for 2003-04 disclose:

- An explanation of how the transition to the Australian Equivalents is being managed, and
- A narrative explanation of the key differences in accounting policies arising from the transition.

The purpose of this Note is to make these disclosures.

Management of the transition to AASB Equivalents to IFRSs
The corporation has taken the following steps in preparation towards the implementation of Australian Equivalents:

- The corporation's Audit Committee has been advised of these requirements and of its responsibility to monitor progress to IFRS.
- The Business Manager is tasked with oversight of the transition to and reporting of progress to the Audit Committee of the Australian Equivalents to IFRSs.
- The Business Manager has attended Australian National Audit Office training on the management of the transition to AASB equivalents to IFRSs. Following the training, a plan has been developed to address the transition.
- A plan, which identifies activities and corresponding due dates for the management of the transition has been developed.

Major changes in accounting policy
Changes in accounting policies under Australian Equivalents are applied retrospectively i.e. as if the new policy had always applied. This rule means that a balance sheet prepared under the Australian Equivalents must be made as at 1 July 2004, except as permitted in particular circumstances by AASB 1 *First-time Adoption of Australian Equivalents to International Financial Reporting Standards*. This will enable the 2005-06 financial statements to report comparatives under the Australian Equivalents also.

Changes to major accounting policies are discussed in the following paragraphs.

Property plant and equipment
It is expected that the Finance Minister's Orders will require property plant and equipment assets carried at valuation in 2003-04 to be measured at up-to-date fair value from 2005-06. This differs from the accounting policies currently in place for these assets which, up to 2002-03, have been revalued progressively over a 3-year cycle.

However, it is important to note that the Finance Minister requires these assets to be measured at up-to-date fair values as at 30 June 2005. Further, the transitional provisions in AASB 1 will mean that the values at which assets are carried as at 30 June 2004 under existing standards will stand in the transitional balance sheet as at 1 July 2004. Assets were therefore re-measured at up-to-date fair values as at 30th June 2004 to assist the transitional provisions in AASB1.

Impairment of Non-Current Assets
The corporation's policy on impairment of non-current assets is at note 1.13.

Under the new Australian Equivalent Standard, these assets will be subject to assessment for impairment and, if there are indications of impairment, measurement of any impairment (impairment measurement must also be done, irrespective of any indications of impairment, for intangible assets not yet available for use). The impairment test is that the carrying amount of an asset must not exceed the greater of (a) its fair value less costs to sell and (b) its value in use.

'Value in use' is the net present value of net cash inflows for for-profit assets of the corporation and depreciated replacement cost for other assets which would be replaced if the corporation were deprived of them.

Employee Benefits
The provision for long service leave is measured at the present value of estimated future cash outflows using market yields as at the reporting date on national government bonds.

Under the new Australian Equivalent standard, the same discount rate will be used unless there is a deep market in high quality corporate bonds, in which case the market yield on such bonds must be used.

Financial Instruments
Financial assets and liabilities are likely to be accounted for as 'held at fair value through profit and loss' or available-for-sale where the fair value can be reliably measured (in which case, changes in value are initially taken to equity). Fair values will be published prices where an active market exists or by appraisal.

Cash and receivables are expected to continue to be measured at cost information.

Financial assets, except those classified as 'held at fair value through profit and loss, will be subject to impairment testing.

Note 3: Economic Dependency

The Cotton Research and Development Corporation was established under the *Primary Industries and Energy Research and Development Act*, 1989.

The corporation is dependent on appropriations from the Parliament of the Commonwealth being disbursed from the *Department of Agriculture, Fisheries & Forestry* as grant revenue for its continued existence and ability to carry out its normal activities.

Note 4: Events Occurring After Reporting 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.

	2004 $	2003 $
Note 5: Operating Revenues		
Note 5A: Revenues from Government		
Grant revenue from Related Entity	**4,765,000**	7,280,000
Total revenues from government	**4,765,000**	7,280,000
Note 5B: Sales of Goods and Services		
Goods	**-**	2,445
Total sales of goods and services	**-**	2,445
Provision of goods to: External entities	**-**	2,445
Note 5C: Interest Revenue		
Deposits	**754,906**	802,389
Total interest revenue	**754,906**	802,389
Note 5D: Net Gain from Sale of Assets		
Infrastructure, plant and equipment:		
Proceeds from disposal	4,400	-
Net book value of assets disposed	(3,883)	-
Write-offs		
Net gain / (loss) from disposal of infrastructure, plant and equipment	**517**	-
Total proceeds from disposals	4,400	-
Total value of assets disposed	**(3,883)**	-
Total net gain from disposal of assets	**517**	-
Note 5E: Reversal of previous asset write-downs		
Asset revaluation increment	54,053	-
Reversal of previous asset write-down	**(27,192)**	-
Net revaluation increment	**26,861**	-
Note 5F: Industry Contributions		
Industry contributions	**2,579,347**	7,136,220
Total Industry Contributions	**2,579,347**	7,136,220

	2004 $	2003 $
Note 5G: Other Revenues		
Royalties	**821,049**	611,297
Project refunds	**712,540**	289,413
Levy penalties	**1,871**	11,369
Grants revenue	**245,276**	40,000
Other revenue	**27,524**	-
Total Other Revenue	**1,808,260**	952,079

Note 6: Operating Expenses

Note 6A: Employee Expenses		
Wages and Salaries	**823,704**	806,595
Superannuation	**113,356**	103,033
Leave and other entitlements	**15,045**	27,569
Total employee benefits expenses	**952,105**	937,197
Workers compensation premiums	**1,795**	1,166
Total employee expenses	**953,900**	938,363
Note 6B: Supplier Expenses		
Goods from external entities	**228,778**	216,619
Operating lease rentals	**35,407**	36,985
Total supplier expenses	**264,185**	253,604

Note 6C: 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	**4,528,219**	5,679,961
State departments	**3,243,240**	3,776,878
Universities and colleges	**660,649**	1,369,074
Other research institutions	**2,116,613**	2,267,490
Corporate Activities	**348,850**	525,149
	10,897,571	13,618,552
Grants to commercial entities	**450,022**	782,050
Total grants expense	**11,347,593**	14,400,602

	2004 $	2003 $
Note 6D: Depreciation		
Depreciation of property, plant and equipment	**43,343**	29,471
Total depreciation	**43,434**	29,471
The aggregate amounts of depreciation expensed during the reporting period for each class of depreciable asset are as follows:		
Buildings on freehold land	**5,619**	5,736
Plant and equipment	**37,724**	23,735
Total depreciation	**43,343**	29,471
Note 6E: Write-Down of Assets		
Plant & equipment - revaluation decrement	**8,693**	-
Total write-down of assets	**8,693**	-

Note 7: Financial Assets

Note 7A: Receivables		
Goods and services	**-**	2,275
Less: Provision for doubtful debts	**-**	2,275
Commonwealth contributions receivable	**1,079,645**	1,079,645
Interest receivable	**209,219**	293,101
GST receivable	**203,042**	286,074
Other receivables	**1,019,459**	1,405,997
Total receivables (gross)	**2,511,365**	3,067,092
All receivables are current assets.		
Receivables (gross) are aged as follows:		
Not overdue	**2,511,365**	3,067,092
Total receivables (gross)	**2,511,365**	3,067,092
Accrued Interest		

The interest rates range from 5.15% to 5.75% (2003: 2.3% to 6.0%) and the frequency of payments range from monthly to annual.

	2004	2003
	$	$

Note 8: Non-Financial Assets

Note 8A: Land and Buildings

Freehold land (2002 fair value)	**73,753**	73,753
- 2004 valuation (fair value) adjustment	**26,247**	
Total freehold land (2004 fair value)	**100,000**	
Buildings on freehold land (2002 fair value)		230,410
- Accumulated depreciation		(5,736)
Buildings on freehold land (2002 fair value)	**224,674**	224,674
Buildings on freehold land (2004 valuation adjustment)	**5,326**	
Total Buildings on freehold land (2004 fair value)	**230,000**	

Note 8B: Infrastructure, Plant and Equipment

Office Equipment		
Office Equipment (2002 fair value)		55,457
- Accumulated depreciation		(5,448)
Office Equipment (2002 fair value)	**50,009**	50,009
Office Equipment (2004 valuation adjustment)	**9,236**	
Total Office Equipment (2004 fair value)	**59,245**	
Computer Equipment		
Computer Equipment (2002 fair value)	**(13,513)**	77,083
- Accumulated depreciation		
Computer Equipment (2002 fair value)	**63,570**	63,570
Computer Equipment (2004 valuation adjustment)	**(12,524)**	
Total Computer Equipment (2004 fair value)	**51,046**	
Fixtures & Fittings		
Fixtures & Fittings (2002 fair value)		47,736
- Accumulated depreciation		(4,774)
Fixtures & Fittings (2002 fair value)	**42,962**	42,962
Fixtures & Fittings (2004 valuation adjustment)	**-**	
Total Fixtures & Fittings (2004 fair value)	**42,962**	
Total Infrastructure, Plant & Equipment (non-current)	**153,253**	156,541

All revaluations are independent and are conducted in accordance with the revaluation policy stated at Note 1. In 2003-04, the revaluations were conducted by an independent registered valuer, Peter J. Spackman.

Movement in Asset Revaluation Reserve	**2004 $**	2003 $
Increment for land and buildings	**16,332**	-
Increment for Property Plant and Equipment	**10,529**	-
	26,861	

Note 8C: Analysis of Property, Plant & Equipment

Item	**Land**	**Buildings**	**Office**	**Computer Equipment**	**Fixtures & Equipment**	**Total Fittings**
	$	**$**	**$**	**$**	**$**	**$**
As at 1 July 2003						
Gross book value	**73,753**	**230,410**	**55,457**	**77,083**	**47,736**	**484,439**
Accumulated depreciation	n/a	(5,736)	(5,448)	(13,513)	(4,774)	(29,471)
Net book value	**73,753**	**224,674**	**50,009**	**63,570**	**42,962**	**454,968**
Additions by purchase			23,510	6,640	-	30,150
Net revaluation increment/decrement	26,247	10,945	(8,693)	12,089	4,774	45,362
Depreciation	-	(5,619)	(5,581)	(27,369)	(4,774)	(43,343)
Write-down of assets						-
Disposals				(3,884)		(3,884)
As at 30 June 2004						
Gross book value	**100,000**	**230,000**	**59,245**	**51,046**	**42,962**	**483,253**
Accumulated depreciation	**-**	**-**	**-**	**-**	**-**	**-**
Net book value	**100,000**	**230,000**	**59,245**	**51,046**	**42,962**	**483,253**

	2004 $	2003 $

Note 9: Provisions

Note 9A: Employee Provisions

Salaries and wages	**11,652**	36,153
Leave	**164,360**	155,949
Superannuation	**918**	
Aggregate employee entitlement liability	**176,930**	192,102
Current	**134,963**	119,740
Non-current	**41,967**	72,362

Note 10: Payables

Note 10A: Supplier Payables

Trade creditors	**66,180**	11,245
Total supplier payables	**66,180**	11,245
All supplier payables are current.		
Trade creditors - settlement is usually made net 30 days		

Note 10B: Grants Payables

Commonwealth organisations	**38,225**	405
State departments		1,121
Universities and colleges	**21,565**	40,703
Other research organisations		43,670
Total grants payable	**59,790**	85,899
All grants payables are current.		

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

Note 10C: Other Payables

Net payable to the ATO	**58,226**	19,605
Total other payables	**58,226**	19,605
All other payables are current.		

Note 11: Equity

Note 11A: Analysis of Equity

Item	Accumulated Results		Statutory Funds		Asset Revaluation Reserve		Total Contributed Equity		TOTAL EQUITY	
	2004 $	2003 $	**2004 $**	2003 $	**2004 $**	2003 $	**2004 $**	2003 $	2004 $	2003 $
Opening balance as at 1 July	**16,229,139**	15,678,046							**16,229,139**	15,678,046
Net Revaluation Increment		-			**26,861**				**26,861**	-
Net surplus/deficit	**(2,682,493)**	551,093							**(2,682,493)**	551,093
Closing balance as at 30 June	**13,546,646**	16,229,139			**26,861**				**13,573,507**	16,229,139

	2004 $	2003 $

Note 12: Cash Flow Reconciliation

Note 12A: Reconciliation of Operating Surplus to Net Cash from Operating Activities:

Reconciliation of operating surplus to net cash from operating activities:		
Operating surplus before extraordinary items	**(2,682,493)**	551,093
Non- Cash Items		
Depreciation and amortisation	**43,343**	29,471
Gain on disposal of assets	**(517)**	
Net write down of non-current assets	**(18,499)**	
Changes in Assets and Liabilities		
(Increase) / decrease in receivables	**555,727**	(241,896)
Increase / (decrease) in employee provisions	**(15,172)**	30,348
Increase / (decrease) in supplier payables	**33,434**	(51,311)
Increase / (decrease) in grants payable	**(26,109)**	(216,985)
Increase / (decrease) in other payables	**38,621**	1,479
Net cash from / (used by) operating activities`	**(2,071,665)**	102,199

Note 12B: Reconciliation of Cash

Cash balance comprises:		
Cash on hand	**500**	500
Corporation	**2,109,053**	1,313,850
Deposits at call	**8,830,462**	11,701,580
Total cash	**10,940,015**	13,015,930
Balance of cash as at 30 June shown in the Statement of Cash Flows	**10,940,015**	13,015,930

Note 13: Contingent Liabilities and Assets

The Corporation has no contingent liabilities or assets of which it is aware.

Note 14: Director Remuneration

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

	2004 $	2003 $
$ Nil - $9,999	**2**	4
$ 10,000 - $ 19,999	**5**	5
$ 20,000 - $ 29,999		
$ 30,000 - $ 39,999	**1**	1
$160,000 - $169,999		1
$170,000 - $179,999	**1**	
Total number of Directors of the Corporation	**9**	11

Aggregate amount of superannuation payments in connection with the retirement of directors	**-**	-
Other remuneration received or due and receivable by Directors of the Corporation	**288,672**	271,523
Total remuneration received or due and received by Directors of the Corporation	**288,672**	271,523

Note 15: Related Party Disclosures

Directors of the Corporation

The Directors of Cotton Research & Development Corporation during the year were:
Bridget Jackson (Chair)
Dick Browne (Vice-Chair)
Ralph Schulzé (Executive Director)
Jeff Bidstrup
Kathryn Adams
Neil Forrester
Adam Kay
TJ Higgins
Graeme Hamilton – Government Director
The aggregate remuneration of Directors is disclosed in Note 14:

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.

	2004 **$**	2003 $
Grants to director related entities (CSIRO Entomology, Plant Industry, Land & Water, Textile and Fibre Technology)	**4,528,219**	5,674,565

Note 16: Remuneration of Officers

The number of officers who received or were due to receive total remuneration of

$110,000 - $119,999		1
$120,000 - $129,999	**1**	

The officer remuneration includes all officers concerned with or taking part in the management of the economic entity during 2003-04 except the Executive Director. Details in relation to the Executive Director have been incorporated into Note 14: Director Remuneration.

Note 17: Remuneration of Auditors

Remuneration to the Auditor- General for auditing the

Financial statements for the reporting period	**7,700**	7,700

No other services were provided by the Auditor-General during the reporting period.

Note 18: Average Staffing Levels

The average staffing levels for the Corporation during the year were:	**9.7**	10.8

Note 19: Financial Instruments

Note 19A: 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							
		2004 $	2003 $	2004 $	2003 $	2004 $	2003 $	2004 $	2003 $	2004 $	2003 $	2004 $	2003 $
Financial Assets													
Cash on Hand	**12B**							**500**	500	**500**	500	**N/a**	N/a
Deposits at call	**12B**	**2,109,053**	1,313,850							**2,109,053**	1,313,850	**5.15**	4.75
Term deposits	**7A**			**8,830,462**	11,201,580	**-**	500,000			**8,830,462**	11,701,580	**5.0**	5.4
Receivables For goods and services (gross)	**7A**							**-**	2,275	**-**	2,275	**N/a**	N/a
Commonwealth contributions receivable	**7A**							**1,079,645**	1,079,645	**1,079,645**	1,079,645	**N/a**	N/a
Accrued Interest	**7A**							**209,219**	293,101	**209,219**	293,101	**N/a**	N/a
Other receivables	**7A**							**1,222,501**	1,692,071	**1,222,501**	1,692,071	**N/a**	N/a
Total Financial Assets		**2,109,053**	1,313,850	**8,830,462**	11,201,580	**-**	500,000	**2,511,865**	3,067,592	**13,451,380**	16,083,022		
Total Assets										**13,934,633**	16,537,990		
Financial Liabilities													
Trade creditors	**10A**							**66,180**	11,245	**66,180**	11,245	**N/a**	N/a
Grants payable	**10B**							**59,790**	85,899	**59,790**	85,899	**N/a**	N/a
Other payables	**10C**							**58,226**	19,605	**58,226**	19,605	**N/a**	N/a
Total								**184,196**	116,749	**184,196**	116,749		
Total Financial Liabilities										**184,196**	116,749		

Note 19B: Net Fair Values of Financial Assets and Liabilities

		2004 $		2003 $	
	Notes	**Total Carrying Amount $**	**Aggregate Net Fair Value $**	Total Carrying Amount $	Aggregate Net Fair Value $
Financial Assets					
Cash on Hand	**12B**	**500**	**500**	500	500
Deposits at call	**12B**	**2,109,053**	**2,109,053**	1,313,850	1,313,850
Term Deposits		**8,330,462**	**8,830,462**	11,701,580	11,701,580
Receivables for goods & services	**7A**	**-**	**-**	2,275	2,275
Commonwealth contributions receivable	**7A**	**1,079,645**	**1,079,645**	1,079,645	1,079,645
Accrued Interest	**7A**	**209,219**	**209,219**	293,101	293,101
Other receivables	**7A**	**1,222,501**	**1,222,501**	1,692,071	1,692,071
		13,451,380	**13,451,380**	**16,083,022**	16,083,022
Financial Liabilities					
Trade Creditors	**10A**	**66,180**	**66,180**	11,245	11,245
Grants payable	**10B**	**59,790**	**59,790**	85,899	85,899
Other payables	**10C**	**58,226**	**58,226**	19,605	19,605
		184,196	**184,196**	116,749	116,749

Financial Assets

The net fair values of cash, deposits on call and non-interest-bearing monetary financial assets approximate their carrying amounts.

The net fair value for listed interest-bearing and equity investments is the quoted market price at reporting date, adjusted for the transaction costs necessary for realisation.

Other than for listed financial assets, none of the classes of financial assets are readily traded on organised markets in standardised form.

Financial Liabilities

The net fair values for trade creditors, bills and grants payable, all of which are short-term in nature, are approximated by their carrying amounts.

Note 19C: Credit Risk Exposures

The economic entity's maximum exposures to credit risk at reporting date in relation to each class of recognised financial assets is the carrying amount of those assets as indicated in the Statement of Financial Position.

The economic entity has no significant exposures to any concentrations of credit risk.

Note 20: Reporting of Outcomes

Note 20A: 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 20B: Net Cost of Outcome Delivery

	Outcome	
	2004	2003
	$	$
Operating expenses		
Employees	**953,900**	983,363
Suppliers	**264,185**	253,604
Grants	**11,347,593**	14,400,602
Depreciation	**43,343**	29,471
Write down of assets	**8,693**	-
Value of assets sold	**3,833**	-
Total Operating Expenses	**12,621,597**	15,622,040
Funded by:		
Revenue from Government	**4,765,000**	7,280,000
Industry contributions	**2,579,347**	7,136,220
Sale of goods and services	**-**	2,445
Revenue from sale of assets	**4,400**	
Interest	**754,906**	802,389
Other	**1,808,260**	952,079
Total operating revenues	**9,911,912**	16,173,133

Note 20C: Corporation Revenues and Expenses by Output

	Outcome					
	Output 1-Economic		**Output 2-Environmental**		**Output 3 - Social**	
	2004	2003	**2004**	2003	**2004**	2003
	$	$	**$**	$	**$**	$
Total Operating expenses	**5,249,679**	5,582,863	**4,604,916**	7,660,058	**2,763,119**	2,379,118
Funded by: Total Operating revenues	**4,133,611**	6,145,791	**3,625,923**	7,601,372	**2,175,687**	2,425,970

The Corporation's outcome and outputs are described at Note 20A.

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

APPENDIX ONE

SELECTION COMMITTEE REPORT

Ms Margaret Thomson
Presiding Member
CRDC Selection Committee
PO Box 56
YARRALUMLA ACT 2600

1 October 2004

Senator the Hon Judith Troeth
Parliamentary Secretary to the Minister for
Agriculture, Fisheries and Forestry
Parliament House
CANBERRA ACT 2600

Dear Senator Troeth

With six CRDC Board appointments made in 2002 and no further appointments due until 30 September 2005, the CRDC Selection Committee did not undertake any activities in the reporting year, nor incur any expenses.

Yours sincerely

MARGARET THOMSON

Presiding Member
Cotton Research and Development Corporation Selection Committee

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
CRC	Australian Cotton Cooperative Research Centre
CRDC	Cotton Research and Development Corporation
CSE	CSIRO Entomology
CSP	CSIRO Plant Industry
CTFT	CSIRO Textile and Fibre Technology
DAN	NSW Department of Primary Industries (formerly NSW Agriculture)
DAW	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
RIR	Rural Industries Research and Development Corporation
UA	University of Adelaide
ULA	La Trobe University
UNE	University of New England
UQ	University of Queensland
UTS	University of Technology, Sydney
US	University of Sydney

RESEARCH AND DEVELOPMENT PROJECTS

Program 1: People and Knowledge

CLW2C	Travel – Dr V. Gupta: Dr Stotzky's Laboratory, New York, USA	$2,250
CRC22C	National Cotton Extension Coordinator	$120,000
CRC35C	IPM Training Coordinator.	$85,898
CRC41C	NSW Industry Development Officer (Trainee)	$95,000
CRC42C	QLD Industry Development Officer (Trainee)	$32,471
CRC53C	Industry Development Extension Program – Darling Downs	$30,000
CRC54C	Cotton Industry Development Officer – Griffith	$90,000
CRC55C	Cotton Industry Development Officer – Moree	$30,000
CRDC190C	Farm Health and Safety R&D Program $20,000	
CRDC196C	Wincott Inc – Women's Industry Network Cotton	$17,500
CRDC213C	Travel – Dr Brian Duggan: Beltwide Cotton Conference, Nashville USA	$4,149
CRDC230C	Commissioned Research 2003–04	$113,356
CRDC231C	UNE course fees for Marje Balfe (Technical Assistant)	($0)
CRDC233C	Travel – Graham Barrett: Attend SAFE Analyst program in Colorado, USA	$2,000
CRDC234C	Travel – Amanda Cleary: 2004 Beltwide Cotton Conference	$2,000
CRDC236C	ESA Ecology 2003: Conference bag sponsorship	$1,500
CRDC237C	Sponsorship for CGA IPM Short Courses for 2003 (part of CRC35C project)	$26,101
CRDC239C	Travel – Emma Cottage: International Plant Protection Congress, Beijing	($0)
CRDC240C	Travel – I. Kennedy/A. Crossan: Contaminants and Ecological Risk Assessment Workshop, Adelaide	$1,500
CRDC241C	Travel – S. Gordon and R. van der Sluijs – ACSA Trade Promotion Tours	$4,250
CRDC243C	ACGRA Cotton Conference, August 2004	$50,000.00
CRDC245C	A Call on Cotton Tour – Post graduate visit to Narrabri, April 2004	$6,296
CRDC247	Post graduate and Community Sponsorship to the 12th Australian Cotton Conference 2004	$4,911
CSP139C	Application of crop simulation within the Australian cotton industry.	$117,000

CSP151C	Support development and independent evaluation of cotton management packages	$100,000
CSP153C	Australian Cotton Research Institute Computing Support	$127,000
CSP163C	Delivering science to Agribusiness – novel decision support tools	$100,000
DAN167C	Cotton Industry Development Officer – Lower Namoi	$95,000
DAN169C	Cotton Industry Development Officer – Macquarie	$100,000
DAQ100C	Extension Agronomy for Cotton Production in central Queensland	$105,000
DAQ114C	Cotton Industry Development Extension Officer – Border Rivers	$90,000
DAQ115C	Cotton Industry Development Extension Officer – Dirranbandi/St. George	$81,000
GU1	Development of a Business Plan for the Cotton Industry's Decision Support Program	$15,000
RIR8C	Australian Rural Leadership Program – Courses 9, 10, 11	($0)
US55C	Undergraduate Scholarship Program – Sydney University	$6,500
US61C	Sponsor prize "Proficiency in fourth year agronomy in the B.Sc.Agr. degree program"	$500
		TOTAL: $1,676,184

Program 2: Integrated Natural Resource Management

AAW4C	Sustainable natural resource management for the Australian Cotton Industry using the Best Management Practices Manual (CRDC Component)	$69,000
ANU7C	Development of a decision support system for water allocation in the Gwydir and Namoi valleys	$111,000
ANU8C	Postgraduate – Karen Ivkovic: Development of a decision support system for water allocation in the Gwydir and Namoi Valleys (in conjunction with ANU7C)	$15,000
CLW1C	Environmental impacts of genetically modified cotton on soil biological processes – effects of farming systems	$71,000
CLW3C	Rhizosphere biological functions as influenced by GM cotton	$139,949
CRC37C	Measuring the influence of water quality on drainage through irrigated cotton soils	$84,000
CRC46C	Cotton Gin Trash and Agroforestry for Sustainable Soil Management	($0)
CRC47C	Quantifying deep drainage using lysimetry	$137,000
CRC50C	Understanding the salinity threat in irrigated cotton growing areas of Australia – Phase IV: Interpretation and Extension	$50,000

CRC51C	Whole farm salinity management strategies for cotton production in the Macquarie Valley	$35,000
CRC57C	Postgraduate – Leah MacKinnon: Insectivorous bats, irrigated cotton, indigenous vegetation remnants and intensive production landscapes (continues from US66C)	$1,500
CRDC203C	Pesticide and odorous degradation product air monitoring in an urban centre surrounded by intensive cotton production	($0)
CRDC216C	Selected application issues for the cotton industry	($0)
CRDC219C	Industry Environmental Audit – GHD Pty Ltd	$1,101
CRDC235C	Evaluation of the Australian Cotton Industry BMP Program – Consultancy Agreement	($0)
CRDC242C	BMP Branding/EMS Pathways Project (Queensland Workshop)	$10,175
DNR4C	Recording, analysing and mapping of biodiversity in cotton areas of the Emerald Irrigation Area	$70,000
GCRC4C	Reducing losses of nitrogen from cotton rotation systems	$40,000
LWA2C	National Program for Sustainable Irrigation project	$65,000
US62C	Postgraduate – Sam Buchanan: Hydrological impacts of irrigation in the Bourke district	$36,000
US66C	Postgraduate – Leah MacKinnon: The biology of insectivorous bats, as predators of pests in cotton fields, and associated woodland or forest remnants	$1,500
US68C	Post– Doc: Dr Angus Crossan – Management of risk for chemicals used in cotton production	$35,000
SLM2C	Management of herbicide effects on soil biological processes essential for plant health and nutrition	($0)
		TOTAL: $972,226

Program 3: Crop Protection

AKC1C	Cotton Industry Codex representation and regulatory support	$12,700
AWA3C	Development of sustainable pest management practices for Bollgard® II production in the Kimberley	$49,000
CRC17C	Post Doctorate – Sarah Mansfield: Enhancing the impact of early season predation on *Helicoverpa* spp.	$15,812
CRC18C	Postgraduate – Florian Yan: Cotton soil health: Influences on cotton root diseases	($0)
CRC29C	Postgraduate – John Harvey: Diversity and pathogenicity of *Thielaviopsis Basicola* (Black Root Rot)	$21,405

CRC30C	Postgraduate – Ingrid Rencken: Role of native vegetation in harboring beneficial insects and reducing insect pest damage in cotton	$19,000
CRC31C	Postgraduate – Richard Kent: The role of weeds as alternative hosts of Fusarium wilt in cotton	$28,425
CRC36C	Managing *Helicoverpa* spp. on cotton with semio signaling chemicals	$90,000
CRC40C	The comparison of spider communities in cotton around Australia	($0)
CRC43C	Postgraduate – Derek Collinge: Gene silencing technologies to control *Helicoverpa armigera*	$29,000
CRDC209C	Assessing a program for post emergent control of problem weeds in cotton using shielded sprayers	($0)
CRDC232C	Independent Review on CRDC's Fusarium R&D – Dr Brett Summerell	($0)
CSE96C	Resistance of *helicoverpa armigera* to *cry2A*	$48,900
CSE101C	High level Cry1Aac resistance in *Helicoverpa armigera*	$51,100
CSE102C	Monitoring Bt resistance	$200,000
CSE104C	Potential for the evolution of resistance to Bt by Helicoverpa *armigera*	$130,000
CSE107C	Ecology of Helicoverpa in relation to transgenic cotton and the efficiency of refuge crops	$130,000
CSE108C	Genetics of Bt resistance in *Helicoverpa armigera*: Resistance to *Cry2Ab*	$150,000
CSP143C	Identification and management of Bunchy Top syndrome in cotton (Years 2 and 3 of CRDC121C)	$95,000
CSP145C	Improving understanding of the ecology and management of cotton aphid	$86,000
CSP147C	Incorporating aphids, insecticides and early season plant compensation in Integrated Pest Management	$162,000
CSP156C	The potential for native Fusarium to give rise to new cotton field pathogens	$64,414
CSP162C	Damage syndromes, economic thresholds and tolerance of cotton green mirids	$150,000
DAN140C	Management of Resistance to Conventional Chemicals in *Helicoverpa* spp.	$100,000
DAN153C	Managing Black Root Rot of Cotton	$160,000
DAN154C	Diseases of Cotton VII	$130,000
DAN160C	Impact and Role of Novel insecticides in Integrated Pest Management	$147,000

DAN162C	Insecticide resistance management in B– biotype *Bemisia tabaci*	$120,000
DAN163C	Insecticide Resistance Management in cotton aphid (*Aphis gossypii*) and cotton mite (*Tetranychus urtice*)	$105,000
DAN164C	Mechanisms of insecticide resistance in the cotton aphid, *Aphis gossypii*	$42,500
DAN172C	Biochemical mechanisms of resistance to *Bacillus thuringiensis* endotoxins in *Helicoverpa armigera*	$33,191
DAN173C	Insecticide resistance in Helicoverpa spp. and the role of IPM/Area Wide Management in Resistance	$140,000
DAN174C	Expanding WEEDpak: developing integrated weed management packages for the cotton farming systems	$100,000
DAN175C	Reducing weed control costs by better understanding the biology and ecology of problem weeds	$95,000
DAN176C	Severity factors in Fusarium wilt of cotton	$75,978
DAQ105C	Improved application and formulation of viral biopesticides against *Helicoverpa*	$1,200
DAQ107C	Ecology and development of management strategies for Fusarium wilt in cotton	$276,000
DAQ110C	Pest status and management of shield bugs in cotton	$110,000
DAQ111C	New biopesticides against emerging sucking pests	$100,000
DAQ116C	Assessment of the potential for resistance to Gemstar	$80,000
DAQ121C	Aphid bio-control in cotton	$82,610
DAQ123C	Best weed management strategies for dryland cropping systems with cotton	$38,000
DAQ126C	Heliothis egg collections for resistance testing from the Darling Downs and South Burnett in southern Queensland	$24,702
MU2C	Postgraduate – Christina Hall: Defence mechanisms of cotton against *Fusarium oxysporum* f.sp. *vasinfectum* and control of Fusarium wilt	$29,000
UNE36C	Postgraduate – Sam Lowor: Pheromones for occasional pests of cotton	$3,625
UQ28C	Postgraduate – Andrew Davies: Ecology of the Trichogramma egg parasites in the Ord River Irrigation Area and their role in cotton IPM	($0)
UQ29C	Postgraduate – Mark Wade: Biology, ecology and utilisation of the Damsel Bug as a predator in cotton – towards real IPM	($0)
UQ35C	Population genetics of *Helicoverpa* migration, recruitment and origins	$100,000
		TOTAL: $3,626,562

Program 4: Farming Systems

CRC33C	Postgraduate – Simon Speirs: Characterising soil structural stability and form of sodic soil used for cotton production	$29,000
CRC34C	Agronomic aspects of Bt efficacy in transgenic cotton	$95,000
CRC45C	Maintaining profitability and soil quality in cotton farming systems	$123,000
CRC48C	Optimising field and farm scale water use efficiency for cotton farming systems	$50,000
CRC52C	Nutritional constraints to efficient cotton production	$180,000
CRC56C	Postgraduate – Kylie Dodd: The impact of sodicity on cotton cropping systems	$14,000
CRDC158C	Water relations of the cotton plant	$44,493
CSE103C	The impact of Area Wide Management (AWM) on beneficial *Anthropod* and *Helicoverpa* populations	$161,000
CSE105C	The influence of beneficial soil fauna on cotton production and its pests and diseases	$49,000
CSP122C	CSIRO Field Experiments at ACRI	$75,000
CSP138C	Refining crop agronomy for dry season cotton production in north western Australia	$89,100
CSP140C	The impact of temperature extremes on cotton performance	$95,000
CSP141C	Postgraduate – Rose Roche: Training in crop physiology – Physiological determinants of ultra narrow row cotton	$29,000
CSP157C	Integrated farm water management for cotton production	$100,000
CSP161C	Physiology of high retention cotton crops	$130,000
DAN151C	Conservation and utilisation of beneficial insects and other biological control agents for IPM in cotton II	$149,000
DAN166C	Operational Costs for Cotton Experiments	$84,000
DAQ104C	(GRDC2C – joint project) Using seasonal climate forecasts for more effective grain–cotton production system	($0)
DAQ112C	Heliothis management in south Queensland farming systems	$73,000
DAQ113C	Postgraduate – Amanda Cleary: The effect of cereal stubble on *Helicoverpa* activity in early season cotton	$30,000
DAQ120C	Area– wide monitoring and cultural control of key cotton pests in central Queensland	$111,000
DAQ122C	Development of novel pest management options for cotton in central Queensland	$100,000

DAQ127C	Managing Bollgard® II cotton farming systems in southern Queensland	$100,000
DPIF2C	Investigation of cotton growing at different sites under different farming systems in the Northern Territory	$45,059
NEC8C	Postgraduate – Simon White: Partial root zone drying and regulated deficit irrigation for cotton using large mobile irrigation schemes	$32,200
NEC9C	Extension and Development to support the adoption of centre pivots and lateral moves in the Australian cotton Industry	$$50,000
US64C	Development of measures of soil health	$86,000
US65C	Postgraduate – Stella Loke: Diversity of VAM fungi in soil health	$29,000
US67C	Postgraduate – Edward Cay: Strategies for ameliorating sodic and saline subsoils of cotton–producing areas in the Hillston district of NSW	($0)
US69C	Postgraduate: Biology of Chytrid fungi in soil	($0)
		TOTAL: $2,152,852

Program 5: Breeding and Technology

CRC49C	Enhancing the insect tolerance of Australian cottons through conventional and transgenic traits	$100,000
CRDC238C	Review of plant breeding and biotechnology	$44,734
CSP113C	Australian native cottons as sources of resistance and new pathotypes of Fusarium wilt	($0)
CSP114C	Post Doctorate – Dr. Helen McFadden: Discovery of genes involved in the expression of cotton resistance esponses to Fusarium wilt by the application of microarray technology	($0)
CSP117C	Development and evaluation of cottonseed oils with improved nutritional and functional properties	$33,000
CSP118C	Manipulating genes to enhance cotton fibre elongation and cellulose synthesis	$19,000
CSP120C	Genetic characterisation of homoeologous recombination and chromosome inheritance in *G. hirsutum* x K genome alien chromosome addition lines	($0)
CSP121C	CSIRO Plant Breeding Fibre Quality Laboratory	$76,731
CSP135C	Postgraduate – Saara Kate Bowen: Molecular analysis and manipulation of terpene biosynthesis in cotton	$21,750

CSP136C	Cotton Biotechnology: Core Program	$309,037
CSP137C	Development of a unigene set of cotton clones for general microarray analysis of gene expression in cotton plants	$103,000
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	$29,000
CSP149C	Isolation of novel cotton promoters to drive the robust expression of useful genes in transgenic cotton	$24,666
CSP154C	Nutritional improvement in cottonseed oils through genetic removal of palmitic acid	$93,070
CSP155C	AFLP diversity of *Fov* in cultivated cotton fields and genotyping of *G.hirsutum* X *G.sturtianum* backcross lines	$23,692
CSP158C	Breeding for resistance to Fusarium wilt (joined with CSP159C)	($0)
CSP159C	Breeding improved cotton varieties	$781,566
CSP160C	Development and evaluation of cottonseed oils with improved nutritional and functional properties	$60,000
HEX1C	Improving the efficiency of embryogenesis in elite cotton cultivars	$91,752
MU1C	Transgenic cotton for the control of Fusarium wilt	$69,189
UA7C	Post Doctorate – Sharon Orford: Genetic manipulation of fibre quality in Australian cotton	$46,686
UA8C	Postgraduate – Sven Delaney: Development of gene promoters for cotton fibre development	$22,000
UA11C	Postgraduate – Damien Lightfoot: Fibre improvement through modulation of transitions in cotton development	$30,000
UA12C	Postgraduate – John Humphries: Analysis of TTG1 homologues in cotton for roles in fibre initiation	$30,000
US48C	Postgraduate – Fiona Frances Ballard: Identification and characterisation of genes for resistance to bacterial blight in the cotton plant	($0)
		TOTAL: $2,008,873

Program 6: Value Chain

CRDC248	Field to Fabric flagship program	$6,034
CRDC251	Pathways to EMS project	($0)
CTFT6C	Improved Quality of Ginned Australian Cotton	$72,000
CTFT7C	Inter-laboratory trials for fibre maturity reference samples	$30,250
CTFT8C	Instrumentation for cotton fineness and maturity measurement	$150,000

TOTAL: $258,284

Total Portfolio Funds: $10,694,981

APPENDIX THREE

CRDC PUBLICATIONS AND ACTIVITIES

Publications

Corporate publications

Annual Report 2002-2003

Annual Operating Plan 2004-2005 (published on www.crdc.com.au)

Magazines

Four editions of CRDC SPOTLIGHT magazine

Bi-monthly 'Research Review' in *The Australian Cottongrower*

Publications funded or contributed to by CRDC

A scoping study on socio-economic indicators for the cotton industry

Australian cotton comparative analysis: 2002 crop

Australian Cotton Industry Council Annual Report: *BMP Management Committee report*

Australian cotton industry Best Management Practices manual: Storage and handling of petrochemicals

Australian cotton industry Best Management Practices manual – Update 1

Changes in attitude to integrated pest management in the cotton industry 1997-2001 and attitudes to Area Wide management

Evaluation of the Australian cotton industry Best Management Practices program

Integrated Pest Management Guidelines, 2nd edition

Industry perceptions on management issues associated with Bollgard® II

Knowledge management in cotton and grain irrigation

Management changes for Bollgard® II and new technology

Managing mirids

Managing riparian lands in the cotton industry

Proceedings of the 2003 CRDC Farming Systems Forum: Improving water management on cotton farms

A review of biodiversity research in the Australian cotton industry

Second cotton industry environmental audit

Survey of Cotton growers' and consultants' experience with Integrated Pest Management in the 2002 and 2003 seasons. Cotton Consultants Australia

World Cotton Research Conference – 3 Proceedings: *Cotton production for the new millennium.* Ed. A Swanepoel, Pretoria, May 2004:

B. A Pyke, 2004. *The performance of Bt transgenic (INGARD®) cotton in Australia over six seasons.*

G. W. Roth, 2004. *Measuring the sustainability of cotton production systems.*

J. N. Stanley, G. W. Roth, D. Gibb & R. S. Jessop, 2004. *Schooling our cotton industry in Australia: sharing the knowledge*

G. W. Roth, 2004. *Conference Summary – agronomy and physiology.*

Media Releases

Boyce Report on website

New guide to aid river and waterways health in cotton valleys

Public seminar on "Cotton biotechnology: the way forward"

Cotton analysis shows best practice benefits

Nine million dollar research program announced

Cotton industry receives funding boost for post-farm gate BMP

National *Helicoverpa* workshop

CRDC 'Mirids in cotton' workshop

New Executive Director for Cotton Research and Development Corporation

School students visit Narrabri to learn cotton industry opportunities

Cotton industry snaps up prizes in CRDC Snapshot Competition

Jointly with Cotton Australia:

Cotton Industry Environmental Audit

2002/03 Crop Results and Forecasts for Next Season

Costs of Cotton Production – Remaining Competitive

New Genetically Modified Cotton Varieties to be Introduced This Season

Triple Bottom Line Report

Workshops, Field Days and Presentations

(organised or funded by CRDC or with significant CRDC input)

Annual cotton extension workshop 2003, Barrington Tops

Annual cotton extension workshop 2004, Narrabri

Australian Cotton CRC annual review, Armidale

Australian Cotton CRC 5th year review, Narrabri

Australian Cotton CRC management committee

Australian Cotton Trade Show, Moree

BMP auditing workshop, Narrabri

BMP management committee meetings

Bureau of Rural Sciences land management workshop, Canberra

Central Queensland review of entomology research

Centre for International Economics farm health and safety round table, Canberra

Cotton Australia and Cotton Grower Association forum, Goondiwindi

Cotton Catchment Communities CRC bid committee

Cotton Consultants Association cotton production seminar and AGM, Narrabri

Cotton Grower Association Forum, Narrabri

Cotton industry second environmental audit launch, Canberra

Cotton Pilot EMS Project steering committee, Goondiwindi

CRDC and Cotton CRC Farming Systems Forum, Moree

CRDC and Cotton CRC post graduate familiarisation tour, Narrabri

CSD and CSIRO crop production research review, Narrabri

CRDC and GRDC Spray drift awareness planning meeting, Gatton

CRDC plant breeding and biotechnology review, Canberra, Narrabri, Goondiwindi and Dalby

Ecological Society of Australia conference, Armidale

EMS Pathways workshop, Brisbane

Field to Fabric field walks, Emerald, Moree and Wee Waa

FUSCOM Fusarium wilt committee, Goondiwindi

Gene Technology Grains Committee workshop, Melbourne

Land and Water Australia RDC benchmarking project, Canberra

Lippia working group

Lower Namoi cotton field day, Wee Waa

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
ACCRC	Australian Cotton Cooperative Research Centre (also Cotton CRC)
ACRI	Australian Cotton Research Institute (located near Narrabri, NSW)
AFFA	Agriculture Fisheries and Forestry – Australia. Now the Australian Government Department of Agriculture, Fisheries and Forestry
ANAO	Australian National Audit Office
APVMA	Australian Pesticides and Veterinary Medicines Authority, formerly the National Registration Authority for Agricultural and Veterinary Chemicals
ARLP	Australian Rural Leadership Program
ARRIP	Australian Agricultural Research in Progress database
AWA	Agriculture Western Australia (Department of)
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)
CAC Act	*Commonwealth Authorities and Companies Act 1997*
CCA	Cotton Consultants Australia Inc.
Cotton CRC	Australian Cotton Cooperative Research Centre
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
DLWC	Department of Land and Water Conservation, New South Wales, now part of the Department of Infrastructure, Planning and Natural Resources
DNR	Department of Natural Resources, Queensland
DOFA	Australian Government Department of Finance and Administration
ESD	Ecologically Sustainable Development
EPA	Environmental Protection Agency, New South Wales
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
GMAC	Genetic Manipulation Advisory Committee
GOA	Groundrig Operators Association
GRDC	Grains Research and Development Corporation
Heliothis	Insect pest, more properly known as *Heliothis* 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.
IP	Intellectual Property
IPM	Integrated Pest Management
LWA	Land and Water Australia
MDBC	Murray–Darling Basin Commission
MLA	Meat and Livestock Australia
MP	Member of Parliament
NFF	National Farmers' Federation
NRA	National Registration Authority for Veterinary and Agricultural Chemicals. Now known as the Australian Pesticides and Veterinary Medicines Authority (APVMA)
NRM	Natural Resource Management
NSW	Department of Agriculture, Agriculture New South Wales, now the Department of Primary Industries
PIERD Act	*Primary Industries and Energy Research and Development Act 1989*
Pima cotton	Gossypium barbardense.Related to Egyptian cotton, having extra long and fine stapes. Limited Australian production in the Darling region.
QDPI	Department of Primary Industries, Queensland
RCMAC	Raw Cotton Marketing Advisory Committee
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, section 9

A. Report of operations

Preliminary	
Exemptions from requirements	nil
Certification	iii
Overview	
Standards of presentation	all pages
Obtaining information from subsidiaries	nil
General information	
Enabling legislation	83
Responsible Minister	84
Organisational structure	92
Review of operations and future prospects	
Statutory object and functions	83-84
Corporate plan	40-82
Principal outputs and contribution to outcomes	40-82
Efficiency and effectiveness of operations	40-82
Links between outcomes, strategies and principal outputs	14-15; 40-82
Factors influencing performance	12-13; 16-18; 35-38; 40-82; 95-96
Significant events	95
Operational and financial results	1-7; 35-38; 40-82; 97-124; 128-136
Developments since the end of the financial year	36
Judicial decisions and reviews by outside bodies	nil
Ministerial directions	nil

Specific information	
Particulars of directors	87-89
Audit Committee	90-91
Statement of corporate governance practices	11
Indemnities and insurance premiums	90
Miscellaneous	
Enabling legislation	83-84
Any other legislation	83
Commonwealth disability strategy	95
Financial statements	97-124
Primary Industries and Energy Research and Development Act, Section 28	
Annual reporting requirements	
R&D activities funded	40-82; 128-136
R&D expenditure	35-3
Ecologically sustainable development	95
Revisions to Principal Plan 2003–2008	nil
Revisions to Annual Operational Plan	nil
Entering into of agreements	nil
Intellectual property	nil
Activities of a company	nil
Formation of a company	nil
Acquisitions and dispositions of real property	nil
Contribution to achievement of corporate objectives	35-38; 40-82
Implementation of Annual Operational Plan	40-82
Contribution to the attainment of objects of this Act	14-15; 40-82
Sources and expenditure of funds	35-38; 97-124
Selection Committee report	126
Other reporting requirements	
Government R&D priorities	19-34
Funding of consultation costs to peak industry bodies	96
Other legislative reporting requirements	
Occupational health and safety	94
Freedom of Information	94
Ecologically sustainable development (Environment Protection and Biodiversity Conservation Act)	95
Fraud control	91-92

APPENDIX SIX

SUBJECT INDEX

accountability, 11, 22, 83, 84–85
acronyms and terminology, 140–141
Annual Operating Plan 2003–2004, 20, 84, 91
Appendices, 125–143
appointments
  Board, 85
  Executive Director, 1, 18, 90, 93, 95
Audit Committee, 90–91
audit, environmental, 2, 16, 22, 50, 51, 57, 73
Australian Cotton Cooperative Research Centre, 16, 23, 33, 34, 40, 41, 46, 48, 54
Australian Cotton Growers' Research Association, 30, 48, 66, 75, 84, 85, 96
Australian Cotton Industry Council, 17, 32, 48, 81
Australian Dryland Production Guide, 46
Australian Greenhouse Office, 54
Australian National Audit Office, report, 98–99
AVCARE, 48

Bacillus thuringiensis (Bt), 59; *see also* Bt cotton varieties
Best Management Practices, 2, 22–23, 26, 32, 51, 54, 55
  evaluation of, 16, 22, 51, 57, 73
  extension of, 68, 81, 87
  industry adoption of, 41, 46, 54, 56, 57
biodiversity management, 2, 16, 23, 55, 58
biosecurity plan, development of, 30
Black Root Rot, 62, 65
Board of Directors, 85–86
  Committees, 90–91
  members, 87–89
  review of performance, 1, 18, 85
  role and responsibilities, 85–91
Bollgard® cultivars, 16, 23, 32, 35, 57, 59–60, 71, 76
BOYCE chartered accountants, 48, 71
BT cotton varieties, 59, 60, 71, 76

Catchment Management Authorities
  collaboration with, 18, 41
Chair
  foreword, 16–18
climate change, impact on cotton industry, 54, 58, 70
Code of Conduct, 91
Committees, Board, 90–91
Commonwealth Authorities and Companies Act 1997, iii, 83, 84, 90, 95
Commonwealth Disability Strategy, 95
competitiveness, global, 4–5, 7, 79–80
compliance index, 142–143
conflicts of interest, 90
consultants and contractors, 93
Cooperative Research Centre for Australian Weed Management, 48
Cooperative Research Centre for Cotton Catchment Communities, 17, 41
Cooperative Research Centre for Irrigation Futures, 18
Cooperative Research Centre for Tropical Plant Protection, 30, 62
corporate governance, 11, 83–96
corporate planning, 91
corporation, income, 40
corporation, structure of, 92
Cotton Australia, 22, 23, 48, 51, 53, 54, 57
Cotton Consultants Association, 48, 64, 78, 95
Cotton Extension and Evaluation Specialist, 40
Cotton Levy Act 1982, 83
Cotton Production during Drought, 46, 67
cotton shippers and ginners, 48
Cotton Varietal Trial Protocol, 76
Crop Protection Program, 59–66
CSIRO, 17, 35, 75, 77, 80, 82
  Plant Industry, 68
  Textile and Fibre Technology, 80–81
CSIRO-bred varieties, 17, 32, 59, 76, 77, 78, 82

decision support tools, 34, 45–46, 68; *see also* HydroLOGIC; WATERpak
deep drainage research, 24, 55, 70
disease management, 30, 62, 66; *see also* Black Root Rot; Fusarium wilt
documents, categories of, 94
drought
  effects on harvest, 13, 16, 35
  effects on funding, 16, 17, 34, 35, 49, 95
Ecologically Sustainable Development and Environmental Management, reporting, 94
EMS Pilot Project, 23, 54; *see also Pathways to Industry EMS* program
ENTOpak, 46
Environment Protection and Biodiversity Conservation Act 1999, 95
environmental audit, 2, 16, 22, 50, 51, 54, 57, 73
environmental management, corporate obligations, 95
environmental management system, industry; *see* Best Management Practices
equal employment opportunity, 93
Executive Director
  appointment of new, 1, 18, 93
  foreword, 16–18
expenditure, summary of, 37; *see also* Financial Statements
extension, role in, 40–41; *see also* National Cotton Extension Network

Farm Health and Safety R&D Program joint venture, 26, 46
Farming Systems Forum, 68
Farming Systems Program, 32, 67–73
Farmsafe Australia, 26, 46, 49
fibre quality, improvement of, 4–5, 32, 71, 79–82
Field to Fabric Initiative, 13, 32, 81
financial analysis, 35–38; *see also* Financial Statements
Financial Statements, 97–124
fraud control, 91–92
Freedom of Information, 94
funding; *see* Financial Statements; Government funding; levy; revenue
fungal diseases, 29, 59; *see also* disease management; Fusarium wilt
Fusarium oxysporum f.sp. *vasinfectum*, 29
Fusarium wilt, 17, 29, 30, 48, 59, 62, 65, 75, 76, 77

Government funding, 16, 17, 23, 32, 54; *see also* Financial Statements; revenue
Government research priorities; *see* National Research Priorities
greenhouse gas emissions, 54, 58, 70
Grains Research and Development Corporation, 17, 24, 29, 48, 63, 70
groundwater salinity risk, 24, 56, 58, 70, 72

harvests, 2004 reductions in, 13, 16, 35
Helicoverpa armigera, 60, 65
Helicoverpa punctigera infestations, 29, 59–60
Helicoverpa-resistant cotton, 23, 55, 58, 59–60, 76
herbicide resistance management, 28, 76; *see also* Roundup Ready® technology
herbicide usage, reduction in, 28, 56, 63–64, 76
highlights of the year, 1–7
Horticulture Australia Ltd, 29–30, 48
HydroLOGIC, 23, 34, 45, 68, 69
'Improving water management on cotton farms' (forum), 68

indemnities, Board, 90
INGARD® cotton varieties, 28, 57, 59–60, 71, 76
insect pest management; *see* integrated pest management
insect pests, 23, 29–30, 55, 60, 61, 62, 65
insecticide usage, reduction in, 28, 60–61, 76; *see also* pesticide usage
Integrated Disease Management Guidelines for Cotton, 46
Integrated Natural Resource Management Program, 50–58
Integrated Pest Management Short Course, 43, 45

Integrated Pest Management Training Coordinator, 40
integrated pest management, 16, 21, 23, 55, 59, 71–72
integrated weed management, 16, 17, 21, 28, 41, 63–64, 76
Intellectual Property Committee, 91
irrigation management, 23–24; *see also* water use efficiency

Land and Water Australia, 18, 23, 24, 48, 55, 70
Land and Water Resources Research and Development Corporation; *see* Land and Water
legislation, iii, 34, 83, 84, 90, 95
letter of transmittal, iii
levy, industry 16, 30, 35, 83, 95
Liverpool Cotton Outlook 'A' index, 77

Managing Cotton Farm Safety manual, 26, 46, 49
Managing Riparian Lands in the Cotton Industry, 23–24, 46, 55
Market Audit of Cotton Crop Production Products, 78
meetings, Board, 90
Ministerial directions, 84
Ministers, 84
mission statement, 9
Murray–Darling Basin Commission, 23, 24, 48, 53, 70
National Cotton Extension Network, 23, 24, 33, 40–41, 49, 54, 55, 64
  evaluations by, 48, 65
National Heritage Trust project, 22–23, 51, 57, 81
National Program for Sustainable Irrigation, 16, 23, 69
National Research Priorities, 19, 20, 21
Natural Resource Management Project for the Australian Cotton Industry, 23
natural resource management, 16, 17, 23, 50–58, 95
New South Wales Department of Infrastructure, Planning and Natural Resources, 23, 55
New South Wales Department of Primary Industries, 41, 68
NUTRIpak, 46

objectives
  program, 40, 50, 59, 67, 75, 79
  related to stakeholder priorities, 21, 25, 27, 29, 31, 33
Occupational Health and Safety, 18, 26, 46, 94
office locations, 83
operating environment, 12–13
operational plan, annual, 20, 84, 91
outcome and outputs framework, 10, 14–15, 38
OZCOT, 68

partners, defined, 10
Pathways to Industry EMS program, 16, 32, 54, 81
payment to representative bodies, 96
People and Knowledge Program, 40–49
performance against stakeholder priorities, 21–34
performance against measures, 48–49, 57–58, 65–66, 72–73, 77–78,
pest management; *see* integrated pest management
Pest Management Short Course, 60
pesticide management practices, 28, 51–53
pesticide usage, reduction in, 16, 22, 26, 50, 60–61, 76
plans
  Annual Operational, 20, 84, 91
  biosecurity, 30
  risk management, 85, 91
  Strategic, 1, 16, 20, 22, 37, 50, 84
Plant Breeding and Biotechnology Program, 75–78
  review of, 4, 17, 28, 43
Plant Health Australia, 30
political disclosure, 96
postgraduate scholarships, 2, 33–34

Primary Industries and Energy Research and Development Act 1989, iii, 34, 83, 90
Primary Industries Levies and Collections Act 1991, 83
publications and activities, 137–139
refereed articles, 58, 73

Queensland Department of Natural Resources and Mines, 23, 55, 67
Queensland Department of Primary Industries, 41

Remuneration Committee, 91
report of operations, programs,
Corporate, 83–96
Crop Protection, 59–66
Farming Systems, 67–73
Integrated Natural Resource Management, 50–58
People and Knowledge, 40–49
Plant Breeding and Biotechnology 75–78
Value Chain, 79–82
Research and Development Portfolio, 127
Research and Development Projects, 128–136
research priorities, stakeholders, 19–34
resistance management, 28, 59, 60, 76; *see also* integrated pest management; Roundup Ready® technology
revenue, 35–36; *see also* Financial Statements
Risk Management Plan, 85, 91
river health, 23–24, 55–56
role, 11
Roundup Ready® technology, 17, 28, 32, 35, 63–64, 76
royalties, 32, 35
Rural Industries Research and Development Corporation, 18, 46, 48

safe work procedures, adoption of, 26, 46, 49; *see also* occupational health and safety
salinity, 24, 55, 70, 72–73
risk mapping, 24, 70
scoping study
deep drainage, 24, 70
socio-economic indicators, 26, 40, 78
Selection Committee Report, 126
Service Charter, 92
significant changes in state of affairs, reporting on, 95–96
significant events, obligation to report, 95
Silverleaf Whitefly, infestations, 29–30, 55, 61, 65
SiroMat, 81, 82
sodicity, 24, 55, 70, 72–73
soil
health, 70, 72–73
salinity, 24, 55, 70, 72–73
sodicity, 24, 55, 70, 72–73
SOILpak, 46
SPRAYpak, 46
staff, 92
stakeholders, 10, 84
research priorities, 19–34
Strategic Plan 2003–2008, 1, 16, 20, 22, 37, 50, 84
Strategic Planning Committee, 91
structure, of corporation, 92

terminology and acronyms, 140–141
training, 93
transgenic crop technology, 23, 28, 41, 55–56, 57, 58, 59–60, 66
transmittal letter, iii
triple bottom line reporting, 1, 22, 38, 41, 50, 95

'Understanding Deep Drainage for Better Catchment Planning', 70

value chain management, 17, 32
Value Chain Program, 79–82
vetch cropping systems, 70, 73
vision, corporate, 8

water conservation; *see* water use efficiency
water quality management, 23–24, 55–56; *see also* groundwater
water use efficiency, 2, 23–24, 67–69
decision support systems, 34, 45–46, 68
'Watermark' Project, 48, 53, 57

WATERpak, 23, 34, 45, 68–69
weed management; *see* integrated weed management
WEEDpak, 46, 64
whole farm management, 71; *see also* Farming Systems Program
Women in Cotton Network (Wincott), 34, 44–45

year in review, 1–7, 16–18




THE RURAL RESEARCH AND DEVELOPMENT CORPORATIONS MODEL

- The Rural R&D Corporations (RDCs), including CRDC, take a leading national role in planning, investing in and managing research and development for their respective industries.
- RDCs are not research "grant" agencies. Their enabling legislation requires them to treat R&D as an investment in economic, environmental and social benefits to their industries and to the people of Australia.
- Rather than focusing mainly on generating new knowledge for its own sake, RDCs strive to deliver high rates of return on research and development investment by influencing the full range of interactions along the innovation chain.
- Striving for high returns on investment also leads RDCs to apply significant resources to translating research outputs into practical outcomes.
- RDCs are required to conduct their activities in accordance with strategic research and development plans and annual operational plans that take account of the needs of end-users and other stakeholders. The plans are approved at ministerial level.
- Although RDCs fund basic research, a high proportion of activity is applied research and development – both short-term and long-term.
- RDCs are fully accountable to their major stakeholders and to the wider community.