Australian Government

Cotton Research and Development Corporation

COTTON RESEARCH AND DEVELOPMENT CORPORATION

Annual Operating Plan

2004 – 2005

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Cotton Research and Development Corporation
2 Lloyd Street
(PO Box 282)
Narrabri NSW 2390

Phone: 02 6792 4088
Fax: 02 6792 4400
Email: crdc@crdc.com.au
Website: www.crdc.com.au

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Cotton industry outlook

RESEARCH & DEVELOPMENT AIDING THE INDUSTRY

There are about 1200 cotton farmers in Australia. Seventy per cent of Australia's cotton is grown in New South Wales, with the remainder grown in Queensland. Australians are the highest consumers of cotton products in the world, with cotton's 'breathability' making it a natural choice in the Australian climate.

Today's cotton farms are typically 500 to 2000 hectares, highly mechanised, capital intensive, technologically sophisticated and require high levels of management expertise. Over the past decade, the Australian cotton industry has achieved a 126 per cent increase in production while the acreage devoted to cotton has increased by only 50 per cent. The average yield for irrigated Australian cotton is 1600 kilograms per hectare – the highest in the world. These figures can be attributed almost entirely to improved cotton breeding and better crop management systems, which have been achieved with a reduced impact on the environment. The economic and environmental health of the industry is due in large part to a high quality of research and development, much of it coordinated and funded by CRDC, combined with its practical implementation by cotton growers who are very quick to pick up research outcomes.

Australian cotton is grown in a relatively compact and contiguous part of the country. This delivers a number of efficiencies but also makes the industry susceptible to drought compared with, for example grain crops grown in more diverse areas, with major cotton regions often under the same weather pattern

Although the cotton industry is, in numbers of participants and physical spread, not a large one, it makes a significant contribution to Australian exports. On a global scale Australia is a relatively small producer, growing (normally) about three per cent of the world's cotton, but the third largest exporter of cotton in the world. Since 1980, the value of Australian cotton produced annually increased dramatically to about $1.4 to $1.6 billion per annum, with almost all of the crop exported. Although the drought has caused a temporary drop in those figures, the corporation expects the upward trend to continue over the medium to longer term.

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

Economic analysis by the Centre for International Economics shows that CSIRO's cotton research, with significant support from CRDC, has provided a net benefit of over $5 billion since 1973, with a benefit:cost ratio of 51. Most of the benefit has come from the cotton breeding program – a major focus of CRDC's research funding – which has returned a net benefits of $4.9 billion, with a benefit:cost ratio of 86. It was against this background that the leader of the CSIRO cotton breeding team, Dr Greg Constable, was named Australia's smartest scientist in *The Bulletin* Smart 100 edition in late 2003.

Cotton's excellent economic record and contribution has suffered a setback in the past two seasons because of the prolonged drought and the effects will be felt for the next two to three seasons. Increased efficiencies delivered in 2004–05 by CRDC funded and coordinated research will aid that recovery, particularly as the corporation's *Field to Fabric Initiative* gathers momentum. In addition, the increased use of ever-improving Bollgard® II varieties will continue to reduce the cost of insecticide inputs to the crop, delivering economic, environmental and health dividends. For example, cotton-related complaints to the New South Wales Environment Protection Agency fell from 130 in 1998–99 to only ten in 2002–03.

THE 2004 HARVEST

Early indications are that the 2004 cotton harvest should exceed the 1.25 million bale forecast used as the basis of CRDC's 2003–04 budget. Some cotton shippers are now forecasting production in the 1.35 to 1.45 million bale range. Even with the revised forecast, 2004 will see Australia's smallest crop since the late 1980s, which means we will be unable to fulfil demand and will lose some key markets. This comes at a particularly unfortunate time for Australian cotton, with the United States and Brazil aggressively targeting those markets.

Initial fibre quality appears good, with a lower proportion falling into the discounted over-mature category than in the preceding drought-affected season. Because of March rains, particularly along the New South Wales and Queensland border, there is an expectation that 'colour' may be less bright on a proportion of the crop. Similarly, some problems with fibre immaturity and neppiness (short, tangled fibres) can be expected because of the slow, mild finish of the crop.

THE COMING SEASON

The outlook for the 2004–2005 season has improved. For prudent budgeting purposes, CRDC is using a two million bale forecast but many in the industry suggest that, even with minor improvement, production should exceed 2.5 million bales.

We can expect up to seventy per cent of the Australian cotton crop to be genetically modified in the coming season. This increase will result from the good performance of Bollgard® II varieties, with two genes of resistance to *Helicoverpa* spp. in trials this year and the continuing advantages of the Roundup Ready® technology.

Corporation outlook

OUR OPERATING ENVIRONMENT

As a consequence of drought, which meant lower production and hence lower levy income, the corporation's expenditure in 2003–04 is expected to fall to $12.7 million, requiring a draw down on reserves of some $4.3 million. By comparison, expenditure in 2002–03, although originally approved at $17.0 million, was cut to $15.6 as the severity of the drought developed.

Based on anticipated expenditure of $12.2 million for 2004–05, CRDC will need to draw a further $3.2 million from reserves. Under existing and predicted weather and water availability conditions, this will be followed by a further $0.75 million in 2005–06, after which rebuilding of corporation reserves will commence. CRDC policy is to maintain reserves at 70 to 75 per cent of anticipated annual expenditure. In the short term this equates to $9.0 million but in the longer term to $12.0 million.

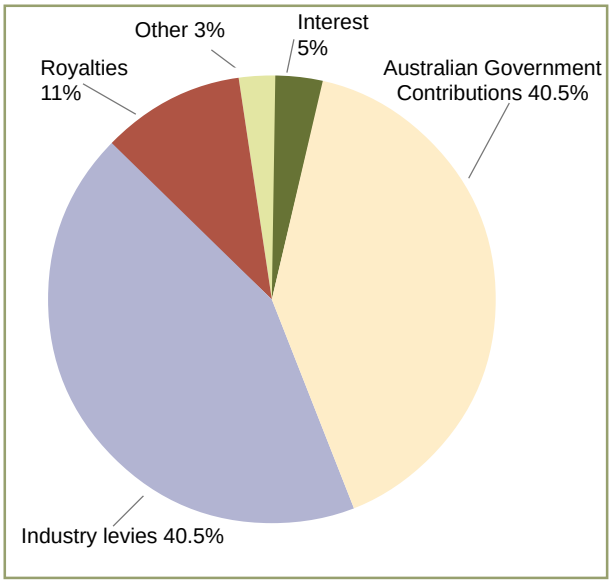
Following a year in which cutbacks were required in research, as well as all other areas, the corporation enters the 2004–05 year with some optimism, tempered by indications of a retreat into drought and the possible threat of a new El Ninõ weather pattern.

CRDC received notification from Senator Judith Troeth, Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry, in April 2004 of the success of an application the corporation and the Australian Cotton Industry Council made on behalf of the cotton industry for funding under the Australian Government's *Pathways to Industry EMS* Program. The CRDC project, "Enhancing the cotton industry's BMP Program to improve adoption", will receive up to $758,000, subject to final negotiation of the funding agreement. The approval of this funding will provide a great fillip for the cotton industry and reinforces the Australian Government's support for the industry's innovative environmental management system, Best Management Practices.

FORECAST REVENUE 2004–05

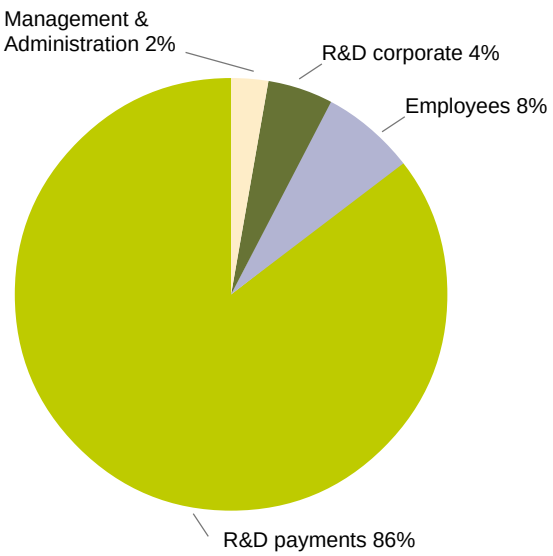
Revenue for the 2004–05 year is expected to recover slightly from the previous year, although still significantly affected by the drought. Total revenue is forecast to be $9.0 million, comprising:

- ‡ $3.6 million in industry levies
- ‡ $3.6 million in Australian Government contribution
- ‡ $1.8 million from other sources, including interest and royalties

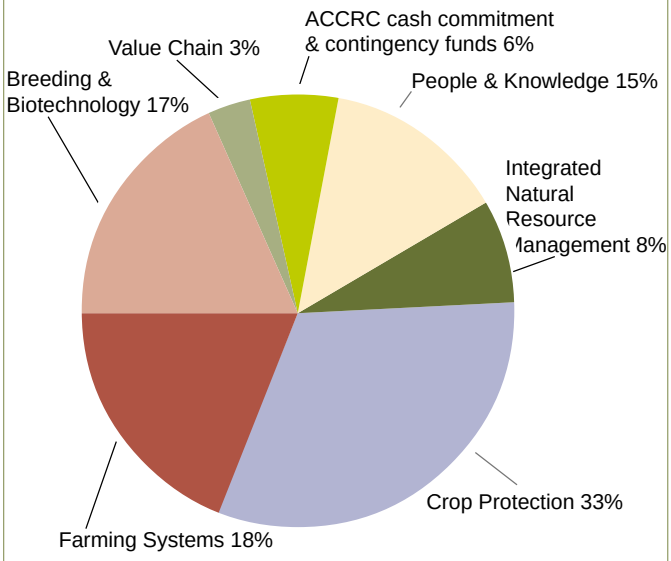


FORECAST EXPENDITURE 2004–05

Budgeted Expenditure $12.2 million



Research Program Expenditure: $9.1 million



OUTCOMES AND OUTPUTS

The corporation will work in partnership with industry, government, research providers and the community during 2004–05 to achieve its integrated corporate outcome. It will achieve this by:

Investing and providing leadership in research, innovation, knowledge creation and transfer for the Australian cotton industry

The map below shows the relationship between the Outcome and contributing Outputs. CRDC's Outputs and Outcome framework and strategic elements are shown on the following pages.

COTTON RESEARCH AND DEVELOPMENT CORPORATION

Chair: Bridget Jackson
Executive Director: Ralph Schulzé

Outcome

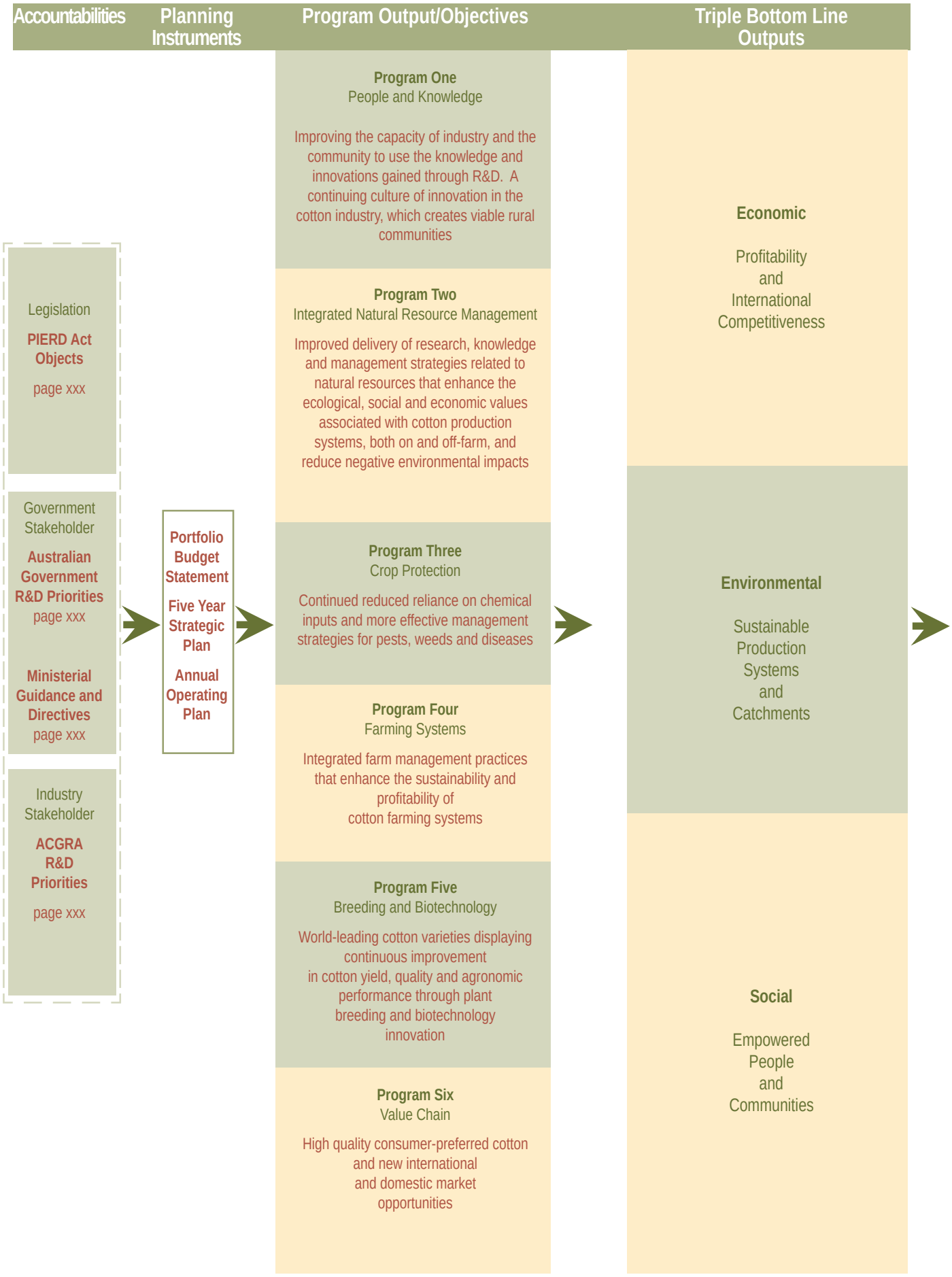
A more sustainable, profitable and competitive cotton industry providing increased environmental, economic and social benefits to regional communities and the nation

Total Revenue: $9.0 million
Total Cost of Outputs: $12.2 million*

Output 1	Output 2	Output 3
Economic	Environmental	Social
Profitability and International Competitiveness	Sustainable Production Systems and Catchments	Empowered People and Communities
Total Cost: $5.2 million	Total Cost: $4.4 million	Total Cost: $2.6 million

*Total cost, rather than total price, is shown as CRDC is primarily funded through industry levies rather than on the basis of its Outputs

Outputs and Outcome Framework



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

CRDC Strategic Elements

VISION

A globally competitive and responsible cotton industry

MISSION

To invest and provide leadership in research, innovation, knowledge creation and transfer

OUTCOME

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

KEY RESEARCH PARTNERS

Australian Cotton Cooperative Research Centre

Federal and state government agencies

Cotton growers

Cotton Consultants Association

CSIRO

Universities

Rural Research and Development Corporations and Cooperative Research Centres

Agribusinesses

KEY STAKEHOLDERS

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

The Australian people, represented by the Australian Government

TRIPLE BOTTOM LINE REPORTING

The Cotton Research and Development Corporation will implement its objectives and outcome using a triple bottom line framework delivering one integrated outcome via three outputs: Economic, Environmental and Social.

Addressing Government Research Priorities

BACKGROUND

In December 2002, the Prime Minister released National Research Priorities under the broad categorisation of:

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

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

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

The timing of the release of both sets of priorities meant they were integrated into the CRDC Five Year Strategic Plan for 2003 to 2008. As in the previous year, these priorities provided important guidance in formulating the research and development program for 2004-05, as demonstrated on the following pages.

NATIONAL AND RURAL RESEARCH PRIORITIES

National

An environmentally sustainable Australia

Rural

Sustainable natural resource management

Improvement to the cotton industry's environmental performance has been a major and integral objective of the corporation's research and development in recent years. An evaluation of the cotton Best Management Practices (BMP) program in early 2004, as part of an Australian Government National Heritage Trust project, showed that there has been significant, positive change in all the areas of farm management covered by the BMP manual over the last five years.

The evaluation identified the independent auditing system developed by CRDC as the major factor influencing recognition by external stakeholders of BMP as a valid, effective and measurable environmental management system. In 2004–05, the independent audit program will be integrated into Cotton Australia's implementation program, which will provide growers with a more cost-effective and integrated system for becoming fully BMP-compliant and maintaining that status over time.

As a further component of the National Heritage Trust project, CRDC, in collaboration with Cotton Australia, will continue to contribute to the development of a land and water management module for BMP, with a pilot implementation program in three regions by late 2004, followed by its extension to the whole industry during 2005.

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

The corporation will follow up on recommendations of a CRDC and Australian Cotton CRC biodiversity review with various government agencies and other rural industries. CRDC will seek to incorporate other sources of research and information in deciding how to further develop its work in this area, including integrating biodiversity issues into BMP. The results of an Murray Darling Basin Commission-funded program for biodiversity management in the rice industry should be of particular interest and relevance.

The cotton industry is developing a greater understanding of functional biodiversity through the adoption of integrated pest management, in which conservation and utilisation of beneficial insects is a high priority. A new project will study the aquatic biodiversity and the ecological value of ring-tank water storages. Other research in 2004–05 will include the biology and activity of insectivorous bats in irrigated cotton, indigenous vegetation remnants and intensive production landscapes.

Together with the NSW Department of Primary Industries, CRDC will fund a new Water Use Efficiency Officer to help expand irrigation extension to cotton farmers in north west NSW. The

release of WATERpak will also assist cotton farmers to improve their understanding and managemement of water. A continuing project is examining the issue of deep drainage (the loss of water beyond the crop's root zone) to improve knowledge and measurement of the water balance. CRDC is also a contributing partner to the National Program for Sustainable Irrigation (NPSI).

Most Australian cotton is grown on grey, cracking soils in northern New South Wales and southern Queensland. These soils are far less susceptible to salinity problems, partly because they are self-mulching, absorbing organic matter as it breaks down. The cotton industry in the Macquarie Valley in central western New South Wales has been established in localised areas with prior streams, where salinity problems could develop. CRDC has invested some $1.2 million in mapping about 450,000 hectares for salinity risks in cotton-growing areas, using 7,500 reference points. The information gained will allow salinity research to move to a major focus on salinity in 2004–05 with well-targeted extension information on its management and prevention in those relatively few areas in the northern Darling basin that have been identified as having existing or potential problems.

Sodic soils are regarded as somewhat more of a problem in cotton-growing areas than salinity. Research in 2004–05 will focus on studying the impact of sodicity on cotton cropping systems and characterising the structural stability and form of sodic soil used for cotton production

Rural

Improving Competitiveness through a whole of industry Approach

Improved trade and market access

During 2003–04 CRDC developed a major Field to Fabric Initiative to improve Australian cotton quality. The first component commenced in the 2003–04 season, with five pilot field trial sites, each concentrating on two or three elite CSIRO Bollgard® II cultivars. The corporation will be guided by the outcome of that research in designing a proposal to put to the Australian government for additional funds to move the program to an international commercial level.

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

Increased investment in plant breeding to improve fibre quality will also help to ensure Australian cotton is preferred in the marketplace and that it avoids quality discounts and attracts premiums. CRDC's Farming Systems program will also play its part in delivering high quality fibre, with a new project to optimise agronomic management for improved yield and fibre quality. CRDC continues to invest in research to improve ginning equipment to reduce mechanical damage to fibre during the ginning process.

National

Promoting and maintaining good health

Rural

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

Cotton is a fibre crop, with oil as the only by-product for human consumption. CRDC-funded research into healthier cotton seed oil delivered plants with higher oleic and stearic acid content in 2003–04. It became apparent that a small amount of research remains to enable the already developed technology to move to potential commercialisation and this will be funded in 2004–05; however, its success will depend on commercial interest and public acceptance of genetically modified oils.

The cotton industry was the first Australian industry to implement an environmental management system – Best Management Practices. Its coming extension into the entire production chain and the land and water module that is to be added in the coming year can give the wider Australian community confidence that the industry seeks to produce and process the crop in an environmentally aware and responsible manner.

National

Frontier technologies for building and transforming Australian industries

Rural

Use of frontier technologies

These priorities are of great importance to the Australian cotton industry, which remains the only major agricultural industry in Australia that uses commercial applications of biotechnology, in the form of insect and herbicide tolerant varieties of cotton. This has led to major reductions in pesticide use and improvements in returns to cotton farmers.

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

Varieties containing two insecticidal genes that control *Helicoverpa* spp. will entirely replace single insecticidal gene INGARD® varieties in the 2004–05 season. The industry's careful management of INGARD to avoid the development of resistance has facilitated this changeover. CRDC anticipates Bollgard II varieties could comprise some 60 to 70 per cent of the crop in the coming season.

In response to a major review of CRDC's Plant Breeding and Biotechnology Program (see Program Five), the corporation has finessed research in this area for 2004–05. Some projects have finished early, but CRDC will continue to invest in a new, enabling biotechnology program as well as several targeted initiatives, especially in fibre development.

National

Safeguarding Australia

Rural

Protecting Australia from invasive diseases and pests

Research into the major pest, Silverleaf Whitefly, in collaboration with the Grains Research and Development Corporation and Horticulture Australia, has been very successful. It has lead to reduced pesticide use and improved management systems in cotton; however, the presence of Silverleaf Whitefly overseas has been associated with the increased prevalence of various viral diseases. CRDC proposes to consult with Horticulture Australia to examine the need to monitor potential risks, particularly for Gemini viruses, which could enter northern Australia and potentially have serious impacts on cotton and horticulture crops.

CRDC continues to collect a levy for the industry's contribution to Plant Health Australia. Development of a biosecurity plan for cotton, involving ACGRA, CRDC and Plant Health Australia, is expected in 2004–05.

Rural

Creating an innovative culture

The cotton industry has a strong record of innovation and rapid adoption of research outcomes. Australian cotton farmers do not compete directly in the market place and act cooperatively, sharing information and technological improvements. This is facilitated by the National Cotton Extension Team, which enters 2004–05 with a major re-focusing on the coordination of its planning and evaluation capacity.

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

Innovations planned for 2004–05 include a CD of the BMP manual with links to the range of resource information 'paks' introduced in recent years, including SOILpak, NUTRIpak and WATERpak.

A decision support business plan currently under way should lead to further opportunities to develop innovative tools using improved wireless and mobile internet access technologies.

CRDC Research & Development Program 2004–2005

PROGRAM 1

People and Knowledge

INPUTS

$1,390,477
7 new projects
9 continuing projects
8 projects to be commissioned

OUTPUT

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

OUTCOME

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

NATIONAL EXTENSION NETWORK

A review of the role of the National Extension Coordinator in 2003 has led to significant changes in delivery of the national extension effort, with a focus not only on maintaining coordination of the team but on improving planning, evaluation and reporting of extension activities and adoption.

In 2004–05, the National Coordinator, now renamed the Cotton Extension and Evaluation Specialist, will focus more on extension methodology and evaluation to improve the skills and knowledge of the whole network. Coordination of the network is now undertaken by a coordinating group that includes the leaders of new extension focus teams. These extension focus teams have been formed from network members, and each team concentrates on a particular area of cotton production and natural resource management such as water, weeds and diseases, environment, insects and farming systems.

Each focus team and individual development officer will be expected to develop evaluation targets and undertake and report on at least one evaluation of adoption of research outcomes during 2004–05.

CRDC funds eight full time equivalent positions within the extension network, as well as two extension and training specialists. Senior CRDC research program staff will continue to provide leadership in the planning and coordination of extension network activities, including the Australian Cotton CRC technology transfer and education program and the extension focus teams.

IMPROVING WATER USE EFFICIENCY

CRDC is a contributing partner to the National Program for Sustainable Irrigation (NPSI). During 2003–04, the extension network conducted phase one of a NPSI-funded project "Knowledge Management in Cotton and Grain Irrigation". In 2004–05, this project may move to phase two, expanding on a range of improvements to the delivery of information and tools for improved water use efficiency. This will be further supported by publication of WATERpak, field validation of HydroLOGIC and appointment of a new Water Use Efficiency Officer, based in Gunnedah, NSW, to enhance the water extension effort within the network.

A previous CRDC-funded CSIRO project benchmarked water use efficiency on 25 cotton farms. Arising out of this project, and working with the Australian Cotton CRC, NSW Department of Primary Industries, Queensland Department of Primary Industries and Fisheries and CSIRO, CRDC will support the updating of this benchmarking effort so that improvements in water use efficiency can be measured more effectively. Further information on water use efficiency and irrigation research can be found under Programs Two and Four.

DECISION SUPPORT SYSTEMS

CRDC commissioned the development of a five to ten year business plan for cotton decision support systems in 2003–04, jointly with the Australian Cotton

CRC and CSIRO. The coming year will see the commencement of the implementation of recommendations from this business plan. The cotton industry's strong culture of using computerised decision support tools will enable the enhanced delivery of decision support through improved access to wireless and broadband technology in 2004–05.

TRAINING AND EDUCATION

2003–04 saw the first full year's delivery of the Integrated Pest Management training course for cotton farmers, agronomy consultants and other industry support personnel. This course is delivered by a CRDC-funded IPM Training Coordinator, but involves a range of cotton researchers in delivering specific components of the course. It has proved to be an excellent means both of delivering research information to growers and providing direct feedback to researchers from growers about managing insect pests. The course will still be delivered in 2004–05, even though future access to financial support to participants from programs such as FarmBis is unclear at this stage. Some components of the course may need to be amended, based on the anticipated rapid uptake of new technologies such as Bollgard II. This project will be included in the review of extension education and training to be conducted in early 2005.

The NPSI knowledge management project has highlighted further training needs in irrigation management. The release of HydroLOGIC and WATERpak provides a knowledge resource that will provide a solid basis for the development of, for example, an irrigation short course for cotton farmers and consultants.

LEADERSHIP IN THE COTTON INDUSTRY

CRDC will continue to financially support Wincott (Women in Cotton Network) in 2004-05, and expects to continue support at a reduced level in 2005-06 as the organisation becomes self-supporting. Wincott has two major roles: to improve the skills and knowledge of women in various capacities in the industry, but also to provide opportunities to develop leadership skills that can then be utilised within other organisation in the cotton industry, regional communities and the Australian agricultural industry.

During the drought, CRDC had to suspend its funding of a scholarship for the Australian Rural Leadership Program; however, the improved crop outlook means CRDC will resume support for a cotton industry scholarship in Course 12 , commencing in 2005.

CRDC will maintain its co-investment with Boyce Chartered Accountants to produce the 2004 Australian Cotton Comparative Analysis. This publication provides the industry with financial and cost of production estimates that are a valuable benchmarking tool.

REVIEW OF EXTENSION, EDUCATION AND TRAINING

This major review will be undertaken in early 2005 in conjunction with the Australian Cotton CRC, in recognition of the opportunities that exist to develop more integrated extension, education and training programs that take into account the many changes affecting cotton growing, such as.

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

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

MEASURES OF SUCCESS

- Evaluation of outcomes of activities conducted by the extension team
- Evidence of improved skills and qualifications of researchers, extension and technical personnel, administrators, consultants and growers
- Women in key industry roles
- Evidence that the use of decision support systems is leading to the adoption of research outcomes and improved practices
- Evidence that the use of information packages and tools is leading to the adoption of research outcomes and improved practices
- The OH&S performance of industry workplaces is improving
- Implementation of outcomes in partnership with a variety of research and development providers

PROGRAM 2

Integrated Natural Resource Management

INPUTS

$788,853

4 new projects
9 continuing projects
2 projects to be commissioned

OUTPUT

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

OUTCOME

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

BEST MANAGEMENT PRACTICES

The cotton Best Management Practices program was reviewed in early 2004 as part of an Australian Government National Heritage Trust project jointly administered by CRDC and Cotton Australia. The review showed significant, positive change in all the areas of farm management covered by the BMP manual over the last five years. It identified the independent auditing system developed by CRDC as the major factor influencing recognition by external stakeholders of BMP as a valid, effective and measurable environmental management system.

Arising from this finding, the report recommended that further steps should be taken to encourage more cotton farmers to have their operations independently audited against BMP. Cotton Australia administers the BMP implementation program via its strategically located field staff. In 2004-05, the independent audit program will be integrated into Cotton Australia's implementation program, which will provide growers with a more cost-effective and integrated system for becoming fully BMP-compliant and maintaining that compliance over time.

As a further component of the National Heritage Trust project, CRDC, in collaboration with Cotton Australia, will continue to contribute to the development of a land and water management module for BMP. Cotton Australia is responsible for the pilot implementation program, in collaboration with the cotton extension network. This will be undertaken in three regions, Emerald, Goondiwindi and Warren, followed by its extension to the whole industry commencing in late 2005.

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

BIODIVERSITY

Professor Hugh Possingham, of the Wentworth Group, launched a CRDC and Australian Cotton CRC biodiversity review at the Ecological Society Conference in late 2003. CRDC will be following up on its recommendations during 2004-05 with government agencies and other rural industries. Of particular interest will be the results of the MDBC-funded program for biodiversity management in the rice industry.

The cotton industry is developing a greater understanding of functional biodiversity through the adoption of integrated pest management, in which conservation and utilisation of beneficial insects is a high priority.

A new project will study the aquatic biodiversity and the ecological value of ring-tank water storages. Other research in 2004-05 will include a project studying the biology and activity of insectivorous bats in irrigated cotton, indigenous vegetation remnants and intensive production landscapes.

SALINITY

CRDC continues to support research in this important area, with the major focus on delivery of well-targeted extension information on the management and prevention of salinity in the relatively few areas in the northern Darling basin that have been identified as having existing or potential salinity problems.

EFFICIENT USE OF WATER IN IRRIGATION

One of the major gaps in knowledge continues to be an inability to measure the complete water balance on-farm, particularly deep drainage (the movement of water beyond the cotton crop's root zone). CRDC has increased its funding support in 2004-05 for research into understanding and measuring deep drainage in typical soils of the northern Darling basin. The corporation believes this work can contribute to national priorities in this area and will be seeking to include some of this research in the NPSI sustainable irrigation program in 2004-05.

Grower interest level and investment in alternative means of delivering water to the crop, such as centre pivot and lateral move irrigation machines is rising steadily. While these techniques have been used for some time in industries such as grains and fodder production, they are recent arrivals in the cotton industry. CRDC will fund research into the precision placement of irrigation water for these alternative delivery methods.

GREENHOUSE GASES

CRDC has contributed additional funds to a joint project with the CRC for Greenhouse Accounting and the Australian Cotton CRC to enhance measurement of greenhouse gas production from nitrogenous fertilisers in irrigated cotton systems. The corporation anticipates the development of a tool during 2004-05 to help the industry calculate the production of nitrous oxide: the main contributor to greenhouse gases in cotton production, based on the type and quantity of nitrogenous fertiliser applied.

SOIL BIOLOGY

Soil biology is now recognised by many cotton growers as an important component of maintaining a sustainable farming system. CRDC has invested in research in this area in recent years and will further expand this research in 2004-05 to monitor the potential positive or negative impacts of transgenic insect- and herbicide-tolerant cottons on soil biology.

At present the cotton industry does not have effective benchmarks for some new commercial practices for managing and enhancing soil health. A new commissioned project will scope these practices and seek to understand and compare what benefits they deliver.

MEASURES OF SUCCESS

- Increased adoption and broader environmental coverage of the Cotton BMP program
- An evaluation of environmental management systems as a farm and natural resource management tool
- Improved trends in landscape and catchment indicators such as salinity, water quality and biodiversity. Project and funding links with other catchment and landscape programs related to biophysical targets and sustainability. Improved community perception of cotton production
- Publication in scientific journals of refereed environmental research related to new transgenic traits
- Benchmarked greenhouse gas emissions, energy use and potential climate change impacts

PROGRAM 3

Crop Protection

INPUTS

$3,399,771
9 new projects
21 continuing projects
3 projects to be commissioned

OUTPUT

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

OUTCOME

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

INSECT MANAGEMENT

In the 2004–05 growing season, Bollgard® II, with twoinsecticidal *Bacillus thuringiensis* (Bt) genes resistant to *Helicoverpa* spp., will completely replace the single resistance gene INGARD®, allowing a larger percentage of insect-tolerant transgenic plantings. This has been made possible by the industry's successful resistance management of the *Cry1Ac Bt* gene in INGARD over the past eight seasons. The industry's capacity to manage resistance successfully is underpinned by the extensive research and monitoring supported by the corporation. The management of the resistance threat to Bollgard II will be a high priority for CRDC in 2004-05 and a major research project in this area will be established with CSIRO Entomology, in addition to the ongoing Bt resistance monitoring project.

The anticipated increase in plantings of Bollgard II cotton will lead to a further reduction in the requirement for pesticides to control *Helicoverpa* spp. which, in turn, may elevate the importance of a range of other insect pests that are currently suppressedby these pesticides. As a consequence, CRDC has increased its emphasis on research to find improved integrated management solutions for this emerging pest complex.

A key outcome of previous research and extension has been the development of successful control strategies for Silverleaf Whitefly in Central Queensland; however, this pest continues to expand its presence in other cotton growing districts and remains a significant potential threat to the industry. Consequently, the corporation is funding additional research in 2004–05 to understand mechanisms of insecticide resistance in this pest.

DISEASES

Two soil-borne diseases remain particular threats in cotton: Fusarium wilt and Black Root Rot. Good progress is being made with Fusarium wilt through the breeding program, but this is a medium to long term solution. In the shorter term, there has been widespread adoption of improved farm hygiene practices to slow the spread of Fusarium, based on research and extension activities supported by the corporation; however, additional improvements to management within the farming system could offer opportunities to reduce the impact of the disease further. Consequently, CRDC will be funding a new project in this area in 2004–05.

Black Root Rot has continued to spread and is now found on most cotton farms. Although it does not have the same dramatic impact on production as does Fusarium, it predisposes the crop to increased weed and insect infestations and delayed maturity. This is a particular problem for southern areas with shorter growing seasons. Current cotton cultivars do not offer resistance to this disease, which means the research effort in 2004-05 will be focused on understanding the pathogen and developing improved management options to reduce the incidence and impact of the disease.

WEEDS

The current weeds program was reviewed in 2003 and will continue to focus on problem weeds, the effective management of Roundup Ready® cotton and improved weed management in dryland cotton farming systems. Further development of WEEDpak is anticipated, with the inclusion of information on weeds currently not covered in this excellent and well-used publication.

MEASURES OF SUCCESS

- Evaluations of the adoption and outcomes of integrated practices, products and technologies that improve returns, use less chemicals, reduce on and off-site environmental impacts, as well as any social outcomes
- Reduced distribution, presence and impact of diseases
- Resistance levels monitored, with the aim of either avoiding resistance or keeping resistance levels in pests and weeds at manageable levels
- Transgenic crop surveys and reports on performance, management and risk assessment

PROGRAM 4

Farming Systems

INPUTS

$1.678,189
4 new projects
16 continuing projects
4 projects to be commissioned

OUTPUT

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

OUTCOME

A more sustainable and profitable cotton farming system

FARMING SYSTEMS AND THE ENVIRONMENT

New technologies, including the use of Bollgard® II and Roundup Ready® cotton varieties, are changing some management strategies and techniques such as the use of fertilisers and plant growth regulators, planting dates, plant populations, water management and management of insects, weeds and diseases. A crucial focus in the Farming Systems research program is to understand the ways in which these new strategies and techniques interact with environmental factors, as well as how they affect the quality of fibre produced.

FIBRE QUALITY MANAGEMENT

CRDC is supporting a CSIRO initiative to understand the key management factors that can be manipulated to achieve the best result in terms of yield and fibre quality. This agronomic focus on quality will lead to new tools to assist growers to make better management decisions during crop production and thus make an important contribution to CRDC's *Field to Fabric Initiative* (see Program Six).

INTEGRATED PEST MANAGEMENT

A new project in 2004–05 will seek to redefine the parameters of integrated pest management now that the extensive use of transgenic varieties has diminished the threat *Helicoverpa* spp. pose to the cotton industry. The project will focus on alternative control methods for the likely new key pest, Green Mirid. These methods will include manipulation of cultural practices, such as planting lucerne strips and avoiding certain alternative crops that boost these pests, as well as testing new biological control options.

CRDC will collaborate with the Grains Research and Development Corporation (GRDC) to continue to support the facilitation and adoption of integrated pest management on the Darling Downs, where cotton is just a component, although an important one, in the region's many mixed farming crop rotations.

WATERPAK

Following the 2003–04 development of WATERpak, a resource package on irrigation management focused on further improvements to water use efficiency, CRDC will coordinate development of a glovebox guide and CD version to make WATERpak accessible under field conditions.

FARMING SYSTEMS FORUM

CRDC organises a Farming Systems Forum each year, concentrating on issues of current importance. These forums are well attended by growers, researchers, agronomic consultants and extension personnel and serve a valuable purpose in disseminating information, as well as identifying any research gaps.

The forum to be held in November 2004 is likely to concentrate on the use of fertilisers, particularly nitrogen, as well as economics, sustainable use, greenhouse gas emissions, decision support tools and rotation crops.

MEASURES OF SUCCESS

- Increased yield per hectare and per megalitre of water
- Improved economic returns to farmers
- Improved water use efficiency on farms
- Adoption of integrated management options for salinity and sodicity
- Benchmark of soil health characteristics and optimise crop nutrition management
- Data on changed farming practices including the economic, environmental or social benefits
- Publication of cotton research related to crop physiology and transfer of agronomic knowledge into other research and extension project outcomes

PROGRAM 5

Breeding and Biotechnology

INPUTS

$1,589,616
4 new projects
8 continuing projects
2 projects to be commissioned

OUTPUT

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

OUTCOME

Continually improving cotton varieties

MANAGING THE BREEDING PROGRAM

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.

In early 2004, CRDC commissioned an external review of research conducted within Program Five. The international review panel was complimentary about the quality and appropriateness of existing research; however, they made a number of recommendations for modifying or extending the program to focus further on issues such as yield, fibre quality and disease resistance. These recommendations were of great importance in formulating the research program for 2004-05.

COTTON BIOTECHNOLOGY

The review panel highlighted the success of the core biotechnology program in delivering new transgenic technology to the CRDC-supported CSIRO cotton breeding program. They stressed the internationally competitive advantage this has given the Australian industry. 2004–05 represents the first year of a three-year renewal of this program, with a substantial financial commitment by the corporation. This project will deliver to the cotton breeding program key second generation transgenic technology, Roundup Ready Flex® with enhanced tolerance of glyphosate sprays.

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

Recently completed research into transgenic lines containing cotton seed oil with superior nutritional benefits and decreased processing requirements produced cotton plants with these characteristics. In 2004–05, a follow-up project will refine this technology in preparation for potential commercial development.

COTTON PLANT BREEDING PROGRAM

Arising out of the review of Program Five, the CSIRO cotton breeding program will receive enhanced funding in 2004–05. This will enable development and testing of cultivars across all cotton growing regions, which will lead to varieties with characteristics suited to specific regions. The breeding of cultivars with improved Fusarium resistance remains a high priority in the breeding program and will also benefit from increased funding in the coming year.

CRDC, together with CSIRO, will seek means of updating the breeding program's High Volume Instrument (HVI), which is critical for determining fibre quality characteristics of breeding lines, using internationally accepted standards.

MEASURES OF SUCCESS

- ‡ Evidence that new cotton varieties are increasing yields and potential returns to the industry
- ‡ Evidence that Australian cotton varieties are meeting the needs of our major textile and oilseed markets
- ‡ Evidence that new varieties can produce higher yields with lower inputs of chemicals and improved water use efficiency
- ‡ Evidence that CRDC's biotechnology investments are delivering industry or community benefits
- ‡ Evidence of the reduced time to introduce genes into cotton varieties
- ‡ Market reports on the demand for Australian cotton lint and seed

PROGRAM 6 Value Chain

INPUTS

$250,261

1 new project

2 continuing projects

3 projects to be commissioned

OUTPUT

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

OUTCOME

High quality consumer-preferred Australian cotton in the world marketplace

THE IMPORTANCE OF QUALITY FIBRE

Each combination of fibre quality has its position in the market place. The fine, mature fibre that a fine count spinner might demand is quite different from the requirement for products such as denim or canvas. Spinners are unlikely to pay a premium for the quality of fibre they require to produce products such as denim, so it is important that cotton farmers aim for the premium end of the market, knowing that this gives them a fallback position should the season be less than perfect.

While plant breeding, combined with weather conditions during the growing season, largely determines cotton fibre quality, other factors such as crop management decisions, mechanical harvesting, ginning and spinning also play a role.

A 'FIELD TO FABRIC' QUALITY APPROACH

During 2003–04 CRDC developed a *Field to Fabric Initiative* to improve Australian cotton quality throughout the production chain. The first component of this program is a "Focus on Quality" program aimed at improving Australia's premium quality market position while attempting to better quantify climatic and management effects on fibre quality.

The field component involves cooperating growers adopting 'best bet' agronomic management options that seek to optimise fibre quality. Five pilot trial sites were established in the 2003–04 season, each concentrating on two or three elite CSIRO Bollgard® II cultivars that are candidate varieties for 2004 and beyond. The corporation will be guided by the outcome of that research in designing a proposal to put to the Australian government for additional funds to move the program to an international commercial level.

This additional work will also embrace international collaboration with the United States Department of Agriculture and other partners to develop improved instrument testing methods and establish a uniform world standard.

EXTENDING BEST MANAGEMENT PRACTICES

The second and very significant component of the *Field to Fabric Initiative* is the extension of Best Management Practice principles throughout the entire production chain. This concept developed from collaboration with all post-farm sectors of the Australian Cotton Industry Council, culminating in a workshop in Brisbane in early 2004.

This workshop delivered a common understanding of and commitment to future direction which, in turn, provided a basis for a successful application for funding under the Department of Agriculture, Fisheries and Forestry *Pathways to Industry EMS* program.

In combination with CRDC's continuing contribution, particularly to fibre research at CSIRO Textile and Fibre Technology, this joint initiative by the Australian Government and the cotton industry has the potential to strengthen Australia's position in the international market place and even to open new 'clean and green' marketing opportunities.

MEASURES OF SUCCESS

- Release of varieties with appropriate fibre and seed characteristics
- Evidence of improved practices that preserve fibre quality. Extension of the Cotton BMP program to post-farmgate issues
- Improved ginning practices, measured by ginning data
- Proportion of the crop objectively measured by HVI increased. Release of new fibre measurement technology
- Number of unsold stocks accumulated and increased relative premium of Australian cotton compared to competitors. Demonstration of value added developments in Australia
- Market reports on the demand for Australian cotton lint and seed

Research & Development Projects

RESEARCH PROVIDERS 2004–2005

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
UTS	University of Technology, Sydney
US	University of Sydney

Program One: People & Knowledge

Project	Title	Researcher	Start Date	Cease Date
CRC22C	National Cotton Extension Coordinator	Ingrid Christiansen	1-7-2000	30-6-2005
CRC35C	IPM Training Coordinator.	Mark Hickman	1-1-2002	30-6-2005
CRC54C	Cotton Industry Development Officer – Griffith	Evan Brown	1-7-2003	30-6-2005
CRC58	Cotton Industry Development Officer – Gwydir	Julie O'Halloran	1-7-2004	30-6-2005
CRDC190C	Farm Health and Safety R&D Program	Bruce Pyke	1-7-2002	30-6-2005
CRDC244C	Sponsorship of NSW Young People's River Health Conference	Dallas Gibb	1-7-2004	31-8-2004
CRDC246	Wincott Inc – Womens Industry Network Cotton	Liz Alexander	1-9-2004	30-8-2006
CSP104	Delivering science to agribusiness: Smart approaches to cotton irrigation management	Dirk Richards	1-7-2004	30-6-2007
CSP151C	Support development and independent evaluation of cotton management packages	Darren Linsley	1-7-2002	30-6-2005
CSP153C	ACRI Computing Support	Tony Pfeiffer	1-7-2002	30-6-2005
CSP163C	To be appointed: Delivering science to Agribusiness – novel decision support tools	Michael Bange	1-7-2003	30-6-2005
DAN167C	Cotton Industry Development Officer – Lower Namoi	Annie Johnson	1-7-2002	30-6-2005
DAN169C	Cotton Industry Development Officer – Macquarie	Kirrily Rourke	1-7-2002	30-6-2005
DAQ128	Extension agronomy for cotton production Central Queensland	Steve Ginns	1-7-2004	30-6-2005
DAQ129	Cotton Industry Development Officer – Border Rivers	Rebecca Smith	1-7-2004	30-6-2005
DAQ130	Travel: David Murray – 2005 Beltwide Cotton Conference, New Orleans, USA	David Murray	2-1-2005	8-1-2005
RIR9	Australian Rural Leadership Program – Course 12	John Quantrill	1-7-2004	30-11-2006
(tba)	New project for St George area in extension	TBA		

Total Funds Program One	$1,390,477

Program 2: Integrated Natural Resource Management

Project	Title	Researcher	Start Date	Cease Date
AAW4C	Sustainable natural resource management for the Australian Cotton Industry using the Best Management Practices Manual (CRDC Component)	Allan Williams	1-7-2002	30-6-2005
ANU7C	Development of a decision support system for water allocation in the Gwydir and Namoi valleys	Rebecca Letcher	1-9-2002	31-8-2005
ANU8C	Postgraduate: Karen Ivkovic – Development of a decision support system for water allocation in the Gwydir and Namoi Valleys (in conjunction with ANU7C)	Karen Ivkovic	1-9-2002	31-3-2006
CLW3C	Rhizosphere biological functions as influenced by GM cotton	Oliver Knox	1-7-2002	30-6-2006
CRC47C	Quantifying deep drainage using lysimetry	Anthony Ringrose-Voase	1-1-2003	30-6-2006
CRC57C	Postgraduate: Leah MacKinnon – Insectivorous bats, irrigated cotton, indigenous vegetation remnants and intensive production landscapes (continues from US66C)	Leah MacKinnon	1-1-2004	31-12-2005
CRC59	Understanding salinity threat: Phase IV Interpretation –-Extension	John Triantafilis	1-7-2004	30-6-2007
CRC61	Development of a field method for measuring deep drainage potential	Alex McBratney	1-7-2004	30-6-2006
FCRC1C	Postgraduate: Susan Lutton – Aquatic biodiversity and the ecological value of ring-tank water storages on cotton farms	Susan Lutton	1-7-2004	30-6-2007
GCRC4C	Reducing losses of nitrogen from cotton rotation systems	Peter Grace	1-7-2003	30-6-2006
NEC10	Precision placement of irrigation water with LEPA for Centre Pivots and Lateral Moves	Joseph Foley	1-7-2004	30-6-2006
US62C	Postgraduate: Sam Buchanan – Hydrological impacts of irrigation in the Bourke district	Sam Buchanan	1-1-2002	31-12-2004
US68C	Post-Doc: Dr A Crossan – Management of risk for chemicals used in cotton production	Angus Crossan	1-7-2003	30-6-2005
Total Funds Program Two				$788,853

Program 3: Crop Protection

Project	Title	Researcher	Start Date	Cease Date
CRC18C	Postgraduate: Florian Yan – Cotton soil health: Influences on cotton root diseases	Florian Yan	1-7-2000	30-6-2005
CRC29C	Postgraduate: John Harvey: Diversity and pathogenicity of *Thielaviopsis Basicola* (Black Root Rot)	John Harvey	1-2-2001	13-2-2005
CRC30C	Postgraduate: Ingrid Rencken – Role of native vegetation in harbouring beneficial insects and reducing insect pest damage in cotton	Ingrid Rencken	1-1-2002	30-9-2005
CRC43C	Postgraduate: Derek Collinge – Gene silencing technologies to control *Helicoverpa armigera*	Derek Collinge	1-7-2002	31-12-2005
CRC60	Managing *Helicoverpa* spp. on cotton with semiochemicals	Chris Moore	1-7-2004	30-6-2005
CSE102C	Monitoring Bt resistance	Ray Akhurst	1-7-2002	30-6-2005
CSE107C	Ecology of Helicoverpa in relation to transgenic cotton and the efficiency of refuge crops	Geoffrey Baker	1-7-2003	30-6-2006
(tba)	BT resistance project	Ray Akhurst & Rod Mahon	1-7-2004	30-6-2007
CSP147C	Incorporating aphids, insecticides and early season plant compensation in Integrated Pest Management (IPM)	Lewis Wilson	1-7-2002	30-6-2005
CSP156C	The potential for native Fusarium to give rise to new cotton field pathogens	Bo Wang	1-1-2004	31-12-2006
CSP162C	Damage syndromes, economic thresholds and tolerance of cotton green mirids	Brian Duggan	1-7-2003	30-6-2006
CSP165	Aphids - control, ecology and CBT resistance	Lewis Wilson	1-7-2004	30-6-2007
DAN160C	Impact and Role of Novel insecticides in Integrated Pest Management	Viliami Heimoana	1-7-2002	30-6-2005
DAN162C	Insecticide resistance management in B-biotype *Bemisia tabaci*	Robin Gunning	1-7-2002	30-6-2005
DAN163C	Insecticide Resistance Management in cotton aphid (*Aphis gossypii*) and cotton mite (*Tetranychus urtice*)	Grant Herron	1-7-2002	30-6-2005
DAN172C	Biochemical mechanisms of resistance to *Bacillus thuringiensis* endotoxins in *Helicoverpa armigera*	Robin Gunning	1-7-2003	30-6-2005
DAN173C	Insecticide resistance in *Helicoverpa* spp. and the role of IPM-Area Wide Management in Resistance Management (Continuation of project CRDC228C)	Louise Rossiter	1-7-2003	30-6-2005
DAN174C	Expanding WEEDpak: developing integrated weed management packages for the cotton farming systems	Graham Charles	1-7-2003	30-6-2006

Project	Title	Researcher	Start Date	Cease Date
DAN175C	Reducing weed control costs by better understanding the biology and ecology of problem weeds	Stephen Johnson	1-7-2003	30-6-2006
DAN176C	Severity factors in Fusarium wilt of cotton	David Nehl	1-7-2003	30-6-2006
DAN177	Diseases of Cotton VIII	David Nehl	1-7-2004	30-6-2007
DAN178	Insecticide resistance management in *Helicoverpa* Spp.	Robin Gunning	1-7-2004	30-6-2007
(tba)	Postdoc in entomology	TBA		
DAQ111C	New biopesticides against emerging sucking pests	Damien Cupitt	19-6-2002	30-6-2005
DAQ123C	Best weed management strategies for dryland cropping systems with cotton	Hanwen Wu	1-7-2002	30-6-2005
DAQ126C	Heliothis egg collections for resistance testing from the Darling Downs and South Burnett in southern Queensland	Hugh Brier	1-11-2002	30-4-2005
DAQ131	Management of Fusarium wilt of cotton	Joe Kochman	1-7-2004	30-6-2007
DAQ132	Improved understanding of the damage, ecology and management of mirids and stinkbugs in Bollgard II	Moazzem Khan	1-7-2004	30-6-2007
(tba)	Technical assistant for DAQ132 project	TBA		
MU2C	Postgraduate - Christina Hall: Defence mechanisms of cotton against *Fusarium oxysporum* f.sp. *vasinfectum* and control of fusarium wilt	Christina Hall	26-3-2002	31-12-2004
UNE37	Molecular factors determining *Thielaviopsis basicola*-cotton interactions leading to Black Root Rot disease	Lily Pereg-Gerk	1-7-2004	30-6-2007
UQ36	Tracking *heliothis* migration and the accumulation of insecticide resistance	Kirsten Scott	1-7-2004	30-6-2005
Total Funds Program 3				$3,399,771

Program 4: Farming Systems

Project	Title	Researcher	Start Date	Cease Date
CRC33C	Postgraduate: Simon Speirs – Characterising soil structural stability and form of sodic soil used for cotton production	Simon Speirs	3-9-2001	30-4-2005
CRC45C	Maintaining profitability and soil quality in cotton farming systems	Nilantha Hulugalle	1-7-2002	30-6-2005
CRC52C	Nutritional constraints to efficient cotton production	Ian Rochester	1-7-2003	30-6-2006
CRC56C	Postgraduate: Kylie Dodd – The Impact of Sodicity on Cotton Cropping Systems	Kylie Dodd	15-9-2003	15-9-2006
CRDC158C	Water relations of the cotton plant (CSP)	James Neilsen	1-1-2002	12-1-2006
CSE103C	The impact of Area Wide Management (AWM) on beneficial Anthropod and *Helicoverpa* populations	Martin Dillon	1-7-2002	30-6-2005
CSP122C	CSIRO Field Experiments at ACRI	Greg Constable	1-7-2000	30-6-2005
CSP141C	Postgraduate: Rose Roche: Training in crop physiology - Functional responses of cotton to environment mediated via internal nitrogen dynamics	Rose Roche	1-7-2001	30-4-2005
CSP161C	Physiology of high retention cotton crops	Lewis Wilson	1-7-2003	30-6-2006
CSP166	Cotton crop management for improved fibre quality	Michael Bange	1-7-2004	30-6-2007
DAN166C	Operational Costs for Cotton Experiments	Tony Meppem	1-7-2002	30-6-2005
DAN179	Conservation and utilisation of beneficial insects and natural pest control agents for IPM in cotton: a Farming Systems Approach	Robert Mensah	1-7-2004	30-6-2007
DAQ113C	Postgraduate: Amanda Cleary: The effect of cereal stubble on *Helicoverpa* activity in early season cotton	Amanda Cleary	1-8-2001	30-8-2004
DAQ120C	Area-wide monitoring and cultural control of key cotton pests in central Queensland	Richard Sequeira	1-7-2002	30-6-2005
DAQ122C	Development of novel pest management options for cotton in central Queensland	Paul Grundy	1-7-2002	30-6-2005
DAQ127C	Managing Bollgard II cotton farming systems in southern Queensland	Brad Scholz	1-7-2003	30-6-2006
DAQ133	Facilitating adoption of IPM in northern region broadacre farming systems	Melina Miles	1-7-2004	30-6-2007
NEC8C	Postgraduate: Simon White – Partial root zone drying and regulated deficit irrigation for cotton using large mobile irrigation schemes	Simon White	1-9-2002	31-8-2005
US64C	Development of measures of soil health	Peter McGee	1-1-2003	31-12-2005
US65C	Postgraduate: Stella Loke – Diversity of VAM fungi in soil health	Stella Loke	1-1-2003	31-12-2005
UTS5	Electrical imaging of furrow irrigation	Bryce Kelly	1-11-2004	30-6-2005
Total Funds Program 4				$1,678,189

Program 5: Breeding & Biotechnology

Project	Title	Researcher	Start Date	Cease Date
CSP121C	CSIRO Plant Breeding Fibre Quality Laboratory	Greg Constable	1-7-2000	30-6-2005
CSP137C	Development of a unigene set of cotton clones for general microarray analysis of gene expression in cotton plants	Yingru Wu	1-7-2001	30-9-2004
CSP146C	Postgraduate: Adriane Machado – Gene discovery in cotton fibre initiation and development by comparing cotton lintless mutants to wild type on cotton ovule cDNA microarrays (IP)	Adriane Machado	1-7-2002	21-7-2005
CSP149C	Isolation of Novel Cotton Promotors to drive the robust expression of useful genes in transgenic cotton	Ranamalie Amarashinge	1-7-2002	30-4-2005
CSP154C	Nutritional improvement in cottonseed oils through genetic removal of palmitic acid	Qing Liu	1-7-2002	15-9-2004
CSP155C	AFLP diversity of Fov in cultivated cotton fields and genotyping of *G.hirsutum X G.sturtianum* backcross lines	Curt Brubaker	1-10-2002	30-9-2004
CSP159C	Breeding improved cotton varieties	Greg Constable	1-7-2003	30-6-2006
CSP160C	Development & evaluation of cottonseed oils with improved nutritional & functional properties	Qing Liu	1-11-2003	30-10-2004
CSP167	Cotton Biotechnology: Core Project	Danny Llewellyn	1-7-2004	30-6-2007
CSP168	Unravelling the molecular basis for cotton fibre quality	Todd Collins	1-7-2004	30-6-2007
CSP169	Development of cottonseed oils with improved nutritional and functional properties	Qing Liu	1-7-2004	30-6-2006
UA8C	Postgraduate: Sven Delaney – Development of gene promoters for cotton fibre improvement	Sven Delaney	12-2-2001	26-9-2004
UA11C	Postgraduate: Damien Lightfoot – Fibre improvement through modulation of transitions in cotton development	Damien Lightfoot	18-3-2002	18-3-2005
UA12C	Postgraduate: John Humphries – Analysis of TTG1 homologues in cotton for roles in fibre initiation	John Humphries	18-3-2002	18-3-2005
UA13	Evaluation of transgenic cotton with altered fibre traits	Sharon Orford	1-7-2004	30-6-2006
Total Funds Program 5				$1,589,616

Program 6: Value Chain

Project	Title	Researcher	Start Date	Cease Date
CTFT7C	Interlaboratory trials for fibre maturity reference samples	Geoffrey Naylor	1-7-2003	30-6-2006
CTFT8C	Instrumentation for Cotton Fineness and Maturity measurement	Geoffrey Naylor	1-7-2003	30-6-2005
CTFT9	Improved quality of ginned Australian cotton: Development of new gin machinery	Stuart Gordon	1-7-2004	30-6-2006

Total Funds Program 6	$250,261

TOTAL PROJECT FUNDING for 2004-05	**$9,097,167**

About the Cotton Research & Development Corporation

ROLE AND RESPONSIBILITIES

The Cotton Research and Development Corporation acts on behalf of the Australian Government and the Australian cotton industry to ensure that the industry's research and development needs are 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). Since August 1998, the corporation has been subject to the *Commonwealth Authorities and Companies (CAC) Act 1997* which provided new levels of accountability as well as a new planning and reporting framework. Hence, the corporation's plans use the outcome/outputs framework required under the CAC Act.

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)

The corporation conducts its business and functions by:

- investigating and evaluating the cotton industry's requirements for research and development and the preparation, review and revision of a research and development plan on that basis
- preparing an Annual Operating Plan for each financial year
- coordinating and funding research and development activities consistent with current planning documents
- monitoring, evaluating and reporting to Parliament, the Minister for Agriculture, Fisheries and Forestry and to industry on research and development activities coordinated or funded by the corporation
- facilitating the dissemination, adoption and commercialisation of research and development results in relation to the cotton industry.
- increasing the economic, environmental and social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of the cotton industry
- achieving the sustainable use and sustainable management of natural resources

- making more effective use of the resources and skills of the community in general and the scientific community in particular
- improving accountability for expenditure upon research and development activities in relation to the cotton industry.

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

The closely integrated nature of the Australian cotton industry and CRDC's close working relationship with the Australian Cotton Industry Council mean the corporation constantly liaises with the broader cotton industry.

FUNDING

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. 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 Australian Government, up to a maximum value of 0.5 per cent of the gross value of production, or up to a maximum of 50 per cent of expenditure, or not exceeding the contribution from industry.
- 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 to 75 per cent of annual expenditure. These reserves are used to supplement the corporation's income where necessary. Due to the continuing impact of the drought on water available from storages, 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 and will next be held in August 2004.

LOCATION

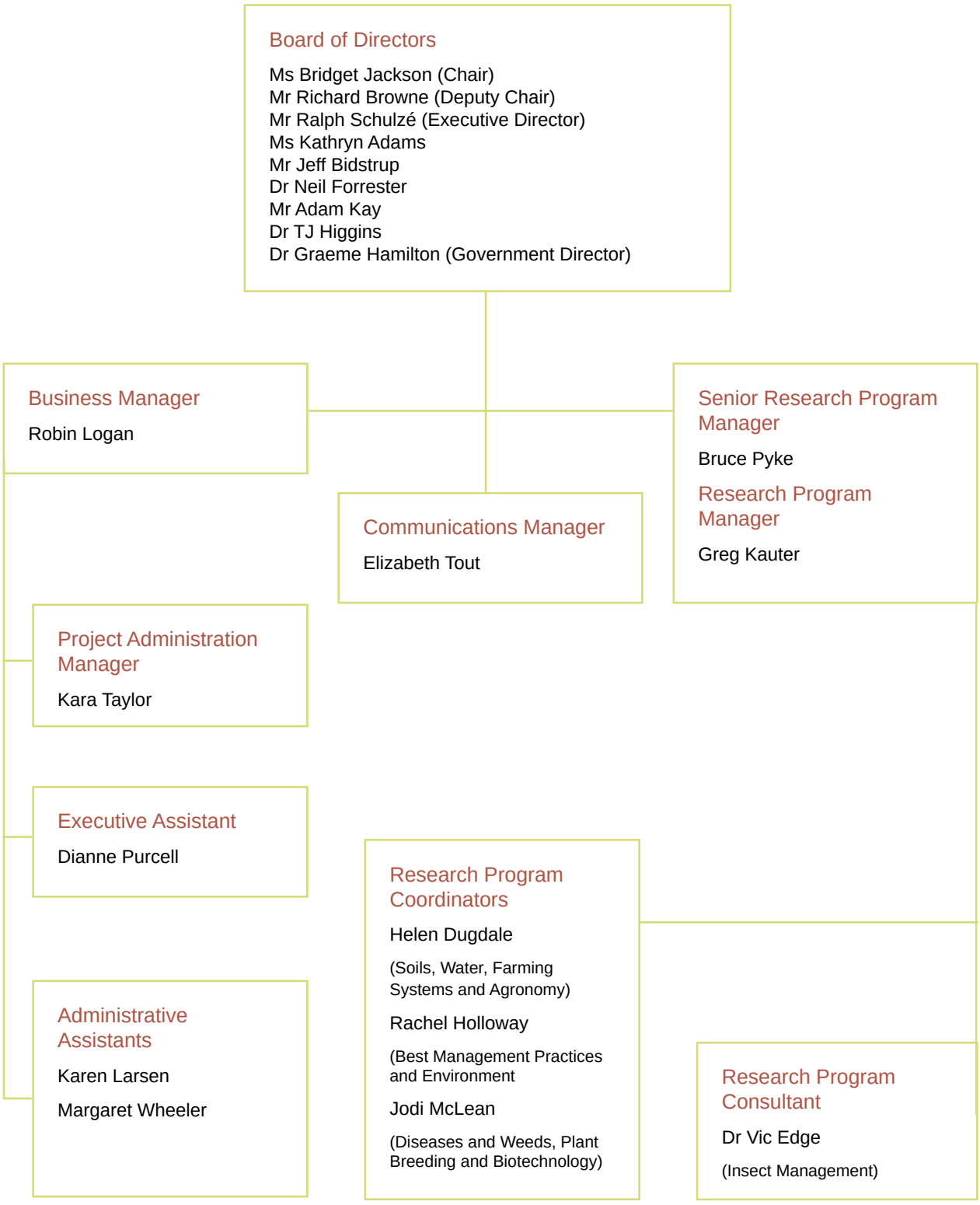
The CRDC is based in the heart of one of Australia's major cotton growing areas at Narrabri in North Western New South Wales. The corporation is close to one of the industry's key research facilities, the Australian Cotton Research Institute, which is also the headquarters for the Australian Cotton Cooperative 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 is working with the other CRC partners to ensure this vibrant research and extension continues. CRDC, together with other partners, is 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

ROLES WITHIN THE CORPORATION



Budget statements 2004–2005

Budgeted Statement of Financial Performance for the period ended 30 June

	Estimated actual 2003-04 $'000	Budget estimate 2004-05 $'000	Forward estimate 2005-06 $'000	Forward estimate 2006-07 $'000	Forward estimate 2007-08 $'000
Revenues from ordinary activities					
Revenue from government	6,734	7,313	9,854	11,458	11,313
Sales of goods and services	1	20	20	20	20
Interest	616	440	385	413	440
Dividends	–				
Net gains from sales of assets	–				
Other	1,058	1,250	1,495	1,495	1,494
Total revenue from ordinary activities	**8,409**	**9,023**	**11,754**	**13,386**	**13,267**
Expenses from ordinary activities					
(excluding borrowing costs expense)					
Employees	947	973	1,004	1,037	1,070
Suppliers	190	210	206	212	219
Grants	11,567	10,974	11,274	11,303	11,245
Depreciation and amortisation	43	46	39	34	39
Write-down of assets					
Net losses from sales of assets					
Other					
Total expenses from ordinary activities (excluding borrowing costs expense)	**12,747**	**12,203**	**12,523**	**12,586**	**12,573**
Borrowing cost expense					
Net surplus or deficit from ordinary activities	**-4,338**	**-3,180**	**-769**	**800**	**694**
Gain or loss on extraordinary items					
Net surplus or deficit	**-4,338**	**-3,180**	**-769**	**800**	**694**
Capital use charge					
Net surplus or deficit after capital use charge	**-4,338**	**-3,180**	**-769**	**800**	**694**

Budgeted Statement of Financial Position as at 30 June

	Estimated actual 2003-04 $'000	Budget estimate 2004-05 $'000	Forward estimate 2005-06 $'000	Forward estimate 2006-07 $'000	Forward estimate 2007-08 $'000
ASSETS					
Financial assets					
Cash	9,518	7,010	6,770	7,594	8,277
Receivables	2,259	1,661	1,161	1,161	1,161
Investments					
Accrued revenues	160	120	100	100	120
Other					
Total financial assets	**11,937**	**8,791**	**8,031**	**8,855**	**9,558**
Non-financial assets					
Land and buildings	293	289	283	277	271
Infrastructure, plant and equipment	126	106	113	105	112
Inventories					
Intangibles					
Other					
Total non-financial assets	**419**	**395**	**396**	**382**	**383**
Total assets	**12,356**	**9,186**	**8,427**	**9,237**	**9,941**
LIABILITIES					
Debt					
Loans					
Leases					
Deposits					
Overdrafts					
Other					
Total debt	–	–	–	–	–
Provisions and payables					
Employees	180	190	200	210	220
Suppliers	35	35	35	35	35
Grants	250	250	250	250	250
Other					
Total provisions and payables	**465**	**475**	**485**	**495**	**505**
Total liabilities	**465**	**475**	**485**	**495**	**505**
EQUITY					
Capital					
Reserves					
Accumulated surpluses or deficits	11,891	8,711	7,942	8,742	9,436
Total equity	**11,891**	**8,711**	**7,942**	**8,742**	**9,436**
Total liabilities and equity	**12,356**	**9,186**	**8,427**	**9,237**	**9,941**
Current liabilities	445	445	445	445	445
Non-current liabilities	20	30	40	50	60
Current assets	11,937	8,791	8,031	8,855	9,558
Non-current assets	**419**	**395**	**396**	**382**	**383**

Budgeted Statement of Cash Flows for the period ended 30 June

	Estimated actual 2003-04 $'000	Budget estimate 2004-05 $'000	Forward estimate 2005-06 $'000	Forward estimate 2006-07 $'000	Forward estimate 2007-08 $'000
OPERATING ACTIVITIES					
Cash received					
Revenue from government	5,783	7,705	9,854	11,458	11,313
Sales of goods and services	1	20	20	20	20
Interest	528	450	421	385	411
Other	3,315	2,545	2,827	2,604	2,602
Total cash received	**9,627**	**10,720**	**13,122**	**14,467**	**14,346**
Cash used					
Employees	909	913	965	990	1,053
Suppliers	217	222	231	235	201
Grants	11,992	12,071	12,126	12,398	12,369
Interest					
Other					
Total cash used	**13,118**	**13,206**	**13,322**	**13,623**	**13,623**
Net cash from operating activities	**-3,491**	**-2,486**	**-200**	**844**	**723**
INVESTING ACTIVITIES					
Cash received					
Proceeds from sales of property, plant and equipment					
Repayments of loans made					
Other					
Total cash received	**–**	**–**	**–**	**–**	**–**
Cash used					
Purchase of property, plant and equipment	7	22	40	20	40
Loans made					
Other					
Total cash used	**7**	**22**	**40**	**20**	**40**
Net cash from investing activities	**-7**	**-22**	**-40**	**-20**	**-40**
FINANCIAL ACTIVITIES					
Cash received					
Proceeds from issuing equity instruments					
Proceeds from debt					
Other					
Total cash received	**–**	**–**	**–**	**–**	**–**
Cash used					
Repayments of debt					
Capital use and dividends paid					
Other					
Total cash used	**–**	**–**	**–**	**–**	**–**
Net cash from financing activities	**–**	**–**	**–**	**–**	**–**
Net increase in cash held	**-3,498**	**-2,508**	**-240**	**824**	**683**
Cash at the beginning of the reporting period	13,016	**9,518**	**7,010**	**6,770**	**7,594**
Cash at the end of the reporting period	**9,518**	**7,010**	**6,770**	**7,594**	**8,277**

Capital Budget Statement for the period ended 30 June

	Estimated actual 2003-04 $'000	Budget estimate 2004-05 $'000	Forward estimate 2005-06 $'000	Forward estimate 2006-07 $'000	Forward estimate 2007-08 $'000
PURCHASE OF NON-FINANCIAL ASSETS					
Funded by capital appropriations	–	–	–	–	–
Funded internally by					
Departmental resources	7	22	40	20	40

Non-financial Assets: Summary of Movement 2004–2005

	Land	Buildings	Total land and buildings plant and equipment	Other infrastructure	Intangibles	Total
	$'000	$'000	$'000	$'000	$'000	$'000
Carrying amount at the start of year	74	219	293	126		419
Additions		2	2	20		22
Disposals			–			–
Revaluation increments			–			–
Recoverable amount write-downs			–			–
Net transfers free of charge			–			–
Depreciation/amortisation expense		6	6	40		46
Write-off of assets			–			–
Carrying amount at the end of year	**74**	**215**	**289**	**106**	**–**	**395**
Total additions						
Self funded		2	2	20		22
Appropriations			–			–
Total	**–**	**2**	**2**	**20**	**–**	**22**

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
ACIC	Australian Cotton Industry Council
ACRI	Australian Cotton Research Institute
ANAO	Australian National Audit Office
APVMA	Australian Pesticides and Veterinary Medicines Authority
ARLP	Australian Rural Leadership Program
ARRIP	Australian Agricultural Research in Progress database
AWA	Agriculture Western Australia
AWM	Area Wide Management
BMP	Best Management Practices
Bt	*Bacillus thuringiensis* (crystal protein expressed in INGARD® and Bollgard® cotton varieties
CCA	Cotton Consultants Australia Inc
CGA	Cotton Growers' Association
CIE	Centre for International Economics
CRC	Cooperative Research Centre
CRDC	Cotton Research and Development Corporation
CSD	Cotton Seed Distributors Ltd
CSIRO	Commonwealth Scientific and Industry Research Organisation
DNR	Queensland Department of Natural Resources
DPI	New South Wales Department of Primary Industries
EMS	Environmental Management System
EPA	New South Wales Environment Protection Authority
GMAC	Genetic Manipulation Advisory Committee
GRDC	Grains Research and Development Corporation
GROA	Groundrig Operators Association
ICAC	International Cotton Advisory Committee

IPM	Integrated Pest Management
MDBC	Murray Darling Basin Commission
NSW Agriculture	*Now* New South Wales Department of Primary Industries
PHA	Plant Health Australia
OGTR	Office of the Gene Technology Regulator
QDPIF	Queensland Department of Primary Industries and Fisheries
RCMAC	Raw Cotton Marketing Advisory Committee
RRDC	Rural Research and Development Corporations
TIMS	Transgenic and Insect Management Strategy Committee
TRC	Technology Resource Centre (located at the ACRI)

‘The Cotton Research and Development Corporation is a partnership between, and jointly funded by, Australian cotton farmers and the Australian Government’

CRDC