If you are participating in the presentations this year, please provide a written report and a copy of your final report presentation by 31 October. If not, please provide a written report by 30 September.

Part 1 - Summary Details

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

CRDC Project Number: **TFT 00004**

Project Title: Commercialisation of Cottonscan Part 2

Project Commencement Date: 1/07/2008 **Project Completion Date:** 30/06/2010

CRDC Program: 6. Value Chain

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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 Mircronaire measurement. In previous CRDC funded projects, CSIRO has been developing the Cottonscan instrumentation to directly measure the average fibre fineness or linear density of a cotton sample. Further, the Cottonscan instrument utilises this linear density value in combination with the Micronaire value to calculate the average fibre maturity of the sample. The instrument has been designed to operate at commercial speeds ie to be compatable with HVI measurements. These two new fibre quality measures, namely average fibre linear density (fineness) and average fibre maturity are of great interest to spinners as they affect both the efficiency of the spinning mill and also the quality of the end product.

2. Objectives and Results

All objectives have been achieved. A brief summary is given below.

Objective 1: Assessment of the value of the technology to the spinner.

Spinning trials were conducted in two major Chinese spinning mills which clearly demonstrated that Cottonscan data can add value for the spinner. For example yarn evenness is a key yarn quality parameter and Table 1 summaries the results from one mill for a range of different yarns. On a theoretical basis it is expected that yarn evenness is affected by the number of fibres in the yarn cross-section. The table illustrates that in a single parameter fit of the measured yarn evenness to the number of fibres in the yarn cross-section, using the Cottonscan linear density value to calculate 'n', the number of fibres in the yarn cross-section improves the R-squared value from 65% to 73% compared to the current practice of using the HVI data. This data is also shown graphically in Figure 1. The data in Figure 1 is particularly pleasing particularly given that it is known that other parameters not controlled in these trials (eg fibre length) are also known to contribute to yarn evenness.

Table 1.

Predictor:	HVI Mic 'n'	Cottonscan 'n'
p	0.00	0.00
R^2 (%)	65%	73%

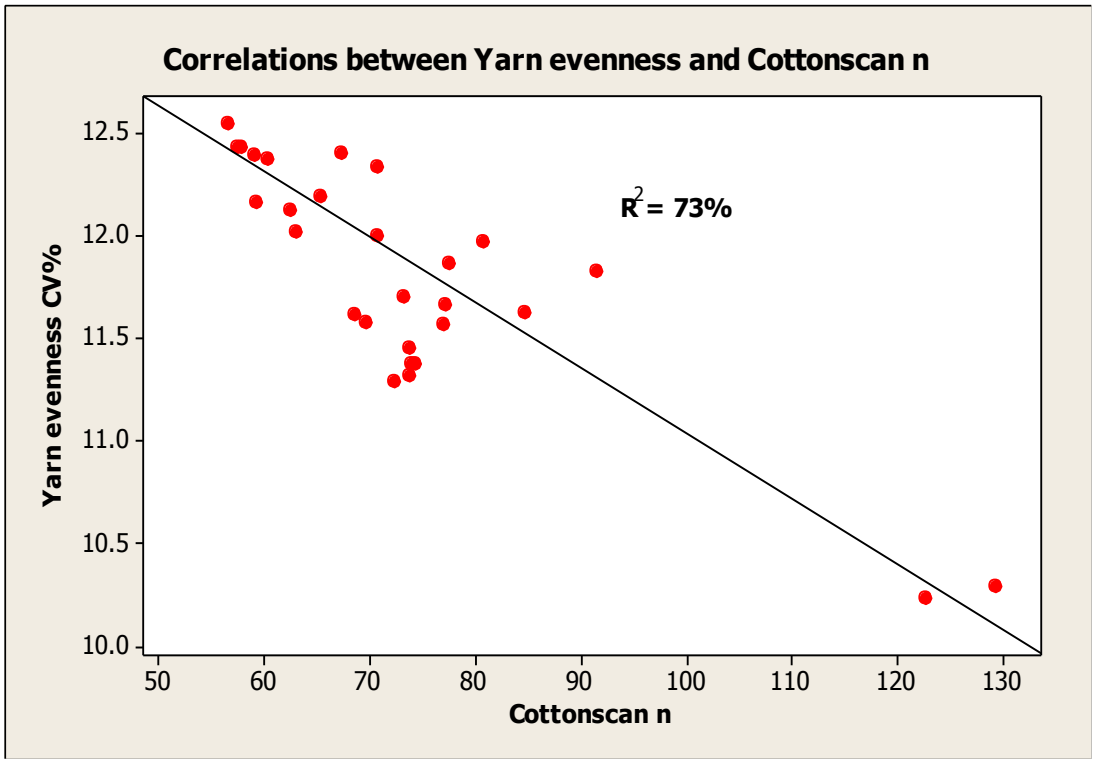

Figure 1. The relationship between yarn evenness and the number of fibres in the yarn cross-section derived from Cottonscan measurements for commercial spinning data from a major Chinese spinning mill.

Objective 2: Assessment of the value of the technology to the Australian merchant community.

An extended trial was undertaken by placing an upgraded Cottonscan instrument with a commercial Classing House for three months. During this time approximately 11,000 samples were measured. Figure 2 summarises the results. It is believed that QC measured a wide range of samples.

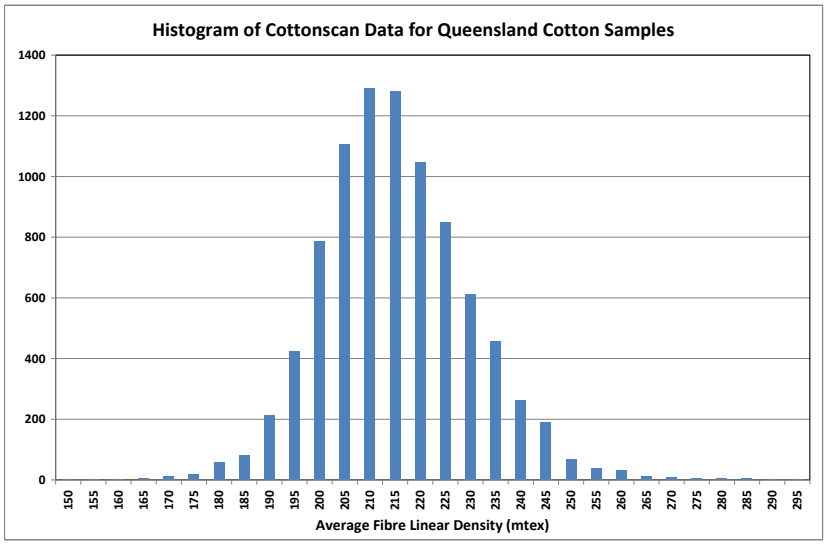

Figure 2. Summary of data from extended trial at Queensland Cotton (n=11,000)

Feedback from QC indicated that the instrument was operator friendly and that on average 47 tests per hour were completed. It was noted that this was a significant improvement achieved in previous trials with an earlier model however they were looking for a test rate of 110 tests per hour to match HVI testing. (It is noted that the measurement module of commercial instrument now available from Cottonscope Ltd meets this requirement. The guillotine based snippet preparation module currently being used with the Cottonscope needs further development to meet this requirement.) The classing house however continue to question the commercial value of the data and it is clear that data similar to that collected in Objective 1 will be key to the commercial success of the technology.

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Recommendation 1: As noted above, the Cottonscope requires an improved sample preparation module. The snippet size used by the Cottonscope is smaller than that used by the Cottonscan rapid mini-core device. It is recommended that the role of snippet length on the measurement and the development of an adequate user-friendly snippet preparation device be addressed as a priority as part of ongoing technical/market support to Cottonscope.

Recommendation 2: As noted above, the commercial success of Cottonscan/Cottonscope will require 'pull' from Spinning mills requesting Cottonscan data. It is recommended that further strategically placed spinning trials using Cottonscan/Cottonscope should be undertaken as an integrated marketing approach to spinning mills to generate this commercial demand for Cottonscan/Cottonscope data.

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Objective 3: Collaborate with US laboratories to obtain additional information on the value of the technology to the spinner**.**

Throughout the two years of this project we have maintained a close collaborative relationship with the USDA Cotton Quality Laboratory in Clemson South Carolina and also Texas Tech University in Lubbock Texas. These are the two leading US laboratories involved in cotton fibre quality measurement and research. Both laboratories have Cottonscan instruments and have been providing valuable feedback on the technical performance of the instrument, and have participated in inter-laboratory trials of the technology. Dr Devron Thibodeaux at USDA Clemson has also been undertaking research into correlating yarn quality with a range of fibre quality measures. His research in this area is ongoing and he is including Cottonscan data in this work.

It is noted that an important route to market in the original business plan for Cottonscan was via international validation of the technology by the ITMF Cotton Quality Measurements Task Force leading to incorporation of the technology into the HVI suite of instruments manufactured by Uster. The support of the two international/US collaborators was critical to this strategy. The business plan for Cottonscan has evolved since this time and an initial commercialisation within Australia is being pursued using an Australian company. The ongoing support and technical validation of the technology by independent international bodies (eg US collaborators and ITMF) remain as critical elements for the broader commercialisation strategy of engaging the international cotton community.

Objective 4: Instrument technical performance**.**

Five instruments were upgraded (three at CSIRO, one at Texas Tech University and one at USDA (Clemson). An extensive inter-laboratory trial of the five instruments was undertaken confirming that the upgrading to improve the measurement time has not affected the performance of the instrument. (For example see References 4, 9 and 11.)

Objective 5: Linkages with other post-harvest projects**.**

The upgraded Cottonscan instrument has been used widely by a range of CRDC and CRC funded projects at CSIRO. This includes the 'Premium Blends' initiative, the 'Nep Survey' project, the Cottonspec project and the 'Linking Farming Systems' project. (For example see References 6, and 10.)

For example, the Cottonscan instrument has been used to measure the fibre linear density and fibre maturity values of approximately 3000 samples over three years of the Australian harvest as part of the CRDC Nep Survey project. The reduced linear density the 350B variety is clearly apparent in these data sets. The outcomes from this project have been reported in detail elsewhere.

Objective 6: Assessment of the opportunity of the technology to positively differentiate Australian cotton**.**

This objective relates to an industry concern that introduction of Cottonscan may highlight a deficiency in this quality aspect of Australian cotton compared to other cottons. As part of the collaboration with Chinese spinning mills, samples of growths from different countries were obtained and measured using Cottonscan. Data on cottons from our major potential competitors indicates a very similar range of average fibre linear density values compared to those observed for Australian cotton. Thus there is no data to suggest that Australian cotton will be negatively impacted in the market by the introduction of this technology.

3. Other Major Achievements:

(a) Commercialisation of the Cottonscan technology has advanced significantly with CSIRO currently finalising a license with BSC Electronics. BSC have produced a prototype instrument combining the Siromat and Cottonscan technologies into one instrument, The Cottonscope Mark 2. The measurement time has been further reduced to approximately 20 seconds (excluding the snippet preparation module mentioned above). A paper on this 'combined' instrument was presented at the ITMF Meeting in March 2010, and this instrument has been displayed at ITMA Asia in June 2010 and at the Australian Cotton Conference in August 2010. Early trials with the prototype commercial instrument are very encouraging. For example Figure 3 demonstrates the good correlation between Cottonscan and Cottonscope data.

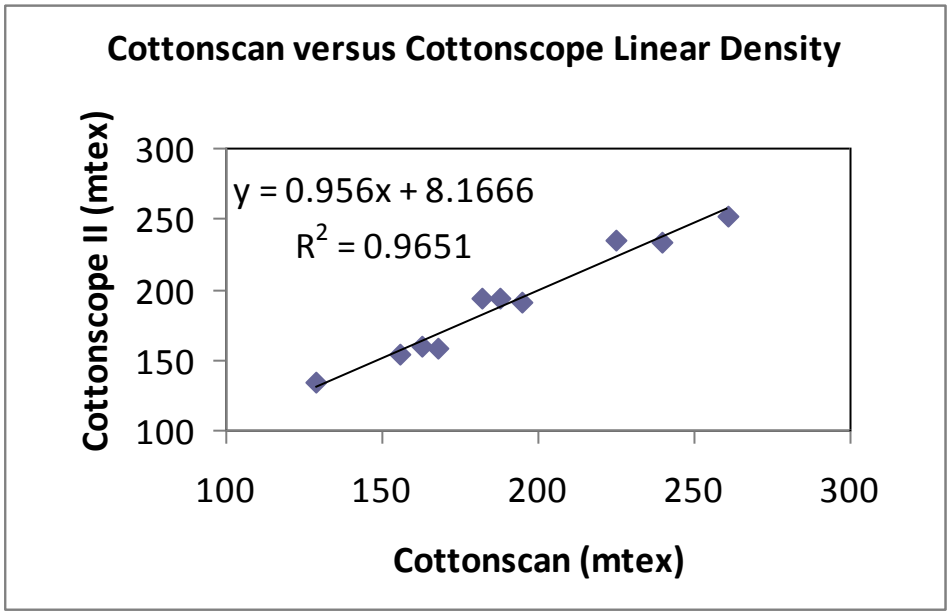

Figure 3. Comparison of Cottonscope and Cottonscan data on a set of cotton samples covering a wide range of average fibre linear density values.

(b) During this period a number of significant papers have been prepared and published covering the major scientific/technical aspects of the Cottonscan technology. The list below also includes papers co-authored by the project team members which have utilised Cottonscan data and/or concepts relating to Cottonscan.

1. Naylor, G.R.S., Gordon, S.G., Long, R.L., and van der Sluijs, M.H.J. 'The Role of Long Staple Upland and Pima Cotton – Opportunities for Medium and ELS Types'. Proc. 14th Aust. Cotton Conference, Aug 2008.

2. Abbott, A.M., Higgerson, G.J., Lucas, S.R., and G.R.S. Naylor. The Performance of an Upgraded Cottonscan for Rapid Measurement of Fiber Fineness. Proc. Beltwide Cotton Quality Conference, 1185-1190, 2009.

3. Gordon, S.G., Long, R.L., and Naylor, G.R.S. The Measurement of Cotton Fibre Linear Density and Maturity and its Potential Value to Textile Processing. Proc. Textile Inst. 'Natural Fibres in Australasia Conference', NZ, 2009.

4. Bange, M.P., Constable, G.A., Gordon, S.G., Long, R.L., Naylor, G.R.S. and van der Sluijs, M.H.J. 'Fibrepak: From Seeds to Good Shirts, A Guide to Improving Australian Cotton Fibre Quality', published by the Cotton Catchment Communities Cooperative Research Centre, Australia, 2009.

5. Abbott, A.M., Higgerson, G.J., Long, R.L., Lucas, S.R., Naylor, G.R.S., C.R. Tischler and Purmalis, M.M. An Instrument for Determining the Average Fiber

Linear Density (Fineness) of Cotton Lint Samples. Text. Res. J. **80**(9), 822-833, 2010.

6. Long, R.L., Bange, M.P., Gordon, S.G., van der Sluijs, M.H.J., Naylor, G.R.S. and Constable, G.A. Fibre Quality and Textile Performance of some Australian Cotton Genotypes. Crop Science **50**(4), 1509-1518, July-Aug 2010.

7. Abbott, A.M., Higgerson, G.J., Hequet, E.F., Lucas, S.R., Naylor, G.R.S., and Thibodeaux, D.P. An Inter-Laboratory Trial of Upgraded Cottonscan™ Instruments for Rapid Determination of Average Fiber Linear Density (Fineness). Proc. Beltwide Cotton Conferences, 1424-1429, 2010.

8. Abbott, A.M., Hequet, E.F., Naylor, G.R.S., Higgerson, G.J., Lucas, S.R., Purmalis, M.M. and Thibodeaux, D.P. Performance of the Cottonscan™ Instrument for Measuring the Average Fiber Linear Density (Fineness) of Cotton Lint Samples. Text. Res. J. (in press, 2010).

9. Abbott, A.M., Higgerson, G.J., Lucas, S.R., and Naylor, G.R.S. An Upgraded Cottonscan™ Instrument for Measuring the Average Fiber Linear Density (Fineness) of Cotton Lint Samples. Text. Res. J. (in press, 2010).

10. 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.

11. Abbott, A.M., Hequet, E.F., Higgerson, G.J., Lucas, S.R., Naylor, G.R.S., and Thibodeaux, D.P. Precision of the Upgraded Cottonscan™ Instrument for Measuring the Average Fiber Linear Density (Fineness) of Cotton Lint Samples. (in preparation).

Electronic copies of the publications (excluding Nos 4 and 11) form part of this report and are supplied as separate documents.

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.

One aspect of the desire to improve the quality of the Australian cotton crop is to introduce new fibre quality imstrumentation to supplement the current Mircronaire measurement. In

previous CRDC funded projects, CSIRO has been developing the Cottonscan instrumentation to directly measure the average fibre fineness or linear density of a cotton sample.

During the two year period coverd by the project, in response to industry feedback, the Cottonscan technology has been significaintly upgraded to improve the measurment time. The five existing Cottonscan instruments (Three at CSIRO, and two in research laboratories in the US) were upgraded. Comparative trials demonstrated that the performance of the instrument was not compromised by the technical upgrade.

A number of spining trial in commercial Chinese mills demonstrated that the data available from the Cottonscan measurement is valuable to the spinner in its superior ability compared to current measurements (HVI micronaire), to predict yarn quality.

Finally, during this period a commercial license to manufacture and sell Cottonscan instruments has been granted to an Australian company. The company, Cottonscope Ltd, have displayed prototype commericial instruments at a number of international trade fairs and conferences.