



Final Report

Off Farm Series | Cotton Research & Development Corporation

Part 1 - Summary Details

Please use your TAB key to complete Parts 1 & 2.

CRDC Project Number: CMSE1101

Project Title: Cottonscan Technology Transfer and Market Support

Project Commencement Date: 1/07/2010 **Project Completion Date:** 30/06/2011

CRDC Program: 4. Product

Part 2 – Contact Details

Administrator: Jo Cain
Organisation: CSIRO Plant Industry
Postal Address: PO Box 59, Narrabri NSW 2390
Ph: 02 6799 1513 **Fax:** 02 6793 1186 **E-mail:** jo.cain@csiro.au

Principal Researcher: Dr Geoff Naylor
Organisation: CSIRO Materials Science and Engineering
Postal Address: P.O. Box 21, Belmont, Vic 3216
Ph: 03 52464000 **Fax:** 03 52464057 **E-mail:** geoff.naylor@csiro.au

Supervisor: Dr Geoff Naylor
Organisation: CSIRO Materials Science and Engineering
Postal Address: P.O. Box 21, Belmont, Vic 3216
Ph: 03 52464000 **Fax:** 03 52464057 **E-mail:** geoff.naylor@csiro.au

Signature of Research Provider Representative: _____

Part 3 – Final Report

1. Background

One aspect of the desire to improve the quality of the Australian cotton crop is to introduce new fibre quality instrumentation to supplement the current Micronaire measurement. In previous CRDC funded projects, CSIRO developed the Cottonscan instrumentation to directly measure the average fibre fineness or linear density of a cotton sample. Recently BSC Electronics have been licensed to commercialise the Cottonscan technology by intergrating both the Cottonscan and SiroMat technologies into an updated version of their commercailly available Cottonscope instrument, i.e Cottonscope Mark 2.

This small project has been designed broadly to enable CSIRO to provide, as required, technical and technical-marketing support to BSC Electronics during the technology transfer phase and early commercialisation of the Cottonscan/Cottonscope technology.

2. Objectives and Results

Table 1 below lists the stated formal objectives for the project. All objectives have been achieved.

Table 1. Planned Project Objectives

Obj No.	Objective	No.	Milestone	No.	Performance Indicator	Start Date (dd/mm/yyyy)	Finish Date (dd/mm/yyyy)
1	Transfer the Cottonscan technology to the licensee	1.1	Liaise with licensee to facilitate the incorporation of the Cottonscan technology into the Cottonscope instrument	1.1	Production of a prototype 'liquid' Cottonscope incorporating the fibre linear density measurement	1/07/2010	30/06/2011
		1.2	Undertake technical trials to evaluate the performance and accuracy of the instrument	1.2	Report	1/07/2010	30/06/2011
		1.3		1.3			
2	Provide market support for the commercial uptake of the technology	2.1	Undertake trials in a commercail mill environment	2.1	Report demonstrating the usefulness of the measurement.	1/07/2010	30/06/2011

Highlights of the activities are summarised below.

In early 2010 BSC produced a prototype instrument combining the Siromat and Cottonscan technologies into one instrument, The Cottonscope Mark 2. This is illustrated in Figure 1. It was initially introduced to the market at the Bremen ITMF Meeting in 2010, and the instrument has been displayed at ITMA Asia in 2010 and at the Australian Cotton Conference in August 2010. The Cottonscope instrument will also be exhibited by BSC Electronics at their stand at the Barcelona ITMA in September 2011.

Cottonscope has recently been a finalist in major two science/engineering competitions in September 2011: (a) The Australia Museum Eureka award in the 'Innovative Use of Technology' category and (b) Engineers Australia NSW Section Engineering Excellence Awards in both the 'Research and Development' and the 'Innovations and Inventions' categories.



Figure 1. Cottonscope Mark 2 including both Cottonscan and SiroMat technologies.

A number of internal (CSIRO) trials have been conducted using Cottonscope Mark 2 to confirm the performance of the instrument. These results have been pleasing, and this formed the basis for a scientific paper presented at the US Beltwide Cotton Conference in January 2011. Figure 2 illustrates the key data presented in this paper.

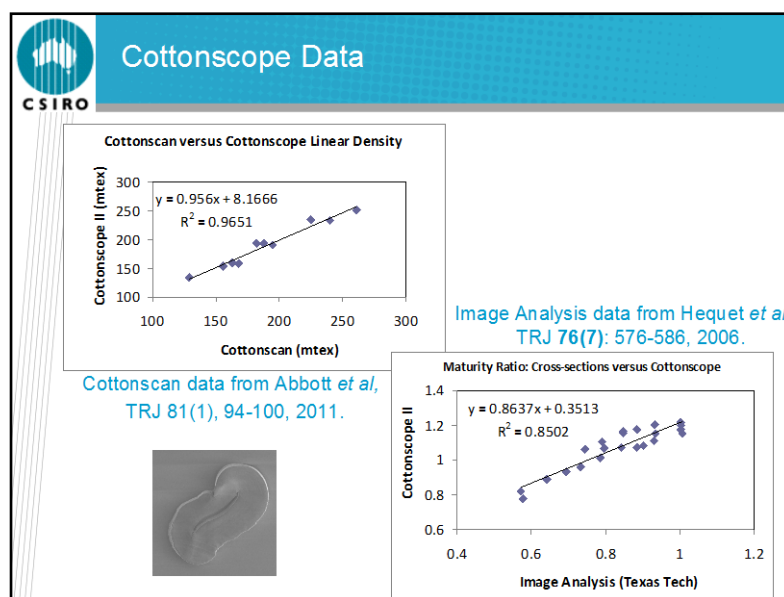


Figure 2. Results of an internal (CSIRO) trial of the performance of the Cottonscope instrument.

An important aspect of the market support has been technical interactions with Prof Eric Hequet at Texas Tech University, Lubbock Texas who purchased a Cottonscope instrument.

Prof Hequet has a major international reputation amongst the fibre quality scientific community for both his unbiased critical assessment of technologies and instrumentation i.e. positive feedback from Prof Hequet will significantly enhance the commercial reputation of the technology. Further Prof Hequet has been an active collaborator during the development of Cottonscan as a core participant in the international inter-laboratory trials of the instrument.

As a result of our close working relationship with Prof Hequet, he shared directly with us the results of his evaluations of his Cottonscope instrument. He identified that the precision or repeatability of the measurement of fibre linear density was unacceptably poor. This is illustrated in Figure 3. In this experiment a cotton sample is measured 10 times on each day and the coefficient of variation associated with these 10 individual readings is plotted. It can be seen that the variation in the maturity (red) and ribbon width (green) data is typically only about one percent however the variability for the linear density/fibre fineness measurement (blue) is much higher and is indeed satisfactory. Following discussions with Prof Hequet it became apparent that the source of the lack of precision was the balance supplied with the instrument. Follow up experiments with an improved analytical balance (4 figure) have resolved the issue and Prof Hequet has subsequently reported an average CV value of 1.7% for the full range of his 104 reference cottons.

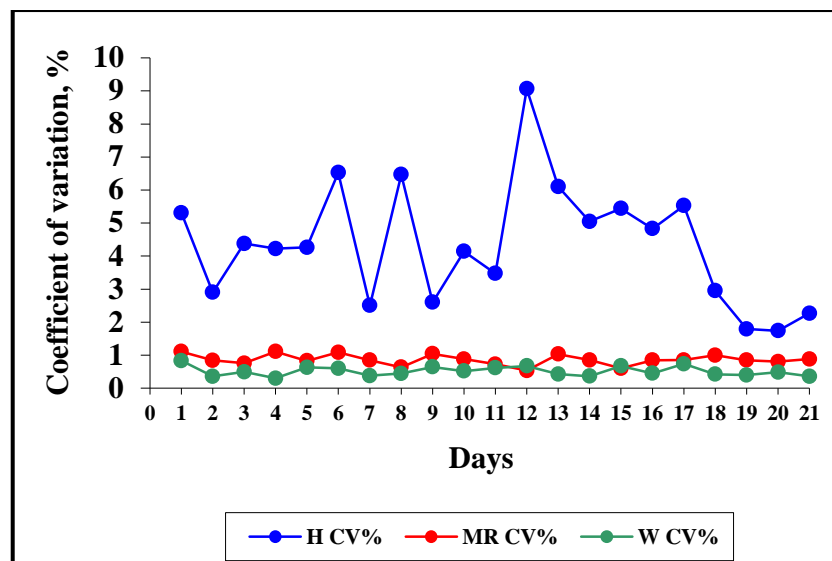


Figure 3. Typical early results from Prof Hequet illustrating the Cottonscope precision associated with multiple repeat measurements on one cotton. The blue dots are for linear density (fineness), the red dots for maturity and the green dots for ribbon width.

Prof Hequet has also independently confirmed that the Cottonscope measured values of fibre linear density (fibre fineness) are in good agreement with expected values. For example Figure 4 illustrates the good agreement he obtained comparing the Cottonscope data with that obtained manually using the British Standard method.

Further more detailed formal comparative trials currently under way with Prof Hequet. They will form the basis of a significant technical publication to underpin the marketing of Cottonscope.

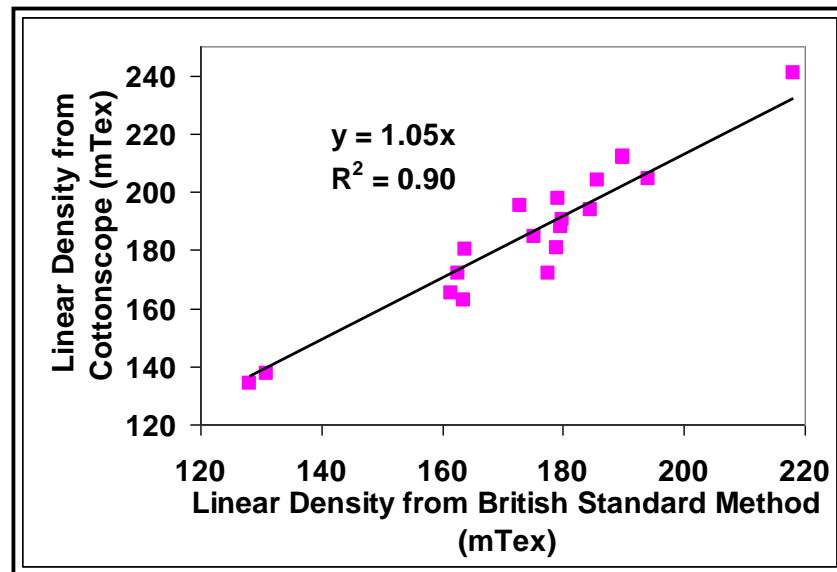


Figure 4. Results from Prof Hequet illustrating the accuracy of the Cottonscope fibre lineal density (fineness) data for a broad range of cottons.

BSC Electronics made a deliberate choice to use 1 mm snippets in the Cottonscope as this significantly enhances the dispersion of the snippets in the instrument. Currently 1 mm snippets are prepared using a guillotine. Further work is required to improve the specimen preparation technique in terms of sample and preparation time and to link the test to higher volume test methods, i.e. to the HVI.

Currently five Cottonscope instruments have been bought or are being used on approval before buying. Cottonscope instruments are located at CMSE Belmont, CPI Narrabri, the USDA ARS SRRC New Orleans LA, Texas Tech University Lubbock TX and Dai Chung Textiles Ltd., Guangdong (owned by Central Textiles Hong Kong).

With the limited resources available for the project, market support for Cottonscope (Objective 2) has focussed on the technical support as highlighted above plus a number of conference, technical and trade presentations. A number of scientific papers on Cottonscan have been completed and published during the year as well as an important conference presentation at the US Beltwide Conference in January 2011 (see list of publications below).

A number of spinning trials have been undertaken in China in conjunction with another project (Cottonspec). These studies have confirmed, as expected, that the number of fibres in the yarn cross-section as calculated from the fibre linear density measurement is an important parameter in determining yarn quality (eg yarn evenness). Further details of these studies will be reported under the Cottonspec project.

3. Extension

Over the twelve months of this project a number of important industry presentations of Cottonscope have occurred as follows:

- ITMA (Asia), Shanghai, China, June 2010
- Australian Cotton Conference, Gold Coast, Australia, August 2010
- CCC CRC Science Forum, Narrabri, Australia, October 2010
- Cottonspec partner mills, Chongqing, Shandong, Guangzhou and Hong Kong, China, December 2010
- Beltwide Cotton Conferences, Atlanta GA, USA, January 2011
- ACSA, Sydney, Australia, March 2011

4. Publications

(a) Scientific Journal Articles (externally peer reviewed)

1. Abbott, A. M., Hequet, E. F., Higgerson, G. J., Lucas, S. R., Naylor, G. R. S., Purmalis, M. M and Thibodeaux, D. P., (2011), Performance of the Cottonscan instrument for measuring the average fiber linear density (fineness) of cotton lint samples, *Textile Res. J.*, **81**(1), 94-100.
2. Abbott, A.M., Higgerson, G.J., Lucas, S.R., and Naylor, G.R.S. (2011) An Upgraded Cottonscan™ Instrument for Measuring the Average Fiber Linear Density (Fineness) of Cotton Lint Samples. *Text. Res. J.* **81**(7), 683-689, 2011.
3. Abbott, A.M., Hequet, E.F., Higgerson, G.J., Lucas, S.R., Naylor, G.R.S., and Thibodeaux, D.P. (2011) Precision of the Upgraded Cottonscan™ Instrument for Measuring the Average Fiber Linear Density (Fineness) of Cotton Lint Samples. *Text. Res. J.* (in press).

(b) Conference

4. Naylor, G. R. S., Gordon, S. G., Brims, M. and Hwang, H., (2011), Cottonscope – Rapid, independent and simultaneous measurement of both cotton fiber linear density (fineness) and maturity. *Proc. Beltwide Cotton Conference*, Atlanta GA, USA, pp1278-1281.

(c) Other (industry journals/magazines)

5. Bange, M., Constable, G., Gordon, S., Long, R., Naylor, G. and van der Sluijs, M. Pre-sowing Considerations to Preserve Fibre Quality. *The Australian Cotton Grower*, **31**(3), 12-16, June-July, 2010.
6. Bange, M., Constable, G., Gordon, S., Long, L., Naylor, G., and van der Sluijs, M., In-season Considerations to Preserve Fibre Quality. *The Australian Cotton Grower*, **31**(7), 38-41, Dec 2010-Jan 2011.

7. Naylor, G. R. S., Yang, S., Gordon, S. G., Brims, M. and Hwang, H., Cottonscope – separate measurement of cotton fibre fineness and maturity. *The Australian Cotton Grower*, **32**(4), 36-40, Aug-Sept 2011.
8. Naylor, G. R. S., Yang, S., Gordon, S. G., Brims, M. and Hwang, H., Cottonscope: Advantages in measuring cotton fibre fineness and maturity separately, *Textile Asia*, **42**(6), 27-29, July 2011.
9. Naylor, G. R. S., Yang, S., Gordon, S. G., Brims, M. and Hwang, H., Cottonscope: Advantages in measuring cotton fibre fineness and maturity separately, *Melliand International*, Sep-Oct 2011 (in press).

Electronic copies of the referred journal publications form part of this report and are supplied as separate documents. Copies of the other publications are available on request.

Part 4 – Final Report Executive Summary

One aspect of the desire to improve the quality of the Australian cotton crop is to introduce new fibre quality instrumentation to supplement the current Micronaire measurement. In previous CRDC funded projects, CSIRO has developed the Cottonscan instrumentation to directly measure the average fibre fineness or linear density of a cotton sample. Recently BSC Electronics have been licensed to commercialise the Cottonscan technology by intergrating both the Cottonscan and SiroMat technologies into an updated version of their commercailly available Cottonscope instrument, i.e Cottonscope Mark 2.

This one year small project was designed to enable CSIRO to provide, as required, technical and technical-marketing support to BSC Electronics during the technology transfer phase and early commercialisation of the Cottonscan/Cottonscope technology.

The project has been successful. Trials comparing Cottonscope test results with reference cross-section test data show good, clear relationships. Importantly the project has successfully resolved an important technical issue with the precision of the Cottonscope data which had potential, if not resolved, to significantly impact negatively on the future of the technology.

Strategically a number of scientific papers, technical reports and trade presentations have been prepared and presented as technical marketing support for the technology.

Finally, Cottonscope instruments are now located and operating at CSIRO in Belmont and Narrabri; the USDA in New Orleans, USA; Texas Tech University in Lubbock TX, USA; and Dai Chung Textiles Ltd., Guangdong, China.