



FINAL REPORT

Part 1 - Summary Details

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

Cotton CRC Project Number: 1.05.08 (was 1.4.01)

Project Title: New Generation Scouting Tools

Project Commencement Date: 01/01/2006 **Project Completion Date:** 30/06/2008

CRC Program: The Adoption

Part 2 – Contact Details

Administrator: Ms Jo Cain (Administration Manager)

Organisation: CSIRO Plant Industry

Postal Address: Locked Bag 59 Narrabri NSW 2390

Ph: 0267991500 **Fax:** 0267931186 **E-mail:** Jo.Cain.csiro.au

Principal Researchers: Dr M. Bange, Ms. S Deutscher, Mr D. Linsley, Mr S. Johnston, Mr. D. Richards, Ms L. Clancy

Organisation: CSIRO

Postal Address: Locked Bag 59 Narrabri NSW 2390

Ph: 0267991500 **Fax:** 0267931186 **E-mail:** Michael.Bange@csiro.au

Supervisor: Dr Michael Bange (Principal Research Scientist)

Organisation: Locked Bag 59 Narrabri NSW 2390

Postal Address: Locked Bag 59 Narrabri NSW 2390

Ph: 0267991500 **Fax:** 0267931186 **E-mail:** Michael.Bange@csiro.au

Signature of Research Provider Representative: _____

Background

Cotton growers continue to face increasing pressure to manage resources more cost effectively and to be more accountable for the impact their decisions have on the surrounding environment. In addition to this there are significant changes in technology such as new transgenics (Bollgard II and Roundup Ready) and an increasing need to improve fibre quality and water use efficiency. There is a dedicated commitment by research in the industry (CSIRO, CRDC and CCC CRC) to develop tools and techniques for decision making from the best information available from research to help all sectors of the industry to meet crop production, social and environmental imperatives. The Australian cotton industry were considered world leaders in developing and using advanced decision tools to optimise crop management to improve profitability and reduce environmental impacts.

Computerised decision support in the Australian cotton industry was a well recognised and proven means of providing responsible and useful information to assist with crop management decisions. At the time of inception of the project together with Telstra Country Wide Ltd., an original CRC supporting partner, we had a unique opportunity to develop and promote innovative decision support solutions for cotton production. We intended to use new technologies such as the high speed wireless broadband technologies and recent advances in capabilities of electronic handheld devices (eg. linkages with the internet and voice recognition) coupled with existing and new software developed by the cotton management support systems team in Narrabri.

Aims and Objectives

The focus of the Cotton Management Support Systems Team was to take a leading role in ensuring that good science is passed on easily and effectively to the industry to assist with complex decisions. Some outcomes of science can be delivered affectively via written documents, but increasingly there is a demand for more interactive information delivery that enables growers to tailor the information to their needs and to rapidly obtain, up-to-date information. The objectives of this project were to:

- Identify new scouting and information collecting tools and decision support systems for the Australian cotton industry that utilise wireless internet technologies and advanced handheld devices
- Develop new decision support tools and explore means of commercialising these to a wider agribusiness community.
- Demonstrate real commitment to developing regional solutions using the latest technology and research from the CCC CRC and Telstra.

Outcomes/outputs:

- Conduct a scoping study on the feasibility and value of high speed wireless technology and voice recognition using handheld devices for crop scouting, in field data collection, and decision support.
- Upgrade CottonLOGIC for handhelds, and enable other internet decision support (e.g. early season diagnosis) for use with broadband wireless technologies.
- Develop new software utilising wireless technologies and advanced electronic handheld devices.

Milestones that were to be achieved during the project

Date for achievement	Description of milestone or deliverable	Key Performance Indicator of Achievement	Achievement
Year 1	Undertake a scoping project identifying the capabilities of 1XRTT technologies and advanced handheld technologies for use in decision support in the Aus. Cotton Industry.	Submission of scoping document to CRC Management	✓
Year 1	Plan redevelopment of existing tools for use with 1XRTT technologies.	Software specifications developed and available for review.	✓
Year 2	Successfully developed software for new versions of Palm operating systems and Pocket PC environments	CottonLOGIC software enabled on Pocket PC devices	✓ Partially as some CottonLOGIC web tools were developed for handhelds
Year 2	Identified new software tools for cotton decision support	New software development initiated	✓

Methods

The cotton management support systems team in Narrabri, in consultation with Telstra, sought to identify and develop decision support tools utilising wireless broadband and handheld technologies. Telstra provided 6 JasJam portable handheld devices and 1 notebook modem with broadband capabilities for testing and development purposes.

To undertake this project's activities we took the opportunity to attract young IT students to Narrabri and expose them to opportunities in IT that were available beyond capital cities. During the course of the project we employed Aman Dayal (Sydney University of Technology) and Jeremy Farr-Wharton (Griffith University). They worked at Narrabri for a period of six months each as part of their industrial experience programs for their computing science degrees.

To meet the aims and objectives of the project the following activities were proposed:

1. Develop a scoping document outlining current and future opportunities in industry data collection and decision support utilising wireless broadband internet access. The document also detailed: the extent of broadband coverage in cotton growing regions; the costs associated with use; and the hardware requirements.
2. Prepare a scoping document investigating the use of handheld and voice recognition for field data collection.
3. Produce documentation that outlines the development requirements for information and web tools delivered on internet enabled phones and handheld devices.
4. Produce a report that assesses the use of the handheld devices and broadband wireless network access in the cotton industry.
5. Develop new handheld enabled web tools for assisting with: information dissemination; data collection; and analysis.

Results

Both students completed the requirements of their industrial training at Narrabri and provided various detailed reports for this project (their reports are attached as appendices). Results of the project activities are briefly summarised below:

Wireless broadband and handheld technology for cotton decision support

In the early stages of this project we had access to only one handheld device with broadband capabilities thus limiting the extent of investigations and development opportunities. The reason for the delay was that Telstra was closing the CDMA network and replacing it with the Next G network. In the interim Aman Dayal prepared a comprehensive document titled 'Exploring Wireless Technology' where he documented an overview of the features of the broadband network capabilities and coverage (including that in cotton growing regions). He also summarised the hardware required and that available to access the broadband network. Some preliminary tests were conducted that showed that the speeds available over the network made development of decision support tools (that requires significant information transfer) feasible. Comprehensive details are contained in the report attached.

In the second phase of the project Telstra was able to provide 5 extra JasJam broadband wireless (Next G) capable handhelds. A user group was formed to provide feedback on the

useability of these devices for in-field use. Jeremy Farr-Wharton was involved in this part of the project and assisted in collecting feedback from the participants and report on the findings. The user group consisted of 2 consultants, 1 researcher, 1 grower, and 1 extension officer. There were also some existing users of these technologies invited to participate in the group. Some of the factors considered with the group were: adoption and use of the device, use of software installed on the handheld, preferred hardware features, current computer literacy, and overall computer use. A report written by Jeremy documented and summarised the survey and interview results from the focus group. Some of the key findings included:

- Results suggested a keen interest across the participants in accessing the web on the handhelds with the improved speeds made available through the Next G network. Access to handheld widgets was also seen as an opportunity. Members of the focus group reported being able to download web pages and browse the internet just as they would using a personal computer with an internet connection.
- Many of the features on the handhelds were not found useful, because they were not specific to the user's needs.
- Group members also suggested using two devices (a phone specific device and handheld specific device) in many instances in the field it was clearly beneficial to be able to be talking on a the mobile phone while accessing information on the handheld. This operation wasn't easily done on the spot with the one device.
- The findings also again highlighted the need for key design features for an in-field handheld device. User group participants highlighted the need for:
 - ruggedness and durability,
 - reliability of device operation,
 - a low weight to size ratio,
 - a longer battery life,
 - higher resolution and visibility of screen in direct sunlight,
 - a touch screen that can be operated by larger fingers and muddy instruments, and
 - have the ability to be waterproof/mud proof

The JasJam devices provided to them were reported to have some of these features but not all and as a consequence, the devices failed on several occasions and required an alternate device to be used. It was considered that the JasJam was a purpose built handheld design for the city office professional. For agribusiness there would be a need for additional design considerations.

- There were some concerns relating to the costs of accessing this technology (both phone and broadband access plan). At the time of the study in early 2008 there remained concerns relating to signal strength in the cotton growing areas in which the devices were used.

Specific information relating to this part of the project is contained in the report titled 'Next Generation Scouting Tools Project Phase 2 – Final Report for CSIRO & Cotton Catchment Communities CRC' contained in the appendices of this report. Overall the project benefited from the focus group feedback in contributing to the understanding of vital elements of handheld adoption in agriculture such as usability and accessibility of the devices. The report produced by Jeremy was provided to Telstra.

Speech recognition and handheld technologies

One of the key activities of this project was to consider the use of speech recognition capabilities as a mechanism for 'hands free' data collection in the field. Specifically we investigated the possibilities of its use in conjunction with handheld devices. Aman Dayal

produced a report documenting the current status of speech recognition in computing use as well as the potential use with handheld devices. His key findings were:

- Despite promotion of speech recognition with handheld devices, it was not in fact true speech recognition. It was identified that current handheld devices simply recorded voice files and these were transcribed at a later point in time on a personal computer when files had been transferred, and the appropriate software had been installed.
- There appeared to no current capability of handhelds to conduct true speech recognition. It was suggested that handhelds currently do not have the processing capabilities.
- IT consortiums are remaining vigilant in their efforts to develop solutions to improve speech recognition overall and still have the uses of mobile devices in their sites.

Specific technical details are contained in the report produced by Aman titled 'Speech Recognition on Handheld Devices' contained in the appendices of the report.

Developing a mobile website

As mentioned previously in this report there is significant opportunity for more information and the use of interactive web tools using handhelds given the improved wireless broadband network speeds offered by 'next G'. A component of this project was to investigate the requirements of developing a website or web tool for specific use on a handheld or mobile phone device. A key element of the investigation was to identify the differences in the development compared with standard web site development for personal computers. Aman Dayal completed this part of the project and documented his findings in the report titled 'Mobile Website Development' contained in the appendices of this report. Briefly his key tips for developing a mobile website were (including technical development issues):

Coding tips

- Use terse, efficient mark-ups.
- Avoid frames.
- Avoid pop-ups.
- Avoid using proprietary features, or use fallbacks.
- Specify image height and width.
- Use alternative text on images.
- Have fallbacks for JavaScript and dynamic effects.

Testing tips

- Test in Browser, in Small-Screen view.
- Test with graphics turned off.
- Test with JavaScript turned off.
- Test with no mouse.

Small-Screen design tips

- Design with document order in mind.
- Design the small-screen version for maximum readability.
- Only use images suited for a small screen, hide the rest.
- Be careful with the use of colours, font sizes, and alignment.

This work culminated in the development of the 'day degree calculator web tool' for smart phones and the mobile pest and beneficial guide that could be downloaded onto a handheld device. These tools will be discussed in more detail in the next section.

Software tools developed during project

During the course of the project both Aman and Jeremy were given the opportunity to undertake some software development utilising the information that they gathered in their reports. It was also an opportunity for them to develop new software development skills working alongside other developers of the cotton management support systems team. Developing these tools enabled the students to recognise limitations, and document opportunities and specifications needed for future developments for handheld technologies. Three tools relevant to this project were developed, they were:

- A 'day degree calculator' for smart phones and handhelds. This tool enables users of internet enabled mobile phones and handheld devices to enter their sowing date and a current date, and utilises the SILO patched point climate dataset available online to calculate day degrees (see Figure 1).
- A pest and beneficial guide for handhelds (see Figure 2). The tool is essentially a handheld version of the online pest and beneficial guide. This tool was developed to assess the design requirements needed to utilise information databases such as the online pest and beneficial guide on handhelds. It specifically identified the necessary development tools, as well as the specific design requirements of web pages for handheld devices.
- A prototype 'crop development' data collection tool (see Figure 3). The handheld crop development tool (CDT) was conceived to assist data collection in the field and transfer of information back to main server for analysis utilising the current online 'crop development tool'. The overall aim of this tool was to test data sharing capabilities between handhelds and online servers and to identify limitations for development, and develop specifications for future tools.



Figure 1: A screen shot of the mobile day degree calculator

Specifications of day degree calculator are contained in the report 'Mobile Website Development', the pest and beneficial guide in the document 'XXX', and the CDT prototype in the 'Next Generation Scouting Tools Project Phase 2 – Final Report for CSIRO & Cotton Catchment Communities CRC' attached to this report. All information will be used as background information for the development of future tools for both web and handheld development.

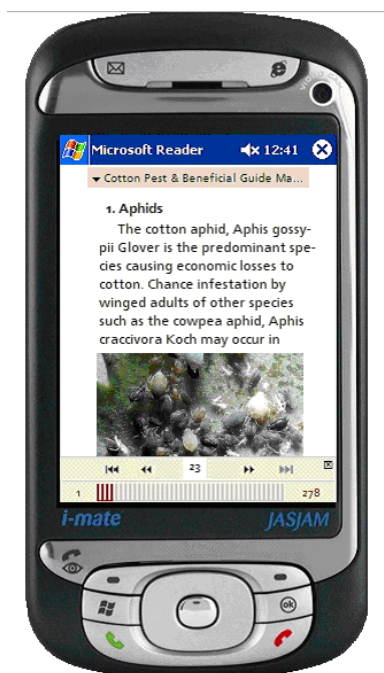


Figure 2; A screen shot of the pest and beneficial guide for handhelds



Figure 3: A screen shot of the crop development tool for handhelds.

Publications, Presentations and Online Resources

Dayal, A., Deutscher, S.D., Bange, M.P. (2007). New generation scouting tools. The Australian Cottongrower. 24(3). pp. 23-24.

Aman Dayal and Jeremy Farr-Wharton both gave a seminar at ACRI.

Final Report Executive Summary

Project Title: New Generation Scouting Tools

Principal Researchers: Dr M. Bange, Ms. S Deutscher, Mr D. Linsley, Mr S. Johnston, Mr. D. Richards, Ms L. Clancy

Students: Aman Dayal, Jeremy Farr-Wharton

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- A scoping document outlining current and future opportunities in industry data collection and decision support utilising wireless broadband internet access was completed. The document also detailed: the extent of broadband coverage in cotton growing regions; the costs associated with use; and the hardware requirements.
- A scoping document investigating the use of handheld and voice recognition for field data collection was completed.
- Production of document that outlines the development requirements for information and web tools delivered on internet enabled phones and handheld devices.
- Produced a report that assesses the use of the handheld devices and broadband wireless network access in the cotton industry.
- Developed new handheld enabled web tools for assisting with: information dissemination; data collection; and analysis.

Both students completed the requirements of their industrial training at Narrabri and provided various detailed reports for this project (their reports are available on request from the CRC). Information generated from this project has provided crucial insights for current and future direction of web and handheld extension tools being developed by CSIRO and the Cotton CRC.