Cotton Catchment Communities CRC

FINAL REPORT

(due within 3 months on completion of project)

Part 1 - Summary Details

Cotton CRC Project Number: **5.01.08**

Project Title: IDO - Central Queensland

Project Commencement Date: 01/07/2005 **Project Completion Date:** 30/06/2008

Cotton CRC Program: The Adoption

Part 2 – Contact Details

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Part 3 – Final Report Guide (due within 3 months on completion of project)

(The points below are to be used as a guideline when completing your final report.)

Background

The direct relevance of southern research to cotton production under the conditions experienced in CQ always has been an issue of debate. In the absence of any personal experience and/or local expertise, CQ cotton growers are wary of the claimed potential benefits of new information/new technology in their own circumstances.

Personal quests by local cotton growers seeking information to build their cotton management and farm business skills always have been a major influence for advancement of the CQ industry. Their adoption of new practices often has identified gaps in knowledge that need to be addressed through local research.

CRDC has recognised this problem and has supported via funding an extension officers Mr Michael S. McCosker and David Kelly to link CQ needs to available industry information. This will ensure that the lead time in dissemination of new information and local adoption of new technology are not affected by the geographical isolation of the CQ region.

This project continued CRDC sponsorship of a development extension officer in a co funding arrangement with DPI&F in Queensland. An industry-sponsored review of the national extension effort for cotton determined such positions should actually reside within the State Departments of Agriculture.

Exciting new challenges were faced by the industry over the five years of this previous project; including developments in transgenic cotton varieties, strategies for resistance management and insecticide use, opportunities for integrated pest management, and a move across agriculture generally to "benchmark" production systems against local best management practises.

Modifications required for local management practices to address these issues (among others) are complex. CQ cotton growers understand "ownership" of the issues will be achieved best through an "action-learning" approach using grower groups and on-farm participatory problem solving methods of research. In addition, the CQ growers need to be linked to the wider national extension network to allow industry issues, information and expertise to be assessed.

This extension project linked with the proposed research project, Integrated Farming Systems for CQ, provided leadership for the agronomic aspects with the assistance of the project Technical Officer. The two projects established the foundation for integrative systems research in the region by bringing together crop agronomy, pest and disease management into a unified framework.

Objectives

- Provide development extension support to cotton growers in central Queensland that is the identifiable conduit between national directions in the cotton industry and local practices.
- Crop Physiology & Agronomy:
    1. Identify knowledge gaps and weaknesses in cotton agronomic management practices in CQ with particular reference to Bollgard II production systems..

2. Quantify the impact of sowing date, crop rotation, cultivar types, nutrition, water use and growth habit on lint yield and quality in Bollgard II production systems.
3. Characterise the interaction between factors in (1 and 2)
4. Develop new agronomic management practice guidelines for growers based on current research.

- Facilitate the adoption of transgenic cotton varieties and relevant Integrated Pest Management (IPM) principles by regional cotton growers.

- Provide cotton growers with a comparative analysis of local production practices to facilitate their adoption of Best Management Practice.

Methods

The project worked in a participative action learning framework through which the local industry, with extension support, developed local sustainable solutions to new challenges. Much of the work was conducted with grower groups and individual growers involving workshops, meetings, on-farm trials, demonstrations, field days, and publications.

The project continued to foster and utilise strong links within the local industry, particularly cotton grower associations and groups (Central Highlands, Dawson Valley, Belyando and Biloela), Area Wide Management Groups (East Nogoa and West Nogoa), local agribusiness (resellers, pesticide applicators, processors), and Cotton Australia.

Results	**Outcomes**
Detail and discuss the results for each objective including the statistical analysis of results.	Describe how the project's outputs will contribute to the planned outcomes identified in the project application. Describe the planned outcomes achieved to date.

Provide a development extension support to cotton growers in central Queensland that is the identifiable conduit between national directions in the cotton industry and local practices.

Results	**Outcomes**
The CQ IDO role has had a strong regional focus, focussed on linking growers with research and facilitating best management practices with in the area. This regional focus has been forged through close links with both Central Highland Cotton Grower and Irrigators Association (CHCG&IA) and Dawson Cotton growers Association (DCGA). The CQ IDO position has been integral in supporting the CHCG&IA Research and technical committee, which has met 12 times during the project period. This support has included facilitating formal group process to identify regional and national priorities, as well as informal grower	CQ research and extension priorities identified and communicated to industry. For example nitrogen efficiency was identified as a key regional issue for CQ. This information contributed to regional activities such as CQ soils forums, cotton tale articles & monitoring, assessment and interpretation of soil for crop nutrition workshops. In addition this information fed into the National extension teams strategies resulting in: CQ IDO project officer being a part of the 06/07 Nutrition & Fibre Quality priority team, and CQ contribution to the nationally linked nitrogen use efficiency

feedback, which have been communicated to industry and contributed to the development of regional and national extension plans.	benchmarking. This information has been communicated regionally and is encouraging improved fertiliser efficiency. An example of a regionally identified issue is confirmation of Tobacco Streak Virus in cotton in CQ. The CQ IDO role worked with the pathologist to communicate key information to industry, locally through cotton tales, and to wider industry through a technical update. The crop protection extension team, including the CQ IDO role, facilitated industry discussion about TSV & biosecurity issues, and have increased awareness of biosecurity and new disease issues through review of integrated disease management manual to include new diseases such as TSV as well as potential threats, update of this information in the cotton pest management guide and the web site.
Over the three years of this project, 42 Cotton Tales Newsletters have been produced and distributed to Central Queensland growers, agronomists. These newsletters promote new research, best practices and emerging issues in a regionally relevant manner. The project officer has collaborated with numerous researchers to ensure that emerging research (eg. new insect thresholds) is communicated to growers in a timely manner and that emerging issues such as the confirmation of Tobacco Streak Virus are communicated to growers, consultants and the wider industry are addressed quickly. The newsletter also profiles local examples of growers practicing best management to encourage adoption. Feedback from growers within each regional advisory panel expressed the importance of the newsletter as a source of locally relevant management information. There is clear local ownership of this newsletter, with growers and consultants actively suggesting topics and providing feedback, *"Very informative"*	CQ growers have ownership of the newsletter, and view it as a mechanism for receiving technical advice. Growers actively suggest newsletter topics and this advice influences on-farm practices. For example the CQ IDO project was contacted regarding impact on future cotton crop from different winter crop stubble management options (burning, retention, tillage). As this was an issue facing many growers in the area, a cotton tale on the topic was produced, with collaboration from a number of researchers. Good feedback was received from growers including comments that it influenced decision making in terms of stubble management, & timing of cotton planting. *"Good info, will help with decision making"*
Update of the 'Protocol for the Prevention of Fusarium Wilt in the Central Highlands' produced with input from researchers, growers and Greening Australia and is aimed	Continued high adoption of growers practicing 'Come Clean Go Clean', including inspection of contract pickers by independent contractor.

at preventing the spread of Fusarium Wilt into the Central Highlands through a strong Come Clean Go Clean message. As well as updating to include recent research, this protocol emphasises the risk from non-cotton related machinery and has been broadened to include weed seeds and other disease issues. An A3 brochure was also produced to ensure the key messages were communicated to growers, consultants, contractors and the broader indsutry.	Fusarium Wilt has not been detected in Central Highlands due to the diligence of the local industry and the extension strategy in place.
The topic of soil health was identified as a regional issue for the extension position to address. In September 2005, in partnership with Cotton Research and Development Corporation (CRDC), the CQ IDO facilitated Healthy Soil Forums in Theodore and Emerald. Researchers presented information on soil nutrition, physical structure, salinity & sodicity and biology highlighting both production and NRM issues (65 attendees overall). Themes were aligned with the BMP L&W module.	Improved grower knowledge of soil health issues, has resulted in a number of growers changing practices to improve soil health including 4 growers using biological soil ameliorants and a majority including rotations into their cropping system. Both forums generated clear research and extension priorities that were included in development of regional plans, and communicated to CRDC and the Cotton CRC Healthy Soils project.
Local BMP activities and grower feedback identified need for improved grower understanding of soil analysis interpretation. In May 2008, the CQ IDO organised the delivery of monitoring, assessment and interpretation of soil for crop nutrition workshops, developed as part of the Cotton CRC healthy soils project and aimed to give growers and consultants the confidence and skills to monitor and assess soils and to help them develop appropriate monitoring and management practices for increased profitability and sustainability. The two workshops were attended by 5 growers, 5 consultants and 3 industry.	All 5 consultants reported that they found the workshop informative with 3 reporting they would do something different as a result of the workshop. Feedback from growers was very positive, with most indicating an improved understanding and/or they would implement a change as a result of the workshop. *"It's good to confirm I was doing the right thing"* *"I now want to organise my data so I can watch for trends over time"* *"We might go home and try that out at home" (re dispersion test)*
The CQ IDO position is a first point of contact for many emerging issues. These has included • An increased incidence of Cotton Bunchy Top (CBT) disease in crops in 05/06 was initially not considered typical symptoms of CBT. The cotton IDO liased with pathologists. Bioassays ruled out TSV at that time. Once CBT was confirmed, the issue was communicated to growers through a number of mechanisms with a focus on encouraging clean up of volunteer cotton plants. • In 2006, glass house trials confirmed that	Emerging issues communicated to industry Growers aware of TSV issues and managing accordingly. Economic impact on irrigators estimate of January 2008 Flood was recorded. This information was used by the Queensland Premiers department in their assessments and historical database.

cotton was a potential host for TSV, and TSV was confirmed in commercial fields in November 2006. This information was communicated to growers and industry by the CQ IDO position through cotton tales and grower meetings. The CQ IDO assisted the pathologist with site selection and collection of samples, as well as obtaining suitable cotton cultivars and pigeon pea for an initial TSV trial, as well as contributing to industry TSV communication. The CQ IDO has actively participated in industry initiatives to improve processes for disease incursions or disease issues. • The CQ IDO position contributed to regional information on January 2008 flood impact through assisting with water level monitoring during the flood event and conducting 24 irrigator economic impact interviews post flood, including three detailed case studies. This has ensured that the extent of the irrigation area's damage has been captured for future reference.	
The National Cotton Extension Network has a well-regarded capacity to address industry priorities in integrated pest, weed and disease management in a farming system context. The CQ industry development officer has contributed to the success of this network. This role has contributed to the following extension team priority teams: • 05/06 Farming Systems focus team, • 06/07 Nutrition & Fibre Quality priority teams, and • 07/08 Soils & diseases priority teams. This National focus has resulted in a range of research and extension activities being supported by the CQ IDO such as: • Nitrogen use efficiency benchmarking in 06/07 & 07/08. • Coordinated the Integrated Diseases Management Manual Review and update, as well as local support to the annual disease survey. In addition, this review has included an update of the cotton pest management guide disease section. This update will ensure that growers and consultants are able to access the latest disease research, as well as increase awareness of exotic disease threats.	The CQ IDO role has contributed to national extension initiatives. Growers and Industry are informed of research outcomes. CQ linkage to extension and research outcomes. 8 CQ applicants participating in RPL process in order to qualify for diploma and certificate qualifications.

• Local coordination of national initiatives such as Fibre to Fabric Road Show (February 2006) and Resistance Roadshow (May 2008). • Assisted with hands on research sessions at both 2006 and 2008 Cotton Conference to promote cotton research and best practice. • The CQ IDO is a point of contact for researchers conducting work within CQ and has provided support for research such as mirid research and local coordination of egg and larvae collection program. • Contributed to development of nationally relevant cotton tales articles that are distributed to all IDO's. The CQ IDO has also supported other National Cotton industry initiatives such as • support to the Natural Resource and Management extension role, particularly regarding Land and water module of BMP and integrating NRM and production messages. • active promotion of the Cotton Skills Recognition Project.	

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Crop Physiology & Agronomy:

Results A major focus for the CQ IDO has been the Integrated Cotton Farming Systems for CQ project. From an agronomic perspective, the CQ environment was always thought to support economically viable cotton production in a wide sowing window from the middle of September to early January prior to this research. The ideal positioning of Bollgard II varieties in the CQ planting window was, therefore, critical to the future of the local cotton industry because growers needed baseline information to determine how best to take advantage of the higher yield potential offered by the Bt cotton technology, optimise irrigation water use and fibre characteristics. The project's outputs include a number of key agronomic findings. Over three growing seasons, Bollgard II crop planted in the traditional sowing window from the middle of September to the end of October consistently produced the highest yields. The	**Outcomes** Clear and quantitative assessment of the impacts of planting outside the traditional cropping window - a yield penalty of between 1-4 bales/ha for November and December planted cotton, communicated to growers. This has influenced recent planting date voting, with growers acknowledging the yield penalty is a major justification not to move the window.

project delivers a clear and quantitative assessment of the impacts of planting outside the traditional cropping window - a yield penalty of between 1-4 bales/ha for November and December planted cotton. Whilst yield penalties associated with December-planted crops are clearly linked to declining heat units in the second half of the crop and a cool finish, those associated with November-planted cotton are not consistent with the theoretical yield potential for this sowing date. Further research to understand and minimize the physiological constraints on November-planted cotton would give CQ cotton growers far greater flexibility to develop mixed/double/rotation cropping farming systems that are relevant to the rapidly evolving nature of Agricultural production in Australia. The equivalence of cultivar types with clearly distinguishable, genetically based growth habits, demonstrated in this project, gives growers important information for making varietal choices. For more information please refer to Integrated Cotton Farming Systems for CQ project final report. The CQ IDO role has played a key role in day to day coordination of the research and farming for the trial, as well as provided assistance with monitoring. The results from the research have been communicated to growers at numerous grower meetings, and there have been two grower field walks.	

- **Facilitate the adoption of transgenic cotton varieties and relevant Integrated Pest Management (IPM) principles by regional cotton growers.**

Results	**Outcomes**
There has been a lot of emphasis placed on the management of Silverleaf Whitefly (SLW), including promotion of SLW protocols prior to harvest time, undertaking survey to get more information on whitefly pressures and local management techniques as well as promotion of Richard Sequeira's Decision-support matrix.	There have been no complaints of sticky cotton and no instances of late season whitefly flare ups which suggest IPM strategies to date are effective.
The CQ IDO position has been integral in ensuring the continued success of the two area wide groups, despite very low cotton plantings. There have been 17 area wide meetings during the three years of this project, focussing on IRMS and insect pest pressures, as well as other best practice issues	Growers have continued to adhere to IRMS. Low incidence of direct spray drift damage.

such as weeds, water use efficiency, water issues, NRM issues, spray drift, local research and other local issues. These forums have been a useful tool for extension, with a CQ IDO regularly giving an update or presentation, as well as organising for guest speakers, such as relevant researchers. This IPM information has been re-enforced with technical cotton tales article.	

Provide cotton growers with a comparative analysis of local production practices to facilitate their adoption of Best Management Practice.

Results	**Outcomes**
Nitrogen use efficiency benchmarking in 06/07 & 07/08. Sixteen fields in Dawson & Central Highlands have been included in this benchmarking study covering a range of soil types and management practices. The information collected as part of the Nutrition Priority Team has been used by Dr Ian Rochester in an industry benchmarking study on nitrogen use efficiency and has been communicated to growers and industry through cotton tales, presentations as grower meetings and in an Australian Cotton Grower Article, see publication listings for details	The CQ data from 06/07 demonstrated that in nearly 50% of cases there was an over application of nitrogen in cotton fields. This information should encourage growers to budget their nitrogen application far more closely in relation to soil tests as there is the potential to save $50-60/ha in fertiliser costs. There is also potential to save on greenhouse gases.
The CQ IDO position provides technical support to Cotton industry BMP, including • support to AGSIP15 project • provided technical support and presented at information sessions regarding BMP L&W module and Land and Water Management Planning (LWMP) requirements organised by Cotton Australia and AGSIP 15 project in Emerald (12 growers) and Theodore (16 growers). • Providing technical support to growers and consultants participating in BMP. Recently this included the support to 9 growers preparing for audits including assistance in vegetation monitoring, water quality interpretation and soils information, as well as technical assistance to a consultant, assisting growers work through the BMP process. • From January to June 2008, the CQ IDO has, has contributed to the NRM extension team, including assisting in development of biodiversity/non-cropping module of revised BMP. • Provide a development extension support	In the reporting period, 10 growers have had pre certification audits that included the land and water module, and an additional 6 were certified for the full seven modules including land and water.

to cotton growers in central Queensland that is the identifiable conduit between national directions in the cotton industry and local practices.	

- Please describe any:-
  a) technical advances achieved (eg commercially significant developments, patents applied for or granted licenses, etc.);
  b) other information developed from research (eg discoveries in methodology, equipment design, etc.); and
  c) required changes to the Intellectual Property register.

Conclusion

1. Provide an assessment of the likely impact of the results and conclusions of the research project for the cotton industry. What are the take home messages?

Cotton production in Central Queensland will continue to impose a unique set of challenges due to climate and it's remoteness from other production areas. These challenges have been met successfully at an industry level in the duration of this project through strong collaboration between growers and local extension network. This project has continued to deliver regional extension linked to national objectives during a period of low cotton production and low grower morale.

The unique and variable Central Queensland climate, has enabled the investigation of planting date as an opportunity to enhance yields, make better use of in crop rains and improve quality. While this research has confirmed that the current window is optimum, and quantified the yield penalties for planting later, there are still opportunities to look at management of a November planted crop, especially within a double cropping situation.

The Central Highlands is one of the only cotton producing regions in Australia that has no confirmed cases of Fusarium wilt. Continued promotion of the Come Clean Go Clean message, has ensured that there is excellent adoption and a continued 'Fusarium free' status.

Central Queensland has been one of the pioneering regions for area wide management following the broad adoption of trap cropping in the late 1990s. With low water availability, the involvement of the extension officer in this project has been paramount to maintaining the momentum of these groups. Outcomes of these groups have included the ongoing high adoption of the IRMS, low incidence of damage due to direct spraydrift, and grower participation in area wide control of environmental weeds (eg parthenium on road sides).

Extension Opportunities

2. Detail a plan for the activities or other steps that may be taken:
   (a) to further develop or to exploit the project technology.
   (b) for the future presentation and dissemination of the project outcomes.
   (c) for future research.

Cotton continues to be a key part of the Central Queensland irrigated farming system. There are many opportunities to improve grower profitability and sustainability through focussing on the farming system and the unique set of opportunities and challenges produced from Central Queensland's climate and remoteness from other production areas. The ongoing presence of a cotton extension officer in Central Queensland offers the opportunity to

maintain a focus on regional priorities, as well as contributing to national extension issues through the national extension priority teams.

Publications

9. A. List the publications arising from the research project and/or a publication plan.
(NB: Where possible, please provide a copy of any publication/s)

Rochester.I, O'Halloran.J, Maas.S, Sands.D, Brotherton.E (2007), "Monitoring nitrogen use efficiency in your region", The Australian Cotton Grower Magazine, Volume 28, No.4, page 22-26.

Maas.S, (2008), "Protocol For The Minimisation Of The Spread Of Fusarium Wilt And Other Weeds And Diseases In The Central Highlands Brochure", Queensland Department of Primary Industries & Fisheries

Maas.S, Sands.D, (2008), "Protocol For The Minimisation Of The Spread Of Fusarium Wilt And Other Weeds And Diseases In The Central Highlands", Queensland Department of Primary Industries & Fisheries

B. Have you developed any online resources and what is the website address?

Part 4 – Final Report Executive Summary

Provide a one page Summary of your research that is not commercial in confidence, and that can be published on the World Wide Web. Explain the main outcomes of the research and provide contact details for more information. It is important that the Executive Summary highlights concisely the key outputs from the project and, when they are adopted, what this will mean to the cotton industry.

The CQ Cotton IDO is the key to delivery of emerging, cutting edge research information and knowledge to the Central Queensland Cotton Industry. The direct relevance of southern research to cotton production under the conditions experienced in CQ always has been an issue of debate. This project links the national research to the region through development and extension, with a strong focus on the major industry production issues including but not limited to; disease, Integrated Pest Management (IPM), soils, nutrition and integrated weed management. This project has facilitated locally based research into the CQ Cotton Farming System, in particular focussing on optimising planting date, in terms of yield, quality and use of in-crop rainfall. The CQ IDO position also supports the implementation of national industry-wide programmes such as Best Management Practices (BMP). The CQ IDO position has contributed to the National Cotton Extension Team. This team works on an industry-wide scale and takes a knowledge management approach to deliver grower focused adoption and extension programmes primarily through the Cotton CRC National Priority Teams.