

The Economic Impact of the Cotton Catchment Communities CRC

David Vere

Senior Research Scientist (Retired), NSW Department of Primary Industries

Fiona Scott

Economist, NSW Trade & Investment, Tamworth

Economic Research Report No. 49

May 2012



**Trade &
Investment**



Cotton Catchment Communities CRC

© NSW Trade and Investment 2012

This publication is copyright. Except as permitted under the Copyright Act 1968, no part of the publication may be reproduced by any process, electronic or otherwise, without the specific written permission of the copyright owner. Neither may information be stored electronically in any way whatever without such permission.

Abstract

The purpose of the economic evaluation reported in this paper was to determine 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 are 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 this evaluation indicate that the Cotton CRC could generate significant economic benefits to the Australian cotton industry where its research programs lead to increases in industry productivity by promoting faster rates and higher levels of new technology adoption. Evaluating the cotton CRC as a full entity generates maximum estimated potential economic benefits with a NPV of \$1,067.2 million and a BCR of 7.8:1, yielding a marginal or incremental benefit (the difference between the NPV estimates for the with- and without- Cotton CRC scenarios) of \$1,070.1 million and an incremental BCR 6.8:1. Sensitivity-testing of key assumptions indicated that the results are the most sensitive to the assumptions regarding industry productivity growth, adoption ceiling and lag values. The overall result of the sensitivity analysis is that the positive benefit-cost outcomes of this evaluation of the Cotton CRC remain robust despite the large reductions in NPV and BCR values that can result from using parameter value assumptions that are significantly lower than those used in the base evaluation.

Keywords: cotton; economic; evaluation; Australia

JEL Code: Q12, Q16

ISSN xxxx-xxxx

ISBN xxxxxx

Author's Contact:

Fiona Scott, NSW Trade and Investment, Tamworth NSW, 2340.

Telephone: (02) 6763 1156

Facsimile: (02) 6763 1222

Email: fiona.scott@industry.nsw.gov.au

Citation: Vere, D. and Scott, J.F. (2012) *The Economic Impact of the Cotton Catchment Communities CRC*, Economics Research Report No. 49, NSW Trade & Investment, Tamworth.

Table of Contents

List of Tables	iii
List of Figures	iv
Acknowledgments.....	v
Acronyms and Abbreviations Used in the Report	v
Executive Summary	vi
1. Introduction.....	1
1.1 Background to the analysis	1
1.2 The Australian Cotton Industry Context.....	5
2. The Cotton CRC and Programs	10
2.1 The Farm Program (2005 to 2011)	13
2.2 The Catchment Program (2005-2011)	15
2.3 The Community Program (2005 - 2011)	18
2.4 The Product Program (2005 -2011)	19
2.5 The Adoption Program	21
3. Economic Scenario and Evaluation Methods	25
3.1 Productivity growth in the Australian cotton industry.....	25
3.2 The evaluation scenario	27
3.3 Economic evaluation methods	29
4. Data and other information for Evaluations.....	32
4.1 Data and information sourced from the literature.....	32
4.2 Data and information sourced from within the Cotton CRC	34
5. Results.....	39
5.1 Results for Programs and CRC	39
5.2 Sensitivity Analysis	44
6. Summary and Comment	47
7. References.....	50
8. Appendices.....	55
8.1 Cotton CRC projects	55
8.1.1 Farm Program Projects	55
8.1.2 Catchment Program Projects.....	58
8.1.3 Community Program Projects.....	60
8.1.4 Product Program Projects	61
8.1.5 Adoption Program Projects.....	62
8.2 – Cotton CRC History.....	65
NSW Department of Trade and Investment Economic Research Report Series	68

List of Tables

Table 1: World and Australian Cotton Production	8
Table 2: National Research Priorities and Cotton CRC research	13
Table 3: Major achievements for the Farm Program	14
Table 4 Major achievements for the Catchment Program	16
Table 5: Major achievements for the Community Program	18
Table 6: Major achievements for the Product Program.....	20
Table 7: Major achievements for the Adoption Program	22

Table 8: World and Australian cotton export trades.....	31
Table 9: Cotton supply and demand 2001 to 2010 (Av. Kt).....	33
Table 10: Cotton supply and demand elasticity estimates.....	34
Table 11: Cotton CRC Farm Program research theme contributions to industry productivity growth and supply shift estimates (based on proportion of total budget)	35
Table 12: Adoption profiles for the with and without Cotton CRC scenarios for the five Farm Program research themes	36
Table 13: CRC and in-kind costs: Farm Program research themes and other programs (\$M)	38
Table 14: BCA estimates for the Cotton CRC ^a	41
Table 15: Regional disaggregation of net total benefits (NPV) to the Cotton CRC's research	43
Table 16: Sensitivity analysis of BCA estimates for the Cotton CRC's research	46

List of Figures

Figure 1: Area of cotton sown in Australia.....	6
Figure 2: Australian Cotton Lint Production	6
Figure 3: Lint yield per hectare.....	7
Figure 4: Total Value of Australian Cotton Production.....	8
Figure 5: World price of raw cotton (US c/lb).....	9
Figure 6: Cotton CRC Management Structure Source: (Cotton CRC 2010).....	11

Acknowledgments

This study was partially funded by the Cotton Catchment Communities CRC. We also wish to acknowledge the considerable efforts of Janine Powell, Paula Jones, Belinda Graham. Tom Nordblom and Anthea McClintock provided valuable referee comments on this Report.

Acronyms and Abbreviations Used in the Report

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
BCA	Benefit-cost analysis
BCR	Benefit-cost ratio, defined as the ratio of discounted benefits to discounted costs
CDF	Cumulative distribution function
Consumer surplus	A measure of economic welfare change affecting consumers, defined as the area below the demand curve and above the price line
CRC	Cooperative Research Centre
CRDC	Cotton Research and Development Corporation
DREAM	Dynamic Research EvaluAtion for Management model
EDM	Equilibrium displacement model
Elasticity (price)	An economic measure of supply or demand response to a price change, defined as the percentage change in quantity supplied or demanded for a one per cent change in price
GM	Genetically modified
IPM	Integrated Pest Management
IWM	Integrated Weed Management
NPV	Net present value, defined as the difference between discounted benefits and discounted costs
PFP	Partial factor productivity
PGR	Productivity growth rate
PPG	Potential productivity growth
Producer surplus	A measure of economic welfare change affecting producers, defined as the area above the supply curve and below the price line
R&D	Research and development

Executive Summary

The Cotton Catchment Communities Cooperative Research Centre (Cotton CRC) commenced operations in October 2005 and will have received Commonwealth and industry funding totalling about \$71.8 million by the end of its seven-year period in mid-2012. The Cotton CRC has also received in-kind contributions from core and supporting parties with an approximate value of \$113.6 million. The current Cotton CRC follows two previous CRCs in the Australian cotton industry that operated between 1993 and 2005.

The current Cotton CRC has five main programs; The Farm, The Catchment, The Communities, The Product and The Adoption. Its overall mission statement is to “provide high quality collaborative research, education and adoption activities which benefit the Australian cotton industry, regional communities and the nation.” The stated purpose of the Cotton CRC is to “facilitate the delivery of a cotton industry that:

- adopts world’s best practice in production, environmental and catchment management,
 - secures international competitiveness using research to increase yield and fibre quality, and
 - generates improved social and economic conditions in cotton communities.”
- (Cotton CRC 2009)

An important measure that the Commonwealth Government will use to judge the Cotton CRC’s ultimate success will be that it has generated a sound economic return to all stakeholders from its public funding (Vere *et al.* 2005).

The purpose of the economic evaluation reported in this paper was to determine the potential benefits of the Cotton CRC’s scientific research to the Australian cotton industry to demonstrate that its research investments have delivered properly measured economic benefits to Australian taxpayers and industry stakeholders. An

integrated economic modelling system that was previously adopted in evaluating two other rural CRCs in Australia was adapted to evaluate the potential impacts on the producers and consumers of cotton products. An emphasis was to demonstrate that improved technologies in cotton production and product development can benefit not only producers but also the consumers of cotton products whose taxes provide the bulk of funding to public research agencies such as the Cotton CRC.

It was considered that the main effect of the Cotton CRC's Farm program research was increasing the scale and intensity of research and expediting the delivery of new technologies to the cotton industry through the provision of additional research and extension funding and by reinforcing the collaborative links that exist among Australian cotton research institutions. Considering the role of the Cotton CRC in this context enabled the definition of a realistic with-CRC evaluation scenario under which the potential benefits from the CRC's research programs could be measured and compared to the benefits that could flow from similar research programs that might be undertaken in the future. The definition of a "counterfactual" without-CRC scenario follows the expectation that most of the areas of research involved in the Farm programs would have continued to be undertaken in the absence of the Cotton CRC, but at a lower level of funding and over much longer periods. Both the with and without-CRC scenarios reflect the generally unfavourable seasonal conditions over the last ten years have impacted heavily on the Australian cotton industry with substantially reduced plantings and corresponding reductions in grower levies for funding industry research and development.

The research evaluation task was, therefore, to measure the incremental or marginal benefits that could be legitimately attributed to the Cotton CRC through the definition of realistic with- and without-CRC scenarios. These incremental or marginal benefits were estimated as the differences in the benefit levels that could result under those scenarios.

Estimates are made of the potential benefits to the Cotton CRC's Farm research themes (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. All benefit and costs were jointly evaluated over a 15-year period commencing in 2011-12 using standard benefit-cost analysis (BCA) procedures and a 4 per cent real discount rate. This process utilised the widely used DREAM research evaluation software. The benefit evaluation process encompasses both the production and consumption levels of the cotton industry. This means that there are other elements of benefit that could flow from the Cotton CRC's research that have not been estimated but would enhance the benefit-cost outcomes if they could be quantified. Such benefits include those to processors and manufacturers, the environment, community resilience, and spill-over benefits to other industries associated with the cotton industry.

The results of this evaluation indicate that the Cotton CRC could generate significant economic benefits to the Australian cotton industry where its Farm research programs lead to increases in industry productivity by promoting faster rates and higher levels of new technology adoption. Under the with-Cotton CRC scenario, the Farms five research themes yield positive net present values (NPVs) of between \$114.1 million for water research and \$7 million for disease research, and benefit-cost ratios (BCRs) values between 14.6:1 and 2.9:1. Each of the Farm's five research theme areas that were evaluated has the potential to generate long-term benefits to the Australian cotton industry. The alternate estimates for the without-Cotton CRC scenario have NPVs between \$4.1 million and -\$4.7 million, and BCRs between 2.3:1 and -0.15:1. The latter estimates have been strongly influenced by the long periods that the cotton industry researchers and experts (who were consulted for this evaluation) considered were likely to be required for this research to be undertaken in the absence of the Cotton CRC due to funding shortages.

Evaluating the Cotton CRC as a full entity generates potential economic benefits with a NPV of \$1,067.2 million and a BCR of 7.8:1, yielding a marginal or incremental benefit (the difference between the NPVs estimates for the with_ and without_Cotton CRC scenarios) of \$1,070.1 million and an incremental BCR 6.8:1. Hence, the Cotton CRC could return \$6.80 in real terms for every \$1 of funding and the value of the in-kind contributions it has received over its seven year period. Further sensitivity analysis indicated that these results were robust under a range of mainly negative value changes to the main determinants of the BCA estimates.