



FINAL REPORT

Part 1 - Summary Details

Cotton CRC Project Number: 5.09.06

Project Title: The Economics of BMP in Cotton

Project Commencement Date: 21.07.2008 Project Completion Date: 30.06.2012

Cotton CRC Program: Adoption

Part 2 – Contact Details

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Part 3 – Final Report ~31st May 2012

Background

The Cotton CRC invests funds it receives from cotton growers and from government in a range of research, extension and education projects. These investments result in new technologies and management strategies which could potentially be adopted by farmers and the community.

In order to enhance adoption of emerging research, best practice and change management, it is important to be able to provide information about the economic incentives facing producers and resource managers associated with the uptake of technologies, emerging research and resource management strategies developed.

The overall objective of the project was to develop, adapt and promote economic analysis which supports the adoption of industry research outcomes relevant to cotton farming systems.

It is important to understand the farm level impacts of the cotton industries research and extension investments but the industry also needs to be able to explain the impact of its activities at industry, community and catchment levels. Economic analyses help guide decisions about the allocation of research and extension resources and provide information to the industry and community about how well their funds have been used.

Project Objectives

Economic research was conducted in three main areas as outlined in the original project proposal;

- A)** *'To provide support to the National Priority Teams to break down the barriers to uptake of research and best practice in the Australian Cotton Industry, through economic analysis.'* Whilst the structure of the CRC changed during the term of the project, work continued to be conducted on the economics of cotton production, including the development of economic tools and databases aimed at assisting research and extension staff.
- B)** *'To provide economic support to the Company Management Team in order to meet the Cotton CRC's higher level or emerging economic needs particularly with respect to assessing the impacts of CRC research and extension investments and guiding the use of research and extension resources.'*
- C)** *'To provide economic assistance in order to enhance NSW DPIs role in the development of the Cotton Industry'*

Work Areas

A) ECONOMICS OF COTTON PRODUCTION

i *Development of economic tools and databases*

A core part of the economists work included developing enterprise farm level economic models to demonstrate the economic incentive facing farmers and the community with respect to technologies being promoted by the Cotton CRC. An important aspect of these models is the ability to adapt them to identify and assess research and extension priorities for the Cotton CRC and NSW DPI. Another objective of economic input was to develop databases on key cotton industry parameters.

Whole Farm Model

A whole farm model was developed that is representative of a typical farm in the Lower Namoi Valley. The whole farm budget was designed to give a 'snapshot' of the financial performance of the model farm and to analyse the financial implications of changes in cropping rotations or changes in management practices. It can also be used to assess the change in farm profit from new ideas and technologies generated by the research and advisory activities of the Cotton Catchment Communities CRC. The model can also be used to give an assessment of the impact on farm profit of policy changes with respect to the management of natural resources.

Characteristics of the farm were determined from published data, by consulting local growers, agronomists, merchants, irrigation specialists and agribusiness lenders from local branches. The whole farm budget provides an indication of the financial performance at a particular point in time, of a farm with a particular set of resources. The framework can be altered to reflect other combinations of rotations and resources for future work.

Within the analysis, water resources were severely restricted to reflect license allocations at the time. Results from the representative farm budgets for the Lower Namoi Valley indicate that even with restricted water allocations, the business would return an operating surplus of \$152,070. This is equivalent to a return on equity of 3.1 per cent. However, the representative farm was found to be particularly vulnerable to commodity price variability.

Apart from providing a broad brush picture of financial performance, the model was used to analyse comparisons of alternative crop rotations in a whole-farm context. Using the model to compare four rotational trials highlighted the importance of crop selection for the financial performance of the business. Mean results indicated a positive return for all rotations within the representative farm budgets for the Lower Namoi Valley. Farm operating surplus ranged from \$177,715 to \$374,755 indicating that given restricted irrigation water and average commodity prices each rotation would ensure that the business returned a profit. The rotations varied in resilience to commodity price variability, however all treatments were likely to return a profit.

Stochastic analysis showed that even the worst performing treatment had a 96% chance of returning a positive farm operating surplus.

The model and results of the crop rotation analysis are outlined in the Economics Research Report No 46 'A Representative Irrigated Farming System in the Lower Namoi Valley of NSW: An Economic Analysis. The report is available in hard copy and online; <http://www.dpi.nsw.gov.au/research/economics-research/reports/err46>

Results were also presented at the 55th Annual Australian Agricultural and Resource Economics Society Conference in 2011 as a contributed paper, entitled "A whole farm comparison of irrigated cotton rotations in the Lower Namoi Valley, NSW".

Australian Cotton Statistics

A time series of economic indicators for the Australian cotton industry was compiled in 2009. This included relevant data from various industry, government and international statistical reports. A summary report entitled "A Times Series of the Australian Cotton Industry 1962 to 2009" was published via the CRC website at: http://www.cottoncrc.org.au/content/Industry/Publications/Economics/Australian_cotton_Production_and_Values.aspx

When the statistics were updated in 2010, the web pages were highlighted in the CRC's E-News and cotton chat. As a result, they were some of the most popular pages for the CRC website in the following months.

Impact Analysis – GHD survey

The economist initiated, sought funding and oversaw the Cotton Grower Survey 2011 (CRC project 5.09.10).

The project had 2 key objectives;

1. Understand the adoption of research and change in key farming practices during the term of the Cotton Catchment Communities CRC (from 2005)
2. Build capacity for the cotton industries Development and Delivery team (D&D team) in designing, writing and conducting quantitative surveys.

Existing information on Cotton CRC investments and related farming practices were collated into 'stories' by Ingrid Rencken (Crop Protection) and Guy Roth (Soils & Nutrition, Water). These stories summarised available information from project data sets, CCA surveys and grower surveys from 2005-2006 onwards. They also identified knowledge gaps in the current data on farm practices. A new survey of cotton growers was agreed to be the most appropriate way to address the identified knowledge gaps. Due to the relatively tight timeframe and low response rate from previous written or electronic surveys, it was agreed that the most reliable approach would be to gather the information through structured telephone interviews. Ingrid Roth from GHD Hassall was engaged to design and conduct the survey in conjunction with a workshop and training of the D&D team.

A total of 177 growers, representing 137,978 ha of cotton were surveyed on cotton growing practices for the 2010-11 season. The response represents 22% of dryland hectares and 30% of irrigated hectares from the 2010-11 season. The phone surveys were conducted by both GHD and the D&D team.

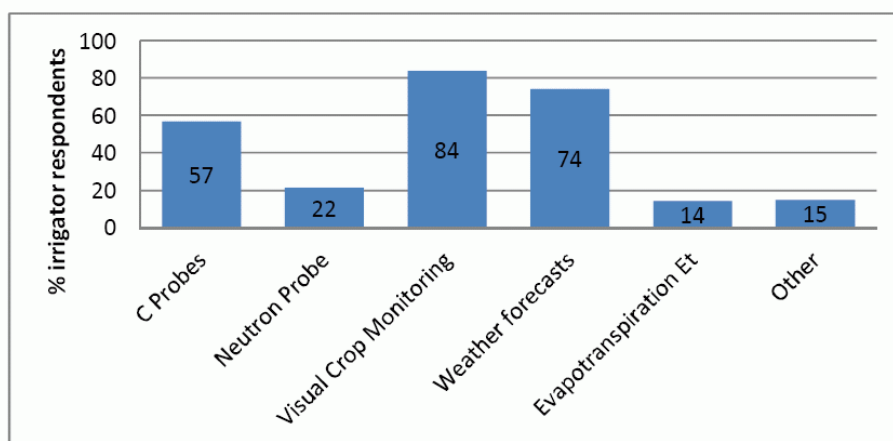
Findings are reported in 'Cotton Grower Practices 2011 Survey – A survey of selected cotton farming practices and grower views across the industry 2010-11 season' by GHD Hassall with the Cotton CRC Development and Delivery team.

A selection of findings from the survey report are shown below.

Pg 12. The cotton farms surveyed had approximately 40% of their total land area dedicated to cultivation (Of which cotton accounted for approximately 1/3 of the area in 2010-11) with a similar proportion dedicated to native vegetation.

Pg 25. With the exception of 2 respondents all used some technique for scheduling irrigations, with the most widely used being visual crop monitoring. 70% of respondents used either a capacitance probe (C-Probe, including Enviroscan) or neutron probe.

Figure 10 Methods used for irrigation scheduling of cotton

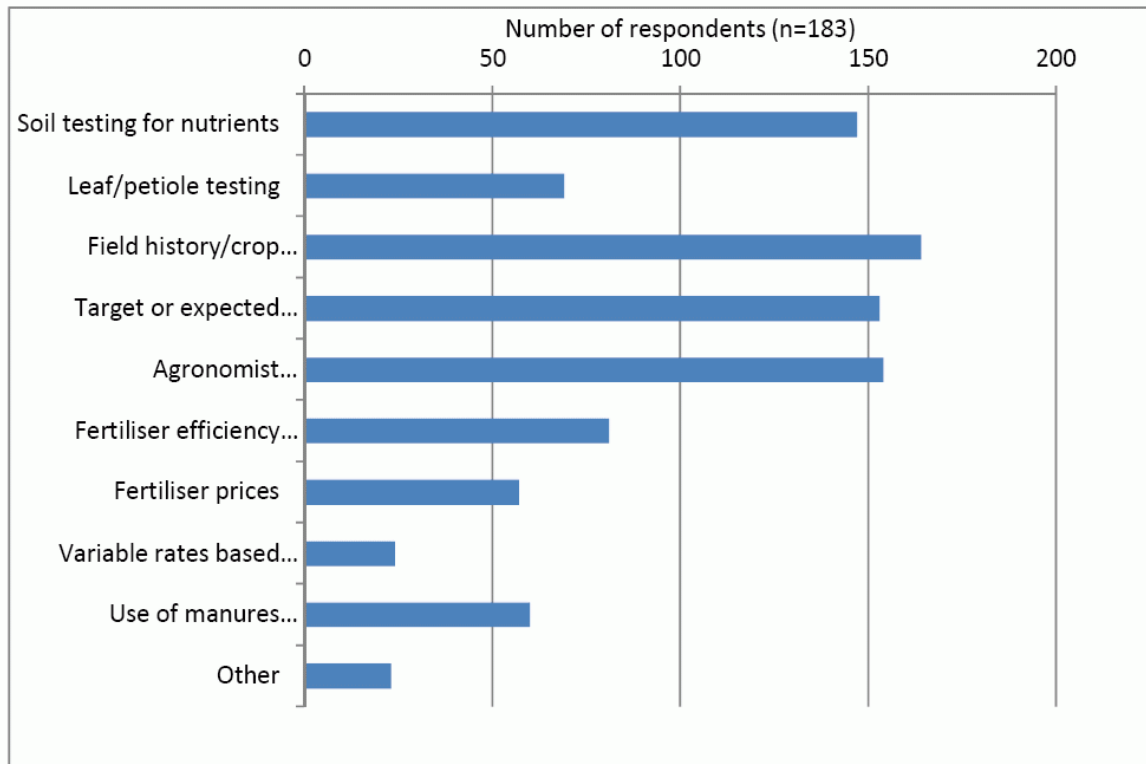


Pg 31-32. Respondents generally considered herbicide resistance to be an important issue which they actively manage for. Changes to weed management practices in the past five years include changing to a Roundup Ready® system, rotating chemicals, increasing cultivation and changing spray techniques.

Pg 36. The most widely used Integrated Pest Management (IPM) strategies include; soft chemistry (which is beneficial friendly), using industry threshold guidelines and insecticide resistance management strategy.

Pg 39. Fertiliser application rate decisions are influenced by a variety of measures and factors as depicted in Figure 21

Figure 21 Methods of calculating fertiliser application rates



Pg 43. Cultivation has generally decreased or remained similar over the past 5 years (Table 30). In some cases they have remained the same because cultivations had been substantially reduced more than 5 years ago. Where an increase in cultivations has occurred this was often due to a need to cultivate problem weeds such as fleabane.

Table 30 Changes in cultivation practices over the past 5 years

Change	# of respondents	%
Increase	14	8%
By more than 3	0	0%
By 3	1	1%
By 2	6	3%
By 1	4	2%
Similar	59	34%
Decrease	99	58%
By 1	9	5%
By 2	35	20%
By 3	23	13%
By more than 3	16	9%

For further results, the final report (Cotton Grower Practices 2011 Survey) can be found on the CRC website. http://www.cottoncrc.org.au/files/1d852d90-2cbb-4dc3-8617-a05f00c5366a/Report_Cotton_Grower_Survey_2011.pdf

ii Assisting Research & Extension staff

Nilantha Hulugalle project

An economic analysis was conducted for the research project 'Maintaining profitability and soil quality in cotton farming systems III' (CRC project 1.04.16). The project, led by Nilantha Hulugalle (DPI Senior Research Scientist) involves various comparative cotton rotation trials that measure soil quality, yield, economic returns and management constraints, conducted in a furrow-irrigated experiment at the Australian Cotton Research Institute, near Narrabri. All rotations (referred to as treatments) were based around cotton-wheat or cotton-vetch and also considered stubble, tillage and irrigation variations.

The financial returns and profitability for each rotation were evaluated for the experiments by comparing cumulative gross margins per hectare and per megalitre (ML) of irrigation water applied. A gross margin is the gross income from an enterprise less the variable costs (costs directly attributed to the enterprise). Fixed costs such as depreciation, permanent labour and overhead costs were not included. Gross margin results were calculated using a cotton price of \$450/bale and a seed price of \$300/tonne and costing of all operations conducted on each treatment, including fallow management. The same output and input prices were used for each season's results, in order to determine the rotation effects. Alteration of prices from year to year would confuse the rotation effect. Cotton price sensitivity testing was also conducted.

The key economic finding of the rotation trial was that the inclusion of vetch was less profitable than a fallow or wheat rotation. With respect to gross margin/ha the difference was minor, but in terms of gross margin/ML the treatments without vetch were significantly more profitable. Generally, including vetch in the rotation did not result in sufficient improvements in cotton yield to compensate for the increase in production costs and water use.

In the tillage/irrigation trial, the minimum-till cotton-wheat rotation consistently achieved the highest cotton yields and the highest gross margin/ML. During the project timeframe, water was the major limiting resource for cotton production, and consequently, cotton growers were looking for a farming system that gave them the greatest return per ML.

Detailed results can be found in the final project report 'Maintaining profitability and soil quality in cotton farming systems III' (CRC project 1.04.16), available on the CRC website. http://www.cottoncrc.org.au/general/Research/Projects/1_04_16

Australian Cotton Production Manual

The Australian Cotton Production Manual was written in 2010 based on the concept of a previous publication (Dryland Cotton Production Guide) in 1993. The manual is a key publication that communicates current best practice and advice to existing and new growers in the cotton industry. Due to the popularity of the manual, it was

updated and reprinted in both 2011 and 2012. The economist oversaw the completion and updating of 4 chapters; Economics, Marketing, Classing and Finance

The Australian Cotton Production Manual can be found online on the Cotton CRC website at

http://www.cottoncrc.org.au/industry/Publications/Paks_Manuals_Guides

Grains Project

Economic analysis was provided for the research project 'High yielding irrigated grains in cotton farming systems' (CRC project 1.04.11.03), led by Verity Gett. Advice was given on the collection of data and a gross margin comparison was conducted for the projects on-farm wheat trials.

B) ASSISTING COMPANY MANAGEMENT TEAM

Economic analysis identified by company management team (CMT) was undertaken to provide an additional economic dimension to overall company information, resources, annual report and progression against strategic goals.

Third Year Review

In 2008, the Cotton CRC was required to report to the Federal Government on the estimated impact of its research activities. The BDA Group were engaged to conduct the analysis with the economist assisting in the collection and collation of data.

The analysis used the Cooperative Research Centres Association's (CRCA) monitoring and evaluation framework to conduct the review. The BDA Group estimated that the potential benefits likely to be generated as a result of investments through the Cotton CRC would be in excess of \$720 million.

Full results were reported by the BDA Group to the Cotton CRC in the report 'Evaluation of the Economic, Environmental and Social Impacts from the Cotton CRC Investment'.

Commercialisation team

The economist provided assistance to the Commercialisation and Development team with feasibility assessments for the commercialisation of various CRC products. In particular, significant time was spent on the Near Infrared (NIR) Scanner and its potential application for cotton seed. This work involved liaising between researchers, industry and The Cotton CRC and resulted in the development of trials and a prototype which are still under investigation for commercial feasibility.

Extension bid

In June 2011 the Cotton CRC applied to the federal government for an extension of funding from 2012 to 2017. To apply for the funds, CRC's needed to use the templates provided within the CRCA application pack. The economist managed the completion of the 'Impact Tool' (one of the two application components), a

comprehensive excel file that gave a cost benefit analysis of the proposed CRC extension. Working closely with the CRC management and extension bid teams in one-on-one meetings, and with consultants through a series of workshops, the Impact tool was successfully completed and submitted.

Independent Impact Analysis

In 2011, independent impact analyses were completed by Deloitte Access Economics and NSW Trade & Investment.

Deloitte Access Economics found that in the area of water use efficiency cost savings of between \$57 million to \$108 million per annum could be attributed to the Cotton CRC. The analysis indicated that water use efficiency gains of between 23% and 31% had been achieved on 45-64% of cotton hectares by applying technologies and practices promoted by the CRC.

The NSW Trade & Investment economic evaluation assessed the potential benefits of the Cotton CRC's scientific research to the Australian cotton industry. It was considered that the main effect of the Cotton CRC's research was to increase the scale and intensity of research and to expedite the delivery of new technologies to the cotton industry through the provision of additional research funding and by reinforcing the collaborative links that exist among Australian cotton research institutions. Estimates were made of the potential benefits to the Cotton CRCs five main scientific programs (diseases, insects, soils, water and weeds) and the entire Cotton CRC using well-recognised economic modelling methods that have been adopted in recent economic evaluations of other agricultural CRCs and of the large-scale research programs supported by the Australian Government.

The results of the evaluation indicated that the Cotton CRC will generate significant economic benefits to the Australian cotton industry. These benefits are driven by the farm research program which has enhanced industry productivity by promoting faster rates of and higher absolute levels of technology adoption. Sensitivity analysis indicated the results were robust under a range of mainly negative value changes.

Production related research by the Cotton CRC will achieve the above mentioned benefits by shaping best management practices that result in reduced inputs (as cost savings) and higher yields for cotton farms. Over a 15 year period, this amounts to an estimated \$1.07 billion in economic benefits, or \$6.80 of economic benefit for every \$1 invested. The analysis will shortly be published in a report in the NSW Trade & Investment Economic Research Report series at:

<http://www.dpi.nsw.gov.au/research/economics-research/reports>.

C) ENHANCE NSW DPI'S ROLE IN THE COTTON INDUSTRY

A key outcome of economic work has been the assistance and support provided to NSW DPI's cotton industry extension and research staff.

The economists annual work plans were closely aligned with NSW DPI's strategic direction and goals. Economic assistance was provided to the departments cotton industry staff, in particular Nilantha Hulugalle (DPI Senior Research Scientist) and Verity Gett (DPI Research Agronomist). The economist also assisted the NSW DPI team with the production of the 2009-10 and 2010-11 Northern NSW summer crop gross margin budgets. These budgets are updated annually and available on line at; <http://www.dpi.nsw.gov.au/agriculture/farm-business/budgets>

Communication of Results

Whilst many reports provided to the Cotton CRC were internal documents, results from this project have also been disseminated in national publications and conferences. Specific details of published articles and oral presentations are given below. The hyperlinks for those items which have been published on-line are also provided.

A. Peer reviewed articles / books

- Powell, J. W. and J. F. Scott (2011). A Representative Irrigated Farming System in the Lower Namoi Valley of NSW: An Economic Analysis. Economic Research Report no. 46. Canberra, Industry & Investment NSW

http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0003/377346/ERR-46.pdf

B. Non-peered reviewed articles

- Hulugalle, N.R., Weaver, T.B., Kimber, S., Powell, J.W., Scott, J.F., 2011. Final Report: Maintaining profitability and soil quality in cotton farming systems III. Cotton Catchment Communities CRC project 1.04.16.

http://www.cottoncrc.org.au/general/Research/Projects/1_04_16

C. Presentations (conference)

- Powell, J. W. and J. F. Scott (2011). A Whole Farm Comparison of Irrigated Cotton Rotations in the Lower Namoi Valley, NSW. Contributed paper - 55th Annual Conference of the Australian Agricultural and Resource Economics Society. Melbourne, VIC, 8-11th February.

D. Online resources

- Australian Cotton Production Statistics

http://www.cottoncrc.org.au/content/Industry/Publications/Economics/Australian_cotton_Production_and_Values.aspx

Part 4 – Final Report Executive Summary

The overall objective of “The Economics of BMP in Cotton” project was to develop, adapt and promote economic analysis which supports the adoption of industry research outcomes relevant to cotton farming systems, which was successfully achieved through work conducted on the economics of cotton production, including the development of economic tools and databases and assisting research and extension staff. Key outcomes and publications included:

- A representative whole farm model of a typical farm in the Lower Namoi Valley was used to compare four rotational trials. The results are reported in the Economics Research Report No 46 ‘A Representative Irrigated Farming System in the Lower Namoi Valley of NSW: An Economic Analysis. The report is available in hard copy or online at; <http://www.dpi.nsw.gov.au/research/economics-research/reports/err46>
- A time series of economic indicators for the Australian cotton industry was compiled in 2009 and updated in 2010. A summary report entitled “A Times Series of the Australian Cotton Industry 1962 to 2009” was published via the CRC website at: http://www.cottoncrc.org.au/content/Industry/Publications/Economics/Australian_cotton_Production_and_Values.aspx
- ‘Cotton Grower Practices 2011 Survey – A survey of selected cotton farming practices and grower views across the industry 2010-11 season’ by GHD Hassall with the Cotton CRC Development and Delivery team http://www.cottoncrc.org.au/files/1d852d90-2cbb-4dc3-8617-a05f00c5366a/Report_Cotton_Grower_Survey_2011.pdf
- Economic analysis conducted for the research project ‘Maintaining profitability and soil quality in cotton farming systems III’ (CRC project 1.04.16). Detailed results can be found in the final project report, available on the CRC website. http://www.cottoncrc.org.au/general/Research/Projects/1_04_16
- Economic analysis was provided for the research project ‘High yielding irrigated grains in cotton farming systems’ (CRC project 1.04.11.03), led by Verity Gett.
- Chapters on Economics, Marketing & Classing were contributed to The Australian Cotton Production Manual for 2010, 2011 and 2012, which can be found online on the Cotton CRC website at http://www.cottoncrc.org.au/industry/Publications/Paks_Manuals_Guides
- Contributions to Third Year CRC review, Cotton CRC Extension Bid, and assistance to the Commercialisation and Development team with feasibility assessments for the commercialisation of various CRC products.
- An ex-ante economic evaluation by NSW Trade and Investment reported on the potential benefits of the Cotton CRC’s scientific research to the Australian cotton industry. The results of the evaluation indicated that the Cotton CRC could generate significant economic benefits to the Australian cotton industry an estimated \$1.07 billion in economic benefits, or \$6.80 of economic benefit for every \$1 invested. The analysis will shortly be published in a report in the NSW Trade & Investment Economic Research Report series at <http://www.dpi.nsw.gov.au/research/economics-research/reports>.