

# Cotton

RESEARCH & DEVELOPMENT

## Annual Operating Plan *2003—2004*



# Annual Operating Plan 2003—2004

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## Contents

<b>About the Corporation</b>	<b>3</b>
Role of the Corporation	3
Statutory Objectives (PIERD Act 1989)	3
Cotton Industry Research Priorities	3
Funding	4
Location	4
Collaboration	4
<b>Australian Cotton — a 2003 snapshot</b>	<b>5</b>
<b>Advancing the National R&amp;D effort</b>	<b>6</b>
Addressing National Research Priorities	7
Addressing Government Priorities for Rural R&D	9
<b>Research Accountabilities 2003–2004</b>	<b>12</b>
<b>Research &amp; Development: 2003–2004 Program</b>	<b>12</b>
Our Operating Environment	13
Outcomes and Outputs	15
Evaluations	17
Strategies for Success	17
Program 1: People and Knowledge	18
Program 2: Integrated Natural Resource Management	21
Program 3: Crop Protection	24
Program 4: Farming Systems	30
Program 5: Plant Breeding and Biotechnology	33
Program 6: Value Chain	36
<b>Budget Statements 2003–04</b>	<b>38</b>
<b>Research Providers</b>	<b>42</b>
<b>Research Projects 2003–04</b>	<b>43</b>
<b>Corporation Responsibilities</b>	<b>49</b>
<b>Acronyms</b>	<b>54</b>





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# About the Corporation

## Role of the Corporation

The Cotton Research and Development Corporation acts in partnership with Federal Government and the Australian cotton industry to ensure that the research and development needs of the industry are being met.

The Corporation was established in 1990 under the Primary Industries and Energy Research and Development (PIERD) Act 1989, which outlines the Corporation's accountability to the Federal Government and to the cotton industry through the Australian Cotton Growers' Research Association (ACGRA).

The Corporation is accountable to Federal Parliament through the Minister for Agriculture, Fisheries and Forestry the Hon. Warren Truss MP and the Parliamentary Secretary to the Minister, Senator the Hon. Judith Troeth.

As stakeholders, the Federal Government and the ACGRA set broad objectives, which the Corporation addresses through its five-year and annual research and development plans. These objectives relate to improving the sustainability and profitability of the cotton industry, effectively using the human resources available and ensuring benefits flow-on to the community, while also maintaining sound and efficient administration of the research and development program.

## Statutory Objectives (PIERD Act 1989)

- ◆ Increase economic, environmental and social benefits to the cotton industry and the community
- ◆ Achieve sustainable natural resource use and management
- ◆ Make effective use of the skills and human resources available in the general community and in the scientific community in particular
- ◆ Manage the R&D effort soundly and effectively

## Cotton Industry Research Priorities

Each year the ACGRA meets to review the applications for new research funding and reports from continuing projects. From this meeting the ACGRA makes a range of recommendations to the CRDC Board regarding the current research program and priority areas for the future. At present, those research priorities are:

- ◆ Invest in the skills, strengths and occupational health and safety of the human resources in the cotton industry and its communities
- ◆ Improve the sustainability of the cotton industry and its catchments
- ◆ Improve the profitability of the cotton industry
- ◆ Create and support strong, focused and committed research program

Through its involvement in the Australian Cotton Industry Council and the Raw Cotton marketing Advisory Committee the Corporation is also able to liaise with the broader cotton industry.

## About the Corporation

### Funding

As the major funding body for research and development in the Australian cotton industry, the CRDC will manage an integrated program of more than 140 projects during the 2003-04 research year. The Corporation receives funding from four sources:

- ◆ An industry contribution, in the form of a levy of \$2.25 for each 227kg bale of cotton produced in Australia. This levy was increased in March 2002 at the request of the industry. The enabling legislation for the setting and collecting of the industry levy is the Cotton Levy Act 1982 and the Primary Industries (Excise) Levies Act 1999.
- ◆ A matching contribution from the Federal Government, up to a maximum value of 0.5 per cent of the gross value of production.
- ◆ Royalties on domestic and international seed sales of CSIRO-bred Australian cotton varieties.
- ◆ Interest on working reserves.

Corporation financial policy has been 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 drought, these reserves will be drawn upon in the coming financial year so the critical mass of the cotton industry's research effort can be maintained.

The Corporation does not make any payments to its industry representative body; however, it funds the publication of the proceedings of the biennial Australian Cotton Conference, which is organised and managed by the ACGRA.

### Location

The Corporation is based in the heart of one of Australia's major cotton growing areas at Narrabri in North Western New South Wales. The Corporation is close to one of the industry's key research facilities, the Australian Cotton Research Institute, which is also the headquarters for the Australian Cotton Cooperative Research Centre (Cotton CRC). This positioning ensures the CRDC remains in close contact with growers, researchers, processors and the communities it serves.

### Collaboration

The Corporation is a core participant in the Australian Cotton Cooperative Research Centre, and is well represented on both the Cotton CRC Board and Management Committee. This involvement helps to improve coordination and collaboration.

The term of the current Cotton CRC expires in June 2006 and the Corporation will work with the other CRC partners to ensure this vibrant research and extension continues. CRDC, together with other partners, will develop a new CRC bid in 2004.

The Corporation is also involved in a range of joint or collaborative research efforts with a range of other organisations, including Grains Research & Development Corporation, Land and Water Australia, Horticulture Australia, Rural Industries Research & Development Corporation, the Murray-Darling Basin Commission and the Cooperative Research Centres for Weeds, Greenhouse Accounting and Fresh Water Ecology.

# Australian Cotton

## a 2003 snapshot

The 2002-03 season saw a reduction in planting from an estimated 404,000 hectares in 2001-02 to 220,000 hectares. The 2001-02 planting was itself a reduction of 105,000 hectares on the year before. Overwhelmingly, the causes of the reduction have been low water storage levels and the drought. Cotton production is forecast to fall to 1.4 million bales for the 2002-03 crop, compared with 3.2 million bales in 2001-02 and 3.4 million bales in 2000-01. (Source: Raw Cotton Marketing Advisory Committee)

According to CRDC calculations, the five-year production average for 1998 to 2002 was 3.2 million bales from 470,000 hectares of cotton. The average Gross Value of Production (GVP) for this period, according to ABARE, was \$1,570 million per year. The Corporation has considered historic data and predictable trends and believes that as soon as the drought ends and water allocations return to previous levels, production will return quickly to the five-year average level.

Australian growers obtain some of the world's highest average yields: more than two and a half times the world average and more than double the average yields achieved in the United States (Source: International Cotton Advisory Committee).

Approximately 70 per cent of Australian cotton is grown in New South Wales with the remainder produced in Queensland. Major production areas include the Macquarie, Namoi, Gwydir and Macintyre valleys, as well as the Darling Downs and Emerald.

Australia, traditionally, is the third largest exporter of raw cotton in the world and Australian cotton normally accounts for approximately 13 per cent of the world trade. Up to 95 per cent of Australian raw cotton is destined for international markets (Source: ICAC). With the significant reduction in production in 2002-03, Australia is unlikely to hold its place as a major exporter.

Indonesia is the largest buyer of Australian cotton, taking about a third of our exports. Japan, Thailand, South Korea and Taiwan are other important markets (Source: Australian Bureau of Statistics). The reduced production could endanger some of Australia's markets.

The United States and China are the world's largest producers of raw cotton with annual production averaging about 17 million bales in the US and 20 million bales in China. The US is the largest exporter of raw cotton and dominates world trade with a 30 per cent share of the market. China fluctuates between being a net importer and a net exporter of cotton (Source: ICAC).

The Centre for International Economics estimates that the aggregate income for Australian cotton producers would rise by an estimated \$42,000 per grower per year if the US were to lift barriers on textile imports and end subsidisations for farmers. Worldwide, cotton producers and consumers would realise significant gains from this move. Consumption on textiles and clothing in the US was estimated to increase by 6.5 per cent, but consumers would spend \$20 billion less due to cheaper prices. (Source: *Trade Distortions and Cotton Markets*, CRDC, 2001)

# Advancing

# the national research effort

## BACKGROUND

Addressing the Government's priorities for rural research and development has been integral to formulation of the Corporation's research program since 1994.

Broadly speaking, NRPs represent wider research objectives for all research and development in Australia while rural research and development priorities are more specific and add further priorities addressing economic and trade-related issues.

In December 2002, National Research Priorities (NRPs) were released by the Prime Minister, under the broad categorisations of:

- ◆ An Environmentally Sustainable Australia
- ◆ Promoting and Maintaining Good Health
- ◆ Frontier Technologies for Building and Transforming Australian Industries
- ◆ Safeguarding Australia

Following the release of the NRPs, Senator the Hon. Judith Troeth, Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry, wrote to the Corporation in March 2003 to advise of the Government's revised priorities for rural research and development:

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

These priorities have been framed to ensure that they are consistent with the NRPs. The timing of their release means that the Corporation's new Strategic Plan 2003-2008 and this Annual Operating Plan are able to incorporate both these priorities and the NRPs. The guidance that the rural research and development priorities have provided over the past decade mean the Corporation is well placed to respond effectively to the NRPs.

The way in which the Corporation is addressing each set of priorities is outlined below, reported in more general terms for the NRPs and more specifically for the rural research and development research priorities.

The Corporation has addressed the general NRP priorities, as well as those priority goals contained within each NRP that fit within the scope of the cotton industry and its activities. More than one research program contributes to each National Research Priority.

Sustainability of the natural resource base forms one of the three research and development Outputs in the Corporation's new Strategic Plan 2003-08, as in the previous Strategic Plan.

**Transforming the cotton industry** in environmental terms has been a major task for the Corporation; a task dictated by government, the wider community and the industry itself. The structure of the Strategic Plan 2003-08 facilitates the continuation of this work through Programs 1 to 5 in 2003-04. In particular, the new Integrated

### Addressing National Research Priorities

#### An Environmentally Sustainable Australia

Natural Resource Management program will strengthen links throughout the production process, thus allowing better integrated environmental management.

During the course of the previous Strategic Plan, the Corporation introduced the Best Management Practice (BMP) Program, which has contributed greatly to addressing the major environmental impacts of cotton growing, such as pollution of waterways, chemical storage and handling, pesticide use and soil and water management.

Under the new strategic plan, the Corporation intends to build on the success of the BMP program by improving the capacity to further address environmental issues – particularly water – and to integrate the environmentally sensitive management of cotton farms into the wider effort to maintain the environmental health of catchments. To that end, we will be seeking to further extend collaborative activities with relevant water catchment management authorities and relevant research bodies.

#### Promoting and Maintaining Good Health

The priority goal with applicability to the work of the Corporation is **Preventive Healthcare**.

Much of the work funded in the past by the Corporation has led to reduced pesticide use; particularly broad spectrum pesticides such as organophosphates. This is of crucial importance to this priority, in addition to addressing sustainability. The future should see further reductions in pesticide, as further improvements to biotechnology available to the industry combines with improved management techniques.

The Corporation funded the development of a Managing Cotton Farm Safety manual, which is now being used in the course delivered by Farmsafe Australia in New South Wales and Queensland. This means the cotton industry is well ahead of many other rural industries in implementing improved farm health and safety. It will be several years before it is possible to fully evaluate the effectiveness of this program. When the opportunity arises, the Corporation will look to provide further investment in farm health and safety, based on the evaluation of the current program.

The Corporation remains highly supportive of the Farm Health and Safety Joint Venture, involving other RRDCs and managed by the Rural Industries RDC. This joint venture has just entered its second five-year strategic period and is addressing a range of issues concerning rural and farm health and safety.

## Advancing the national research effort

### Frontier Technologies for Building and Transforming Australian Industries

The NRP priority goal of **Frontier Technologies and New Industries** is of crucial importance to the cotton industry, which remains the only major agricultural industry in Australia that has used commercial applications of biotechnology, in the form of insect- and herbicide-tolerant varieties of cotton. The Corporation has been measuring the performance of INGARD<sup>®</sup> cotton, which contains a single gene that controls two key pests, for six years and the results clearly show that this technology enables cotton farmers to make major reductions in pesticide use. The industry has managed INGARD<sup>®</sup> technology with great care and concern for the potential for resistance to develop. The Corporation has funded research to monitor pest populations for any signs of the development of resistance. To date, no significant change in resistance to the single gene in INGARD<sup>®</sup> has been detected. This is important for the anticipated introduction of Bollgard II<sup>™</sup>, carrying two pest control genes instead of one. Varieties carrying two pest control genes are much less prone to the development of resistance in key pests and the industry expects that this will allow a larger proportion of the crop area to be planted to Bollgard II<sup>™</sup> than was possible with INGARD<sup>®</sup>. If this eventuates, further large reductions in pesticide use across the industry are expected, with consequent environmental, health and economic benefits.

The Corporation has been investing in a range of biotechnology research such as cotton with healthier cottonseed oil, genes associated with fibre development and genetic markers to assist plant breeding. The science of biotechnology is a rapidly expanding and complex field and the Corporation has to be particularly vigilant that its investments are well targeted to meet the future needs of the industry. To assist in forward planning, the Corporation will be commissioning a review of biotechnology plant breeding in late 2003.

The Corporation also gives weight to the priority goal of **Advanced Materials**. Over the past decade, the Corporation's research led to the development of Colana, a new fabric combining wool and cotton and delivering the best features of each. An Australian company now holds the patent for this product.

Building on this success, the Corporation, together with Australian Wool Innovations, will commission a project in 2003-04 to explore further opportunities for wool and cotton smart fabrics. Research also continues into fibre development and modification using biotechnology to alter characteristics such as fibre length, strength and cellulose structure. Looking further into the future, the Corporation believes this work may open up different specifications for the fibre with exciting new applications. CRDC will monitor the outcomes of such research closely, exploring any such potential applications.

### Safeguarding Australia

Within this NRP, one priority goal is of importance to the work of the Corporation: **Protecting Australia from invasive diseases and pests**. The cotton industry has already experienced the impact of an introduced, invasive pest. The Silverleaf Whitefly, thought to have been introduced to Australia about ten years ago, has become a problem in some northern cotton growing areas in central Queensland. Understanding how to manage this pest has required a significant collaborative investment by CRDC, GRDC and Horticulture Australia.

Preventing the incursion of such pests avoids the need for this expenditure, meaning the Corporation treats this priority goal very seriously. CRDC contributes, on behalf of the cotton industry, to Plant Health Australia as part of the national effort to keep pests and diseases out of Australia. During 2003-04 the Corporation will be collaborating with Plant Health Australia to develop a biosecurity plan specific to the cotton industry.

### Addressing Government Priorities for Rural R&D

#### Sustainable natural resource management

To better address this important rural research and development priority, the Corporation is moving to a new program of Integrated Natural Resource Management in its Strategic Plan 2003-08. By this means, the Corporation intends to ensure that linkages between the National Action Plan on Salinity and Water Quality, catchment management processes and on-farm natural resource management are strengthened.

The Corporation will expand its focus on water-related research in 2003-04. Major activities will include:

- ◆ Contributing to Land and Water Australia's (LWA) National Program for sustainable Irrigation (PSI) through a Cotton CRC project to measure accurately the deep drainage of water under cotton fields as a basis for developing improved measurement of the water balance, leading to improved water use monitoring and management techniques.
- ◆ A new project to document and extend technical knowledge on alternative overhead irrigation systems to farmers.
- ◆ A contribution to an AFFA-funded Cotton Australia environmental management systems program, including an evaluation of the outcome of five years of the cotton Best Management Practice program and implementation of a new Land and Water module.
- ◆ Extension of Riparian Management Guidelines, with the Cotton CRC.
- ◆ Release of WATERpak, HydroLOGIC and a farmer-friendly water use efficiency calculator.

CRDC has funded research on understanding the salinity threats in cotton growing areas for almost ten years. In 2003-04, it is funding an awareness and extension program to reap the benefits of this research.

A new joint project with the CRC for Greenhouse Accounting and the Cotton CRC will benchmark nitrous oxide emissions from cotton fields as a first step to reducing greenhouse gas emissions from cotton farms.

CRDC is committed to understanding the unique role cotton farms can play in maintaining Australia's biodiversity and has a longer term goal within the new Strategic Plan of pursuing research in this area. While a project on recording, analysing and mapping of biodiversity in cotton areas of the Emerald irrigation area will continue, it is a source of regret to the Corporation that due to drought-induced budgetary restrictions no new research on biodiversity can be undertaken in the coming year.

## Advancing the national research effort

Improving competitiveness through a whole-of-industry approach  
*and*  
Improved trade and market access

The nature of the cotton industry value chain means these research priorities are interlinked. The Corporation's 'Field-to-Fabric' research program involves whole-of-industry input through growers, researchers, ginners, marketers and spinners. It aims to identify the various impacts on fabric quality throughout the whole value chain, as well as opportunities to improve fibre quality.

Over fifty per cent of the Australian cotton area has now been audited under the industry's Best Management Practice program. Apart from the environmental benefits this provides, it opens opportunities for Australian cotton marketers to create new markets for cotton produced using sustainable natural resource management.

High quality fibre allows Australian cotton ready access to many of its key markets and provides a major focus for the Corporation's research program. In 2003-04, the Corporation will pursue this aim through a number of measures, including:

- ◆ Increased investment in plant breeding to improve fibre quality
- ◆ Committing funds to a commissioned project that will investigate development of a post farm gate BMP-type module for fibre quality. Although it is too early to determine if BMP for fibre quality will be developed, it will provide a focus on how our marketers can gain higher value for Australia's high quality crop.
- ◆ Research to further develop and commercialise improved fibre maturity measuring technology. At present, micronaire instruments carry out this task inadequately, which means Australian cotton may be unnecessarily discounted in the market place. If these new instruments can do a better job in a commercial setting, not only would demand for the instruments themselves be strong, both in Australia and internationally, such technology would provide the potential for extracting further value from Australia's high quality fibre.

The Corporation recently commissioned two studies on trade-related issues. These focused on distortions to world trade caused by subsidies, export incentives and import controls. This information has been effectively used in the international area, not only by the Australian cotton industry, but also by the Department of Foreign Affairs and Trade, as well as the National Farmers Federation.

When funds are available, the Corporation plans to expand research into trade and market access-related issues such as the development of an alternative cotton classification system that better reflects fibre quality values than does the current system based on the United States Department of Agriculture requirements.

Maintaining and Improving Confidence in the integrity of Australian agricultural food products

Because cotton is a fibre, with cottonseed oil as its only food by-product, this research priority is of less relevance to the Corporation. Cottonseed oil has lost some of its market share to vegetable, animal and synthetic oils in recent years. The industry, as well as other experts, advised that cotton could regain market share if its constituent oils were modified to make them 'healthier'; for example, with higher oleic and stearic content. This research, already well advanced, also seeks to simplify the refining process and, in so doing, reduce the generation of cholesterol-raising trans fatty acids. In 2003-04, the Corporation will fund a project examining the potential for commercial exploitation of these oils.

## Advancing the national research effort

### Use of frontier technologies

The use of frontier technologies has been and remains a major priority in CRDC's research program. Over the past decade, the Corporation has invested in a number of areas such as providing resources to enhance the access and use of commercial transgenes into Australian cotton varieties, development of cotton with modified healthier cottonseed oil, identification of genes associated with cotton fibre development, identification of genes or genetic markers to improve disease resistance in cotton and development of new or novel insect resistance transgenes.

The Corporation recognises that the field of biotechnology is developing rapidly and in order to gain maximum benefit for the Australian cotton industry it must have a very strategic and targeted approach.

Consequently, internationally recognised independent experts in late 2003 will review the current investments in biotechnology and plant breeding. CRDC expects this review to form the foundation for any new investments in biotechnology during the course of the new Strategic Plan.

### Protecting Australia from invasive diseases and pests

CRDC contributes, on behalf of the cotton industry, to Plant Health Australia as part of the national effort to keep pests and diseases out of Australia.

During 2003-04 the Corporation will be collaborating with Plant Health Australia to develop a biosecurity plan specific to the cotton industry. The Corporation will then use this plan to determine future research priorities for proactive incursion management.

### Creating an innovative culture

The Australian cotton industry has a strong culture of innovation and rapid adoption of research outcomes. Australian cotton farmers are not directly competing against each other, which means they are willing to share information and technological improvements. This is facilitated by the Cotton Extension Team, which is a crucial link between researchers and farmers. CRDC recognises the importance of the Extension Team and will continue to support its activities in 2003-04 despite budgetary restrictions.

Nearly all Australian cotton farmers use computers to aid their farm management. Previous research has already delivered the award winning CSIRO CottonLOGIC decision support tools for personal computers and the world first agricultural linkage of Palm Pilot handheld technology for field data collection that can be downloaded to databases on personal computers. The Palm Pilot and PCs are programmed to use the CottonLOGIC decision support platform. CRDC is investing in a new project to develop and deliver further novel decision support tools for cotton producers. For example, in 2003-04 will see the release of new water management computer-based decision support tools, the CSIRO's HydroLOGIC and water use efficiency calculator. Further developments will see improved integration of print, CD and web-based decision support tools.

# Research Accountabilities 2003—2004

## Objects of the PIERD Act 1989

- a) Increase economic, environmental or social benefits
- b) Achieve sustainable use and management of natural resources
- c) Make more effective use of human resources and skills
- d) Improve accountability for expenditure



# RESEARCH & DEVELOPMENT 2003—2004

## Our Operating Environment

The Corporation's 2003–04 research year marks the first year of operation under the Strategic Plan 2003–08. The strategic planning framework reflects a 'triple bottom line' approach to planning, implementation and reporting, focusing on economic, environmental and social outcomes. The new strategic plan has been streamlined and adopts a more holistic, integrated and systematic approach to research and development. The previous structure of 11 programs has been reviewed and integrated into six programs. This structure aims to improve linkages with the Australian Cotton Growers Research Association and deliver enhanced economic, environmental and social outcomes to the industry and the broader community.

Evaluation of the results and achievements of the preceding years is an important part of planning effectively for the next five years. Accordingly, the Corporation will be reporting on implementation of the completed Strategic Plan 1998–2003, using triple bottom line reporting for the first time.

Implementation of the 1998-2003 strategic plan has seen significant changes within the cotton industry, with the introduction of new technologies (particularly genetically-modified cotton varieties) and expansion of the industry in traditional and new production areas. In addition, July 2003 will see the introduction of improved methods of managing production in an environmentally-aware fashion (Best Management Practices). The Corporation changed its structure significantly during the 1998-2003 period, to enable it to best meet the needs of the cotton industry and the challenging environment in which it operates. The Corporation believes that its current organisational structure will enhance implementation of the new strategic plan.

## Considering the Environment

As part of developing its research program, the Corporation ensures that it does not involve itself in activities or research with the potential to harm the environment.

## Budgetary Considerations

While world cotton prices have improved, issues surrounding supply of water for irrigation continue to test the industry. Acreage in 2002-03 has been well down on the previous years and the Australian Bureau of Agricultural and Resource Economics (ABARE) forecasts cotton plantings could reduce even further in 2003-04. If rain does not replenish water storage in 2003-04 and beyond, the availability of water will continue to be a serious constraint on the development of the Australian cotton industry.

With major water storages at very low levels, the Corporation has had to assume that production in 2004 may well be below the already low 2003 crop level. The 2003-04 budget is affected by both the reduced 2003 crop and prospects for next season's production. Despite the predicted end of the current El Nino weather pattern, our budgetary forecast for next

## Research and Development 2003—2004

season has had to take account of the current state of stored water and water allocations for the 2003-04 crop.

These conditions mean the Corporation has had to work within severe constraints in formulating its 2003-04 budget, which will require in excess of five million dollars from Corporation reserves. Drought-related financial problems are exacerbated by the probable forfeiture of some matching Commonwealth contributions.

In such a challenging economic environment, CRDC has had some difficult choices to make. The loss of experienced and valued researchers would have been an unsustainable blow to the industry's research and development effort. Rather, the Corporation has aimed to maintain research capacity by continuing to support research personnel while reducing operating budgets. This could slow the progress of some research projects and in some cases affect the capacity to meet original objectives; however, it has the important longer-term benefit of retaining researchers within the industry and ensuring that current research directions can be maintained.

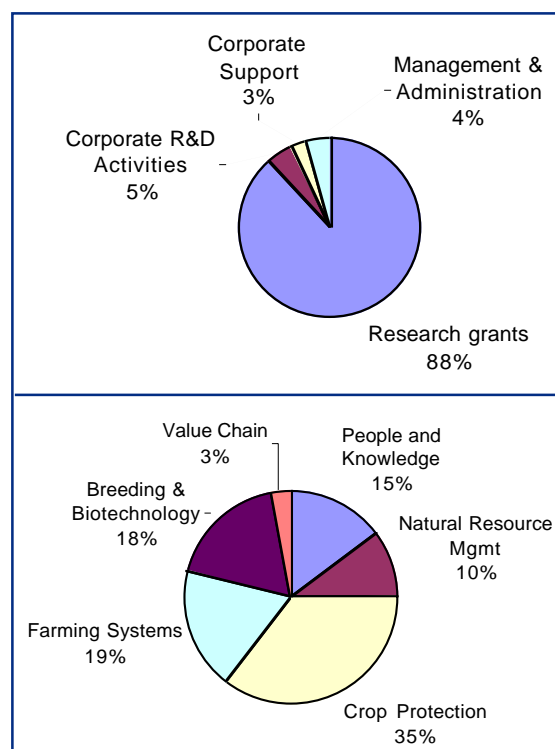
### Forecast Revenue 2003—2004

The 2003 Australian cotton harvest is expected to be down by a massive 65 per cent, compared to 2002. This affects the CRDC budget for both the current and coming budgets. Total revenue for 2003-04 is forecast to fall to \$8,331 million (2002-03 estimated actual \$13.53 million). This is composed of:

- ◆ \$2.572 million from industry levies
- ◆ \$4.748 million matching Commonwealth Government contribution
- ◆ Monies from other sources, including interest and royalties, totalling \$1.011 million.

### Forecast Expenditure 2003—2004

**TOTAL  
EXPENDITURE:  
\$12.819m**



**RESEARCH  
GRANTS  
EXPENDITURE:  
\$11.291m**

## Outcomes and Outputs

The Corporation will work in partnership with industry, government, research providers and the community during 2003-04 to achieve its corporate outcome of:

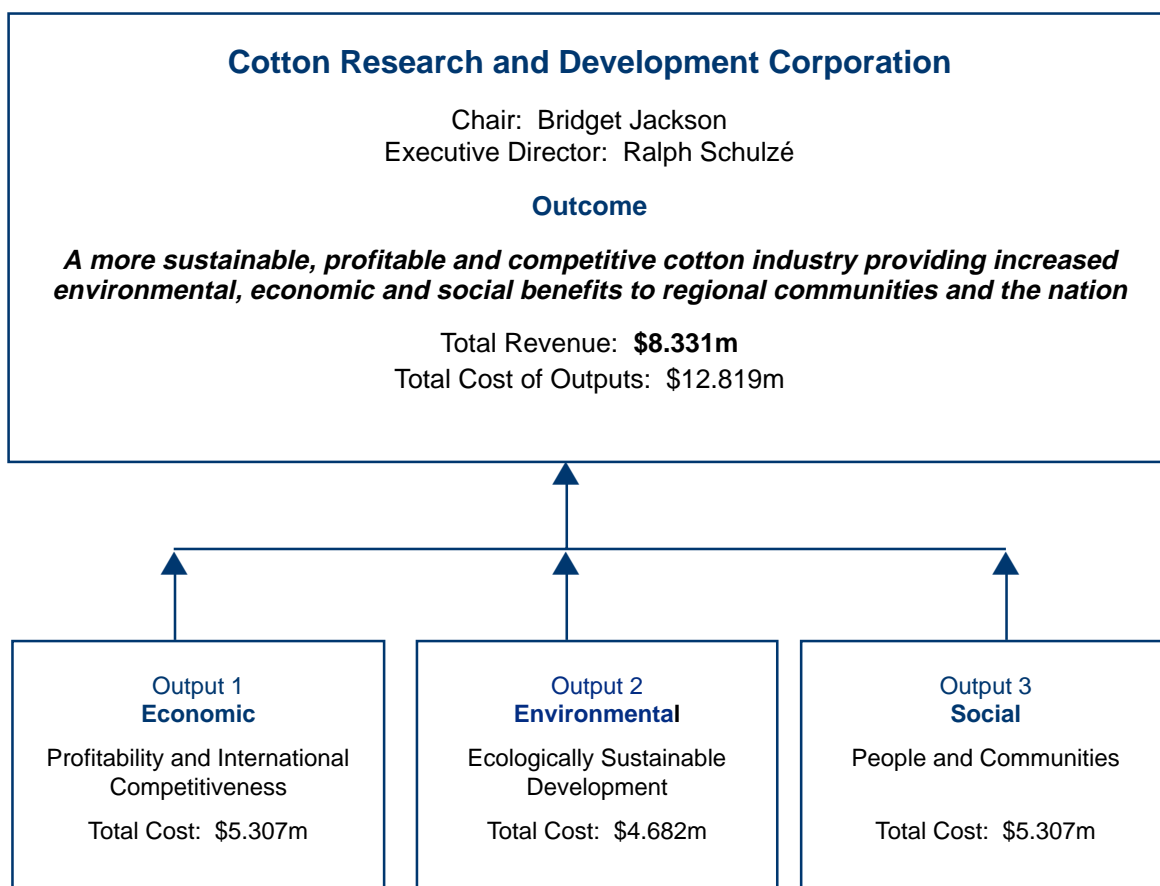
*A more sustainable, profitable and competitive cotton industry, providing increased environmental, economic and social benefits to regional communities and the nation.*

The Corporation will do this by:

*Investing and providing leadership in research, innovation, knowledge creation and transfer for the Australian Cotton Industry*

Map 1 shows the relationship between the Outcome and the contributing Outputs for the Cotton Research and Development Corporation

Map 1: Outcomes and Output groups



(Total cost , rather than total price, is shown because the Corporation is primarily funded through industry levies rather than on the basis of the price of their Outputs)

## Research and Development 2003—2004

### Effectiveness Performance Information for Outcome

<p><b>Output 1 – Environmental (ecological sustainability)</b></p>	<p>Industry reports and surveys investigating implementation and continued use of sustainable farming practices, including:</p> <ul style="list-style-type: none"> <li>• Continuous improvement in resource and environment</li> <li>• Reductions in pesticide contamination of the riverine environment (target: 20 per cent)</li> <li>• Adoption of Best Management practices (target: 100 per cent of growers over five years)</li> <li>• Adoption of EMS (target: five per cent over five years)</li> <li>• Improved water use efficiency (target: 10 per cent over three years)</li> </ul>
<p><b>Output 2 – Economic (profitability and international competitiveness)</b></p>	<p>Industry reports, financial benchmarks and surveys on farm profitability, costs, yield and fibre quality:</p> <ul style="list-style-type: none"> <li>• Comparative analysis of international production systems and costs (target: relative reduction of five per cent over five years)</li> <li>• Market analysis of pricing, demand and application for Australian cotton vs competitors</li> <li>• Industry reports on farming practices changes</li> </ul>
<p><b>Output 3 – Social</b> (Provision of jobs for flow on benefits to regional communities)</p>	<p>Social and economic research indicating environmental and financial impacts:</p> <ul style="list-style-type: none"> <li>• OH&amp;S improvements on farms, with reduction in farm accidents (target five per cent per annum)</li> <li>• Maintain industry capacity through training for growers and postgraduate students</li> </ul>

### Efficiency Performance Information for Outcome

<p><b>Output 1 – Environmental (ecological sustainability):</b> continuous improvement in resource and environmental management</p>	<p><b>Quality:</b> All projects assessed and performance reviewed by industry (ACGRA); independent research (peer) review of projects and programs when deemed necessary.  <b>Quantity:</b> 140* projects  <b>Price:</b> \$4.682m</p>
<p><b>Output 2 – Economic (profitability and international competitiveness):</b>  Greater reductions in the cost of production than our international competitors, with improved product quality</p>	<p><b>Quality:</b> All projects assessed and performance reviewed by industry (ACGRA); independent research (peer) review of projects and programs when deemed necessary.  <b>Quantity:</b> 140* projects  <b>Price:</b> 5.307m</p>
<p><b>Output 3 – Social:</b>  Creation and filling of jobs within the industry and cotton communities, specifically in research, management and supporting industries; viable regional communities enjoying the flow-on benefits of improved resource and environmental management</p>	<p><b>Quality:</b> All projects assessed and performance reviewed by industry (ACGRA); independent research (peer) review of projects and programs when deemed necessary.  <b>Quantity:</b> 140* projects  <b>Price:</b> \$2.830m</p>

\*The Cotton Research and Development Corporation funds a comprehensive and integrated research and development program, with research sub-programs and even individual projects contributing to the achievement of multiple Outputs. The price for each output is on a pro-rata basis and includes an allocation for corporate management and support costs.

### Evaluations 2003–2004

- ◆ an environmental audit of the cotton industry
- ◆ socio-economic research assessing the impacts of the cotton industry on regional communities
- ◆ ongoing comparative analyses of farm management strategies
- ◆ an annual review of the performance of genetically modified cotton in the field

A number of focused research reviews are also anticipated, in order to maintain the quality and focus of research and development activities.

- ◆ a review of plant breeding and biotechnology research priorities and outcomes
- ◆ a 'triple bottom line' report of the 1998-2003 Strategic Plan and outcomes of the BMP program
- ◆ a number of benefit cost analyses of selected research programs.

### Strategies for Success

The 2003-2008 Strategic Plan outlines a number of strategies to help achieve the Corporation's objectives. The Corporation will use most of these strategies in the 2003-04 research year, with some remaining as longer term goals within the plan because of current budgetary restraints.

#### **Make greater use of commissioned R&D by initiating projects**

*This will be deferred in 2003-04, due to budgetary restraints.*

#### **Seek multidisciplinary approach and integrated outcomes**

*This is an integral part of the new program structure to be implemented in 2003-04, especially the Crop Protection, Farming Systems and Integrated Natural Resource Management programs.*

#### **Increase co-investment and partnerships**

This will occur in 2003–04, particularly through partnership in the important Cotton CRC project to accurately measure the deep drainage of water under cotton fields.

#### **Sharpen evaluation of projects**

In 2003–04 the extension team will receive further training in project evaluation. In addition, increased reporting obligations will be placed on researchers, with a greater focus on evidence of outcomes.

#### **Use a triple bottom line framework for reporting outcomes**

This will come into effect in 2003–04. In addition, the Corporation will report on implementation of the Strategic Plan 1998–2003 using a triple bottom line framework.

#### **Broaden its range of research providers**

Due to the reduced program in 2003–04 the number of research providers is actually reduced from 30 to 25, with one new provider. The Corporation will continue to identify new research providers through both advertising and proactive commissioning of research.

#### **Enhance its communications with industry and the community**

The Corporation's publication *Spotlight* keeps growers up to date with research and development within their industry. To achieve new immediacy and readability, it has now moved to a smaller and more frequent format. The Corporation's website [www.crdc.com.au](http://www.crdc.com.au) will be enhanced by addition research project reporting information.

## Program 1

# People and Knowledge

Investment in people and their capacity to access and use knowledge is an important contributor to the success of the Australian cotton industry. The new People and Knowledge Program will aim to achieve a culture of innovation and continuously improving skill level among scientists, advisers and growers.

One of the key approaches to the transfer of knowledge gained from the Corporation's research programs has been supporting and developing an effective, well-trained extension team. Feedback from growers and field consultants in all regions has consistently been highly supportive of the role played by CRDC and Australian Cotton CRC funded Industry Development Officers (IDOs).

IDOs are located in all major cotton growing centers and provide the industry with the capacity to deal with the adoption of research outcomes at both a national and regional level. Despite the impact of the drought on CRDC's income in 2003-04, the proportion of the total budget invested in the Extension Team has been maintained.

Another approach to the consolidation and capture of knowledge used by CRDC is the development of written resources. In 2002-03 two new information packages, WEEDpak and Integrated Disease Management Guidelines, and one revised information package, SPRAYpak (second edition), were released.

This approach to compiling the relevant information and knowledge in a defined discipline area will continue in 2003-04 with the compilation of WATERpak, a resource package on irrigation management focused on further improvements to water use efficiency. Further information on WATERpak can be found in Program 4: Farming Systems.

In 2002, CRDC surveyed cotton growers to gather a picture of how information sources were being used and what the preferences were for accessing information. This survey showed that while some 90 per cent of respondents had access to the Internet, all but 10 per cent preferred to continue to receive information in hard copy.

There is likely to be a range of reasons why this preference exists, including lack of familiarity with searching the Internet for information and the value of written material that can be taken into the field. However, the need to develop improved tools for allowing internet users to access relevant information has led to a new project, funded in 2003-04 jointly with the Cotton CRC, to continue the development of novel decision support tools.

## Research and Development 2003—2004

### Program 1 Research Projects 2003

<b>Quantity</b>	3 new projects 16 continuing projects 3 projects to be commissioned
<b>Price</b>	\$1,471,442 (excludes projects to be commissioned)
<b>Projects</b>	<p>CRC22C National Cotton Extension Coordinator</p> <p>CRC35C IPM Training Coordinator</p> <p>CRC41C NSW Industry Development Officer</p> <p>CRC42C Qld Industry Development Officer</p> <p>CRC53C Industry Development Extension Program: Darling Downs</p> <p>CRC54C Cotton Industry Development Officer: Griffith</p> <p>CRDC190C Farm Health and Safety R&amp;D Program</p> <p>CRDC196C Wincott Inc – Women’s Industry Network Cotton</p> <p>CSP139C Application of crop simulation within the Australian cotton industry</p> <p>CSP151C Support development and independent evaluation of cotton management packages</p> <p>CSP153C ACRI Computing Support</p> <p>CSP163C Delivering science to Agribusiness – novel decision support tools</p> <p>DAN167C Cotton Industry Development Officer: Lower Namoi</p> <p>DAN169C Cotton Industry Development Officer: Macquarie</p> <p>DAQ100C Extension Agronomy for Cotton Production in CQ</p> <p>DAQ114C Cotton Industry Development Extension Officer: Border Rivers</p> <p>DAQ115C Cotton Industry Development Extension Officer: Dirranbandi &amp; St George</p> <p>US55C Undergraduate Scholarship Program – Sydney University</p> <p>US61C Sponsor prize “Proficiency in fourth year agronomy in the B.Sc.Agr. degree program”</p>
<b>Output</b>	Improving the industry’s and community’s capacity to use the knowledge and innovations gained through research and development. This provides innovative people for the industry and improves the viability of rural communities
<b>Research Priorities</b>	<p>Maintaining a well coordinated, focused Extension Team</p> <p>Delivery of a new information resources package: WATERpak</p> <p>Development of novel decision support tools</p>
<b>Strategies</b>	<p>Support and coordinate a highly trained, efficient and effective Cotton Extension Team</p> <p>Foster the Professional development of innovative and highly trained researchers, extension officers, consultants and growers</p> <p>Continue to develop a variety of effective decision support systems that support the implementation of research outcomes</p> <p>Foster the professional development of innovative and highly trained researchers, extension officers, consultants and growers</p> <p>Continue to develop a variety of effective decision support systems that supports the implementation of research outcomes</p> <p>Support the ongoing development of information packages and tools that consolidate and disseminate research outcomes</p> <p>Promote safe, healthy workplaces through the adoption of appropriate Occupational Health and Safety work practices</p> <p>Facilitate effective coordination and partnerships with research and development providers, industry and community organisations</p>

**Measures of success**

- 1. Detailed evaluation of projects conducted by the extension team
- 2. Evidence of improved skills and qualifications of researchers, extension personnel, consultants and growers
- 3. Evidence that the use of decision support systems are leading to the adoption of research outcomes and improved practices
- 4. Evidence that the use of information packages and tools are leading to the adoption of research outcomes and improved practices
- 5. An improvement in the OH&S performance of industry workplaces
- 6. Evaluate implementation of outcomes in partnership with research and development providers, industry and communities.

**Outcome**

**Innovative people for the industry and community that develop a sustainable cotton industry and viable regional community**

## Program 2

# Integrated Natural Resource Management

Best Management Practices (BMP) is the leading cotton industry program of its type in the world, implementing an industry wide environmental risk management system on cotton farms. Currently, more than 50 per cent of cotton grown in Australia has gained accreditation under the Best Managements Practices audit program and the program continues to grow, with more cotton growers becoming accredited every year. In 2003-04, the Corporation will evaluate the BMP program to capture the production and environmental improvements cotton growers have made since the program was launched in 1997.

The BMP program continues to widen in response to the requirements of farmers and government policy. A draft Land and Water Module, which attempts to incorporate the planning requirements proposed in both New South Wales and Queensland, has been developed. This draft module will be trialed by cotton growers in the coming year to determine its practicability.

There are many natural resource management issues that cotton growers are now expected to consider on their farms. To help address these issues, the Corporation has commissioned a project to build the BMP program into a broader environmental package that addresses the full range of natural resource management issues relevant to cotton production. A pilot study group has been established to develop, trial and evaluate the resulting environmental management system.

Although biodiversity is one of the Federal Government's national research priorities, and one that the Corporation supports, budgetary constraints in 2003-04 due to the drought mean that only one substantial project in this area will continue. The project will focus on improving cotton growers' understanding of biodiversity on cotton farms. It will complement integrated catchment management plans and help to achieve some of the targets. The Corporation takes a comprehensive view of soil health, encompassing physical, chemical and biological aspects and, together with the Cotton CRC, is coordinating greater collaboration across the disciplines.

Nitrous oxide, caused by the breakdown of nitrogenous fertilisers, has been identified as a likely source of greenhouse gas emissions. Initial studies will commence in the coming year to benchmark greenhouse gas emissions from cotton production systems and to consider how best management practices can be developed for nitrogenous fertilisers.

Salinity is an issue of national importance and the Corporation has continued to support research in this area. The Corporation has been investigating salinity issues for 10 years and effective extension strategies are now being put in place to ensure cotton growers are able to prevent salinity becoming a problem.

Measuring the drainage component of the water balance continues to be a gap in efforts to improve on-farm water use efficiency and minimise any salinity risks. It is important to be able to quantify any water lost from the system in order to develop appropriate management techniques, so the Corporation has established a project with the Cotton CRC to accurately measure the drainage of water under cotton fields.

## Program 2 Research Projects 2003-04

<b>Quantity</b>	3 new projects 13 continuing projects 1 project to be commissioned	
<b>Price</b>	\$1,009,400 (excludes project to be commissioned)	
<b>Projects</b>		
	AAW4C	Sustainable natural resource management for the Australian Cotton Industry using the Best Management Practices Manual
	ANU7C	Development of a decision support system for water allocation in the Gwydir and Namoi Valleys
	ANU8C	Postgraduate: Karen Ivkovic. Development of a decision support system for water allocation in the Gwydir and Namoi Valleys (in conjunction with ANU7C)
	CLW1C	Environmental impacts of genetically modified cotton on soil biological processes – effects of farming systems
	CLW3C	Rhizosphere biological functions as influenced by GM cotton
	CRC37C	Measuring the influence of water quality on drainage through irrigated cotton soils
	CRC47C	Quantifying deep drainage using lysimetry
	CRC50C	Understanding the salinity threat in irrigated cotton growing areas of Australia. Phase IV: Interpretation & Extension
	DNR4C	Recording, analysing and mapping of biodiversity in cotton areas of the Emerald Irrigation Area
	FCRC1C	Postgraduate – Aquatic biodiversity and the ecological value of ring-tank water storages on cotton farms
	GCRC4C	Reducing losses of nitrogen from cotton rotation systems
	US62C	Postgraduate – Sam Buchanan: Hydrological impacts of irrigation in the Bourke district
	US64C	Development of measures of soil health
	US65C	Postgraduate – Stella Loke: Diversity of VAM fungi in soil health
	US66C	Postgraduate – Leah MacKinnon: The biology of insectivorous bates as predators of pests in cotton fields and associated woodland or forest remnants
	US68C	Post-Doc – Dr A Crossan: Management of risk for chemicals used in cotton production
<b>Output</b>	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.	

# Research and Development 2003—2004

<p><b>Research Priorities</b></p>	<p>Piloting of Environmental Management System          Greenhouse Gas Benchmarking          Biodiversity on farms          Evaluation of BMP Program</p>
<p><b>Strategies</b></p>	<p>Incorporate a broader range of environmental issues in the Cotton BMP program and facilitate their adoption</p> <p>Investigate and evaluate environmental management systems as an industry-led approach to improved natural resource management</p> <p>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</p> <p>Facilitate the necessary environmental impact research for any new transgenic traits introduced into cotton varieties</p> <p>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</p>
<p><b>Measures of success</b></p>	<ol style="list-style-type: none"> <li>1. Increased adoption and broader environmental coverage of the Cotton BMP program</li> <li>2. An evaluation of environmental management systems as a farm and natural resource management tool</li> <li>3. 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</li> <li>4. Publication of refereed environmental impact research in scientific journals related to new transgenic traits</li> <li>5. Benchmarked greenhouse gas emission and potential climate change impacts</li> </ol>
<p><b>Outcome</b></p>	<p><b>Increased ecosystem health, community wellbeing and economic wealth of cotton growing regions and a reduction in the negative environmental impacts of cotton production systems.</b></p>

## Program 3

# Crop Protection

Crop Protection is the Corporation's largest program under the Strategic Plan 2003-2008, combining the research efforts on insects, diseases and weeds. This reflects the relative challenges and importance placed on protecting the crop from pests and diseases. Even when projects that bridge the gap between CRDC's previous five-year plan (1998-2003) and the new plan are concluded, Crop Protection will remain the largest program. Some of the reasons for this are:

- ◆ In 2003 the industry expects that the new Bt cottons carrying two Bt genes (Bollgard II™) will be available for commercial planting. Bollgard II™ is expected to solve some of the industry's most difficult pest problems, but the anticipated reductions in pesticide use that this will permit could open the door to other pests not previously considered to be major problems.
- ◆ The ongoing use of herbicide tolerant cotton varieties is expected to continue to expand in area as new transgenic products are introduced. As with Bollgard II™, the changes to weed management resulting from herbicide tolerant crops are expected to bring both benefits and new challenges as possible changes to the weed spectrum occur.
- ◆ It is now ten years since Fusarium wilt was discovered in cotton in Australia for the first time. During that time this disease has spread to most cotton growing valleys and continues to be a big challenge to growers and researchers. However, the momentum that has built in the research effort on this disease is expected to benefit the industry significantly during the next five years.

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### Insects

Over the last five years the cotton industry has made significant progress in reducing insecticide use. The introduction of transgenic Bt cotton varieties, combined with integrated pest management (IPM) practices have allowed total chemical insecticide inputs to be reduced by between 43 and 82 per cent in INGARD® Bt cotton and by between 10 and 25 per cent in conventional cotton.

The adoption of Integrated Pest Management (IPM) practices, where reduced reliance on broad-spectrum pesticides provides greater opportunities for natural mortality of insect and mite pests, continues. Across the industry, farmers have been learning together and helping each other with their pest management problems through participation in Area Wide Management groups, many of which are facilitated by CRDC funded Industry Development Officers. Benchmarking in many of these groups has shown that an area wide approach to IPM can preserve populations of beneficial insects, reduce pesticide inputs

(particularly in broad-spectrum products) and increase profits in both conventional and transgenic cotton.

The imported pest, Silverleaf Whitefly, became a significant problem in cotton for the first time during the 2001-02 season with an outbreak in central Queensland. During 2002-03 the Corporation worked closely with cotton farmers, consultants, research and extension officers in central Queensland to improve the management of this pest. This included supporting an Australian study tour to US cotton areas where Silverleaf Whitefly was being successfully managed, coordinating a series of submissions to the National Registration Authority for permits for more effective pesticides and the sponsoring of a visit from a US whitefly expert during the cotton season. The end result of these activities was a major advance in the capacity to manage this pest. In 2003-04, additional funds have been provided to the research effort to monitor Silverleaf Whitefly populations in all cotton growing districts and to monitor resistance to the key pesticides used for their control in central Queensland.

Subject to approval by the Gene Technology Regulator and the Australian Pesticides Veterinary Medicine Authority, the commercial release of Bollgard II™ cotton is expected in 2003-04. Pre-release information regarding the performance of Bollgard II™ indicates it will be far more effective in controlling *Helicoverpa* spp. pests than the varieties carrying INGARD, the currently available single Bt gene product. The planting of Bollgard II™ varieties is expected to allow cotton farmers to reduce pesticide use further, due to improved efficacy and the fact that planting area restrictions that were placed on INGARD® varieties to minimise the risk of pest resistance, are likely to be relaxed because plants with two genes are less likely to select for resistance. Nevertheless, the Corporation has funded a new project to study the genetics of resistance to the second Bt gene and to Bollgard II™ and another new project to study the efficiency of refuge crops used in the management of *Helicoverpa* to prevent resistance to transgenic crops.

The Corporation is anticipating that the possible widespread planting of Bollgard II™ cotton from 2004-05 could change the spectrum of insect pests requiring management, as reduced pesticide use for *Helicoverpa* spp. may allow certain secondary pests to become more prevalent and hence more damaging. As a result, a new project has been funded to study damage and economic thresholds for green mirids. In addition, research on aphids and green vegetable bugs will continue. The Corporation anticipates that many Bollgard II™ crops could have higher fruit retention because of improved fruit protection, which may require different agronomic management. The linkages between agronomic and pest management requirements for Bollgard II™ cotton will require careful monitoring. The Corporation proposes to hold a workshop to bring together researchers working on a range of Bollgard II™ management aspects so that coordination of experiments and regional trials can be enhanced.

### Diseases

CRDC's investment in disease research is focused on the development of practices and technology to reduce or prevent the spread and impact of cotton diseases. In particular, a fungal disease discovered ten years ago, Fusarium wilt, is continuing to spread to new farms and cotton growing regions. Fusarium wilt is considered to be the major disease threatening the cotton industry. At present, no complete solution has been found to manage it effectively; however, good progress is being made with research and adoption of practices aimed at slowing the rate of spread.

CRDC has increased its investment in cotton breeding for resistance to Fusarium (see Program 5) and has funded two new projects in 2003–04. The first of these will seek to investigate the main risk factors for the spread of the disease in New South Wales. The second will study the potential for native Fusarium to give rise to new cotton field pathogens and is based on current research, which has shown that cotton Fusarium originated from non-pathogenic Fusarium native strains in Australia.

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### Weeds

To complement existing projects support by CRDC, the Cotton CRC and Weeds CRC, the Corporation has invested in two new weeds research projects that will ensure that a solid research effort on weeds and their management is maintained.

In August 2002, WEEDpak, a guide for integrated management of weeds in cotton, was released and provided the Corporation with a strong indicator that its previous investments had encouraged development of a productive weeds research program. WEEDpak addressed a real need of the industry by providing a practical guide aimed at integrated weed management. Both new projects will aim to conduct research that will add further components to WEEDpak, as well as providing a more detailed understanding of the biology and ecology of key weeds species.

Components of the new and existing weeds research program involve research on the use of herbicide tolerant cotton such as Roundup Ready®, including changes to the weed spectrum and weed resistance management issues.

# Research and Development 2003—2004

## Program 3 Research Projects 2003-04

**Quantity** 10 new projects  
33 continuing projects  
3 projects to be commissioned

**Price** \$3,677,837 (excludes projects to be commissioned)

**Projects**

AWA3C	Development of sustainable pest management practices for Bollgard II™ production in the Kimberley
CRC17C	Post Doc – Sarah Mansfield: Enhancing the impact of early season predation on <i>Helicoverpa</i> spp
CRC18C	Postgraduate – Florian Yan: Cotton soil health: Influences on cotton root diseases
CRC29C	Postgraduate – John Harvey: Diversity and pathogenicity of <i>Thielaviopsis Basicola</i> (Black Root Rot)
CRC30C	Postgraduate – Ingrid Rencken: Role of native vegetation in harbouring beneficial insects and reducing insect pest damage in cotton
CRC36C	Managing <i>Helicoverpa</i> spp
CRC43C	Postgraduate – Zacary Chai: Gene silencing technologies to control <i>Helicoverpa armigera</i>
CRDC209C	Assessing a program for post emergent control of problem weeds in cotton using shielded sprayers
CSE101C	High level Cry1Aac resistance in <i>Helicoverpa armigera</i>
CSE102C	Monitoring Bt resistance
CSE104C	Potential for the evolution of resistance to Bt by <i>Helicoverpa armigera</i>
CSE107C	Ecology of <i>Helicoverpa</i> in relation to transgenic cotton and the efficiency of refuge crops
CSE108C	Genetics of Bt resistance in <i>Helicoverpa armigera</i> : Resistance to Crv2Ab
CSE96C	Resistance of <i>Helicoverpa armigera</i> to Cry2A
CSP143C	Identification and management of Bunchy Top syndrome in cotton
CSP145C	Improving understanding of the ecology and management of cotton aphid
CSP147C	Incorporating aphids, insecticides and early season plant compensation in Integrated Pest Management (IPM)
CSP156C	The potential for native <i>Fusarium</i> to give rise to new cotton field pathogens
CSP162C	Damage syndromes, economic thresholds and tolerance of cotton green mirids
DAN140C	Management of Resistance to conventional Chemicals in <i>Helicoverpa</i> spp.
DAN153C	Managing Black Root Rot of Cotton
DAN154C	Diseases of Cotton VII
DAN160C	Impact and Role of Novel insecticides in Integrated Pest Management
DAN162C	Insecticide resistance management in B-biotype <i>Bemisia tabaci</i>

## Research and Development 2003—2004

DAN163C	Insecticide Resistance Management in cotton aphid ( <i>Aphis gossypii</i> ) and cotton mite ( <i>Tetranychus urticae</i> )
DAN164C	Mechanisms of insecticide resistance in the cotton aphid, <i>Aphis gossypii</i>
DAN172C	Biochemical mechanisms of resistance to <i>Bacillus thuringiensis</i> endotoxins in <i>Helicoverpa armigera</i>
DAN173C	Insecticide resistance in <i>Helicoverpa spp.</i> and the role of IPM/Area Wide Management in Resistance Management
DAN174C	Expanding WEEDpak: developing integrated weed management packages for the cotton farming systems
DAN175C	Reducing weed control costs by better understanding the biology and ecology of problem weeds
DAN176C	Severity factors in Fusarium wilt of cotton
DAQ105C	Improved application and formulation of viral biopesticides against <i>Helicoverpa</i>
DAQ107C	Ecology and development of management strategies for fusarium wilt in cotton
DAQ110C	Pest status and management of shield bugs in cotton
DAQ111C	New biopesticides against emerging sucking pests
DAQ121C	Aphid bio-control in cotton
DAQ122C	Development of novel pest management options for cotton in central Queensland
DAQ123C	Best weed management strategies for dryland cropping systems with cotton
DAQ126C	<i>Heliothis</i> egg collections for resistance testing from the Darling Downs and South Burnett in southern Queensland
MU2C	Postgraduate – Christina Hall: Defence mechanisms of cotton against <i>Fusarium oxysporum f.sp. vasinfectum</i> and control of fusarium wilt
UNE36C	Postgraduate – Sam Lower: Pheromones for occasional pests of cotton
UQ35C	Population genetics of <i>heliiothis</i> migration, recruitment and origins

### Research Priorities **Insects**

Integrated Pest Management in conventional and Bt cotton  
Monitoring Silverleaf Whitefly populations and insecticide resistance  
Monitoring and managing of pest resistance to insecticides and Bt  
Research on Bollgard II™ cotton – coordination and collaboration

### **Diseases**

Evaluating the risk of the new *Fusarium* strains emerging  
Understanding risk factors for the spread of *Fusarium* in NSW  
Further development of Integrated Disease Management guidelines for major diseases

### **Weeds**

Additional integrated weed management information for WEEDpak  
Biology and Ecology of key weed species  
Management of herbicide-tolerant cotton

# Research and Development 2003—2004

<b>Output</b>	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.
<b>Strategies</b>	<p>Improve integrated non-chemical and chemical management of insect and mite pests.</p> <p>Improve integrated non-chemical and chemical management of weeds.</p> <p>Develop practices and technologies that reduce the spread and impact of cotton diseases.</p> <p>Ensure the development of resistance is minimised through the design and implementation of resistance management strategies for both insecticides and transgenic technologies.</p> <p>Ensure the benefits of transgenic crop technology are maximised through responsible management based on sound scientific risk assessment.</p>
<b>Measures of success</b>	<ol style="list-style-type: none"> <li>1. Evaluations on the adoption and outcomes of integrated practices, products and technologies.</li> <li>2. Reduced distribution, presence and impact of diseases</li> <li>3. Monitor resistance levels with an aim to either avoid or keep resistance levels in pests and weeds at manageable levels</li> <li>4. Transgenic crop surveys and reports on performance, management and risk assessment</li> </ol>
<b>Outcome</b>	<b>Continued reduced reliance on chemical inputs and more effective management strategies for pests, weeds and diseases.</b>

## Program 4

# Farming Systems

The Farming Systems program encompasses projects specific to on-farm management practices, while catchment outcomes generic or industry-wide outcomes for soil and water research form part of Program 2: Integrated Natural Resource Management. The new Farming Systems program is an amalgamation of three previous research programs: Soils; Water; and Farming Systems and Agronomy. It also includes those aspects of the previous Insect Program that influence on-farm decisions, including projects that deal with Area Wide Management and Integrated pest Management.

Farming Systems is a crossover research program where results from other areas of the Corporation's funding are brought together and overall management strategies developed. Farms are complex systems requiring land and water resources, labour, capital and management strategies. Cotton cropping systems have changed considerably in recent years with innovations such as precision agriculture, narrow row cotton, legume crop rotations, stubble retention, transgenic cotton varieties and new irrigation techniques.

Research will continue to evaluate new cropping rotations and the potential benefits for yield, soil health, disease reduction and improved water use efficiency. Greater emphasis will be placed on the phosphorous and potassium nutrition of transgenic high boll retention crops. Fundamental research on cotton agronomy, growth and plant physiology for both conventional and transgenic varieties will continue.

The corporation will be developing, with the cotton CRC, a 'one-stop shop' for cotton water management, WATERpak. It will have a similar style to other popular 'paks' such as those on soils, weeds, nutrition, diseases and spray application techniques. A new project examining the potential of irrigated skip row cotton, improving the farmer-friendly water use efficiency calculator and evapotranspiration estimates will commence in 2003-04.

Integrated Pest Management (IPM) is becoming more widespread and accepted in the cotton industry. This has led to successful Area Wide Management Groups taking care of their local region in terms of reducing pesticide use and encouraging beneficial insect populations. New research and methodologies will continue to be passed on to these groups, who can then consider them when making farm management decisions.

## Research and Development 2003—2004

<b>Quantity</b>	8 new projects	
<b>Price</b>	\$2,033,352 (excludes project to be commissioned)	
<b>Projects</b>		
	CRC33C	Postgraduate – Simon Speirs: Characterising soil structural stability and form of sodic soil used for cotton production
	CRC34C	Agronomic aspects of Bt efficacy in transgenic cotton
	CRC45C	Maintaining profitability and soil quality in cotton farming systems
	CRC48C	Optimising field and farm scale water use efficiency for cotton farming systems
	CRC51C	Whole farm salinity management strategies for cotton production in the Macquarie Valley
	CRC52C	Nutritional constraints to efficient cotton production
	CRDC158C	Water relations of the cotton plant (CSP)
	CSE103C	The impact of Area Wide Management (AWM) on beneficial Anthropod and <i>Helicoverpa</i> populations
	CSE105C	The influence of beneficial soil fauna on cotton production and its pests and diseases
	CSP122C	CSIRO Field Experiments at ACRI
	CSP138C	Refining crop agronomy for dry season cotton production in north west Australia
	CSP140C	The impact of temperature extremes on cotton performance
	CSP141C	Postgraduate – Rose Roche: Training in crop physiology – Functional responses of cotton to environmental mediated via internal nitrogen dynamics
	CSP157C	Integrated farm water management for cotton production
	CSP161C	Physiology of high retention cotton crops
	DAN151C	Operational Costs for Cotton Experiments
	DAQ104C	GRDC2C – Using seasonal climate forecasts for more effective grain-cotton production systems (joint project)
	DAQ112C	Heliothis management in south Queensland farming systems
	DAQ113C	Postgraduate – Amanda Cleary: The effect of cereal stubble on <i>Helicoverpa</i> activity in early season cotton
	DAQ116C	Assessment of the potential for resistance to Gemstar
	Daq120C	Area wide monitoring and cultural control of key cotton pests in central Queensland
	DAQ127C	Managing Bollgard II <sup>®</sup> cotton farming systems in southern Qld
	DPIF2C	Investigation of cotton growing at different sites under different farming systems in the Northern Territory
	NEC8C	Postgraduate – Simon White: Partial root zone drying and regulated deficit irrigation for cotton using large mobile irrigation schemes
	NEC9C	R&D to support the adoption of centre pivots and lateral moves in the Australian cotton industry
	US67C	Postgraduate – Edward Cay: Strategies for ameliorating sodic and saline subsoils of cotton-producing areas in the Hillston district of NSW

# Research and Development 2003—2004

<b>Output</b>	Integrated farm management practices that enhance the sustainability and profitability of cotton farming systems
<b>Research Priorities</b>	<p>Achieving further irrigation efficiencies</p> <p>Managing salinity and sodicity</p> <p>Improving soil health</p> <p>Agronomic aspects of Bt cotton</p>
<b>Strategies</b>	<p>Improve water use efficiency on farms using new and existing infrastructure, new tools and technologies</p> <p>Understand salinity, sodicity and deep drainage on farms and develop appropriate farm management strategies.</p> <p>Strengthen our understanding of soil health and improve crop nutrition management</p> <p>Increase profitability with better whole farm management strategies and innovative precision agricultural systems</p> <p>Continue fundamental research on cotton agronomy, growth and plant physiology for both conventional and transgenic varieties.</p>
<b>Measures of success</b>	<ol style="list-style-type: none"> <li>1. Increased yield per hectare and per megalitre of water</li> <li>2. Improved economic returns to farmers</li> <li>3. Improved water use efficiency on farms</li> <li>4. Adoption of integrated management options for salinity and sodicity</li> <li>5. Benchmark of soil health characteristics and improved crop nutrition</li> <li>6. Data on changed farming practices, including the economic, environmental or social benefits</li> <li>7. Publication of fundamental cotton research related to crop physiology and cotton growth. Transfer of this knowledge into other research and extension projects.</li> </ol>
<b>Outcome</b>	<b>A more sustainable and profitable cotton farming system</b>

## Program 5

# Plant Breeding & Biotechnology

Australia's cotton breeding program has played a significant part in the success of the Australian cotton industry, delivering increases in production per hectare and the improvements in fibre quality that our markets want.

The Australian breeding program is conducted by the CSIRO, with funding support from the Cotton Research and Development Corporation. New varieties developed through this program are commercialised exclusively through the industry-owned, not-for-profit organisation, Cotton Seed Distributors. CSIRO-developed varieties make up the majority of seed planted in Australia. Through a royalty sharing agreement with the CSIRO, the Corporation receives an additional income stream from domestic and international sales of CSIRO-bred seed.

Australian cotton enjoys a relative market advantage, underpinned by the high fibre quality cotton varieties bred by Australian researchers. A low degree of neppiness (short, tangled fibres), combined with a high proportion of cotton within the most acceptable micronaire range, means that Australian cotton is strongly sought after in the market and commands a sizeable premium. The importance to the industry of the plant breeding program is demonstrated by the Corporation's decision to increase funding for cotton breeding at a time when drought is seriously affecting its income.

Most of the additional funds will be used to enhance the breeding of varieties with improved resistance to the diseases Fusarium wilt and Black Root Rot. However, regional adaptation and testing of cotton varieties continues to be an important objective, particularly in areas such as central Queensland and southern New South Wales where climate differs from northern NSW and southern Queensland.

CRDC continues to invest in biotechnology to introduce insect and herbicide tolerance genes to Australian cotton varieties and to seek to improve cotton fibre quality, disease tolerance and cottonseed oil quality. Genetically modified cotton with improved cottonseed oils have been developed and a new project supported by CRDC aims to assess the prospects of commercialisation following regulatory approval.

Cotton was the first Australian agricultural industry to have commercial access to genetically modified varieties. This industry has now gained valuable experience in the use and management of transgenic varieties, including the prevention of resistance development. Last year saw the limited release of the genetically modified Bollgard II® commercial varieties, which produce two Bt toxin proteins. Bollgard II® varieties have been found to increase efficacy against *Helicoverpa* by approximately 2.5 times as compared to INGARD® varieties that have only one Bt gene. Subject to final Office of the Gene Technology Regulator (OGTR) and Australian Pesticides Veterinary Medicine Authority (APVMA) approval, the first commercial production of Bollgard II® is anticipated in 2003/04.

## Research and Development 2003—2004

In recent years the complexity of the cotton-breeding program has increased, with the development of transgenic cotton alongside conventional cotton and the need to develop both transgenic and conventional lines in the Fusarium breeding effort. Biotechnology is also a rapidly advancing science and, with limited resources to invest, the decisions CRDC makes must be well focused on the future needs of the industry. In order to meet these complex challenges, the Corporation plans to review its investments in biotechnology and plant breeding in 2003. This review will involve both local and overseas independent expertise and is expected to provide important direction for the future and is timed appropriately at the start of the new strategic plan.

### Program 5 Research Projects 2003-04

**Quantity** 4 new projects  
20 continuing projects  
1 project to be commissioned

**Price** \$1,889,823 (excludes project to be commissioned)

Projects		
CRC49C	Enhancing the insect tolerance of Australian cottons through conventional and transgenic traits	
CSP113C	Australian native cottons as sources of resistance and new pathotypes of Fusarium wilt	
CSP114C	Post Doc – Dr Helen McFadden: Discovery of genes involved in the expression of cotton resistance responses to Fusarium wilt by the application of microarray technology	
CSP117C	Development and evaluation of cottonseed oils with improved nutritional and functional properties	
CSP118C	Manipulating genes to enhance cotton fibre elongation and cellulose synthesis	
CSP120C	Genetic characterisation of homeologous recombination and chromosome inheritance in <i>G. hirsutum</i> x K genome alien chromosome addition lines	
CSP121C	CSIRO Plant Breeding Fibre Quality Laboratory	
CSP135C	Postgraduate – Saara Kate Bowen: Molecular analysis and manipulation of terpene biosynthesis in cotton	
CSP136C	cotton Biotechnology: Core Program	
CSP137C	Development of a unigene set of cotton clones for general microarray analysis of gene expression in cotton plants	
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	
CSP149C	Isolation of Novel Cotton promoters to drive the Robust Expression of useful Genes in Transgenic Cotton	
CSP154C	Nutritional improvement in cottonseed oils through genetic removal of palmitic acid	
CSP155C	AFLP diversity of Fov in cultivated cotton fields and genotyping of <i>G. hirsutum</i> X <i>G. sturtianum</i> backcross lines	
CSP158C	Breeding for resistance to Fusarium wilt	
CSP159C	Breeding improved cotton varieties	

## Research and Development 2003—2004

CSP160C	Development and evaluation of cottonseed oils with improved nutritional and functional properties
HEX1C	Improving the efficiency of embryogenesis in elite cotton cultivars
MU1C	Transgenic cotton for the control of Fusarium wilt
UA11C	Postgraduate – Damien Lightfoot: Fibre improvement through modulation of transitions in cotton development
UA12C	Postgraduate – John Humphries: Analysis of TTG1 homologues in cotton for roles in fibre initiation
UA7C	Post-Doc – Sharon Orford: Genetic manipulation of fibre quality in Australian cotton
UA8C	Postgraduate – Sven Delaney: Development of gene promoters for cotton fibre development
US48C	Postgraduate – Fiona Frances Ballard: Identification and characterisation of genes for resistance to bacterial blight in the cotton plant
<b>Output</b>	World leading cotton varieties displaying continuous improvement in cotton yield, quality and agronomic performance through plant breeding and biotechnology innovation
<b>Research Priorities</b>	<p>An enhanced Fusarium breeding effort</p> <p>Increased support for the breeding program and regional testing of varieties</p> <p>Assessing the potential for commercialisation of cotton with improved cottonseed oil.</p>
<b>Strategies</b>	<p>Develop regionally adapted cotton varieties exhibiting improved yield, quality, insect and disease resistance and herbicide tolerance</p> <p>Targeted, innovative biotechnology focused on solving production and quality constraints confronting the Australian cotton industry</p> <p>Reduction in time required to introduce improved or novel genes into elite cotton varieties through the development of frontier technologies, without compromising scientific rigour</p> <p>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</p>
<b>Measures of success</b>	<ol style="list-style-type: none"> <li>1. Evidence that new cotton varieties are increasing yields and potential returns to the industry</li> <li>2. Evidence that Australian cotton varieties are meeting the needs of our major textile and oilseed markets</li> <li>3. Evidence that new varieties can produce higher yields with lower inputs of chemicals and improved water use efficiency</li> <li>4. Evidence that CRDC's biotechnology investments are delivering industry or community benefits</li> <li>5. Evidence of the reduced time to introduce genes into cotton varieties</li> <li>6. Market reports on the demand for Australian cotton lint and seed</li> </ol>
<b>Outcome</b>	<b>Continuously improving cotton varieties</b>

## Program

### 6

## Value Chain

Plant breeding and the climatic environment largely determine the intrinsic qualities of cotton fibre quality; however, the realised quality is influenced by crop management, mechanical harvesting, ginning (initial processing where seeds and some trash are removed) and spinning. Each of these, in turn, can affect the value and range of uses for that fibre.

An important development in the marketing chain is now seeing the introduction of new devices that can test fibre quality and quickly identify potential problems further down the processing chain. The use of these tests is likely to affect the way raw cotton is priced and cotton demonstrating undesirable qualities may be discounted.

The Corporation continues to approach this issue in a number of ways. The major collaborative 'Field-to-Fabric' research program is continuing and aims to identify the various impacts on fabric quality, as well as strategies to avoid fibre quality problems. A recently commenced research program is looking specifically at ginning in Australia to identify any potential for improving the process and delivering better fibre to spinning mills.

A number of other projects in this field have examined new technologies for measuring the elements of fibre quality, such as fibre fineness and maturity. Unfortunately, lack of income funds will force the Corporation to curtail much of this research. It is the Corporation's hope that it will be possible to reach the initial pre-commercial stage before this comes into effect.

For the first time, BMP is extending into post farm gate processing. Various industry stakeholders have expressed a wish for best practices for managing fibre quality, should this prove possible. The Corporation is committing funds in 2003-04 to a commissioned project that will investigate development of such a module. Although it is too early to determine if BMP for fibre quality will be developed, it will provide a focus on how our marketers can gain higher value for Australia's high quality crop.

The Corporation has a number of linkages with the processing end of the production chain and is encouraging greater communication and co-ordination throughout the Australian industry. The marketing, processing and spinning of cotton are areas with which many growers are unfamiliar. In order to help redress this situation, the Corporation has organised a major Field-to-Fabric forum in which farmers will participate. The forum will involve overseas cotton spinners representing the International Textile Manufacturers Federation (ITMF). The Corporation will continue to perform a secretariat function for the Raw Cotton Marketing Advisory Committee (RCMAC) as a further demonstration of its commitment to 'post farm gate' communication.

## Research and Development 2003—2004

### Program 6 Research Projects 2003-04

<b>Quantity</b>	2 new projects 1 continuing project 3 projects to be commissioned
<b>Price</b>	\$252,250 (excludes projects to be commissioned)
<b>Projects</b>	CTFT6C Improved Quality of Ginned Australian Cotton CTFT7C Interlaboratory trials for fibre maturity reference samples CTFT8C Development of Cottonscan: an instrument for measuring the fineness and maturity values of cotton fibre samples
<b>Output</b>	To produce high quality consumer preferred cotton and develop new international and domestic market opportunities
<b>Research Priorities</b>	Implement a partnership for the commercial development of Cottonscan and related fibre measurement technology  Ensure that improvements to ginning practice originating from research are adopted  Involve the post farm gate section of the industry in developing Best Management Practice and Fibre Quality Protection
<b>Strategies</b>	Develop regionally adapted cotton varieties exhibiting improved yield, quality, insect and disease resistance and herbicide tolerance  Targeted, innovative biotechnology focused on solving production and quality constraints confronting the Australian cotton industry  Reduction in time required to introduce improved or novel genes into elite cotton varieties through the development of frontier technologies, without compromising scientific rigour  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
<b>Measures of success</b>	<ol style="list-style-type: none"> <li>1. Release of varieties with appropriate fibre and seed characteristics</li> <li>2. Evidence of improved practices that preserve fibre quality. Extension of the Cotton BMP program to post gate issues</li> <li>3. Improved ginning practice measured by ginning data</li> <li>4. Proportion of the crop objectively measured by HVI increased. Release of new fibre measurement technology</li> <li>5. Number of unsold stocks accumulated and increased relative premium of Australian cotton compared to competitors. Demonstration of value added developments in Australia</li> </ol>
<b>Outcome</b>	<b>High quality consumer preferred Australian cotton in the world market place</b>

# Budget Statements 2003—2004

## Budgeted Statement of Financial Performance for the period ended 30 June

	Estimated actual	Budget estimate	Forward estimate	Forward estimate	Forward estimate
	2002-03	2003-04	2004-05	2005-06	2006-07
	\$'000	\$'000	\$'000	\$'000	\$'000
<b>Revenues from ordinary activities</b>					
Revenue from government	12,147	7,320	7,548	11,327	12,768
Sales of goods and services	1	1	2	2	2
Interest	600	450	450	405	360
Dividends					
Net gains from sales of assets					
Other	782	560	844	967	1,026
<b>Total revenues from ordinary activities</b>	<b>13,530</b>	<b>8,331</b>	<b>8,844</b>	<b>12,701</b>	<b>14,156</b>
<b>Expenses from ordinary activities (excluding borrowing costs expense)</b>					
Employees	953	935	963	992	1,022
Suppliers	73	285	289	294	309
Grants	15,396	11,568	10,614	10,215	10,701
Depreciation and amortisation	27	31	36	41	36
Write-down of assets	-				
Net losses from sales of assets	-				
Other	-				
<b>Total expenses from ordinary activities (excluding borrowing costs expense)</b>	<b>16,449</b>	<b>12,819</b>	<b>11,902</b>	<b>11,542</b>	<b>12,068</b>
Borrowing cost expense					
<b>Net surplus or deficit from ordinary activities</b>	<b>-2,919</b>	<b>-4,488</b>	<b>-3,058</b>	<b>1,159</b>	<b>2,088</b>
Gain or loss on extraordinary items					
<b>Net surplus or deficit</b>	<b>-2,919</b>	<b>-4,488</b>	<b>-3,058</b>	<b>1,159</b>	<b>2,088</b>
Capital use charge					
<b>Net surplus or deficit after capital use charge</b>	<b>-2,919</b>	<b>-4,488</b>	<b>-3,058</b>	<b>1,159</b>	<b>2,088</b>

# Budget Statements 2003—2004

## Budgeted Statement of Financial Position as at 30 June

	Estimated actual 2002-03 \$'000	Budget estimate 2003-04 \$'000	Forward estimate 2004-05 \$'000	Forward estimate 2005-06 \$'000	Forward estimate 2006-07 \$'000
<b>ASSETS</b>					
<b>Financial assets</b>					
Cash	1,200	1,000	800	800	900
Receivables	100	100	100	100	100
Investments	10,720	6,468	3,392	4,448	6,407
Accrued revenues	813	813	1,037	1,171	1,216
Other					
<b>Total financial assets</b>	<b>12,833</b>	<b>8,381</b>	<b>5,329</b>	<b>6,519</b>	<b>8,623</b>
<b>Non-financial assets</b>					
Land and buildings	294	288	282	276	270
Infrastructure, plant and equipment	137	132	122	107	97
Inventories					
Intangibles					
Other					
<b>Total non-financial assets</b>	<b>431</b>	<b>420</b>	<b>404</b>	<b>383</b>	<b>367</b>
<b>Total assets</b>	<b>13,264</b>	<b>8,801</b>	<b>5,733</b>	<b>6,902</b>	<b>8,990</b>
<b>LIABILITIES</b>					
<b>Debt</b>					
Loans					
Leases					
Deposits					
Overdrafts					
Other					
<b>Total debt</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Provisions and payables</b>					
Employees	165	170	140	150	150
Suppliers	60	60	60	60	60
Grants	280	300	320	320	320
Other					
<b>Total provisions and payables</b>	<b>505</b>	<b>530</b>	<b>520</b>	<b>530</b>	<b>530</b>
<b>Total liabilities</b>	<b>505</b>	<b>530</b>	<b>520</b>	<b>530</b>	<b>530</b>
<b>EQUITY</b>					
Capital					
Reserves					
Accumulated surpluses or deficits	12,759	8,271	5,213	6,372	8,460
<b>Total equity</b>	<b>12,759</b>	<b>8,271</b>	<b>5,213</b>	<b>6,372</b>	<b>8,460</b>
<b>Total liabilities and equity</b>	<b>13,264</b>	<b>8,801</b>	<b>5,733</b>	<b>6,902</b>	<b>8,990</b>
<b>Current liabilities</b>	<b>337</b>	<b>353</b>	<b>347</b>	<b>353</b>	<b>353</b>
<b>Non-current liabilities</b>	<b>168</b>	<b>177</b>	<b>173</b>	<b>177</b>	<b>177</b>
<b>Current assets</b>	<b>12,833</b>	<b>8,381</b>	<b>5,329</b>	<b>6,519</b>	<b>8,623</b>
<b>Non-current assets</b>	<b>431</b>	<b>420</b>	<b>404</b>	<b>383</b>	<b>367</b>

## Budget Statements 2003—2004

### Budgeted Statement of Cash Flows for the period ended 30 June

	Estimated actual 2002-03 \$'000	Budget estimate 2003-04 \$'000	Forward estimate 2004-05 \$'000	Forward estimate 2005-06 \$'000	Forward estimate 2006-07 \$'000
<b>OPERATING ACTIVITIES</b>					
<b>Cash received</b>					
Revenue from government	13793	7320	7548	11327	12768
Sales of goods and services	1	1	2	2	2
Interest	690	450	450	405	360
Other	953	579	640	894	1035
<b>Total cash received</b>	<b>15,437</b>	<b>8,350</b>	<b>8,640</b>	<b>12,628</b>	<b>14,165</b>
<b>Cash used</b>					
Employees	944	949	1013	1043	1075
Suppliers	94	285	289	294	309
Grants	15419	11548	10594	10215	10702
Interest					
Other					
<b>Total cash used</b>	<b>16,457</b>	<b>12,782</b>	<b>11,896</b>	<b>11,552</b>	<b>12,086</b>
<b>Net cash from operating activities</b>	<b>-1,020</b>	<b>-4,432</b>	<b>-3,256</b>	<b>1,076</b>	<b>2,079</b>
<b>INVESTING ACTIVITIES</b>					
<b>Cash received</b>					
Proceeds from sales of property, plant and equipment					
Repayments of loans made					
Other					
<b>Total cash received</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Cash used</b>					
Purchase of property, plant and equipment	25	20	20	20	20
Loans made					
Other					
<b>Total cash used</b>	<b>25</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>
<b>Net cash from investing activities</b>	<b>-25</b>	<b>-20</b>	<b>-20</b>	<b>-20</b>	<b>-20</b>
<b>FINANCIAL ACTIVITIES</b>					
<b>Cash received</b>					
Proceeds from issuing equity instruments					
Proceeds from debt					
Other					
<b>Total cash received</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Cash used</b>					
Repayments of debt					
Capital use and dividends paid					
Other					
<b>Total cash used</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Net cash from financing activities</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Net increase in cash held</b>	<b>-1,045</b>	<b>-4,452</b>	<b>-3,276</b>	<b>1,056</b>	<b>2,059</b>
Cash at the beginning of the reporting period	12,965	11,920	7,468	4,192	5,248
Cash at the end of the reporting period	11,920	7,468	4,192	5,248	7,307

## Budget Statements 2003—2004

### Capital Budget Statement for the period ended 30 June

	Estimated actual 2002-03 \$'000	Budget estimate 2003-04 \$'000	Forward estimate 2004-05 \$'000	Forward estimate 2005-06 \$'000	Forward estimate 2006-07 \$'000
<b>PURCHASE OF NON-FINANCIAL ASSETS</b>					
Funded by capital appropriations	-	-	-	-	-
Funded internally by Departmental resources	25	20	20	20	20

### Non-financial Assets - Summary of Movement (2003-04)

	Land \$'000	Buildings \$'000	Total land and buildings \$'000	Other infrastructure plant and equipment \$'000	Intangibles \$'000	Total \$'000
Carrying amount at the start of year	74	220	294	137	-	431
Additions			-	20		20
Disposals			-			-
Revaluation increments			-			-
Recoverable amount write-downs			-			-
Net transfers free of charge			-			-
Depreciation/amortisation expense		6	6	25		31
Write-off of assets			-			-
<b>Carrying amount at the end of year</b>	<b>74</b>	<b>214</b>	<b>288</b>	<b>132</b>	<b>-</b>	<b>420</b>
<b>Total additions</b>						
Self funded			-	20		20
Appropriations			-			-
<b>Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>20</b>	<b>-</b>	<b>20</b>

# Research Projects 2003—2004

## 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 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
US	University of Sydney

# Research Projects 2003—2004

## Program 1 People & Knowledge

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
CRC22C	National Cotton Extension Coordinator	Ms Ingrid Christiansen	1/7/00	30/6/05	\$120,000
CRC35C	IPM Training Coordinator.	Mr Mark Hickman	1/1/02	30/6/05	\$112,000
CRC41C	NSW Industry Development Officer (IDO, Trainee)	Ms Penny van Dongen	1/1/02	30/6/04	\$95,000
CRC42C	QLD Industry Development Officer (IDO, Trainee)	Mr Steve Ginns	1/1/02	30/6/04	\$64,942
CRC53C	Industry Development Extension Program - Darling Downs	Ms Jenelle Hare	1/7/03	30/6/06	\$30,000
CRC54C	Cotton Industry Development	Mr Evan Brown Officer - Griffith	1/7/03	30/6/06	\$90,000
CRDC190C	Farm Health and Safety R & D Program	Mr Bruce Pyke	1/7/02	30/6/05	\$20,000
CRDC196C	Wincott Inc: Womens Industry Network Cotton	Ms Helen Zilm	1/7/02	30/6/04	\$17,500
CSP139C	Application of crop simulation within the Australian cotton industry.	Mr Dirk Richards	1/7/01	30/6/04	\$117,000
CSP151C	Support development and independent evaluation of cotton management packages	Dr Michael Bange	1/7/02	30/6/05	\$100,000
CSP153C	ACRI Computing Support	Mr Tony Pfeiffer	1/7/02	30/6/05	\$127,000
CSP163C	Delivering science to Agribusiness: novel decision support tools	To be appointed	1/7/03	30/6/06	\$100,000
DAN167C	Cotton Industry Development Officer: Lower Namoi	Ms Annie Spora	1/7/02	30/6/05	\$95,000
DAN169C	Cotton Industry Development Officer: Macquarie	Ms Korrily Rourke	1/7/02	30/6/05	\$100,000
DAQ100C	Extension Agronomy for Cotton Production in Central Queensland	Mr David Kelly	1/7/99	30/6/04	\$105,000
DAQ114C	Cotton Industry Development Extension Officer: Border Rivers	Ms Anne Sullivan	1/7/01	30/6/04	\$90,000
DAQ115C	Cotton Industry Development Extension Officer: Dirranbandi & St. George	Ms Rebecca Smith	1/7/01	30/6/04	\$81,000
US55C	Undergraduate Scholarship Program - Sydney University	Prof Les Copeland	1/7/99	30/6/04	\$6,500
US61C	Sponsor prize "Proficiency in fourth year agronomy in the B.Sc.Agr. degree program"	Dr Lindsay Campbell	1/7/01	30/6/04	\$500
<b>PROGRAM ONE TOTAL</b>					<b>\$1,471,442</b>

## Research Projects 2003—2004

### Program 2 Integrated Natural Resource Management

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
AAW4C	Sustainable natural resource management for the Australian Cotton Industry using the Best Management Practices Manual	Mr John Williams	1/7/02	31/12/04	\$69,000
ANU7C	Development of a decision support system for water allocation in the Gwydir and Namoi valleys	Dr Rebecca Letcher	1/9/02	31/8/05	\$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)	Ms Karen Ivkovic	1/9/02	31/3/06	\$15,000
CLW1C	Environmental impacts of genetically modified cotton on soil biological processes -effects of farming systems	Dr Vadakattu/ V.S.R. Gupta	1/7/01	30/6/04	\$71,000
CLW3C	Rhizosphere biological functions as influenced by GM cotton	Dr Oliver Knox	1/7/02	30/6/06	\$139,000
CRC37C	Measuring the influence of water quality on drainage through irrigated cotton soils	Dr Naidu Bodapati	1/7/01	30/6/04	\$84,000
CRC47C	Quantifying deep drainage using lysimetry	Dr Anthony Ringrose-Voase	1/1/03	30/6/06	\$138,000
CRC50C	Understanding the salinity threat in irrigated cotton growing areas of Australia -Phase IV : Interpretation & Extension	Dr John Triantafilis	1/7/03	30/6/06	\$50,000
DNR4C	Recording, analysing & mapping of biodiversity in cotton areas of the Emerald Irrigation Area	Mr Bill Wilkinson	1/7/02	30/6/04	\$70,000
FCRC1C	Postgraduate - Aquatic biodiversity and the ecological value of ring-tank water storages on cotton farms	To be appointed	1/7/02	30/6/05	\$34,900
GCRC4C	Reducing losses of nitrogen from cotton rotation systems	Dr Peter Grace	1/7/03	30/6/04	\$40,000
US62C	Postgraduate - Sam Buchanan: Hydrological impacts of irrigation in the Bourke district	Mr Sam Buchanan	1/1/02	31/12/04	\$36,000
US64C	Development of measures of soil health	Dr Peter McGee	1/7/02	30/6/05	\$86,000
US65C	Postgraduate - Stella Loke: Diversity of VAM fungi in soil health	Ms Stella Loke	1/1/03	31/12/05	\$29,000
US66C	Postgraduate - Leah MacKinnon: The biology of insectivorous bats as predators of pests in cotton fields, and associated woodland or forest remnant	Ms Leah MacKinnon	1/1/03	30/6/04	\$1,500
US68C	Post-Doc: Dr A Crossan - Management of risk for chemicals used in cotton production	Dr Angus Crossan	1/7/03	30/6/05	\$35,000
<b>PROGRAM TWO TOTAL</b>					<b>\$1,009,400</b>

## Research Projects 2003—2004

### Program 3 Crop Protection

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
AWA3C	Development of sustainable pest management practices for Bollgard II™ production in the Kimberley	Dr Amanda Annells	1/7/02	30/6/05	\$49,000
CRC17C	Post Doc - Sarah Mansfield: Enhancing the impact of early season predation on <i>Helicoverpa spp.</i>	Dr Sarah Mansfield	16/1/01	16/1/04	\$15,812
CRC18C	Postgraduate - Florian Yan: Cotton soil health: Influences on cotton root diseases.	Ms Florian Yan	1/7/00	30/6/04	\$12,000
CRC29C	Postgraduate - John Harvey: Diversity and pathogenicity of <i>Thielaviopsis Basicola</i> (Black Root Rot)	Mr John Harvey	1/2/01	31/1/04	\$21,405
CRC30C	Postgraduate - Ingrid Rencken: Role of native vegetation in harboring beneficial insects and reducing insect pest damage in cotton	Ms Ingrid Rencken	1/7/01	30/4/06	\$19,000
CRC31C	Postgraduate - Richard Kent: The role of weeds as alternative hosts of Fusarium wilt in cotton	Mr Richard Kent	1/1/02	31/12/04	\$37,900
CRC36C	Managing <i>Helicoverpa spp.</i> on cotton with semio (signalling) chemicals	Dr Chris Moore	1/7/01	30/6/04	\$90,000
CRC43C	Postgraduate - Zacary Chai: Gene silencing technologies to control <i>Helicoverpa armigera</i>	Zacary Chai	1/1/03	31/12/05	\$29,000
CRDC209C	Assessing a program for post emergent control of problem weeds in cotton using shielded sprayers	Mr John Rochecouste	1/7/02	1/8/03	\$0
CSE101C	High level Cry1Aac resistance in <i>H. armigera</i>	Dr Ray Akhurst	1/7/02	30/6/04	\$51,100
CSE102C	Monitoring Bt resistance	Dr Ray Akhurst	1/7/02	30/6/05	\$200,000
CSE104C	Potential for the evolution of resistance to Bt by <i>Helicoverpa armigera</i>	Dr Rod Mahon	1/7/02	30/6/04	\$130,000
CSE107C	Ecology of <i>Helicoverpa</i> in relation to transgenic cotton and the efficiency of refuge crops	Dr Geoffrey Baker	1/7/03	30/6/06	\$130,000
CSE108C	Genetics of Bt resistance in <i>H. armigera</i> : Resistance to Cry2Ab	Dr Rod Mahon	1/7/03	30/6/06	\$150,000
CSE96C	Resistance of <i>Helicoverpa armigera</i> to cry2A	Dr Ray Akhurst	1/7/01	30/6/04	\$48,900

## Research Projects 2003—2004

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
CSP143C	Identification and management of Bunchy Top syndrome in cotton	Dr Amelia Reddall	1/7/01	30/6/04	\$95,000
CSP145C	Improving understanding of the ecology and management of cotton aphid	Dr Lewis Wilson	1/9/01	30/6/04	\$86,000
CSP147C	Incorporating aphids, insecticides and early season plant compensation in Integrated Pest Management (IPM)	Dr Lewis Wilson	1/7/02	30/6/05	\$162,000
CSP156C	The potential for native Fusarium to give rise to new cotton field pathogens	Dr Bo Wang	1/1/04	31/12/06	\$64,414
CSP162C	Damage syndromes, economic thresholds & tolerance of cotton green mirids	Dr Tom Lei	1/7/03	30/6/06	\$130,000
DAN140C	Management of Resistance to Conventional Chemicals in <i>Helicoverpa spp.</i>	Dr Robin Gunning	1/7/99	30/6/04	\$100,000
DAN153C	Managing Black Root Rot of Cotton	Dr Om Jhorar	1/7/01	30/6/04	\$160,000
DAN154C	Diseases of Cotton VII	Dr David Nehl	1/7/01	30/6/04	\$130,000
DAN160C	Impact and Role of Novel insecticides in Integrated Pest Management	Mr Viliami Heimoana	1/7/02	30/6/05	\$147,000
DAN162C	Insecticide resistance management in B-biotype <i>Bemisia tabaci</i>	Dr Robin Gunning	1/7/02	30/6/05	\$120,000
DAN163C	Insecticide Resistance Management in cotton aphid ( <i>Aphis gossypii</i> ) and cotton mite ( <i>Tetranychus urticae</i> )	Dr Grant Herron	1/7/02	30/6/05	\$105,000
DAN164C	Mechanisms of insecticide resistance in the cotton aphid, <i>Aphis gossypii</i>	Dr Emma Cottage	1/7/02	30/6/04	\$85,000
DAN172C	Biochemical mechanisms of resistance to <i>Bacillus thuringiensis</i> endotoxins in <i>Helicoverpa armigera</i>	Dr Robin Gunning	1/7/03	30/6/05	\$33,191
DAN173C	Insecticide resistance in <i>Helicoverpa spp.</i> and the role of IPM/Area Wide Management in Resistance Management	Dr Louise Rossiter	1/7/03	30/6/05	\$140,000
DAN174C	Expanding WEEDpak: developing integrated weed management packages for the cotton farming systems	Mr Graham Charles	1/7/03	30/6/06	\$100,000

## Research Projects 2003—2004

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
DAN175C	Reducing weed control costs by better understanding the biology and ecology of problem weeds	Dr Stephen Johnson	1/7/03	30/6/06	\$95,000
DAN176C	Severity factors in Fusarium wilt of cotton	Dr David Nehl	1/7/03	30/6/06	\$75,978
DAQ105C	Improved application and formulation of viral biopesticides against <i>Helicoverpa</i>	Dr Andrew Reeson	1/7/00	30/6/04	\$1,200
DAQ107C	Ecology and development of management strategies for Fusarium wilt in cotton	Dr Joe Kochman	1/7/00	30/6/04	\$276,000
DAQ110C	Pest status and management of shield bugs in cotton	Dr Moazzem Khan	1/7/01	30/6/04	\$110,000
DAQ111C	New biopesticides against emerging sucking pests	Mr Damien Cupitt	19/6/02	30/6/05	\$100,000
DAQ121C	Aphid bio-control in cotton	Mr Bernard Franzmann	1/7/02	30/6/04	\$82,610
DAQ122C	Development of novel pest management options for cotton in central Queensland	Mr Paul Grundy	1/7/02	30/6/05	\$100,000
DAQ123C	Best weed management strategies for dryland cropping systems with cotton	To be appointed	1/7/02	30/6/05	\$38,000
DAQ126C	Heliothis egg collections for resistance testing from the Darling Downs and South Burnett in southern Queensland	To be appointed	1/11/02	30/4/05	\$24,702
MU2C	Postgraduate - Christina Hall: Defence mechanisms of cotton against <i>Fusarium oxysporum f.sp. vasinfectum</i> and control of Fusarium wilt	Ms Christina Hall	26/3/02	31/12/04	\$29,000
UNE36C	Postgraduate - Sam Lowor: Pheromones for occasional pests of cotton	Mr Samuel Lowor	1/1/02	30/6/04	\$3,625
UQ35C	Population genetics of heliothis migration, recruitment and origins	Dr Kirsten Scott	1/7/03	30/6/06	\$100,000
<b>PROGRAM THREE TOTAL</b>					<b>\$3,677,837</b>

# Research Projects 2003—2004

## Program 4 Farming Systems

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
CRC33C	Postgraduate - Simon Speirs: Characterising soil structural stability and form of sodic soil used for cotton production	Mr Simon Speirs	3/9/01	31/12/04	\$29,000
CRC34C	Agronomic aspects of Bt efficacy in transgenic cotton	Dr Ian Rochester	1/7/01	30/6/04	\$95,000
CRC45C	Maintaining profitability and soil quality in cotton farming systems	Dr Nilantha Hulugalle	1/7/02	30/6/05	\$123,000
CRC48C	Optimising field and farm scale water use efficiency for cotton farming systems	Dr Phil Goyne	1/7/03	30/6/06	\$50,000
CRC51C	Whole farm salinity management strategies for cotton production in the Macquarie Valley	Mr David Mitchell	1/7/03	30/6/06	\$35,000
CRC52C	Nutritional constraints to efficient cotton production	Dr Ian Rochester	1/7/03	30/6/06	\$160,000
CRDC158C	Water relations of the cotton plant (CSP)	Mr James Neilsen	1/1/02	12/1/06	\$44,493
CSE103C	The impact of Area Wide Management (AWM) on beneficial Anthropod and <i>Helicoverpa</i> populations	Mr Martin Dillon	1/7/02	30/6/05	\$161,000
CSE105C	The influence of beneficial soil fauna on cotton production and its pests and diseases	Dr Geoffrey Baker	1/7/02	30/6/05	\$49,000
CSP122C	CSIRO Field Experiments at ACRI	Dr Greg Constable	1/7/00	30/6/05	\$75,000
CSP138C	Refining crop agronomy for dry season cotton production in north Western Australia	Dr Brian Duggan	1/7/01	30/6/04	\$89,100
CSP140C	The impact of temperature extremes on cotton performance	Dr Michael Bange	1/7/01	30/6/04	\$95,000
CSP141C	Postgraduate - Rose Roche: Training in crop physiology - Functional responses of cotton to environment mediated via internal nitrogen dynamics	Ms Rose Roche	1/7/01	30/6/04	\$29,000
CSP157C	Integrated farm water management for cotton production	Dr Sunil Tennakoon	1/7/03	30/6/06	\$100,000
CSP161C	Physiology of high retention cotton crops	Dr Stephen Milroy	1/7/03	30/6/06	\$130,000

## Research Projects 2003—2004

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
DAN151C	Conservation and utilisation of beneficial insects and other biological control agents for IPM in cotton II	Dr Robert Mensah	1/7/01	30/6/04	\$149,000
DAN166C	Operational Costs for Cotton Experiments	Mr Dallas Gibb	1/7/02	30/6/05	\$84,000
DAQ104C/ GRDC2C	Using seasonal climate forecasts for more effective grain-cotton production systems (joint project)	Mr Graham Harris	1/7/99	31/12/03	\$0
DAQ112C	Heliothis management in south Queensland farming systems	Dr David Murray	1/7/01	30/6/04	\$73,000
DAQ113C	Postgraduate - Amanda Cleary: The effect of cereal stubble on <i>Helicoverpa</i> activity in early season cotton	Ms Amanda Cleary	1/8/01	30/8/04	\$30,000
DAQ116C	Assessment of the potential for resistance to Gemstar	Dr Caroline Hauxwell	1/7/01	30/6/04	\$80,000
DAQ120C	Area-wide monitoring and cultural control of key cotton pests in central Queensland	Dr Richard Sequeira	1/7/02	30/6/05	\$111,000
DAQ127C	Managing Bollgard II cotton farming systems in southern Queensland	Dr Brad Scholz	1/7/03	30/6/06	\$100,000
DPIF2C	Investigation of cotton growing at different sites under different farming systems in the Northern Territory	Mr Andrew Dougall	1/7/01	30/6/04	\$45,059
NEC8C	Postgraduate - Simon White: Partial root zone drying and regulated deficit irrigation for cotton using large mobile irrigation schemes	Mr Simon White	1/9/02	31/8/05	\$32,200
NEC9C	R&D to support the adoption of centre pivots and lateral moves in the Australian cotton Industry	Mr Joseph Foley	1/7/03	30/6/06	\$50,000
US67C	Postgraduate - Edward Cay: Strategies for ameliorating sodic and saline subsoils of cotton-producing areas in the Hillston district of NSW	Mr Edward Cay	5/1/04	31/12/07	\$14,500
<b>PROGRAM FOUR TOTAL</b>					<b>\$2,033,352</b>

## Research Projects 2003—2004

### Program 5 Breeding & Biotechnology

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
CRC49C	Enhancing the insect tolerance of Australian cottons through conventional and transgenic traits	Dr Gary Fitt	1/7/03	30/6/06	\$100,000
CSP113C	Australian native cottons as sources of resistance and new pathotypes of Fusarium wilt	Dr Bo Wang	1/1/01	31/12/03	\$0
CSP114C	Post Doc-Dr. Helen McFadden: Discovery of genes involved in the expression of cotton resistance responses of Fusarium wilt by the application of microarray technology	Dr Helen McFadden	1/7/00	30/9/03	\$0
CSP117C	Development and evaluation of cottonseed oils with improved nutritional and functional properties	Dr Qing Liu	1/11/00	30/10/03	\$33,000
CSP118C	Manipulating genes to enhance cotton fibre elongation and cellulose synthesis	Dr Yong-Ling Ruan	1/9/00	3/12/03	\$19,000
CSP120C	Genetic characterisation of homeologous recombination and chromosome inheritance in <i>G. hirsutum</i> x <i>K</i> genome alien chromosome addition lines	Dr Augusto Becerra	1/1/01	3/1/04	\$0
CSP121C	CSIRO Plant Breeding Fibre Quality Laboratory	Dr Greg Constable	1/7/00	30/6/05	\$76,731
CSP135C	Postgraduate – Saara Kate Bowen: Molecular analysis and manipulation of terpene biosynthesis in cotton	Ms Saara Kate Bowen	1/1/02	27/10/05	\$29,000
CSP136C	Cotton Biotechnology: Core Program	Dr Danny Llewellyn	1/7/01	30/6/04	\$309,037
CSP137C	Development of a unigene set of cotton clones for general microarray analysis of gene expression in cotton plants	Dr Yingru Wu	1/7/01	30/9/04	\$103,000
CSP146C	Postgraduate – Adriane Machado: Gene discovery in cotton fiber initiation and development by comparing cotton lintless mutants to wild type on cotton ovule cDNA microarrays	Mrs Adriane Machado	1/7/02	30/6/05	\$29,000

## Research Projects 2003—2004

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
CSP149C	Isolation of Novel Cotton Promoters to drive the Robust Expression of useful Genes in Transgenic Cotton	Dr Ranamalie Amarashinge	1/7/02	30/8/04	\$24,666
CSP154C	Nutritional improvement in cottonseed oils through genetic removal of palmitic acid	Dr Qing Liu	1/7/02	30/6/04	\$93,070
CSP155C	AFLP diversity of Fov in cultivated cotton fields and genotyping of <i>G.hirsutum</i> X <i>G.sturtianum</i> backcross lines	Dr Curt Brubaker	1/10/02	30/9/04	\$23,692
CSP158C	Breeding for resistance to Fusarium wilt	Dr Greg Constable	1/7/03	30/6/08	\$200,000
CSP159C	Breeding improved cotton varieties	Dr Greg Constable	1/7/03	30/6/08	\$500,000
CSP160C	Development & evaluation of cottonseed oils with improved nutritional & functional properties	Dr Qing Liu	1/11/03	30.10.2006	\$60,000
HEX1C	Improving the efficiency of embryogenesis in elite cotton cultivars	Dr Simon Poon	1/7/02	30/6/05	\$91,752
MU1C	Transgenic cotton for the control of Fusarium Wilt	Dr Robyn Heath	28/2/02	28/2/06	\$69,189
UA11C	Postgraduate – Damien Lightfoot: Fibre improvement through modulation of transitions in cotton development.	Mr Damien Lightfoot	1/3/02	28/2/05	\$30,000
UA12C	Postgraduate – John Humphries: Analysis of TTG1 homologues in cotton for roles in fibre initiation	Mr John Humphries	11/2/02	11/2/05	\$30,000
UA7C	Post-Doc – Sharon Orford: Genetic manipulation of fibre quality in Australian cotton	Dr Sharon Orford	1/7/00	30/6/04	\$46,686
UA8C	Postgraduate – Sven Delaney: Development of gene promoters for cotton fibre development.	Mr Sven Delaney	1/2/01	31/12/03	\$22,000
US48C	Postgraduate – Fiona Frances Ballard: Identification and characterisation of genes for resistance to bacterial blight in the cotton plant	Ms Fiona Ballard	1/3/99	30/1/04	\$0
<b>PROGRAM FIVE TOTAL</b>					<b>\$1,889,823</b>

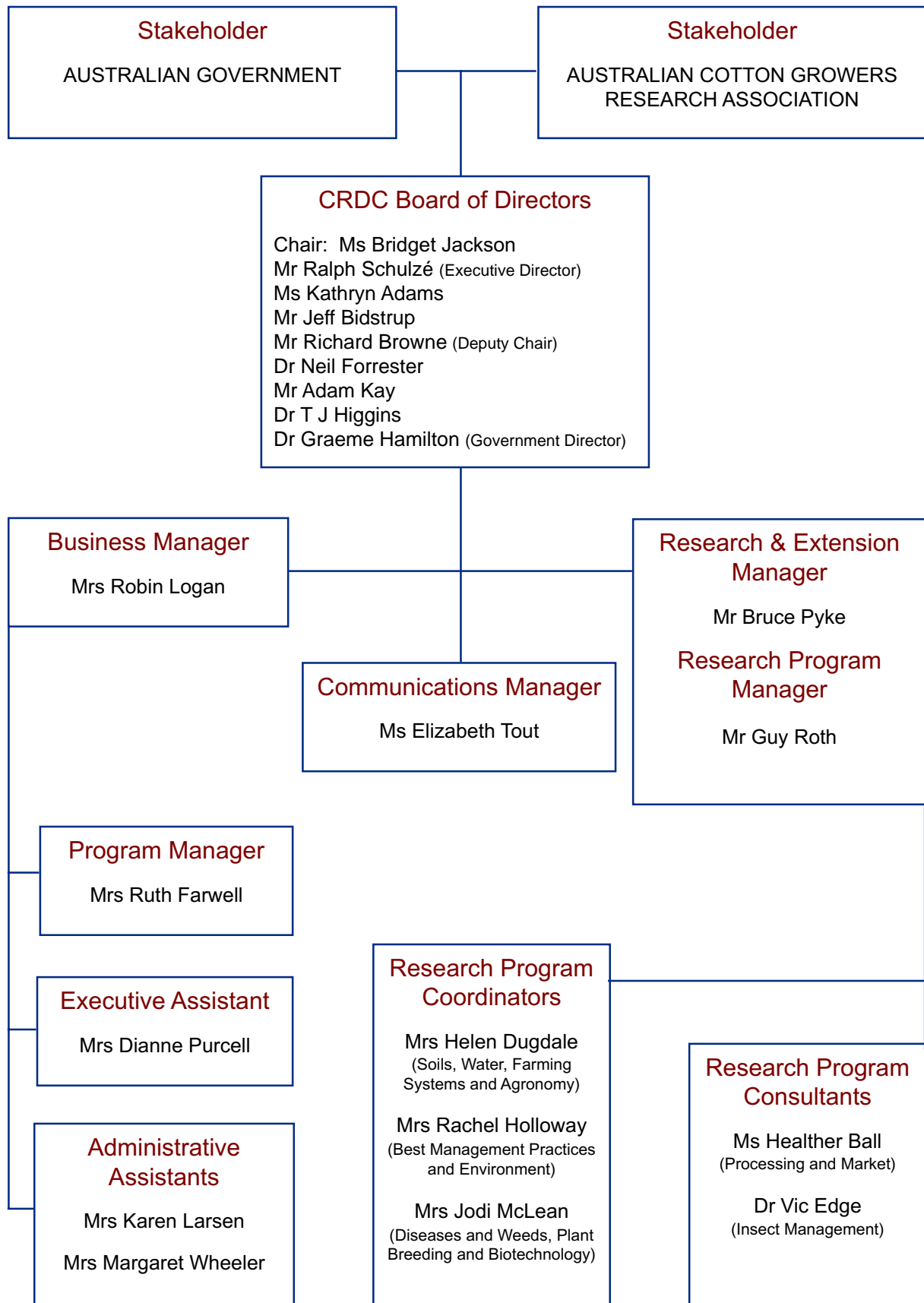
## Research Program 6 Value Chain

Project code	Project Title	Researcher	Start Date	Cease Date	2003-04 Budget
CTFT6C	Improved Quality of Ginned Australian Cotton	Dr Stuart Gordon	1/7/02	30/6/04	\$72,000
CTFT7C	Interlaboratory trials for fibre maturity reference samples	Dr Geoffrey Naylor	1/7/03	30/6/06	\$30,250
CTFT8C	Development of Cottonscan: an instrument for measuring the fineness and maturity values of cotton fibre samples	Dr Geoffrey Naylor	1/7/03	30/6/06	\$150,000
<b>PROGRAM 6 TOTAL</b>					<b>\$252,250</b>

**RESEARCH & DEVELOPMENT PROGRAM GRAND TOTAL**

**\$10,334,104**

# Corporation Responsibilities



# Acronyms

AAAA	Aerial Agricultural Association of Australia
ABARE	Australian Bureau of Agricultural and Resource Economics
ACAHS	Australian Centre for Agricultural Health and Safety
ACCRC	Australian Cotton Cooperative Research Centre
ACEC	Australian Cotton Exhibition Centre
ACGRA	Australian Cotton Growers' Research Association
ACIC	Australian Cotton Industry Council
ACRI	Australian Cotton Research Institute
AFFA	Agriculture Fisheries and Forestry – Australia
ANAO	Australian National Audit Office
APVMA	Australian Pesticides Veterinary Medicine Authority
ARLIP	Australian Rural Leadership program
ARRIP	Australian Agricultural Research in Progress database
AWA	Agriculture Western AustraliaAWM Area Wide Management
BMP	Best Management Practice
Bt	<i>Bacillus thuringiensis</i> (crystal protein expressed in INGARD® cotton)
CCA	Cotton Consultants Australia Inc
CGA	Cotton Growers' Association
CIE	Centre for International Economics
Cotton CRC	Australian Cotton Cooperative Research Centre
CRC	Cooperative Research Centre
CRDC	Cotton Research and Development Corporation
CSD	Cotton Seed Distributors
CSIRO	Commonwealth Scientific and Industrial Research organisation
DNR	Queensland Department of Natural Resources
DPIF	Northern Territory Department of Primary Industries and Fisheries
EPA	NSW Environmental Protection Agency
GMAC	Genetic Manipulation Advisory Committee
GRDC	Grains Research and Development Corporation
GROA	Groundrig Operators Association
ICAC	International Cotton Advisory Committee
IPM	Integrated Pest Management

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PHA	Plant Health Australia
OGTR	Office of the Gene Technology Regulator
QDPI	Queensland Department of Primary Industries
RCMAC	Raw Cotton Marketing Advisory Committee
RRDC	Rural Research and Development Corporations
TIMS	Transgenic and Insect Management Strategy Committee
TRC	Technology Resource Centre (at the ACRI)

# Cotton

RESEARCH & DEVELOPMENT

Cotton Research and Development Corporation  
ANNUAL OPERATING PLAN 2003—2004

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