



PRELIMINARY FINAL REPORT

(due on completion of project)

Part 1 - Summary Details

Cotton CRC Project Number: 5.07.01

Project Title: Schedule 1.1 Integrating NRM into Irrigated Cotton Farming Systems in the Namoi Catchment

Project Commencement Date: 01/07/09 **Project Completion Date:** 30/06/12

Cotton CRC Program: The Catchment

Part 2 – Contact Details

Administrator: Kym Orman

Organisation: Cotton CRC

Postal Address: Locked Bag 1001 Narrabri NSW 2390

Ph: 02 6799 1592 **Fax:** 02 6793 1171 **E-mail:** kym.orman@cottoncrc.org.au

Principal Researcher: Peter Verwey

Organisation: Cotton CRC

Postal Address: Locked Bag 1001, Narrabri NSW 230

Ph: 02 6799 2476 **Fax:** 02 6793 1171 **E-mail:** peter.verwey@cottoncrc.org.au

Supervisor: Jane Macfarlane

Organisation: Cotton CRC

Postal Address: Locked Bag 1001 Narrabri NSW 2390

Ph: 02 6799 2402 **Fax:** 02 6793 1171 **E-mail:** jane.macfarlane@cottoncrc.org.au

Signature of Research Provider Representative: _____

Part 3 – IP and In-kind

Since the November 2011 6 monthly report, please outline the additional IP and in-kind that has been generated in the project.

1. Intellectual Property developed within the project.

(What Know-How (New Ideas), Confidential Information, Copyright, Patents or Provisional Patents, Registered Design, Trade Secrets or Trademarks have come from this project to date)

No new know-how or intellectual property has been developed within the project since the November 2011 6 month report.

2. Project In-kind

(Grower Consultant Ginner or Grower Group In-Kind: Are you conducting part of your project on a cotton farm or in conjunction with an in-kind contribution from a consultant, ginner or Grower Group? Please supply group name - Number of persons involved per week and the number of hours per week involved.)

In-kind support has been provided by:

- Namoi CMA staff
 - Glenn Bailey, member of Steering Committee and Project Team
 - Stacey Vogel, member of Steering Committee and Catchment Team
 - Leith Hawkins, GIS support
- Namoi Cotton Growers
 - Phil Firth, member of Steering Committee
- Catchment Team members
 - Sally Dickinson, Landcare
 - Tanya Slack-Smith, Landcare
 - Sandra Deutscher, CSIRO
- NSW DPI
 - Rod Jackson
- Cotton Grower Groups
 - Lower Namoi CGA
 - Upper Namoi CGA
 - Walgett CGA
- Cotton Australia
 - Ken Flower
 - Rebecca Rogan
 - Jim Wark
 - Allison Davis, ex Cotton Australia myBMP Officer
- CRDC
 - Rohan Boehm
- members of D&D team

Part 4 – Final Report Guide (due at end date of project or 31st May 2012)

(The points below are to be used as a guideline when completing your final report.)

Background

Outline the background to the project.

Since 2005, the Cotton Catchment Communities CRC (Cotton CRC) and the Namoi Catchment Management Authority (Namoi CMA) have had a partnership to work with cotton growers within the Namoi valley as well as other government organisations, industry bodies, research organisations and the general community to deliver natural resource management outcomes in line with the Namoi Catchment Action Plan (CAP). The Namoi CMA and Cotton CRC worked collaboratively with research organisations to provide the industry and agency extension staff and growers with the best available information to make land management decisions.

Under a signed umbrella agreement, the 'Schedule 1.1 Integrating NRM into Irrigated Cotton farming Systems in the Namoi Catchment' project is a part of this major collaboration between the Cotton CRC and the Namoi CMA. The project ran for three years, commencing in July 2009 and finishing at the end of June 2012.

Kate Lightfoot started in the role of cotton catchment officer at the commencement of the project, continuing the work she had done in her previous project, 'Schedule 1.2 Supporting the adoption of Best Management Practice (BMP) in the cotton industry in the Namoi Catchment'. Kate left this project in September 2009 and her final report can be found on the Cotton CRC website.

Peter Verwey started in the role of cotton catchment officer on the 17th November 2009 and continued in the role until the end of the project. This report documents the work that Peter has done in this project.

Objectives

List the project objectives and the extent to which these have been achieved.

The Cotton CRC in partnership with the Namoi CMA employed a cotton catchment officer for a period of three years to meet the following three main objectives:

- To foster better natural resource management outcomes for the Namoi Catchment through the integration of Cotton CRC's NRM adoption targets and the Namoi CMA Catchment and Management targets as defined in the Catchment Action Plan.
- To develop strategies and tools to assist the Namoi CMA and Cotton CRC in implementing NRM best practice within irrigated cotton farming systems in the Namoi Catchment.
- To provide technical support to irrigators implementing best practice in NRM activities (as can be defined by the Australian Cotton Industry's BMP 'Natural Assets' module), in the Namoi Catchment.

Through this project there has been an increase in the number of growers integrating natural resource management (NRM) into their irrigated farming systems, together with an improvement with the NRM skills and knowledge of growers in the Namoi. Through regular interaction with the three Namoi cotton grower associations (CGA) Namoi growers have increased their awareness of the Cotton CRC NRM adoption targets and also the Namoi CMA Catchment and Management targets.

The following are specific targets used to monitor the progress of the project:

- 50% of cotton growing hectares in the Namoi regularly monitoring groundwater quality.
- 70% of cotton growing hectares in the Namoi with an up-to-date property plan – 30 property plan maps completed.
- 5% of riparian area in cotton growing area managed for riparian values.
- Focused NRM publications developed and distributed – 10 publications produced and distributed.
- Training / knowledge workshops developed – 12 workshops undertaken.
- Attendance at relevant grower and NRM meetings.
- Continue to support the Cotton Industry BMP program – technical support given to growers.

- Extension advice on the implementation of NRM activities provided – number of visits and activities.

The table below (Table 1) shows the progress towards meeting the project targets at the conclusion of May 2012.

Deliverables	Target	Achieved
50% of cotton growing hectares in the Namoi regularly monitoring groundwater quality	50% of ha	23% of Namoi farms current best practice (every year) > 65% of Namoi farms regular (every few years)
70% of cotton growing hectares in the Namoi with an up-to-date property plan (30 property plan maps completed)	70% of ha	52% of ha
	30 plans	64 myBMP Namoi farm assessments 16 level 2 practices 14% (9) have 100% of practices 30% (19) have > 75% 42% (27) have > 50% Another 23% (15) have verbally confirmed they have property maps but not yet in the myBMP system, leading to: 66% (42) have > 50%
5% of riparian area in cotton growing area managed for riparian values	5% of riparian area	18.9% of riparian area
Focused NRM publications developed and distributed	10 publications	16 publications
Training / knowledge workshops developed and undertaken	12 workshops	17 workshops

Table 1: Final update on Schedule 1.1 deliverables, May 2012.

Methods

Detail the methodology and justify the methodology used. Include any discoveries in methods that may benefit other related research.

As the catchment officer I have worked with the Namoi cotton growers to promote natural resource management outcomes both on farm and on a catchment scale.

To achieve the project objectives, specific measurable targets were worked towards:

- 50% of cotton growing hectares in the Namoi regularly monitoring groundwater quality.
- 70% of cotton growing hectares in the Namoi with an up-to-date property plan – 30 property plan maps completed.
- 5% of riparian area in cotton growing area managed for riparian values.

- Focused NRM publications developed and distributed – 10 publications produced and distributed.
- Training / knowledge workshops developed – 12 workshops undertaken.
- Attendance at relevant grower and NRM meetings.
- Continue to support the Cotton Industry BMP program – technical support given to growers.
- Extension advice on the implementation of NRM activities provided – number of visits and activities.

Determining the extent of cotton hectares

Two of the main targets for this project involved benchmarks against the number of cotton growing hectares in the Namoi. This presented some difficulty as there is no definitive value for this within the industry. There are figures available that approximate the total number of sown hectares of cotton in any season per valley. However, the targets are farm based targets and therefore the appropriate measure is to use whole-of-farm hectares, not green hectares. This required some spatial data analysis and a source of known cotton growing farms.

To determine the extent of cotton growing hectares in the Namoi Catchment and to use that with a spatial component I created a GIS shapefile containing properties that were known to grow cotton. The properties were taken from the digital cadastral database (DCDB) layer supplied by the Namoi CMA. Using the 2009 Cotton Map data showing where cotton had been planted, as areas susceptible to 2,4-D spray drift, I manually digitised the Cotton Maps data into a custom shapefile. This was then intersected with the property shapefile and the DCDB properties that intersected with the cotton shapefile were extracted and exported into a new shapefile that forms the basis of the cotton hectares for the project targets.

The area of cotton grown varies between cotton growing seasons due to complex interactions between resource conditions, farm management, and market factors. The figure used for benchmarking in this report was taken from a return to high levels of cotton production from previous drought years with much lower production.

Cotton hectares may not be the best measure for benchmarking cotton deliverables. A better unit could be percentage of farms, which is much easier to measure and quantify. The industry also does a lot of its reporting using number of bales produced. This could be used if the number of bales produced at each participating farm could be determined.

50% of cotton growing hectares in the Namoi regularly monitoring groundwater quality.

Two Groundwater Monitoring and Management workshops were conducted in the Upper and Lower Namoi valleys with presenters from multiple agencies including Namoi CMA, Cotton CRC, NSW DPI, UNSW Water Research Laboratories, and KLC Environmental. At each of these workshops cotton growers were encouraged to bring along a sample of water from their bore for on-site water quality testing. Growers were also given the opportunity to take back to the farm a Namoi CMA supplied salt kit so that they could continue to monitor their groundwater and surface water quality on the farm.

The workshops were followed up by an article in Spotlight magazine to further extend the messages delivered in the workshops.

Prior to the groundwater workshops, I conducted two water quality monitoring training workshops with cotton growers in the upper and lower Namoi valleys. Each of the attending growers was provided with a Namoi CMA supplied salt kit that includes basic instrumentation for conducting on-site water quality testing.

In 2011 a Cotton CRC phone survey asked cotton growers across the cotton industry questions including a section on groundwater and surface water monitoring. The results of this survey have been used to benchmark the uptake of regular groundwater water quality monitoring in the Namoi and other catchments. The relevant pages from this survey report are included in appendix 1 of this report and the results are presented and discussed later in this report.

A phone survey was conducted in early 2012 to determine how the Namoi CMA supplied salt kits were being used.

70% of cotton growing hectares in the Namoi with an up-to-date property plan – 30 property plan maps completed.

myBMP workshops

To achieve this target I adopted a novel approach to attracting cotton growers to attend workshops. Engaging cotton growers to attend dedicated property planning workshops proved unfruitful. After discussions with growers across the three CGAs it was decided to run a series of small workshops with a focus on providing a solid introduction to myBMP and to have each attending grower register on the system and start using myBMP while still at the workshop.

The myBMP introduction workshops that I facilitated across the Namoi catchment had a strong emphasis on the Natural Assets module and in particular the property planning practices. All workshop participants used the property planning section of Natural Assets as their first practical introduction to the myBMP assessment tool. As the technical support contact for these practices I was able to answer all queries relating to property planning during the workshop. One of the Key Areas in the Natural Assets module of myBMP is Property Planning. By starting growers in this key area, I was able to capture their progression towards having a property plan and use this data for achieving this target.

Growers are busy people. Securing grower time away from the farm is a challenge for any workshop organizer. The feedback I was given is that short sessions of around half a day were more manageable than full days or multiple days. Additionally, smaller workshop sizes were preferred to facilitate open conversations between workshop presenters and attendees, and also between the attendees themselves. The format I chose to employ was for a half day workshop of between 3 and 4 hours duration, with approximately 5 growers in attendance. The workshops were all held in close proximity to the attending growers, either in farm houses, or in local venues, such as the Breeza Community Hall, or the Walgett Sporties Club.

The real key to making these workshops achieve their goal was having a live internet connection and a laptop for every grower attending. Rather than a 'sit and listen' workshop, everyone was able to use the myBMP system 'live' and explore the system for themselves. This 'hands-on' approach proved very successful and succeeded in engaging the growers attending and many discussions were started on aspects of the system that would not have been started otherwise.

Following the success of these Namoi workshops, I have facilitated the same workshop format in the Gwydir and Central West catchments as well.

Other workshop opportunities

The Namoi CMA and Grazing BestPrac held a number of GPS and Property Planning workshops in the Namoi, two of which I attended and presented a session on the myBMP property planning requirements, making a direct link between the workshop content and current best management practices.

Future directions

In the closing stages of this project I worked with the myBMP Team to investigate ways to spatialise the myBMP system and to provide electronic mapping using GIS to all cotton growers through the myBMP website. Four software providers that have software solutions including GIS and farm management were considered. A recommendation has been made to the myBMP Team, and the successful software provider is currently developing the system which will be launched at the 2012 Australian Cotton Conference. The potential of such a system is huge. Once launched, the myBMP mapping system will be able to provide a confidential and private uniform farm mapping service to all cotton growers. Elements of these maps could be used for other industry purposes including populating CottonMap, a mapping system for preventing 2,4-D spray drift problems.

Verwey has been successful in his CRDC FRP application and is in negotiations with NSW DPI to host a 3 year project which will continue the work mentioned above, and supporting cotton growers to develop property plans. The project 'Demonstrating the Integration of Spatial Technologies and Best Practice in Australian Cotton Production' has the following aims:

- to develop spatial components for the cotton industry's research and development programs including the cotton industry's best management practices program (myBMP),
- to develop spatially aware mobile device applications, and
- to support myBMP.

5% of riparian area in cotton growing area managed for riparian values.

The current level of riparian area adjacent to cotton growing areas managed for riparian NRM values was benchmarked and found to exceed the target for this project. Using geographic information systems (GIS) and a layer of known cotton properties, the riparian areas adjacent to cotton farms were identified and a length of riparian section derived. There was a documented record of existing riparian works through the CMA with a length factor. This was calculated as a percentage of the riparian length to achieve the final result.

Growers were informed of Namoi CMA incentive program opportunities to partner with the CMA to conduct further riparian works.

At the myBMP introduction and training workshops attention was given to the importance of riparian management and the options that are available to growers.

The data to support these results comes from Cotton CRC project reports. Note that the area included in the results is only for Cotton CRC work and does not include Namoi CMA works, and as such will under represent the percentage of riparian area managed for NRM in the target area.

Focused NRM publications developed and distributed – 10 publications produced and distributed.

The publications produced were aimed to extend the reach of information provided through workshops and research outcomes of the Cotton CRC.

Formats included: a poster, a brochure, FAQ sheets, radio interviews, magazine articles, and conference presentations. The publications are listed later in this report and most are included as an appendix.

Training / knowledge workshops developed – 12 workshops undertaken.

Several training and knowledge workshops were run during the course of the project, including the following:

- General bore water quality monitoring training following Waterwatch procedures.
- Groundwater monitoring and management workshops.
- Introduction to myBMP and full training in the online system with a strong emphasis on the Natural Assets module.

The NRM skills and knowledge of Namoi cotton growers has also been improved through the publications listed later in this methodology. These include information on Namoi CMA/ Cotton CRC partnerships, groundwater monitoring, myBMP, and property planning.

As catchment officer I have also taken on the role of technical help contact for the majority of the practices listed in the myBMP Natural Assets module. This functions as the first point of contact for any queries relating to the practices in that module.

Attendance at relevant grower and NRM meetings.

Throughout the project I have worked closely with the three Namoi cotton grower associations (CGA's) and been an active member of their committees, regularly attending meetings. This has helped to develop strong communication channels between the CGA committee members and growers that they represent and my position representing the Cotton CRC and Namoi CMA.

Continue to support the Cotton Industry BMP program – technical support given to growers.

Throughout this project I have taken a very proactive approach to supporting myBMP, the new revised cotton industry BMP program. I have participated on information stands at the Cotton Conference and Cotton Field Days and have successfully run 13 myBMP introductory workshops across 3 catchments.

In addition I have participated in the training of myBMP auditors, providing expert input for the Natural Assets module section of their training.

As part of the Cotton CRC Catchment Team I have contributed to a review and gap analysis of the resources available within the Natural Assets module.

Each practice in myBMP has a contact for online requests for technical help against that practice. I have been appointed as the contact for many of the Natural Asset module practices.

The boundaries of this project are tied to the Namoi Catchment, however in the course of the project I have rolled out the myBMP workshops that have worked successfully in the Namoi into both the Gwydir and Central West catchments.

Extension advice on the implementation of NRM activities provided – number of visits and activities.

I have been able to provide extension advice on NRM activities through close collaboration with cotton grower associations, researchers, the Namoi CMA, Namoi schools, and being available for general enquiries.

Results

Detail and discuss the results for each objective including the statistical analysis of results.

50% of cotton growing hectares in the Namoi regularly monitoring groundwater quality.

Current best management practice suggests that groundwater quality should be measured at least every year, if not more often. The results for this target will show the percentage of growers that have adopted current best management practice for groundwater quality monitoring, and also the percentage that have not met best practice but do regularly monitor their groundwater (ie every few years).

- Approx. 23% of Namoi growers monitor according to best practice recommendations.
- Approx. 67% of Namoi growers monitor regularly at least every few years.

In response to the 'A survey of selected cotton farming practices and grower views across the industry: 2010-2011 season' survey, 66% of Upper Namoi growers and 70% of Lower Namoi and Walgett growers, answered that they regularly monitor their groundwater quality at least every few years.

The measure for this target was percentage of Namoi cotton hectares. This information was not available, so an alternative measure of percentage of growers has been used. The data for this target has been sourced from a 2011 Australian cotton industry survey as detailed in the next paragraph.

In 2011 GHD conducted a survey of the Australian cotton industry growers titled, 'A survey of selected cotton farming practices and grower views across the industry: 2010-2011 season'. This survey of cotton growing practices on the 2010-2011 season was undertaken for the Cotton CRC and CRDC. It sought to establish the adoption of key farming practices by cotton growers to inform review of the impact and adoption of past research and future planning of research directions. A section of the survey report including details of the sample size and number of respondents is available in Appendix 1.

Table 2 below shows the figures for each valley with percentages of growers who monitor: more than once a year; annually; every few years; only once; and never. The data for this target has been calculated from Figure 1, entered into Table 2, and then combined to give percentages for current best practice (blue in Table 2), and regular monitoring (green in Table 2).

	More than once a year	Annually	Every few years	Once	Never
Lower Namoi (inc. Walgett)	19	3.5	47.7	15.3	14.5
	22.5		47.7	15.3	14.5
	70.5			15.3	14.5
Upper Namoi	11.3	11.3	44.1	11.3	22
	22.6		44.1	11.3	22
	66.7			11.3	22

Table 2: Namoi frequency of groundwater monitoring calculated from Figure 1.

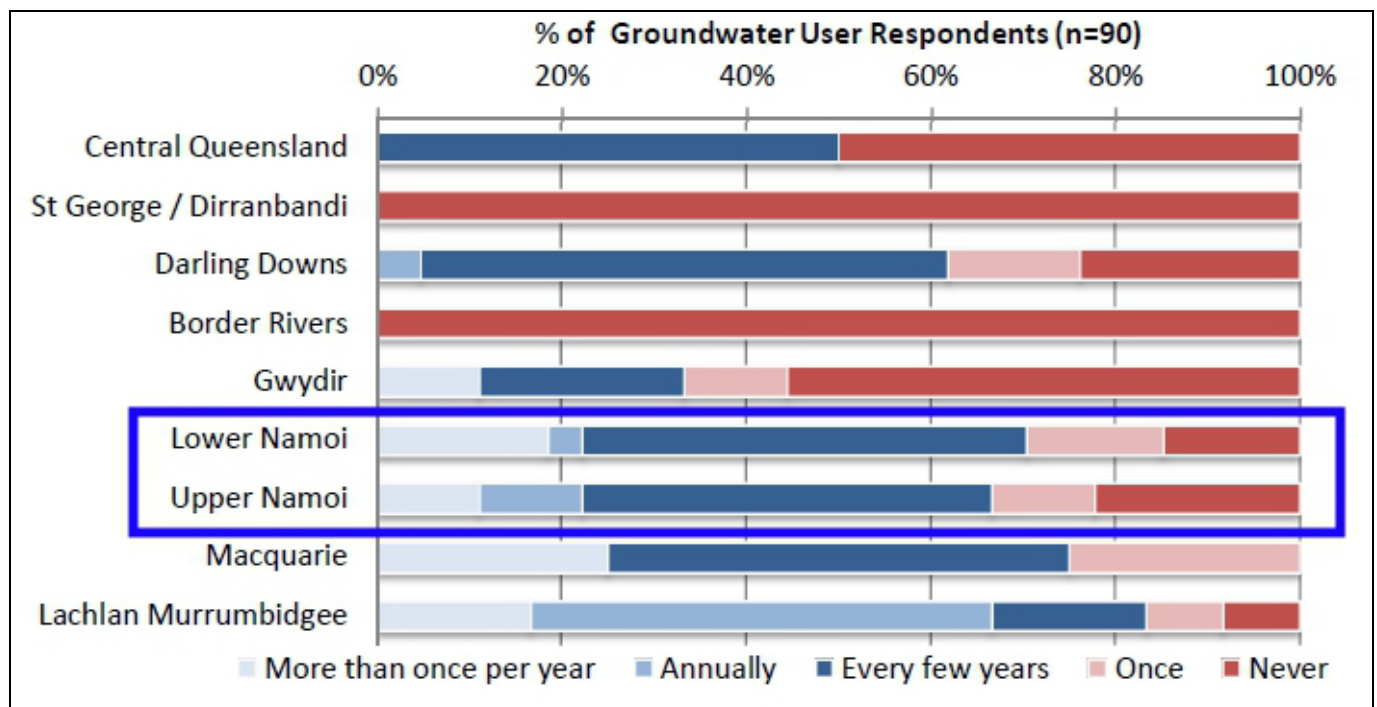


Figure 1: Frequency of groundwater monitoring by region (Figure 14 from 'A survey of selected cotton farming practices and grower views across the industry: 2010-2011 season' report – Appendix 1)

Using the figure of 23% of Namoi growers monitoring according to best practice recommendations, this target has not been met. However it is encouraging that greater than 65% of growers are regularly monitoring their groundwater quality at least every few years.

Groundwater Monitoring and Management workshops

The Groundwater Monitoring and Management Workshops were held in March 2011. For each of these workshops I was assisted by an expert team of presenters, all of whom contributed to the success of the workshops:

- Wendy Timms, Water Research Lab UNSW
- Ken Crawford, KLC Environmental and Namoi CMA
- Bryce Kelly, Water research Lab UNSW
- Stacey Vogel, Namoi CMA
- Rod Jackson, NSW DPI
- George Truman, Namoi CMA
- Jane Macfarlane, Cotton CRC

In addition to the information sessions the workshop participants were encouraged to bring a bore water sample from their farm for on-site free water quality testing. This testing was performed by George Truman during the workshops, with results and interpretation of results available to the growers at the conclusion of the workshop. Another session included hands-on water quality testing using the salt-kit EC meter. The Namoi CMA supplied salt-kits free of charge to any grower who agreed to conduct on-farm monitoring of their bore water EC (and potentially the EC of any water source and also soil EC).

Upper Namoi workshop:

- 13 growers and 4 Namoi CMA staff attended the workshop
- 11 growers brought a bore water sample for testing
- 7 growers indicated they had previously tested their bore water quality
- 10 growers accepted a salt-kit from the Namoi CMA to continue monitoring back at the farm

Lower Namoi workshop:

- 8 attended the workshop
- 5 growers brought a bore water sample for testing
- 2 growers indicated they had previously tested their bore water quality
- 6 growers accepted a salt-kit from the Namoi CMA to continue monitoring back at the farm

Salt Kit use survey:

- 16 kits handed to growers at the workshops
- 8 growers had previously monitored
- 4 growers had used the kit
- 3 growers had lab tests for water quality
- Most growers indicated they will use the kits, when using bore water

The period since the workshop has been very wet, and there has been very little use of groundwater for irrigation on cotton farms during that period. As a result, most growers had not used the salt kits to test for bore water quality at this stage. Most stated that once they began pumping then they would use the kits to test their groundwater quality. The growers all exhibited an acceptable level of understanding of their groundwater quality. Some growers stated that the water quality does not change at all, where others stated that they had observed changes in groundwater salinity between tests.

70% of cotton growing hectares in the Namoi with an up-to-date property plan – 30 property plan maps completed.

More than half of the cotton farm hectares in the Namoi Catchment are covered by a property plan. At present 171,625 hectares or 52% of cotton farm hectares in the Namoi have an up to date property plan, as such, the target of 70% has not been met. See Figure 2 (Appendix 10, internal distribution only) for a map of the current known properties with and without a property plan.

Current best practice for farm maps as defined in myBMP requires all 16 level 2 Property Information mapping practices in the Natural Assets module to be checked.

Using data from a myBMP report generated on 28/5/12, the target of 30 property plans has also not been met, with only 9 properties with all 16 practices checked. This represents only 14% of Namoi farms that have an active myBMP assessment.

For the whole of the Namoi there are 64 farms that have registered on myBMP and have started a farm assessment. Looking at those with a property plan, there are 33 farms that have at least 1 of the 16 practices checked.

The following table lists the uptake of farm maps through myBMP and the level of progress towards completing all the 16 practices in myBMP:

- 14% (9 of 64) growers have 100% of practices (16 of 16)
- 30% (19 of 64) growers have greater than 75% of practices (more than 12 of 16)
- 42% (27 of 64) growers have greater than 50% of practices (more than 8 of 16)

Extra information:

Early in 2012, the myBMP Team extended an invitation to farms that were previously BMP Accredited (the old BMP system) to extend their accreditation until October 2012, due to the impact of flooding across the industry in previous years. There was a two-part process for meeting the requirements: firstly all level 1 practices must be checked by the end of March 2012; and secondly all level 2 practices must be checked by October 2012, at which time the farm should be ready for a myBMP audit.

There was increased effort across the whole industry to bring as many eligible growers as possible up to level 1 by the end of March. Most have met the level 1 requirements, and have left the level 2 practices until they have more time, ie following picking. In the Namoi this has resulted in an increase in the number of farms with an assessment, and also a disproportionate increase in the number that do not have the farm mapping practices checked in the system (as they are all level 2 practices).

I have identified 2 cotton businesses that account for 15 of the farms with zero farm mapping practices checked. After speaking with the farm staff responsible for myBMP at both businesses, I have verbal confirmation that all 15 farms do have property plans and farm maps, but the practices have not been checked as they have not progressed beyond adding the level 1 practices at this stage.

If the extra 15 farms were included in the results, and assuming they had at least 50% of practices checked, then the result could be shown to be:

- 66% (42 of 64) growers have greater than 50% of practices (more than 8 of 16)

During the course of the project it became apparent that many, if not most, growers already have a property plan for their farm. Because of this, engaging growers to attend property planning workshops, or to request assistance to develop a property plan has proved very difficult. A change of focus was discussed with the steering committee

and Glenn Bailey from the Namoi CMA to use the uptake of myBMP and the practices in the Property Planning key area of the Natural Assets module to qualify as evidence of a farm having a property plan. There has been a steady uptake of myBMP, and the Namoi is leading the way with uptake across the industry.

5% of riparian area in cotton growing area managed for riparian values.

Almost a fifth of riparian area adjacent to cotton growing areas in the Namoi is managed for riparian values. With a total riparian length of 428.5km, there are 15.6km that have been revegetated, and 65.4km of conserved riparian area, representing 18.9% of the riparian length. See Figure 3 (Appendix 11, internal distribution only) for a map showing the riparian areas identified as being adjacent to cotton growing areas.

The data to support these results comes from Cotton CRC project reports. Note that the area included in the results is only for Cotton CRC work and does not include Namoi CMA works, and as such will under represent the percentage of riparian area managed for NRM in the target area.

Focused NRM publications developed and distributed – 10 publications produced and distributed.

The following list shows the publications developed during this project. Many can be found in the appendices of this report.

- Conference poster, see Appendix 2
- Partnerships brochure, see Appendix 3
- Property planning FAQ, see Appendix 4
- Groundwater workshop radio interview – 2MAX-FM Inside Cotton
- Groundwater workshop radio interview – ABC FM Rural Hour
- Groundwater workshop flyer and information sheet, see Appendix 5
- myBMP FAQ, see Appendix 6
- Spotlight water quality, see Appendix 7
- Spotlight myBMP, see Appendix 8
- Science Forum presentation 2011 – catchment officer update
- Upper Namoi 2010 Crop Competition Map 2010, see Appendix 9
- Science Forum presentation 2012 – Namoi myBMP
- Australian Cotton Water Story – Namoi groundwater and myBMP (submitted)
- Australian Cotton Water Story – Bryce Kelly 3D paper (submitted)
- Australian Cotton Production Manual 2012 – Groundwater Quality Monitoring (submitted)
- Spotlight June 2012 – Tilapia – biodiversity threat (submitted)

The following publications are yet to be developed.

- *Groundwater research newspaper 2 page spread*
- *WATERpak chapter – groundwater quality monitoring*

The Cotton Conference poster in Appendix 2 was the recipient of the People's Choice Award at the 2010 Australian Cotton Conference.

Highlights for this project have been the case studies for myBMP and groundwater monitoring in Spotlight and the inclusion of groundwater monitoring information in the upcoming publications of Australian Cotton Water Story, Australian Cotton Production Manual 2012, and the revised WATERpak (due to be submitted June 2012).

Training / knowledge workshops developed – 12 workshops undertaken.

A total of 17 workshops were delivered during this project. They are detailed below.

Groundwater Monitoring and Management workshops

The Groundwater Monitoring and Management Workshops were held in March 2011. For each of these workshops I was assisted by an expert team of presenters, all of whom contributed to the success of the workshops:

- Wendy Timms, Water Research Lab UNSW
- Ken Crawford, KLC Environmental and Namoi CMA
- Bryce Kelly, Water research Lab UNSW
- Stacey Vogel, Namoi CMA
- Rod Jackson, NSW DPI
- George Truman, Namoi CMA
- Jane Macfarlane, Cotton CRC

In addition to the information sessions the workshop participants were encouraged to bring a bore water sample from their farm for on-site free water quality testing. This testing was performed by George Truman during the workshops, with results and interpretation of results available to the growers at the conclusion of the workshop. Another session included hands-on water quality testing using the salt-kit EC meter. The Namoi CMA supplied salt-kits free of charge to any grower who agreed to conduct on-farm monitoring of their bore water EC (and potentially the EC of any water source and also soil EC).

Upper Namoi workshop:

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- 11 growers brought a bore water sample for testing
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Lower Namoi workshop:

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- 5 growers brought a bore water sample for testing
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- 6 growers accepted a salt-kit from the Namoi CMA to continue monitoring back at the farm

myBMP Introductory workshops

13x myBMP training and introduction workshops were held in the Namoi, Gwydir and Central West:

- Willawah (Paul Hawkins) – 7 growers
- 31/5/11 Breeza Hall – 5 growers
- 1/6/11 'Kilmarnock' – 5 growers
- 2/6/11 'Merced Farms' (James Kahl) – 4 in attendance (representing 3 farms)
- 7/6/11 'Carlton' (Wal Friend) – 7 in attendance (representing 4 farming businesses, Landcare, and cotton consultant)
- 26/7/11 – 1-on-1 at 'Cardale' (Mike Carberry) – 1 grower
- 27/7/11 – Spring Ridge (5 attended ???)
- 30/8/11 – 1-on-1 at 'ACRI' (David Halliday) – 1 grower
- 14/9/11 – (Gwydir) 'Midkin' with Sally Dickinson (5 attended ???)
- 22/9/11 – (Gwydir) 'Tellerega' with Sally Dickinson (7 attended ???)
- 23/9/11 – Walgett with Sally Hunter (1 attended)
- 2/12/11 – (Central West) Warren with Julie Wise (5 attended ???)

- 28/5/12 – Rosecot at ‘Yungella’ – 2 attended

It should be noted that both Allison Davis and Sandra Deutscher were invaluable in the development of these workshops and both helped run the first few workshops.

Groundwater water quality testing workshops

Early in the project two water quality testing workshops were held, in Narrabri and Breeza, with a total of 7 growers (5 and 2 respectively). These were done closely following the NSW Waterwatch procedures drawing on the expertise of both Peter, and Stephanie McCaffrey from the Namoi CMA.

Attendance at relevant grower and NRM meetings.

I have regularly attended CGA meetings across the Namoi and contributed as an active committee member on 2 of the 3 CGAs.

Throughout this project I was an active committee member on the Lower Namoi CGA and Upper Namoi CGA. The Walgett CGA meets infrequently and although I had requested notification of meetings this was not done in time to attend the CGA meetings.

The Lower Namoi CGA committee meets monthly at Cotton Seed Distributors (CSD) in Wee Waa. I represented the Cotton CRC at the majority of these meetings during the project and also participated in the Science sub-committee for the CGA. I also attended the AGM each year.

The Upper Namoi CGA committee meets less frequently, approximately quarterly at the Gunnedah Services Club, and I represented the Cotton CRC at the majority of their committee meetings during the project. I also attended the AGM each year.

The Walgett CGA was more difficult to connect with, however through grower attendance at the myBMP workshops in Walgett I was able to build a working relationship with the Walgett CGA committee members.

During the project I attended field days for all 3 Namoi CGAs, the annual crop competition awards dinner for the Lower Namoi CGA and Upper Namoi CGA, and the Lower Namoi CGA pump efficiency forum in Narrabri.

Continue to support the Cotton Industry BMP program – technical support given to growers.

This target has been achieved through proactive myBMP introductory workshops in the Namoi as well as Gwydir and Central West catchments. I have also participated on information stands at the Cotton Conference and at the Moree Cotton Field Day. The workshops have been detailed previously in this report.

At every opportunity I have represented myBMP to Namoi growers and offered assistance to help them transition from the old system to myBMP, or to start fresh on myBMP.

Together with the Catchment Team I have done a gaps analysis on the resources available in the Natural Assets module of myBMP.

I have been the contact for Technical Help requests for the majority of the Natural Asset module practices.

Finally, I have participated in 2 myBMP auditor training workshops offering guidance and expert knowledge of the Natural Assets module.

Extension advice on the implementation of NRM activities provided – number of visits and activities.

During the project I have actively promoted NRM activities, the Cotton CRC, Namoi CMA, and myBMP. This has been done through face-to-face discussions, presenting at workshops, participating in committee meetings, attending field days, and other activities. The following list outlines the scope of activities I have been involved with:

- Cotton Conference
 - Partnerships poster
 - myBMP stand
- Cotton Field Day at Moree
 - myBMP stand
- CGA field days
 - Walgett CGA @ Walgett – myBMP talk
 - UNCGA crop comp 2010 assisted judges / dinner / field day
 - UNCGA crop comp dinner
 - IAL Pump Efficiency forum at Narrabri RSL – with NSW DPI / IAL / LNCGA
- CMA field days
 - Schools Property Planning Competition Field Day 2011
 - River Rallies / Bush Bash – Narrabri x2 / Burren Junction / Wee Waa, Yarrie Lake
 - Carp Muster 2011
 - Namoi Angler Monitoring Program information day at Boggabri 2011
 - Walgett Carp Muster 2012
 - Walgett Primary School Waterwatch 2012
- WRL field days
 - WRL Manly (after IAH Uncertainty in Groundwater conference)
 - Breeza research station ‘microgravity’
- Goondiwindi careers day – year 8 school students
- EnviroBeat youth conference 2012
- IAH Uncertainty in Groundwater conference @ Darling Harbour

Discussion

Discuss the methods and results from this project.

Quantifying cotton hectares

For this project, without an industry data set to benchmark against, the cotton hectares were calculated roughly by using the 2009 CottonMap mapped cotton fields. This is by no means an accurate representation but provided a working dataset to use for benchmarking purposes.

To date there is no cotton industry data that accurately quantifies the number of cotton hectares in each season. There are a number of ways that the concept of what is a cotton hectare can be considered:

- The green hectares of planted cotton in a particular season.
- The total number of hectares of a farm that are capable of growing cotton.
- The total number of farm hectares including all aspects of the farm – cropping, grazing, infrastructure, and natural assets / native vegetation.

In my opinion the industry would benefit from having up-to-date data covering all three of the above.

- Seasonal statistics can best be represented if the seasonal hectares are known.
- The potential for any season and long term statistics can be calculated by knowing potential cropping hectares.

- Farm management, and the whole premise of myBMP, is concerned with the entire farm, not just the cropping areas.

Currently, information on seasonal hectares is supplied by CSD as a measure of how much seed was ordered and the potential area in hectares that could be sown.

The work towards spatialising myBMP will help to accurately determine the area of cotton in any particular season, once there is sufficient uptake of the system.

Property plans

Using cotton hectares, 52% of Namoi cotton growing hectares have an up-to-date property plan.

If you look at the Namoi farms that have started a myBMP assessment, there are 64 farms in total, and 33 of those have checked at least 1 practice indicating that they are progressing towards a property plan. There are 27 farms (42%) that have checked at least half of the practices needed to meet full best practice according to myBMP for farm maps.

If the extra 15 farms (that have an accreditation extension) that have indicated they do have a property plan and farm map were included in the results, and assuming they had at least 50% of practices checked, then the result could be shown to be 66% (42 of 64) growers have greater than 50% of practices (more than 8 of 16).

The figure of 52% of cotton growing hectares having an up-to-date property plan could be misleading. Firstly the accuracy of the dataset is not what it could be if an industry dataset was available. Secondly, the number represents the growers that have engaged with me for the purpose of this project and through discussions with growers and CGA members, I would suggest that the majority of growers do have a property plan but many have not engaged with the project and this information has not been captured. The following are examples of property planning elements that farmers have indicated are already completed:

- Hand drawn farm maps, generalizing the farm layout and major features.
- Maps drawn over satellite / aerial imagery.
- Full GIS electronic maps using commercial software applications – eg PAM, Phoenix – as part of a farm management package.
- Highly detailed and accurate GIS maps of fields used for tractor guidance and aerial spray application.

With the release in 2010 of the new and revised myBMP system, I would suggest that the process of participating in myBMP and even starting to assess your farm practices against the current and future industry best management practices, does actually represent a 'property plan'. To that end I would argue that myBMP is in fact a property plan at a high level covering all aspects of managing a cotton farm, including developing a more traditional property map, but representing so much more than just a map.

If this project was to run again, I would suggest changing the target unit away from percentage of cotton hectares and towards the uptake of myBMP by number of farms.

Groundwater Monitoring

The Namoi Catchment is in the early stages of a significant mining boom with coal mines and coal seam gas extraction rapidly gaining traction throughout the catchment, and in close proximity to many cotton farms. The importance of regular groundwater monitoring and establishing resource condition baselines is starting to be seen by many growers that may not have seen much if any benefit of regular monitoring before. There is debate to the potential of aquifer interference through mining activities and the effect that this could have on the aquifers that are accessed by cotton irrigators.

The level of at least once a year monitoring of groundwater quality is still very low at 23% across the Namoi. Maybe the introduction of mining into the local systems will encourage more growers to increase their monitoring efforts and gain a better understanding of their local groundwater condition.

myBMP adoption

Across the Australian cotton industry, the Namoi Catchment is amongst the leaders in the uptake of myBMP. This is largely due to the success of the introductory myBMP workshops that I have developed and run across the catchment.

The following are elements of the workshops that have been critical to their success:

- Small numbers of attendees – approximately 5, no more than 10
- A laptop for each attendee.
- Live internet, and live access to myBMP at the workshop.
 - This was achieved using a standard NextG USB modem plugged into a wireless router capable of using the USB modem.
 - At some venues, wifi access was available and was used – eg when there was no NextG coverage.
- Deliver the workshop in close proximity to the target audience.
 - Use local venues, or on-farm in a homestead of one of the participants.
- Keep the duration short, 3-4 hours is sufficient.
- The presenter must have a thorough working knowledge of the structure and function of every aspect of the myBMP website that the grower will encounter.
- Promote and encourage open discussion and questions at any stage of the workshop.
- Finally, focus on the area of expertise of the presenter – in my case this was the Natural Assets module.

As stated previously, the workshops have also been rolled out to the Gwydir and Central West catchments, with staff now able to run their own workshops in each location.

The success of the uptake of myBMP across the Namoi Catchment demonstrates the contribution of the project to meeting the project objectives. By registering for myBMP and starting a farm assessment growers are committing to document and consider the management of their whole farm system. This includes not only the cropping systems and related practices, but also a strong focus on the natural resource management of the farm as a whole.

Growers can choose if they want to become myBMP accredited. Should they do so, there are a set of core modules that must be completed to Level 1 (identified legal requirements) and Level 2 (current industry best management practice) to achieve accreditation. The Natural Assets module is one of the core modules that must be completed and assessed in a myBMP audit to reach accreditation.

The online resources available to users of myBMP cover every aspect of the system with resources available for the majority of practices. In the case of the Natural Assets module there are numerous Cotton CRC and Namoi CMA documents and links within the resource contents. These are readily available to all growers who have access to the system.

An example of the benefit to growers can be seen through two comments received at one of the Walgett myBMP workshops.

- From an established and successful grower – the resources available in the system provided easy access to relevant and timely updates to industry information on topics such as disease outbreaks, and guidance on how to better manage farm operations.
- From a new grower, who had recently purchased a farm, and was yet to plant their first crop – they were amazed at the depth of knowledge available through the system and said that they would have a much easier task establishing their cotton farming systems with the help of the available resources.

There is already a wealth of Cotton CRC information in the system. With the Cotton CRC coming to an end, the influx of Cotton CRC information will eventually cease.

Future directions

In the closing stages of this project I worked with the myBMP Team to investigate ways to spatialise the myBMP system and to provide electronic mapping using GIS to all cotton growers through the myBMP website. Four software providers that have software solutions including GIS and farm management were considered. A recommendation has been made to the myBMP Team, and the successful software provider is currently developing the system which will be launched at the 2012 Australian Cotton Conference. The potential of such a system is huge. Once launched, the myBMP mapping system will be able to provide a confidential and private uniform farm mapping service to all cotton growers. Elements of these maps could be used for other industry purposes including populating CottonMap, a mapping system for preventing 2,4-D spray drift problems.

Verwey has been successful in his CRDC FRP application and is in negotiations with NSW DPI to host a 3 year project which will continue the work mentioned above, and supporting cotton growers to develop property plans. The project 'Demonstrating the Integration of Spatial Technologies and Best Practice in Australian Cotton Production' has the following aims:

- to develop spatial components for the cotton industry's research and development programs including the cotton industry's best management practices program (myBMP),
- to develop spatially aware mobile device applications, and
- to support myBMP.

Another key area that has gained momentum is the development of mobile device applications. This aims to adopt the new technology of tablet computers and smart phones to engage growers and the whole industry. Verwey has been an active member of the mobile apps team and was integral in obtaining the mobile devices for this ongoing project. There are a number of apps that will be ready for launch at the 2012 Australian Cotton Conference.

Both of the areas above, spatialising myBMP and developing mobile apps, fit into this project by providing new means to engage growers, to capture industry information, and to deliver resources to growers and other end users.

Benchmarking using myBMP

The new myBMP system has the capacity to be an extremely valuable industry tool. Beyond being a management tool for cotton growers, the information that can be captured in myBMP has the potential to greatly value-add to industry statistics and to assist in the prioritization of research, development and delivery or research outcomes.

Outcomes

Describe how the project's outputs will contribute to the planned outcomes identified in the project application. Describe the planned outcomes achieved to date.

The objectives of this project are:

- To foster better natural resource management outcomes for the Namoi Catchment through the integration of Cotton CRC's NRM adoption targets and the Namoi CMA Catchment and Management targets as defined in the Catchment Action Plan.

- To develop strategies and tools to assist the Namoi CMA and Cotton CRC in implementing NRM best practice within irrigated cotton farming systems in the Namoi Catchment.
- To provide technical support to irrigators implementing best practice in NRM activities (as can be defined by the Australian Cotton Industry’s BMP ‘Natural Assets’ module), in the Namoi Catchment.

Approximately 23% of Namoi cotton farms are regularly monitoring their groundwater water quality according to best practice recommendations at least once every year, with greater than 65% regularly monitoring their groundwater water quality at least once every few years. Using the figure of 23% of Namoi growers monitoring according to best practice recommendations, this target has not been met. However it is encouraging that greater than 65% of growers are regularly monitoring their groundwater quality at least every few years.

52% of cotton hectares have a property plan, which falls below the target of 70% set for the project. However, using myBMP as a measure of whether a farm has a property plan, we find that 14% of Namoi cotton farms are 100% compliant with myBMP recommendations for farm maps, and as high as 66% of Namoi farms have checked at least half the recommended practices.

16 publications have been produced. This has met the target set for 10 publications for the project.

18.9% of riparian area adjacent to cotton producing areas is being managed for riparian values. This has met and exceeded the target of 5% set for the project.

17 training and knowledge workshops were held during the project. These covered water quality testing, groundwater monitoring and management, and myBMP.

The Cotton CRC and Namoi CMA were regularly represented at meetings of the Lower Namoi CGA and Upper Namoi CGA, providing a communication channel for information exchange between the Cotton CRC, Namoi CMA, and the growers and grower associations.

Extension advice on the implementation of NRM activities has continued throughout the project through a diverse range of activities including CGA and Namoi CMA field days, information stands at cotton conferences and trade shows, and working with the future generation of farmers through school based activities such as the Namoi CMA river rallies and EnviroBeat.

Following on from the success of the Namoi CMA partnership with the Cotton CRC, I would strongly encourage the Australian cotton industry to continue to partner with the Namoi CMA and to continually develop new resources and update existing resources to provide an ongoing flow of information from the Namoi CMA to all growers across the Australian cotton industry, but particularly the Namoi growers. This partnership model could be used throughout the cotton industry footprint to maximize the expert input from local NRM agencies.

I believe myBMP is the perfect tool for assisting the Namoi CMA and Cotton CRC to implement NRM best practice within irrigated cotton farming systems in the Namoi Catchment.

Deliverables	Target	Achieved
50% of cotton growing hectares in the Namoi regularly monitoring groundwater quality	50% of ha	23% of Namoi farms current best practice (every year) > 65% of Namoi farms regular (every few years)
70% of cotton growing hectares in the Namoi with an up-to-date property plan (30 property plan maps completed)	70% of ha	52% of ha
	30 plans	64 myBMP Namoi farm assessments 16 level 2 practices 14% (9) have 100% of practices

		30% (19) have > 75% 42% (27) have > 50% Another 23% (15) have verbally confirmed they have property maps but not yet in the myBMP system, leading to: 66% (42) have > 50%
5% of riparian area in cotton growing area managed for riparian values	5% of riparian area	18.9% of riparian area
Focused NRM publications developed and distributed	10 publications	16 publications
Training / knowledge workshops developed and undertaken	12 workshops	17 workshops

Table 1 (again): Final update on Schedule 1.1 deliverables, May 2012.

Conclusion

Provide an assessment of the likely impact of the results and conclusions of the research project for the cotton industry. What are the take home messages?

The project has successfully increased the NRM skills and knowledge of Namoi cotton growers through regular interaction with growers and grower associations and providing a structured and approachable way for growers to become involved with the new myBMP system.

The development and refinement of the structure and content of the myBMP introductory workshops has the potential to increase the uptake of myBMP by growers across the Australian cotton industry. The Namoi has experienced a significant uptake of myBMP and the workshops have been successfully rolled out to both the Gwydir and Central West catchments. This model could be used in any of the cotton growing regions across the industry. To achieve this there is a requirement for a myBMP expert to be available to coordinate and run these workshops. At the end of this project there will be no formal locally based Namoi cotton position to continue the contact with growers and grower associations to deliver research and extension.

Part 5 – 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.

Since 2005, the Cotton Catchment Communities CRC (Cotton CRC) and the Namoi Catchment Management Authority (Namoi CMA) have had a partnership to work with cotton growers within the Namoi valley as well as other government organisations, industry bodies, research organisations and the general community to deliver natural resource management outcomes in line with the Namoi Catchment Action Plan (CAP). The Namoi CMA and Cotton CRC worked collaboratively with research organisations to provide the industry and agency extension staff and growers with the best available information to make land management decisions.

Under a signed umbrella agreement, the 'Schedule 1.1 Integrating NRM into Irrigated Cotton farming Systems in the Namoi Catchment' project is a part of this major collaboration between the Cotton CRC and the Namoi CMA. The project ran for three years, commencing in July 2009 and finishing at the end of June 2012.

The Cotton CRC in partnership with the Namoi CMA employed a cotton catchment officer for a period of three years to meet the following three main objectives:

- To foster better natural resource management outcomes for the Namoi Catchment through the integration of Cotton CRC's NRM adoption targets and the Namoi CMA Catchment and Management targets as defined in the Catchment Action Plan.
- To develop strategies and tools to assist the Namoi CMA and Cotton CRC in implementing NRM best practice within irrigated cotton farming systems in the Namoi Catchment.
- To provide technical support to irrigators implementing best practice in NRM activities (as can be defined by the Australian Cotton Industry's BMP 'Natural Assets' module), in the Namoi Catchment.

To achieve the project objectives, specific measurable targets were worked towards:

- 50% of cotton growing hectares in the Namoi regularly monitoring groundwater quality.
- 70% of cotton growing hectares in the Namoi with an up-to-date property plan – 30 property plan maps completed.
- 5% of riparian area in cotton growing area managed for riparian values.
- Focused NRM publications developed and distributed – 10 publications produced and distributed.
- Training / knowledge workshops developed – 12 workshops undertaken.
- Attendance at relevant grower and NRM meetings.
- Continue to support the Cotton Industry BMP program – technical support given to growers.
- Extension advice on the implementation of NRM activities provided – number of visits and activities.

The project has successfully increased the NRM skills and knowledge of Namoi cotton growers through regular interaction with growers and grower associations and providing a structured and approachable way for growers to become involved with the new myBMP system.

The development and refinement of the structure and content of the myBMP introductory workshops has the potential to increase the uptake of myBMP by growers across the Australian cotton industry. The Namoi has experienced a significant uptake of myBMP and the workshops have been successfully rolled out to both the Gwydir and Central West catchments. This model could be used in any of the cotton growing regions across the industry. To achieve this there is a requirement for a myBMP expert to be available to coordinate and run these workshops. At the end of this project there will be no formal locally based Namoi cotton position to continue the contact with growers and grower associations to deliver research and extension.

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Final update on Schedule 1.1 deliverables, May 2012

Approximately 23% of Namoi cotton farms are regularly monitoring their groundwater water quality according to best practice recommendations at least once every year, with greater than 65% regularly monitoring their groundwater water quality at least once every few years. Using the figure of 23% of Namoi growers monitoring according to best practice recommendations, this target has not been met. However it is encouraging that greater than 65% of growers are regularly monitoring their groundwater quality at least every few years.

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Appendices

Cotton Grower Practices 2011 Survey



**A survey of selected cotton farming practices
and grower views across the industry
2010-11 season**

**GHD Hassall with the
Cotton CRC Development and Delivery team**



Contact:
Ingrid Roth
PO Box 802 Narrabri 2390
ingrid.roth@ghd.com
0428 195 485



**Australian Government
Cotton Research and
Development Corporation**

Purpose

This survey of cotton growing practices on the 2010-11 season was undertaken for the Cotton Catchment Communities Cooperative Research Centre (Cotton CRC) and Cotton Research and Development Corporation (CRDC). It sought to establish the adoption of key farming practices by cotton growers to inform review of the impact and adoption of past research and future planning of research directions.

Survey sample and response

The survey was posted to a sample of cotton growers randomly selected from the Cotton CRC/CRDC industry list and followed up by telephone. To make up for low response rates, this randomly selected group was further supplemented through direct contact with others growers known to the interviewers. There is an element of potential bias in using a list of growers who are registered with or known to the Cotton CRC/CRDC .

A total of **177 growers** completed the survey, representing **137,978 ha** (160,032 field ha – comprising of 45,410 dryland and 114,622 ha irrigated) of cotton production in 2010-11. Of these 95 were completed by telephone interview and 82 were returned by mail, fax or email. **A further 93** of the 645 growers contacted did not grow cotton in the 2010-11 season – some of these had not grown cotton for several years and some indicated that they are unlikely to grow cotton again but some wished to stay on the industry list.

As some growers had multiple farms which differed sufficiently to justify a separate entry per farm, the **total number of 'respondents' is 183**.

Table 1 Total hectares surveyed, by region

Region	Number of respondents*	Dryland (field ha)	Irrigated (ha)	Total Farm (ha)
Central Queensland	14	1,679	4,832	15,260
Darling Downs	36	6,446	9,519	48,979
Border Rivers (incl Mungindi)	8	3,283	8,002	23,164
St George / Dirranbandi	16	404	30,483	190,154
Gwydir	22	15,794	15,340	117,195
Lower Namoi (incl Walgett)	40	16,098	25,343	168,467
Upper Namoi	11	1,631	2,811	21,952
Macquarie	16	75	4,241	64,598
Bourke	3	0	3,025	57,400
Lachlan Murrumbidgee	17	0	11,027	414,723
TOTAL	183	45,410	114,622	1,121,892

* The distribution by region is reasonably in balance with the relative numbers of growers in each region.



Starting soil moisture

We now measure only what we can manage

Irrigated cotton being grown as single skip. Dryland is double skip

Optimise irrigation - getting water on and off field quickly by pushing more water in the head ditch and shorting of irrigation cycles

Trialed:

1. Lateral move overhead irrigator; 2. Bay less irrigating; 3. various syphon configurations

Analysis of overall farm water balance (during and post season)

Farm has irrigated cotton under a pivot

Have developed a fixed syphon irrigation system suited to his fields which tend to have red country at the top of the fields and black soil at the bottom.

Monitoring of Groundwater Quality

90 of the irrigator respondents were groundwater users. Some regions had no groundwater use (Bourke) or a very small number of groundwater users (Table 20).

Table 20 Number and proportion of surveyed farms using groundwater in each region

	Number of groundwater users	% of irrigator respondents
Central Queensland	4	31
Darling Downs	21	72
Border Rivers	2	25
St George / Dirranbandi	2	13
Gwydir	9	47
Lower Namoi	27	73
Upper Namoi	9	90
Macquarie	4	27
Bourke	0	0
Lachlan Murrumbidgee	12	71
Totals	90	54

The majority of groundwater users monitor every few years or not at all (Figure 14) with salinity being the most commonly measured parameter (Table 21).



Figure 14 Frequency of groundwater monitoring by region

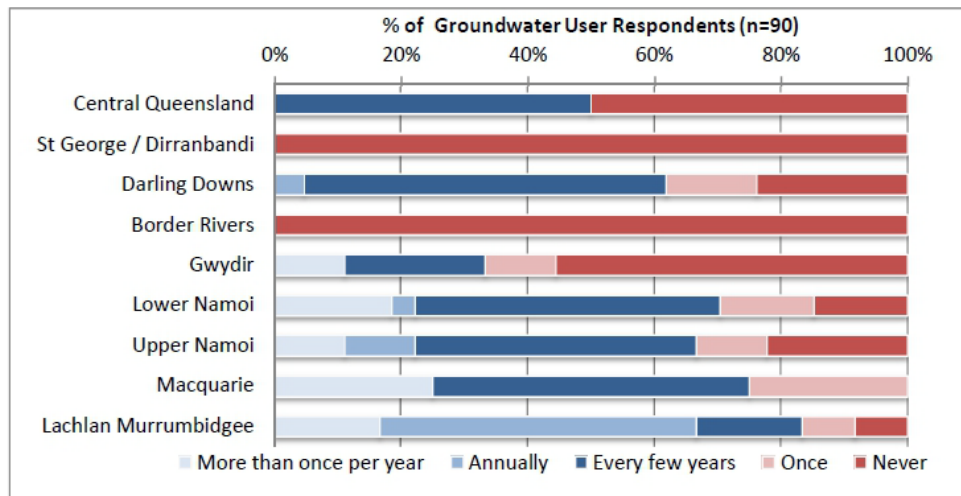


Table 21 Groundwater quality attributes monitored

	Number of respondents	% of groundwater user respondents
EC / Salinity	49	54%
pH	23	25%
SAR (Sodium Absorption Ratio)	8	9%
Nitrates	6	7%
Trace Elements	8	9%
Other:	17	19%
General water quality test	(5)	
Depth	(4)	
Hardness	(3)	
Temperature	(3)	
RDC	(1)	
Cone Index	(1)	

Table 22 Further comments on groundwater

Groundwater Comments
There has been little change over time
Groundwater is magnificent
River-fed bore water is of drinking quality - no salinity issues etc.
Very good groundwater
Mainly concerned with EC especially with the lateral moves.
High quality town water
Uses groundwater only as a last resort
We regular monitor the ground water level from the surface and we also test for changes in water quality every few years.
Salt was the main answer. He asked should he be looking at water quality more often, he was under the impression ground water quality did not change very quickly over time.
No water quality testing conducted
Salt was the main concern for ground water



Best Practice Partnerships

For the past five years the Cotton Catchment Communities CRC (Cotton CRC) and the Namoi Catchment Management Authority (Namoi CMA) have had a partnership to work with cotton growers within the Namoi Valley as well as other Government organisations, industry bodies, research organisations and the general community to deliver natural resource management outcomes within the catchment.

The three key investment areas were **research**, **extension** and **adoption**.

Peter Verwey, Janae Macfarlane, Kate Lightfoot - Cotton Catchment Communities CRC
 Stacey Vogel - Namoi Catchment Management Authority

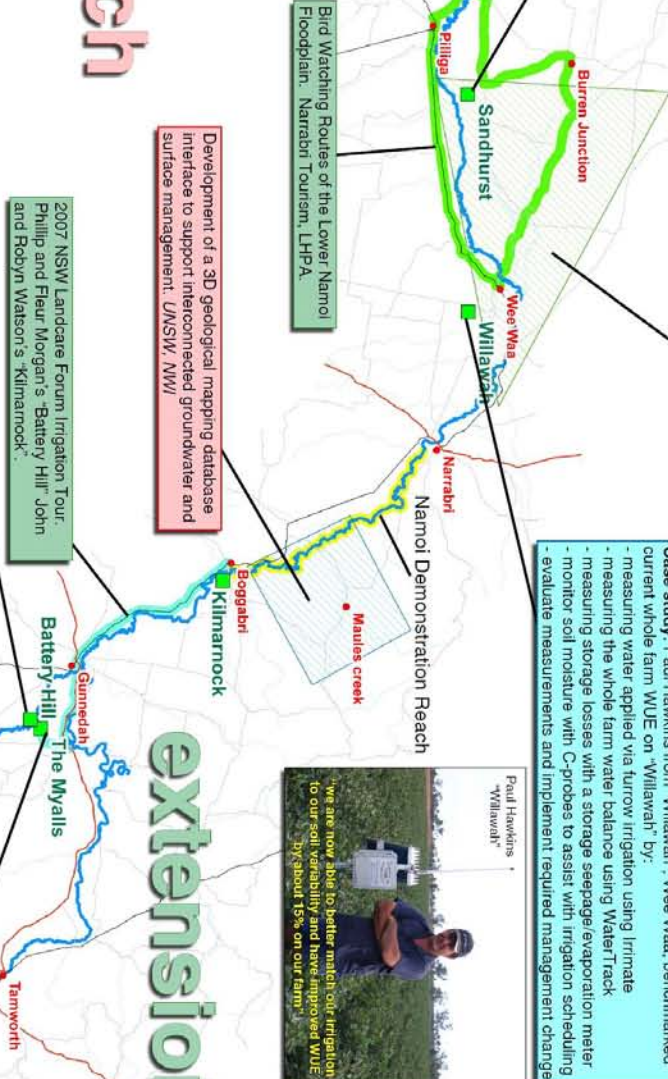


Identifying habitat requirements for birds on cotton farms in the Lower Namoi. *Birds Australia*

Water Use Efficiency (WUE)
Target: Improve WUE on cotton farms across the Namoi Valley.
Outcome: 15% improvement across participating farms in WUE.
5000ML of water saved over 8,000ha.
Case study: Paul Hawkins from "Willawah", "Wee Waa, benchmarked current whole farm WUE on "Willawah" by:
 - measuring water applied via furrow irrigation using Irrimate
 - measuring the whole farm water balance using WaterTrack
 - measuring storage losses with a storage seepage/evaporation meter
 - monitor soil moisture with C-probes to assist with irrigation scheduling
 evaluate measurements and implement required management changes



Development of a 3D geological mapping database interface to support interconnected groundwater and surface management. *UNSW, NWU*



research



Further information:
 Cotton Catchment Communities CRC
 Australian Cotton Research Institute
 Locked Bag 1001, Narrabri NSW 2390
 Website: www.cottonccrc.org.au
 peter.verwey@cottonccrc.org.au
 stacey.vogel@cma.nsw.gov.au

2007 NSW Landcare Forum Irrigation Tour
 Phillip and Fleur Morgan's "Battery Hill" John and Robyn Watson's "Kilmarnock"

Best Management Practice (BMP)
Target: Increased number of cotton growers within the Namoi Valley participating in the Industry's BMP Program.
Outcome: 110,000ha of land covered by a BMP plan.
Case study: Phillip Morgan "Battery Hill", Breeza is participating in the Cotton Industry's BMP program and has undertaken the Land and Water Management module.



extension adoption

Riparian
Target: Improved health of riparian ecosystems on cotton farms within the Namoi Valley.
Outcome: 90km of riparian vegetation within the Lower Namoi Catchment conserved and improved.
Case study: The Namoi Demonstration Reach is part of the Namoi Aquatic Habitat Initiative which is a partnership with NSW Industry and Investment and Namoi CMA which restored 120km of the Namoi River and its tributaries between Bogabri and Narrabri. Around 28km of the demonstration reach is managed by cotton farmers.



Appendix 2: Cotton conference Best practice partnerships poster.



Best Practice Partnerships



For the past five years the Cotton Catchment Communities CRC (Cotton CRC) and the Namoi Catchment Management Authority (Namoi CMA) have had a partnership to work with cotton growers within the Namoi valley as well as other government organisations, industry bodies, research organisations and the general community to deliver natural resource management outcomes in line with the Namoi Catchment Action Plan (CAP).

The three areas of investment were research, extension and adoption. The collaborative investment for each area was \$6.2 million in research, \$4.1 million in extension and \$2.5 million in adoption.

research

“Without the partnership, neither organisation would have been able to achieve the same level of NRM outcomes which resulted from better management practices, improved use of resources, conservation and re-vegetation.” (Roberts Evaluation Report, 2009)

The Namoi CMA and Cotton CRC worked collaboratively with research organisations to provide industry and agency extension staff and growers with the best available information to make land management decisions. Some of the research projects undertaken include:

- Identifying bird habitat requirements on cotton farms in the Lower Namoi. *Birds Australia*
- Development of a 3D geological mapping database interface to support interconnected groundwater and surface management. *UNSW, NWI*
- Riparian Conditions Assessment Index for Namoi River. *EcoLogical*



Cotton Catchment Communities CRC



Namoi
CATCHMENT MANAGEMENT AUTHORITY



WHOLE FARM WATER USE EFFICIENCY

TARGET: Improve WUE on cotton farms across the Namoi valley.

WHAT WAS ACHIEVED: 15% improvement across participating farms in WUE, 5000ML of water saved over 8000ha.

BEST PRACTICE IMPLEMENTED: Benchmarking and evaluating whole farm water balance and in-field efficiencies and making necessary land management changes.

MMB BENEFIT: More bales per ML.

PRODUCTION BENEFIT: Reduced deep drainage and potential for salinisation of underlying aquifers.

CASE STUDY EXAMPLE: Paul Hawkins "Willawah" *"We are now able to better match our irrigation to our soil variability."*



PROPERTY PLANNING

TARGET: Increased number of Cotton Growers within the Namoi valley participating in the industry's BMP Program.

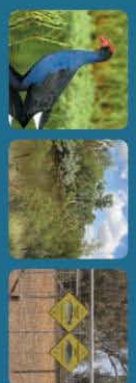
WHAT WAS ACHIEVED: 110,000ha of land covered by a BMP plan.

BEST PRACTICE IMPLEMENTED: Identification of key environmental and human risks on farm and development of action plans to address those risks.

PRODUCTION BENEFIT: A planning tool and process to monitor and evaluate management practices.

MMB BENEFIT: Improved sustainability of on-farm natural resources, improved ability to adapt to climate variability.

CASE STUDY EXAMPLE: Phil Morgan "Battery Hill" *"The Land and Water Management module has helped us identify our on-farm risks, identify what our compliance issues were, and gave us guidelines for managing the sensitive areas on our farm such as areas of native vegetation and the riparian zones."*



RIPIARIAN

TARGET: Improved health of riparian ecosystems on cotton farms within the Namoi valley.

WHAT WAS ACHIEVED: 90km of riparian vegetation within the Lower Namoi valley conserved and improved.

BEST PRACTICE IMPLEMENTED: Revegetation, weed and pest control, re-snagging of river to stop bend erosion and provide more fish habitat, bank battering, strategic grazing and fencing to restrict stock access.

PRODUCTION BENEFIT: Reduced streambank erosion and loss of valuable agricultural land and improved water quality.

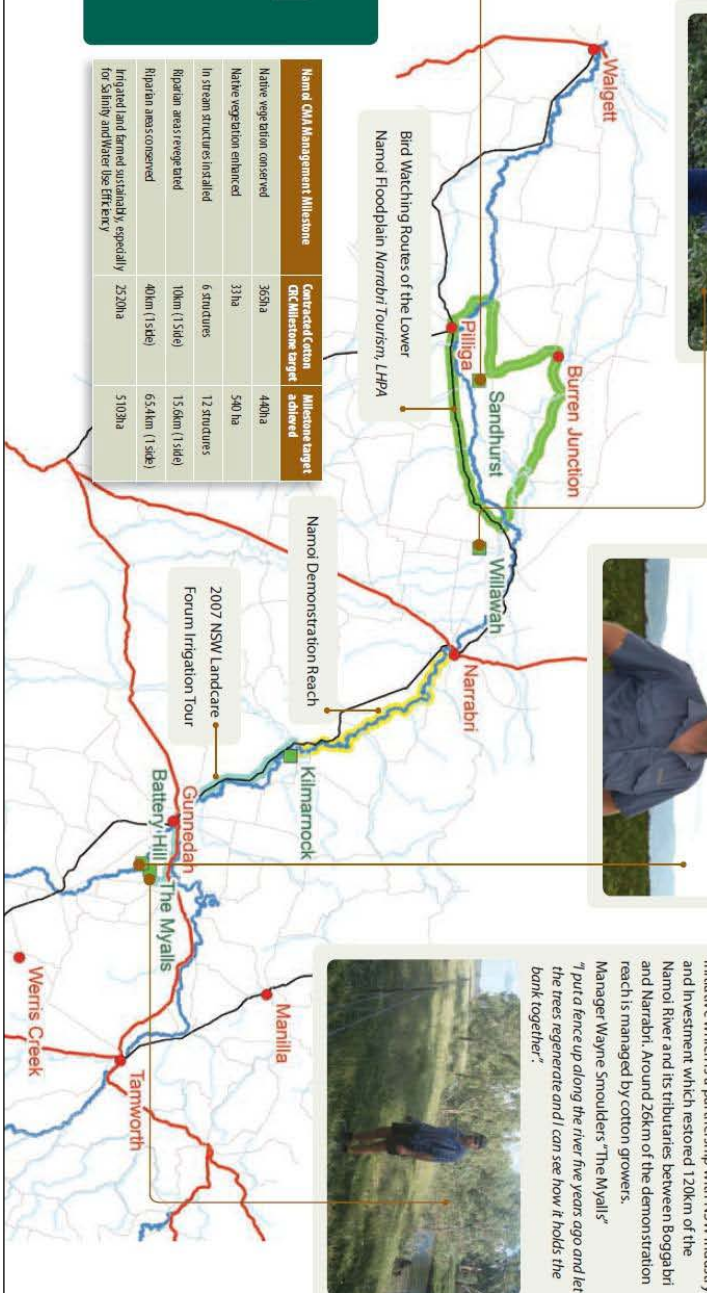
MMB BENEFIT: Improved health of riparian ecosystems and surface water quality.

CASE STUDY EXAMPLE: The Namoi Demonstration Reach is part of the Namoi Aquatic Habitat Initiative which is a partnership with NSW Industry and Investment which restored 120km of the Namoi River and its tributaries between Bogghabi and Narrabri. Around 26km of the demonstration reach is managed by cotton growers.

Manager Wayne Smoulders "The Myalls" *"I put a fence up along the river five years ago and let the trees regenerate and I can see how it holds the bank together."*



CASE STUDY EXAMPLE: David Grellman "Sandhurst" *"Subdividing our paddocks has made stock management much easier because we now know how much feed we have ahead of us."*



Namoi OMM Management Milestone	Conserved Cotton CRC Milestone target	Milestones target achieved
Native vegetation conserved	365ha	440ha
Native vegetation enhanced	37ha	540ha
In stream structures installed	6 structures	12 structures
Riparian areas revegetated	10km (1.5M)	15.6km (1.5M)
Riparian areas conserved	40km (1.5M)	65.4km (1.5M)
Irrigated land farmed sustainably, especially for Salinity and Water Use Efficiency	2520ha	5100ha

adoption

Forty-Five Cotton Growers across the Namoi valley undertook on-ground projects to improve the condition of their natural assets on their farm.

extension

Approximately 50% of the industry within the valley participated in natural resource training.



Some of the training workshops and extension tools developed:

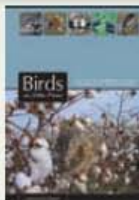
- Irrigated Cotton and Grains Workshop series
- 2007 Lippia Management Forum
- BMP Land and Water Management Workshop series
- Birds on Farms: Monitoring Biodiversity and Habitat Workshop series.

Cotton Catchment Communities CRC

Locked Bag 1001 Narrabri NSW 2390
stacey.vogel@cma.nsw.gov.au
peter.verwey@cottoncrc.org.au
www.cottoncrc.org.au



2008 Biodiversity in cotton landscapes
Calendar (maintaining our natural workforce) and factsheet series



Birds on cotton farms
 (A guide to common species and habitat management)



Common Plants of grazing pastures on the Lower Namoi floodplain



Fishes on cotton farms
 (A guide to Native fish habitat management for north-west NSW)



Lippia Management Book

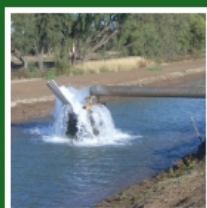
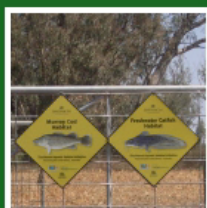
PUBLICATIONS

FUNDING CONTRIBUTORS

- Namoi CMA ●●●●●
- Cotton CRC ●●●●●
- NSW Industry & Investment (Former NSW DPI) ●●●●●
- Department of Agriculture, Fisheries and Forestry ●●●●●
- Exchange National Vegetation Knowledge Service ●●●●●
- Greening Australia ●●●●●
- Swift NRM ●●●●●
- Central West CMA ●●●●●
- Border Rivers Gwydir CMA ●●●●●
- National Lippia Working Group ●●●●●
- Western CMA ●●●●●
- Queensland Murray-Darling Committee ●●●●●
- UNE ●●●●●
- Birds Australia ●●●●●
- Natural Heritage Trust ●●●●●
- Condamine Alliance ●●●●●
- Envirofund ●●●●●
- Murray Darling Basin Authority ●●●●●
- Australian Cotton Grower Association ●●●●●
- CSIRO ●●●●●



Farm Mapping and myBMP



Why should I map my farm?

Good environmental planning and management has the major economic benefit of limiting exposure to risk and enhancing property value.

Farm maps are also an integral part of the myBMP Natural Assets module.

myBMP links to farm mapping

Getting the balance right between farm productivity and enhancing its 'natural assets' is fundamental to the future of your operation. The Natural Assets module of myBMP is designed to create an awareness of the value of vegetated and riparian areas you may have on your farm, and to take stock of your soil and water assets.

“ Having a good environmental management plan for your property is like having an environmental insurance policy in place. ”

Ken Flower, General Manager Best Practice & Research Implementation (Cotton Australia, Cotton CRC, CRDC)

Making your farm map

Making your farm map doesn't need to be a difficult process. Most of the information to be recorded will come from you, the landowner, from your own knowledge of the farm, its layout, infrastructure, and natural assets.

There are a number of ways you can make your farm map, ranging in ease of use and available features. A couple are outlined here.

Background image

Before you start any mapping it is a good idea to obtain up to date aerial photography or satellite imagery to use as a background to your farm map. This can usually be obtained through your local Catchment Management Authority or Natural Resource Management board. Another alternative is to save an image from Google Maps to use as a background.

Hand drawn map

This is the simplest method and provides basic features and functions when complete. Using the aerial photo or satellite image as a background, separate clear plastic sheets are used to draw map details as an overlay. For example there could be separate overlays for property boundaries, farm

infrastructure, soils, vegetation and biodiversity, riparian, and future proposed works.

Once complete, you can add and remove layers to see just the information you need at any given time for management decisions.

Geographic Information Systems map

Another option is to use computer software to create an electronic map that can be viewed on screen or printed out. This is most commonly done using GIS, which stands for Geographic Information Systems, essentially a computerised mapping tool. There are many GIS packages available and choosing which is right for your needs is a balance of cost and ease of use. Cost can be anywhere from free to thousands of dollars. All GIS packages will require initial learning to use them, some are relatively simple, while others are very complex and offer a wide range of advanced features.

The big advantages of an electronic map are that it can be edited when there are changes to be made, it can be kept up to date, information can be turned on and off, the map can display as little or as much information as you need at the time. It is also easier to make multiple copies to distribute to staff and contractors.



www.cottoncrc.org.au

myBMP items to be mapped

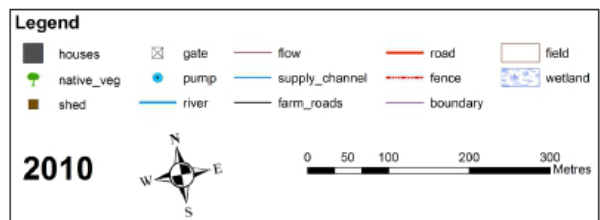
Level 2

- Scale
- North arrow
- Maps are based on aerial or satellite imagery
- Property boundaries
- Land contours / slopes
- Watercourses and riparian areas, wetlands, natural drainage lines and floodways
- Areas of native vegetation and buffer zones
- Flood information: areas of inundation, direction of flows, discharge points
- Soil types and their distribution across the farm
- Problem areas requiring management or monitoring
- Irrigation system layout
- Cropping areas (ha)
- Sheds & houses

- Roads, power lines, chemical & fuel storage areas
- Fences
- Any proposed infrastructure or development

Level 3

- The different types of vegetation present
- Test or monitoring sites for soils
- Significant areas of weeds / weed problems
- Known areas of disease



Start with an up to date aerial photo or satellite image as the background to your farm map.



Draw features over the background image. Shown above are: fields, roads, fences, pumps, sheds, rivers, wetlands, and native trees.

Other information to record

Level 2

- The location and area of the property (in ha)
- Ownership and farm management details
- Descriptions of soil types present and their key features
- Irrigation system type and capacity
- Water sources and licence / allocation details
- Water supply reliability
- Water quality for all water sources (in particular - EC, SAR and pH). Any issues regarding the suitability for irrigation should be noted and addressed.
- Irrigation requirements for typical rotations are calculated, and a water budget is prepared
- Typical flood impacts such as known heights, severity of impact and frequency of events
- Any proposed changes to infrastructure or management practices
- Development controls that affect the property

Level 3

- Climate information, including annual rainfall and reference evapotranspiration (ET_o) data

Where to from here?


www.mybmp.com.au

Once you have mapped your farm and completed the Natural Assets module of myBMP, there are other modules to work towards.

Login to the myBMP website for more details.

myBMP Modules

- Bioresecurity
- Biotechnology
- Energy and Input Efficiency
- Fibre Quality
- Human Resources
- IPM - Insects, Weeds & Diseases
- Natural Assets
- Pesticide Management
- Petrochemical Storage & Handling
- Soil Health
- Water Management





Cotton Catchment Communities CRC



Further Information

Cotton Catchment Communities CRC
Australian Cotton Research Institute
Locked Bag 1001 Narrabri NSW 2390

web: www.cottoncrc.org.au

email: peter.verwey@cottoncrc.org.au

phone: 02 6799 2476



Namoi Groundwater Monitoring & Management Workshops

Upper Namoi

10th March 2011 – Gunnedah Services Club

Lower Namoi

17th March 2011 – ACRI Conference Room

Start 8:30am Finish 1:30pm



Water in the Namoi – Latest groundwater research results. What is the quality of your groundwater – bring a sample for testing. Managing water quality for your crop.

To register contact Peter Verwey on 6799 2476 or 0408 972 516

Email: peter.verwey@cottoncrc.org.au

RSVP now or no later than 7th March 2011

FREE WATER QUALITY TESTING bring along your bore samples for EC testing



- Use a plastic container, not coke or juice container.
- Collect the water sample from a freely flowing bore (ie, at pump outlet or spill point)
- Pump must have been running for at least 15 minutes, prior to sampling
- Rinse the collection container with at least 4 volume of sample water before collecting a sample for measurement
- Collect at least 100ml and try to avoid air bubbles when sampling
- Label the bottle with your name, sample date and time and bore number if sampling more than one bore.
- Store in a cool place
- Remember to bring the sample to the workshop for testing.





myBMP

for Growers
powered by Research

FREE TRAINING WORKSHOPS

Contact Peter or Sally to organise a free training session.

Training can be either one on one or in a small group to introduce you to the myBMP system and get you up and running.

Namoi

Peter Verwey
phone (02) 6799 2476
peter.verwey@cottoncrc.org.au

Border Rivers / Gwydir

Sally Dickinson
phone 0427 521 498
sally.dickinson@gvia.org.au



Training outline

- Registration
- History of myBMP
- How the myBMP system works
- Recording your progress
- Hands-on, using myBMP
- Questions

A product of
The Australian Cotton Industry
Development and Delivery Team

Best Practice

myBMP supports continual improvement, one of the keys to Australian cotton grower's ongoing status as world leaders in quality, sustainability and best practice.

- Easy to use web-based system
- Self-assessed practices
- Optional audit to become myBMP Certified
- 11 modules cover whole farm operations
- Practices categorised into 4 levels
- Industry Development & Delivery Team support
- Industry based Accredited Advisors can provide expert advice on all aspects of myBMP
- Getting started is easy at

www.mybmp.com.au

Level 1

identified legal requirements

Level 2

current industry best practice

Level 3

'5 year' aspirational best practice

Level 4

'10 year' aspirational best practice



myBMP Service Desk ph 1800 COTTON (1800 268 866) email admin@mybmp.com.au

Appendix 6: myBMP FAQ sheet, DL card front and back



John Hamparsum's family has been testing the groundwater continuously for 46 years on their property on the Breeza Plains of NSW.

TESTING THE WATER

AT GROUNDWATER WORKSHOPS IN THE NAMOI VALLEY RECENTLY THE MAJOR RECOMMENDATION WAS TO HAVE GROUNDWATER TESTED AT THE LEAST ONCE A YEAR, IDEALLY AT THE VERY START OF THE IRRIGATION SEASON.

An annual groundwater test should be a full irrigation analysis through an accredited laboratory. Added to this, regular in-season testing conducted by growers themselves helps identify trends in resource condition throughout the season.

By keeping records year to year, any changes in the groundwater resource will be easier to identify and farm management of the groundwater resource and water quality will help achieve maximum crop yields.

Upper Namoi cotton grower John Hamparsum is setting the benchmark for sustainable management of his farm's groundwater resources through regular monitoring of bore water levels and water quality.

John is the second generation to farm at "Drayton" on the Breeza Plains. His father Ian began farming there in 1961 and it was four years later the farm's first production bore was commissioned.

What is outstanding is that the Hamparsums have continually monitored their farm bores since the first bore was drilled, giving them 46 years of water records.

Today, 11 bores have their standing water level measured at least both pre and post-season. Three bores have a full irrigation suite of water quality tests done annually through a NATA (National Association of Testing Authorities) accredited laboratory. John can also do on-farm water quality

testing and monitors the surface water used on farm using inexpensive hand-held EC meters.

"When asked what parameters had been tested back in 1965 John produces a folder with handwritten laboratory reports from that year right through to current printed reports for testing this season," said CRC Catchment Officer Pete Verwey, who works with growers in the Namoi to assist them with resources to successfully implement natural resource management activities.

"All results have been entered into spreadsheets for backup and to also graphically show changes over time. Other related records kept are climate and rainfall data, and bore construction details."

Pete said from the graphs it is clear to see trends such as extra drawdown during drought periods as well as periods of recharge during wetter years. Another trend is a small but noticeable increase in EC from an untouched system to an extracted system.

John said he sees regular testing and well kept records as a powerful tool for sustainability on the farm.


The groundwater resource changes over time and with land use change and increased pressure from more bores being drilled for other types of industry. Mining in the area is one of

the newest and groundwater is being carefully monitored for any changes.

"Some years you just get busy and feel you don't have time to do the testing, but you just have to make sure that as you start the bores up to make the time and always do the tests," he said.

"All irrigators are interested in the water they are using, and with regular monitoring and record keeping the data they collect will be there for future generations to help them sustainably manage their farm," he said.

For more information on presentations from the groundwater workshops go to the Cotton CRC website, www.cottoncrc.org.au and follow the links on the "Catchments" home page.

Other water quality tools available for growers are available through NSW Office of Water's on-line, real-time groundwater database, CottASSIST water quality tool and *myBMP*. 

see our website 

email us 

Peter Verwey
026799 2476 / 0408 972 516
or mailto:
peter.verwey@cottanrc.org.au
NATA -
<http://www.nata.asn.au/accreditation>



WORKSHOPS MAKE IT EASY



BREEZA STATION'S ANDREW PURSEHOUSE ATTENDED A MYBMP WORKSHOP RECENTLY AND SAYS HE WOULD RECOMMEND ALL GROWERS AND MANAGERS ALSO MAKE THE MOST OF THE OPPORTUNITY.

Run by Cotton CRC Catchment Officer Peter Verwey, *myBMP* workshops were held at Breeza, Wee Waa, Boggabri, Walgett and Spring Ridge. The three-hour sessions were aimed at giving an introduction to the functions, tools, information and use of the web-based system.

Andrew and Cindy Pursehouse had registered for *myBMP* at the Cotton Conference last year, but had not progressed with the system since that first registration.

"The workshop I attended was good because it allowed me to explore all the

abilities of *myBMP* compared to the previous BMP," Andrew said.

"The registration process over-awed me at the Cotton Conference, but there was more time to explore (at the workshops), I was able to go through all the features of the program and get a snapshot of what it can do.

"I would encourage everyone to come to these workshops. You have to really explore *myBMP* yourself, and put a toe in the water. I haven't found any faults and the system is really well put together.

"The new *myBMP* system is a breath of fresh air compared to the old BMP system - you can't really compare it to the old system."

Andrew said there seemed to be endless possibilities with the new *myBMP*.

"You can work towards levels 1 and 2, or higher to 3 and 4, or just pick the pieces that are immediately applicable to you, for example - workplace agreements," he said.

"Since the workshop we have been working our way through the Human

Resources module at Breeza Station.

"We have also been looking at our fuel handling situation and soon we will be installing ground filling inlets on all tanks."


Andrew's advice to other growers/managers/office staff is the workshops are a good place to kick off where you can ask questions and get answers.

"It is handy to bounce ideas off the presenter and other growers," he said.

"Human nature being what it is, sometimes you need a shove in the side to kick things off and get started. The workshops are nice and brief and quick at three hours and don't take up a full day.

"I would encourage all growers and managers to go to one of these *myBMP* training workshops."

More workshops will be run and all people involved with running the farm are encouraged to attend.

Call Peter (Namoi) or Gwydir Landcare Officer Sally Dickinson to discuss a training for your locality. 

Namoi *myBMP* Enquiries:
Peter Verwey
02 6799 2476/0408 972 516
peter.verwey@cottoncrc.org.au



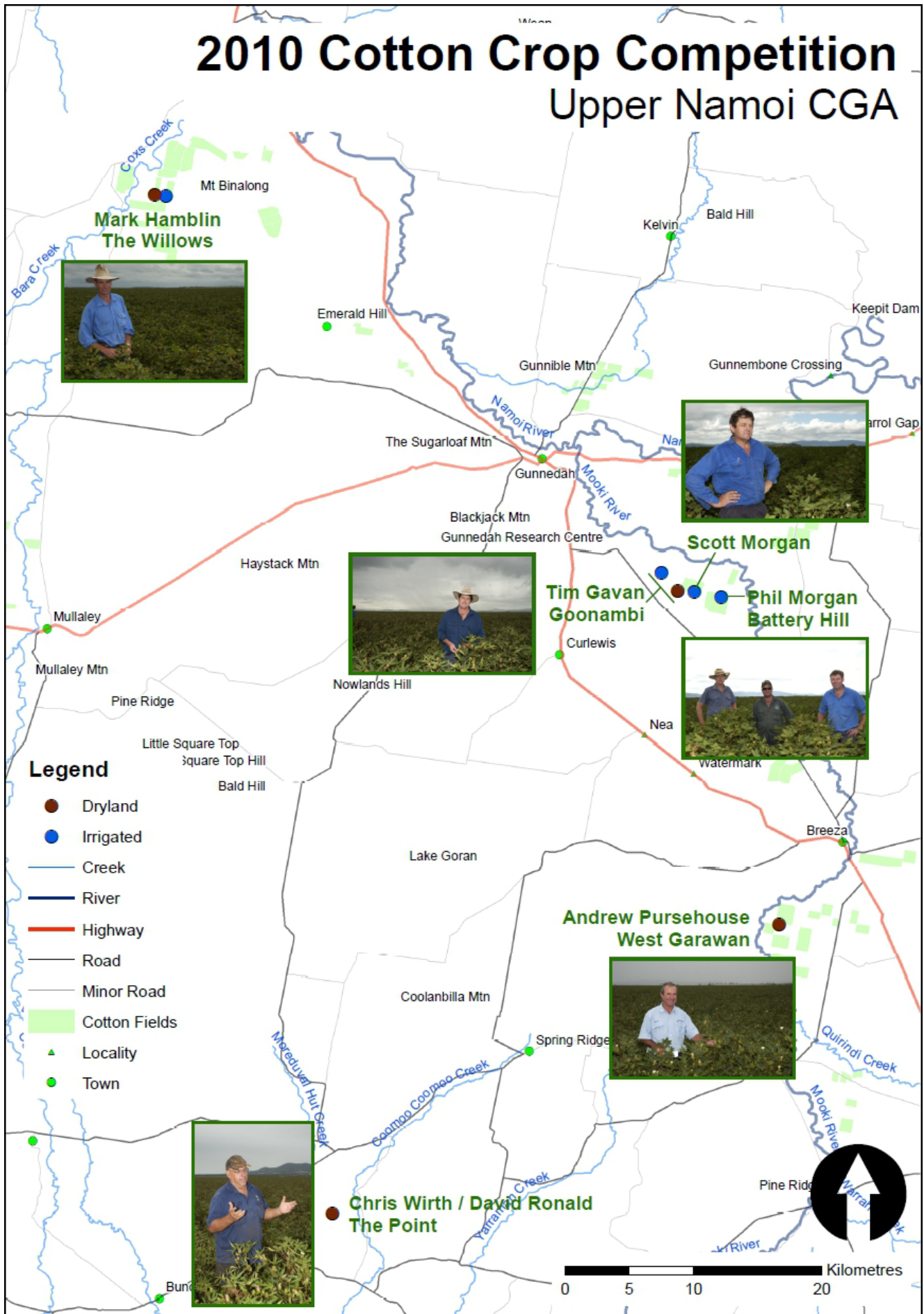
Gwydir *myBMP* Enquiries
Sally Dickinson
0427 521 498
sally.dickinson@gvia.org.au



Cindy and Andrew Pursehouse of "Breeza Station".

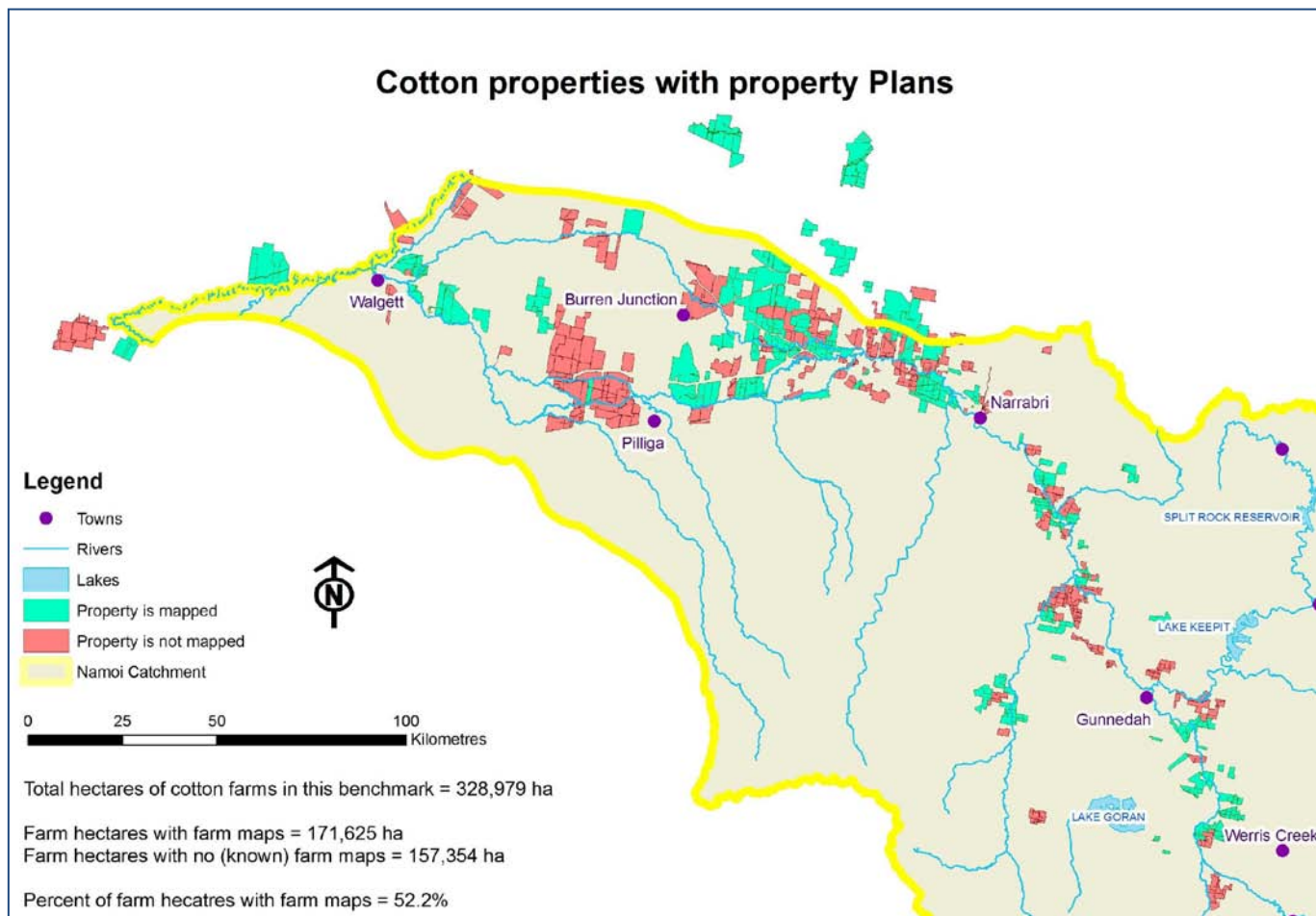
"THE NEW *myBMP* SYSTEM IS A BREATH OF FRESH AIR COMPARED WITH THE OLD BMP SYSTEM."

2010 Cotton Crop Competition Upper Namoi CGA



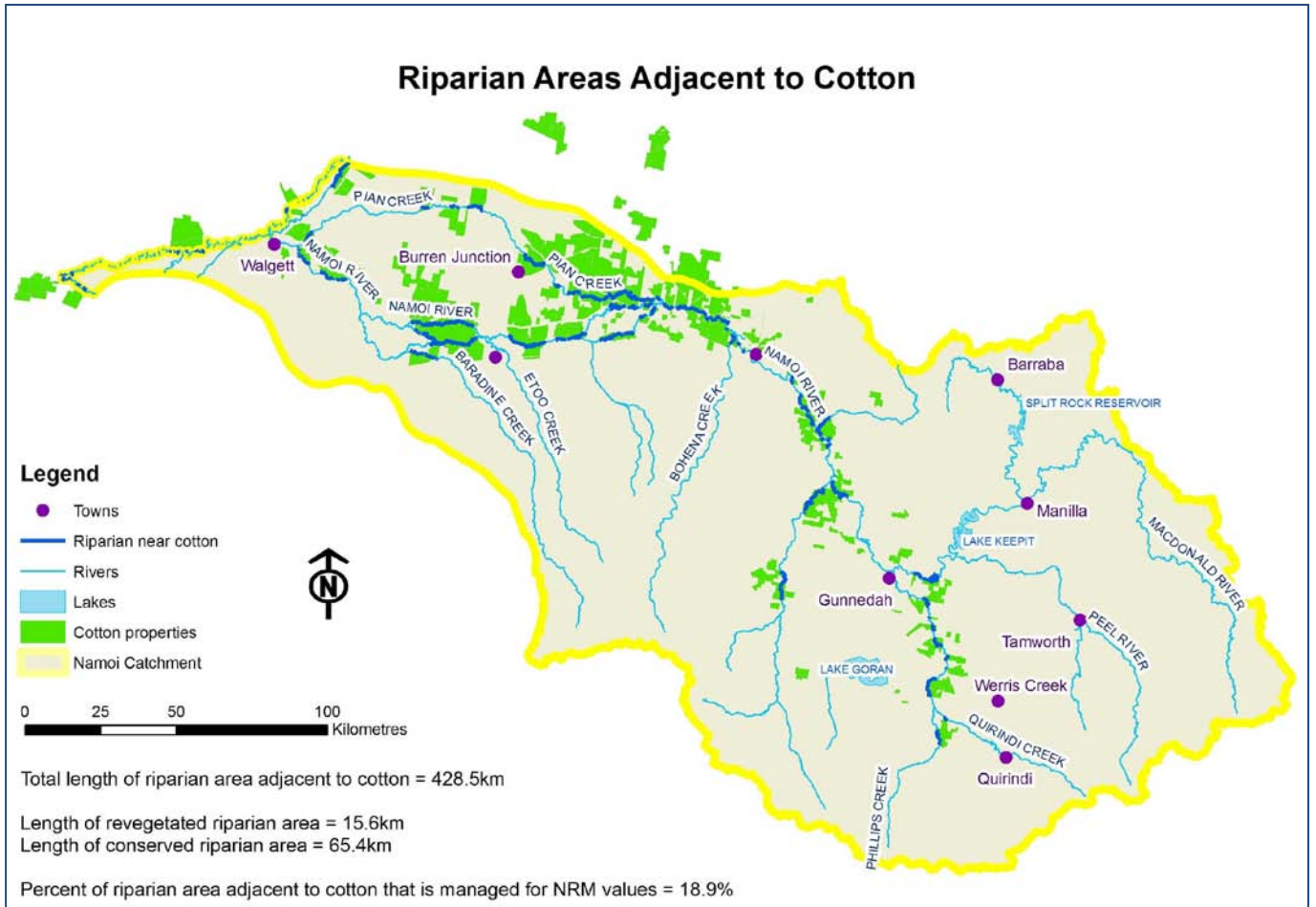
Appendix 9: Map of Upper Namoi 2010 Crop Competition winners

THIS MAP IS NOT FOR PUBLIC DISTRIBUTION



Appendix 10: Figure 2: Cotton properties with property plans.

THIS MAP IS NOT FOR PUBLIC DISTRIBUTION



Appendix 11: Figure 3: Riparian areas adjacent to cotton.