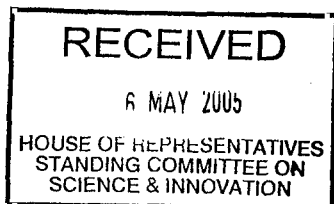


Australian Cotton Cooperative Research Centre



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The Secretary
Standing Committee on Science and Innovation
House of Representatives
Parliament House
Canberra ACT 2600

Dear Sir/Madam,

The Australian Cotton Cooperative Research Centre welcomes the Inquiry into Pathways to Technological Innovation. A detailed submission is attached.

The Australian Cotton CRC provides an excellent example or case study of successful technological innovation and partnership between industry and research providers. For example;

- An independent economic evaluation of the payoff of some programs of the Australian Cotton CRC investments was completed in March 2004 by the BDA Group, Melbourne. It found the outcomes were estimated to deliver benefits of \$586m to the Australian cotton industry. Accounting for price effects, 87 per cent of these benefits would be captured within Australia, or \$510m in total representing a net return of \$438m or \$7 for every dollar invested.
- An Independent Review Panel concluded in 2004 on the CRC "*The success of the CRC is reflected in the exceptionally high levels of adoption of its innovative research developments*"
- With its commercial partner Ag Biotech and The University of New England the CRC developed a commercialised product known as Magnet that "attracts-and-kills" the main moth pest of cotton (*Helicoverpa* spp). It is now being sold in Australia and being tested for other crop pests both in Australia and overseas.
- Together with other industry partners such as the Cotton Research and Development Corporation, Cotton Australia, CSIRO, commercial companies, and State DPIs the Australian Cotton CRC has assisted with the technology implementation of transgenic cotton crops, which now represent the majority of Australia's \$1.2 billion cotton industry. This has resulted in a 70% reduction in pesticide use, improved grower returns and improved water quality in catchments. The Cotton CRC has contributed Integrated Pest Management strategies and other agronomic packages to help farmers grow these new biotechnology crops.

As a result of our experience, the CRC concept is integral to the successful adoption of commercialised technological innovations, ensuring that they are quickly adopted across disciplines, institutional and State boundaries. Cooperation, coordination and good will are vital to success



CSIRO – NSW Agriculture – Department of Primary Industries Queensland – NT Department of Primary Industry and Fisheries
Agriculture Western Australia – University of Sydney – University of New England – Cotton Research and Development Corporation
Cotton Seed Distributors – Queensland Cotton – Western Agricultural Industries

Despite successes, there remain impediments in regional areas

- Most technological innovations occur through lengthy and time-consuming research, which requires a reservoir of skilled personnel in numerous areas of research and technology. These skills are not always freely available in rural or remote regions. Incentives are needed to attract and keep people.
- Remote regional research infrastructure and facilities are generally poorly resourced. Infrastructure improvements are vital to attract and maintain interest among research individuals and their families in regional communities.

I would be happy to further discuss any matters of interest with committee members as they progress their inquiry.

Yours sincerely

Yours sincerely,



Guy Roth
Chief Executive Officer

31st April 2005



**Submission to Parliament of Australia House of Representatives
Standing Committee on Science and Innovation
Inquiry into Pathways to Technological Innovation**

**Prepared by
The Australian Cotton Cooperative Research Centre
Narrabri NSW**

Background

The Cotton CRC is ideally placed to comment on technological innovation and pathways to commercialisation, particularly as it applies in rural and regional areas.

The cotton industry is the only major agricultural industry to so far commercially implement agricultural biotechnology in the form of insect and herbicide tolerant crops across its 1500 SME cotton growing businesses and is therefore at the nation's forefront in this area.

Other frontier technologies proposed are the implementation and development of semiochemicals (signal chemicals) for pest management, and the use of molecular technologies to improve diagnostic techniques for disease management and management of pesticide resistance.

The Cotton CRC is achieving these objectives through a close partnership with industry organisations and growers. As a result of these endeavours, an integrated cotton industry is developing that will lead technological advancement in rural areas as well as undertake programs that support the drivers for workforce participation and broader social economic trends through the community program.

Much of the commercial value and outcomes of the CRC's research is through improving the performance of cotton production – we are aiming to generate economic returns for Australia by selling more, higher quality cotton.

At the catchment and community level the value comes from addressing agreed regional issues, thereby providing the basis on which cotton production can continue.

ROLE OF THE COTTON CRC

The Australian Cotton CRC is highly regarded for its strength in technology transfer and education programs for industry. The CRC learning and adoption systems have been developed and continually improved to adapt to differing issues and target groups. Deploying modern extension methodologies and specialised staff has allowed the CRC to develop a highly effective extension and education network that is now one of Australia's leading rural extension models.

Recent research shows that cotton growers and consultants are experiential learners who actively seek information and experiences to develop their knowledge. Strategies are needed to aid experiential learning for assisting substantial changes in issues that cannot be easily "learnt by doing". Knowledge services are moving towards partnerships between growers, consultants, research and extension.

The role of crop science is to generate new knowledge for use by farmers. However due to many challenges, including information overload, this knowledge is not always useful or used. Research highlights opportunities and partnerships to improve the uptake and use of research and industry learnings.

Research has identified that the cotton industry is responsive to change and willing to continually learn, with all sectors prepared to share information. The Cotton CRC's adoption strategies have contributed to innovation in industry that is considered to be on par with leading firms in business. Regular local testing and application of research from a trusted source such as the Cotton CRC has been identified as a critical part of this strategy.

This submission contends that the CRC is the best model for collaborative R & D, delivering proven excellence in research, adoption, commercialisation, innovation, independence and integrity.

Collaboration and synergies enable 'bigger picture' questions to be tackled through collaboration among disciplines and with industry partners, hence opportunities for SME's to commercialise R&D, with the benefit of the CRC's access to specialized skills and resources across State and industry boundaries.

As an example of these developments, one of its commercial partners, Ag Biotech Ltd, is currently treating more than 20,000 ha of cotton with Magnet, a CRC developed system for attract-and-kill of the moth pest *Helicoverpa* spp. We are also testing Magnet on other pests and in other countries.

It is our contention that the CRC investment provides the glue, stimulates the synergistic benefits and accelerates innovation and adoption by a number of years, because it sees environment and communities as directly related to the industry's bottom line.

An independent economic evaluation of the payoff of some programs of the Australian Cotton CRC investments was completed in March 2004 by the BDA Group, Melbourne. It found the outcomes were estimated to deliver benefits of \$586m to the Australian cotton industry. Accounting for price effects, 87 per cent of these benefits would be captured within Australia, or \$510m in total representing a net return of \$438m or \$7 for every dollar invested.

The Year 5 review of the CRC was conducted in June 2004 by an Independent Review Panel comprising; Professor Daniel Kreig, International Cotton Specialist, Texas Tech University (Chair), Dr Michael Keller, Deputy Head of School of Agriculture (Entomologist) University of Adelaide, Mr Hamish Millar, Vice Chairman, Australian Cotton Growers Research Association and cotton grower, Dr John Williams, former Chief CSIRO Land and Water, and Professor Henry Nix (Centre Visitor). The review panel's Executive Summary reported;

"This CRC has been extremely successful over the past five years as measured by a number of criteria. The reasons for the success include:

- A. Intelligent, dedicated Research Scientists addressing real-world problems in a scientific manner.*
- B. A Technology Transfer Team that truly interacts with the Research Scientists to develop state-of-science programs for the Cotton Industry using a variety of delivery mechanisms.*
- C. The CRC has been effectively and efficiently managed using a relatively small administrative structure and a management committee that truly fosters collaborative research and extension efforts for the good of the Cotton Industry and the community at-large. It has truly developed a spirit of cooperation and collaboration among Industry, Government and University personnel that has no equal in the scientific world. No single agency could ever achieve the degree of success enjoyed by the CRC.*

"Very importantly, the CRC benefits from serving an Industry that is well educated and eagerly seeking immediate, feasible solutions to their on-farm production problems as well as long-term solutions addressing sustainability of their environment for future generations. The industry demonstrated to us that they are not only totally supportive, but provide leadership and interact strongly with the research activities, and the technology transfer approaches used to deliver solutions to the major problems associated with cotton production in Australia. Therefore the CRC benefits from Industry through financial, political, and emotional support

"This CRC has been extremely successful in solving some of the most-pressing problems of the cotton industry and demonstrating both economic and environmental benefits to the producers they serve and to the community at-large. The success of the CRC is reflected in the exceptionally high levels of adoption of its innovative research developments and in the 7:1 financial returns on investment from its outputs. These accomplishments are truly "Crown Jewels" of which all in this CRC can be very proud."

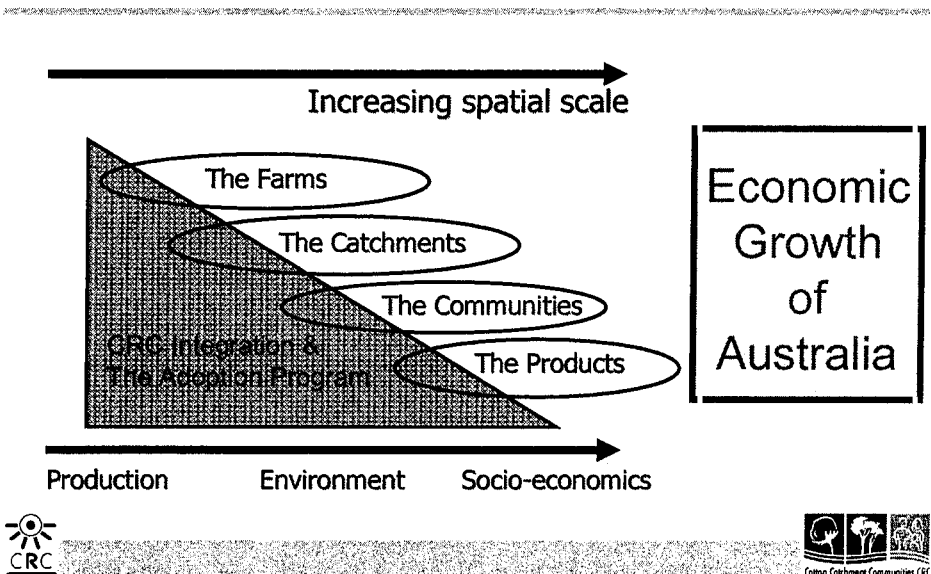
FUTURE DIRECTIONS

In July 2005, the current CRC is to be replaced by a new Cotton Catchment Communities CRC (CCC CRC).

The new CRC will build on these strengths and the established trust, respect and CRC "brand" that have been developed in the industry. It will be client driven and innovative to deliver outcomes to an even wider diversity of end-users, including cotton farmers, agribusiness, cotton shippers, international and domestic spinners, governments (Local, State and Commonwealth), community organisations, indigenous groups and catchment authorities.

Market research and learning analyses will be undertaken to identify the differing needs and learning styles of these users, particularly the newer sectors of the client base. This understanding will be used to develop, adapt and target a variety of adoption mechanisms to suit differing needs and audiences. Effectively partnering public and private sector delivery, and building the necessary capacity, will be a core part of the adoption strategy.

A plan for the future



Pathways to commercialisation:

The pathways for adoption will be multi-directional with regular exchange of knowledge between stakeholders. Knowledge will be communicated to end-users via a variety of mechanisms that also encourage reciprocal communication, from end-users to researchers. The participation of end-users directly in the adoption loops (rather than at the end of the line) leads to greater ownership that in turn leads to higher levels of adoption, and in many cases a more innovative adoption of science.

The feedback also enables targeting and practical adaptation of research to meet industry needs. The RD&E programs will work in partnership with private consultants, who are key players in the cotton knowledge exchange system, providing an additional exchange of ideas.

This continually improving culture of innovation and skill development amongst scientists, advisers, farmers and the workforce will deliver benefits to industry and regional communities. Relevant and targeted short courses and vocational training will be developed in response to need and demand.

Information packages, decision support systems, new tools and platforms will be supported by a highly effective cotton extension network to help disseminate research outputs and achieve the best outcomes from the CRC in the shortest possible time.

These concepts are further explained as an example of Knowledge and Learning in the Australian Cotton Industry can be found- http://www.cropscience.org.au/icsc2004/symposia/6/4/1358_christiansen.htm

Improvements will be made to the capacity to monitor production efficiency, environmental sustainability and research adoption and to measure outcomes from a Triple Bottom Line perspective.

Partnering Public and Private Sector

Private sector consulting services will be a key part of the CCC CRC's adoption and commercialisation strategies. There is a high proportion of private SMEs serving the cotton industry and their peak representative body, the Cotton Consultants Association, with 300 members, is a new partner in the CRC. Independent irrigation consultants are also involved. The Cotton Consultants Association will be represented in specialist advisory panels to ensure all members are aware of developments and capable of delivering them.

The CRC-based cotton extension network will partner closely with the private sector. In adopting new technologies, end-users will often require individual advice or monitoring services from specialised independent consultants.

Where these specialised skills are not readily available in cotton regions, the CCC CRC will work to encourage the demand for and build the supply of independent services. Encouraging demand includes raising awareness amongst end-users of new technologies, key issues and the value of making changes.

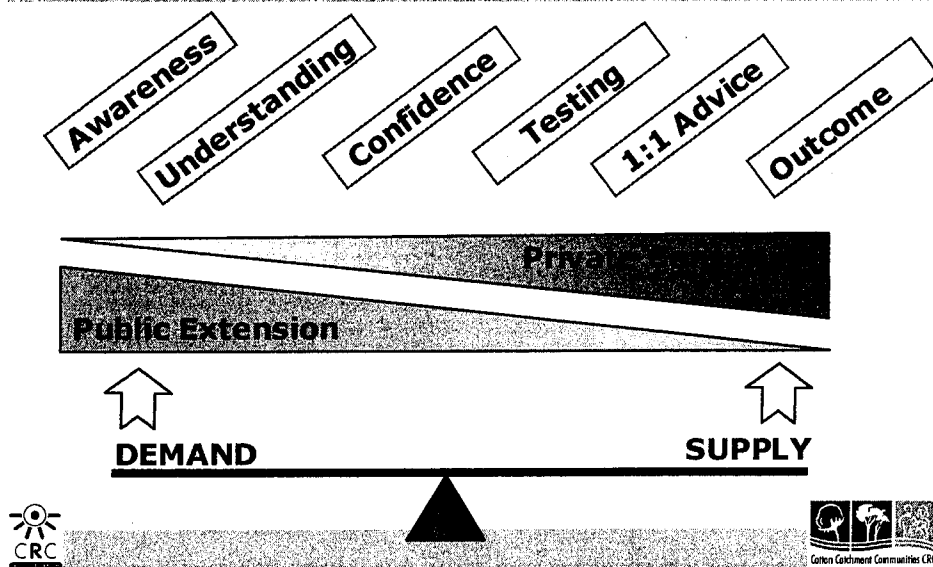
This creates a viable consulting opportunity to attract skills to the regions to assist end-users to adopt proven technologies. This is one part of building the "supply" side of knowledge services. The other is in building regional capacity through training.

The CCC CRC's targeted education programs will ensure that skilled consulting services are available to industry that promote new research findings. Accreditation of this training helps the end-user to choose quality consulting advice. Where suitable, business plans for commercialisation of CCC CRC products or knowledge will be developed and promoted.

Extension has shifted from being solely a public sector role to a mix of public and private services. There is opportunity for these sectors to effectively partner rather than compete in the knowledge value chain.

The relative roles of the public sector, which raises awareness and creates demand along with the private sector that delivers the specialised one to one advice are shown below.

Partnering public and private sector knowledge services



Participation and engagement will be core values of this CRC. The diversity of stakeholders will be engaged through formal channels such as advisory panels, forums, program steering committees, conferences and joint projects. Specific projects will work closely with stakeholders in on-farm or in-region research.

Most of the staff of the CRC's core and participating partners live and work in rural communities and will therefore be highly engaged with users through formal and informal channels. Staff in the Adoption program will have formal accountability for partner and user participation in their employment contracts. All projects will include a formal requirement to participate in technology transfer and adoption.

Regional, trusted extension and research staff - Research into cotton knowledge systems highlights the importance of locally relevant and proven examples of new technologies, personal contact between growers (individually and in group learning situations), researchers and extension specialists and the use of short, concise, locally targeted information.

Providing this local focus and demonstration of CRC research outcomes will be Cotton Industry Development, Environmental Extension and Water Use Efficiency Officers who will be located in each regional centre/catchment and funded by partners of the new CRC.

They will build on the highly successful model developed by former Cotton CRCs and the Cotton Research and Development Corporation, working in a coordinated program to enhance knowledge flow, ownership and learning between research, farmers and farm advisors.

Education will be a key tool in developing a highly skilled and knowledgeable workforce in the industry and local communities. University and TAFE courses (undergraduate and postgraduate), industry short courses, vocational training and skill development, and school education programs will be tailored to end users, including agribusiness and farmers. Farmers are seeking new skills to meet the changing demands of the industry and technology such as water management and transgenic crop management.

The Cotton CRC's Cotton Production Course (Grad Certificate and Certificate level at UNE) is highly regarded throughout the industry as a key avenue for consultants to gain essential skills. Cotton Consultants Australia have recognised it as a criterion for the accreditation of Certified Practising Cotton Consultants. This course will be maintained to train new generations of cotton consultants and will be expanded to allow matriculation to Masters level.

Consultation with industry has identified that further training is required in the areas of water management, crop nutrition and fibre quality technology. Cotton growers and merchants require high level marketing and trading skills to market their product. The CRC will provide training through university or short course programs in this key skill area.

Opportunities for innovative delivery via internet or other technologies will be explored and pilot tested using the new access centre network of UNE and TAFE, which installed from 2004 to 2006.

Other Capacity Building In addition to formal training, further capacity building will include field days, action learning groups, development of the industry's environmental management systems, benchmarking, information tools, decision support tools and approaches that will be developed as needed for new and emerging issues.

Communication strategies will be developed for each program to target the relevant community sectors including cotton growers, cotton consultants, agribusiness, the general community, NRM groups, schools, marketers, spinners, buyers, government and the scientific community.

Communication will include print, TV, radio, electronic media, conference and scientific papers as well as interactive forums. Information will be delivered through industry avenues, regional media or broader public media via news releases and regular liaison.

For example, The *Cottongrower* Magazine has been identified by industry as a key avenue for gathering information about management and research. The publishers of this journal, Greenmount Press, are new partners in the CRC and will provide a key, respected communication channel, as will the several regional media organisations (newspapers and radio), which are also new partners. Training to enhance the public communication skills of researchers will continue.

The Australian Cotton CRC produces "*CottonTales*" in each region. These fortnightly fax/email newsletters are highly regarded by industry for their short, timely, relevant nature. They are considered highly worthwhile by over 90 per cent of industry) and will be continued.

The current CRC website will be converted to the new CRC format, updated and maintained as a key, searchable information repository. (It currently receives over 500 visits per day). New interactive tools will be developed to enhance the functionality of the website. The capacity to share information via the internet will be expanded for crucial decision-making and regional crop and pest forecasting tools.

Displays will be exhibited at key events to promote the CRC and its science.

Field days, farm walks, workshops, seminars, school visits and community forums will provide more interactive communication channels.

The CCC CRC will be underpinned by an ethos of engagement through open and actively cultivated communication channels with the diverse range of stakeholders. A full time communications officer will be employed by the CRC to produce publications, however the main pathway to adoption will be the extension network of locally based staff.

Information Technologies and Decision Support Systems will enhance the cotton industry's capability to exploit new information technology and telecommunications systems, as they are made available. The cotton industry is highly innovative and a high user of the internet (over 80 per cent of the industry access the internet at least weekly; most daily). A business plan will be developed and implemented to provide strategic direction for these tools.

The capacity of cotton decision support tools for data sharing and analysis will be enhanced – providing significant opportunity for real-time communication and learning between farms. It will be complemented with a commercial record keeping package satisfying diverse identified industry needs. The handheld

capability of "in-field" cotton decision support will be enhanced by developing software for both Palm and PC environments and utilising Telstra high speed CDMA wireless technology.

With knowledge believed to be doubling every 7 years, smart systems are needed to help sift through the large amounts of information required for decision-making. Artificial intelligence and intelligent agents will be explored for this purpose, linking also with precision agriculture technologies.

Information will be available through the Technology Resource Centre established by the CRC as its' information shopfront. Opportunities to adapt this to a virtual centre, and the usability of this will be identified. To overcome the distances covered by this CRC, and the industry and communities in general, a sophisticated media and communications lab will be developed with communication nodes throughout the industry. This will particularly aid the accessibility for communities in remote areas.

The CRC provides technical support for the Best Management Practices Program, the Cotton Industry's Environmental Management System. A "BMP CD" tool will be developed to provide direct links between best practice and relevant research knowledge. New COTTONpaks and other information resources will be cross-linked to BMP. Cotton Australia and Cotton Research and Development Corporation have been leading the development and implementation of BMP.

Commercialisation: Novel technologies and tools will be commercialised in partnership with private enterprises that have specialised skills in biotechnology, software manufacture, IT, telecommunications, and textiles. Examples include water accounting and measurement tools, nutritional diagnostics, fibre quality forecasting products, bio-pesticides and semiochemicals, molecular diagnostics, hands free decision support tools and precision application technologies. Potentially commercial IP will be identified early in a project's life and driven down an appropriate commercialisation pathway. The Board will have a commercialisation sub-committee to drive this.

How will the commercial partners take this to market?

- Coordinated and collaborative public and commercial partnerships developing the capacity to provide the services and products based on advanced and regionally adapted research and technology.
- Cotton growers will do through the more rapid uptake of improved knowledge, information and practice change resulting from the CRC's research. This generates \$ for Australia because we sell the product.

Cotton consultants, agronomists and advisors will receive more advanced training and professional development based on CRC research and education and will be better able to assist their clients to improve production and profitability with reduced environmental impact.

There will be commercial delivery of tools; Application of research tools to improve services (Aquatech consulting); Partnerships with Incitec Fertilisers to better understand fertilizer requirements of high yielding crops and develop new fertiliser blends therefore optimising inputs.

Regarding intellectual property, there are three levels of project review being the Program Management Committee, the Discipline Advisory Panels (some members are supporting partners) and the CRC Board.

Any IP coming from the projects will be reported at appropriate meetings. Project reporting templates will be designed to ensure that IP is a major reporting criterion. Training will be provided to up skill staff in helping program and project leaders identify IP with potential for protection and commercialisation.

Any IP reported will be registered in the CRC IP register, and the Program Management Committee will make recommendations, on the exploitation of this IP; to the Discipline Advisory Panels who will then make recommendation to the CRC Board for approval.

Once an approach is approved at Board level the IP will be protected (copyright or patent or company secret etc) and a commercialisation plan completed for its commercialization/adoption - it will be the Business Managers responsibility to ensure that these processes are completed.

If the IP is recommended with "Commercial Value" Patent and Trade Mark Attorneys will be hired to complete the necessary searches and patenting process. Contract commercialization experts will be used to complete plans and licensee searches.

If appropriate a subsidiary company will be set-up to commercialise the IP, each Participating Partner (PP) will be a party to this company. The constitution of this company will detail the share of IP income and will ensure that royalties are distributed from the company after the CRC Company has completed its seven-year term.

How will the cotton industry identify and manage project IP to ensure it gets into hands of end users?

- Our project application and review process will specifically require IP reports
- Our review process will involve end users
- Staff with responsibility for commercialisation will work with project managers to identify IP with commercial potential and to manage it in accordance with company policy. Partners also have people with skills in this area.
- We will provide training and events to drive culture change on IP
- The Board will have an IP sub committee which will drive this process

The use of commercialisation plans will ensure that the appropriate licensee and therefore end users are identified. Our main aim will to get the product onto the market for the benefit of the Australian cotton industry and Australian economy in general – we are aware of the need to watch for large companies who wish to buy the licence and shelve the product. These criteria will need to be spelt out in the commercialisation plans and have PP signoff reinforcement.

About the Australian Cotton CRC

The Australian Cotton Cooperative Research Centre (Cotton CRC) commenced operations on 1 July 1999 when it successfully secured a second round of funding under the Commonwealth CRC Program. It succeeds the Cooperative Research Centre for Sustainable Cotton Production, which was established in 1993.

Mission

To enhance the development and growth of the Australian cotton industry through the application of collaborative research, education and the adoption of sustainable farming systems.

Participants

Commonwealth Governemnt

CSIRO - Divisions of Plant Industry, Entomology, Sustainable EcoSystems, and Textile & Fibre Technology.

State Governments

NSW Department of Primary Industries

Queensland Department of Primary Industry & fisheries

Agriculture Western Australia

NT Department of Businss Industry and Resource Development

Universities

The University of New England

The University of Sydney

Industry

Cotton Research and Development Corporation

Cotton Seed Distributors

Queensland Cotton

Western Agricultural Industries
