Cotton Catchment Communities CRC

FINAL REPORT

Part 1 - Summary Details

Cotton CRC Project Number: 5.02.37

Project Title: IPM Target Pest Lead

Project Commencement Date: **Project Completion Date:** 30/6/2012

Cotton CRC Program:

Part 2 – Contact Details

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Part 3 – Final Report Guide (due at 31st May 2012)

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

Background

1. This project commenced in 2010, with the appointment of Sal Ceeney as the Target Pest Lead to provide extension support to industry on managing key insect pests. The 2 day per week, part time position, supported key cotton entomologists, Lewis Wilson, Robert Mensah, Mary Whitehouse, Melina Miles, Zara Hall, Moazzem Khan and more recently Paul Grundy. The role was established to increase the effectiveness and efficiency of knowledge exchange from key researchers to cotton growers and consultants through a streamlined delivery service. Working with regional extension specialists and entomologists the position assessed and monitored arising pest issues and provided information updates to clients on an as needed basis. The project was linked to the myBMP program to ensure that industry best practice was being promoted throughout as well as to ensure the practices outlined in the myBMP program were up to date and consistent with best practice recommendations arising from current research. Ian Taylor was appointed to the Target Pest Lead Position in November 2011 to provide ongoing support to the role while Sal Ceeney undertook Parental Leave

Objectives

2. The two main objectives for the project were:
    - Target 1.01 At least 50% of cotton Ha adopting industry best practice on recommended sampling and thresholds
    - Target1.02 At least 50% of Ha selecting chemistry to conserve beneficial insects.

The two main targets were amended to better reflect current industry position following an industry survey indicating that demonstrated that the cotton industry has been meeting the target of 50% of the industry following IPM guidelines. The two main project objectives became:

- Greater than 50% of growers/consultants adopting the CPMG sampling and thresholds for insect pests. This will result in an improvement of the confidence that growers and consultants have to follow industry recommendations on when insect control may be necessary and can be measured by a reduction in the number of insect sprays applied 'below threshold'.
- Greater than 50% of growers/consultants using published IPM guidelines to select chemistry that conserves beneficial insects. Examples may include a reduction in the reliance of one type of chemistry (e.g. fipronil) for mirid control. Or this may be a reduction in the amount of broad spectrum early season sprays that are disruptive to beneficial insect populations.

In addition to the two main targets additional objectives built into the project agreement for Ian Taylor included:

- Update cotton Tale No 5
- Co-ordinate with CRDC, CCA and Cotton Australia to determine if another CBT survey was required
- Review the Target Pests Marketing Campaign
- Review Strategies To Manage Sucking Pests in Cotton
- In conjunction with Susan Maas, amend the Cotton Pest Management Guide for 2012.
- Co-ordinate early season bug checker information workshops with Melina Moazzem and Paul.
- Establish and run a twitter network
- Attend industry meetings as required.

Methods

3. A detailed marketing Campaign was developed for this project: Details are included below:

Measurement of Targets and Benchmarking:

The primary quantitative forms of measurement will be through the annual CCA survey and myBMP. Follow up of the impact of individual activities (such as grower meetings) will also be conducted.

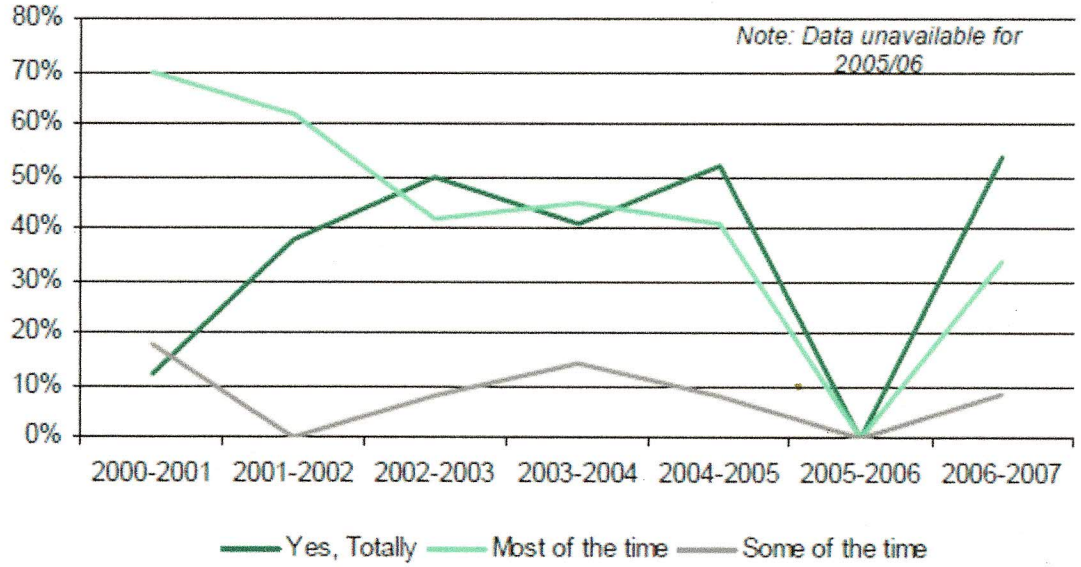
The CCA survey will give the primary quantitative data for the targets as it covers a large percentage of the industry (71% in 2009/10) and targets consultants, who are often the primary decision makers and enforcers of IPM on cotton growing farms. The CCA survey was redesigned for the 2010 season to ensure data was being gathered to specifically address whether the targets are being met.

myBMP data will be used to collect information on grower's adherence to IPM strategies, however given the timeframe of the target (to 2012) may only cover a small percentage of the industry in the next 2 years.

Follow up of individual activities will be used to gauge the success of individual activities and as a way of obtaining more quantitative data, or a feel for what is happening 'on ground' in terms of grower and consultant attitudes towards IPM. Quantitative data will also be collected as part of the CCA survey and will be used to obtain a wider view of consultant and grower attitudes towards IPM, rather than just relying on qualitative data alone.

Where are we now?

The figure below from the 2006/07 survey shows levels of IPM adherence over time.



Since 2003, the industry has been meeting the target of 50% of the industry following IPM guidelines. This will continue to be measured through the CCA survey. As an overall industry measure this is useful, however if we look more closely at specific IPM issues, the targets are not always being met.

Survey work conducted by Mary Whitehouse (CSIRO) for the 2006/07 season showed that 60% of mirid sprays were being applied below the industry recommended thresholds. Of these sprays, there was a high dependence on the use of fipronil for 63% of sprays, with many fields receiving more than one application of this insecticide in a season.

Although the industry has been at 50% IPM adoption since 2003, as a benchmark of success it is hoped that this steadily improves and becomes consistently higher than 50%.

This will be defined by:

- Greater than 50% of growers/consultants adopting the CPMG sampling and thresholds for insect pests. This will result in an improvement of the confidence that growers and consultants have to follow industry recommendations on when insect control may be necessary and can be measured by a reduction in the number of insect sprays applied 'below threshold'.
- Greater than 50% of growers/consultants using published IPM guidelines to select chemistry that conserves beneficial insects. Examples may include a reduction in the reliance of one type of chemistry (e.g. fipronil) for mirid control. Or this may be a reduction in the amount of broad spectrum early season sprays that are disruptive to beneficial insect populations.

3.1 Key drivers to change practices;

3.1a Knowledge

In order to change practices, growers must be able to recognise when change is needed by having knowledge of the issue and how it affects their business. Widespread knowledge of what IPM is and why it is important is a key driver to getting growers and consultants to recognise that IPM practices are important to their business.

3.1b Methods

Once it is acknowledged that change is needed, growers need to be given the tools to implement these changes in their business.

3.1c Benefit

A key driver in implementing change is the benefit gained. By improving IPM, cotton producers need to see an environmental, social and economic benefit.

The recent emergence of secondary pests in Bollgard II cotton has, and will, be a key driver to improving IPM in Australian cotton systems.

The spread of Silverleaf Whitefly throughout the industry, particularly when many growers expected it to be a warm climate pest, has seen IPM re-emerge as a major consideration for cotton growing.

The potential economic costs to both growers and the industry mean that effective management of SLW is vital. Given the pests ability to become resistant to insecticides used for their control, an effective IPM strategy is the key to successfully, and economically, controlling the pest.

The recent incursion of mealybug in the Emerald district is another pest that requires good IPM for control and is a further driver for the practice of good IPM in the industry.

Environmental benefits are gained through IPM by not only potentially reducing the number of insecticides applied to cotton but also the nature of these sprays, so they are less disruptive to non-target pests and the environment.

Social benefits are also a driver of IPM as the reduction of the number of insecticides and the number of broad spectrum sprays applied improve on farm O,H&S conditions for farm workers and improve the cotton industry 'reputation' in the wider community.

3.2. Strategies to achieve change

3.2a Knowledge

Provide up to date, easy to understand information on IPM.

IPM information will be distributed via a number of pathways including print, media, grower meetings and workshops.

Information on the IPM is published each year in the Cotton Pest Management Guide (CPMG).

A series of Cotton tales will be produced during the season dealing with relevant IPM issues including pest pressure considerations for the season, Cotton Bunchy Top and aphid control and management of SLW.

Valley specific grower meetings will be held throughout the industry highlighting IPM issues. An IPM short course will be held in Southern NSW targeting new growers and consultants to the industry to introduce them to IPM in the cotton industry.

3.2b Methods

Provide easy to understand tools for doing best practice in insect management

The tools required for IPM have been available for the industry for a number of years in the form of published IPM guidelines in the Cotton Pest Management Guide. These guidelines include thresholds, sampling, control measures and the impact of control on beneficial populations. Recent and continued improvements to the CPMG, particularly ensuring it is widely

available prior to planting, will see it continue to be the major IPM tool for growers and consultant.
Practical demonstrations of these tools will be given to new growers and consultants to the industry in Southern NSW via the IPM short course.

3.2c Benefits

Highlight benefits of best practices
A series of case studies, to be published in major media including Spotlight magazine and the Australian Cottongrower, will highlight grower and consultant experiences in implementing IPM in their businesses, including successes and failures.
Reinforce best practices behaviours
The myBMP program will be used to reinforce best practice behaviours by allowing growers to benchmark their IPM performance against the industry standards.

3.2 Market Campaign to achieve Change

3.3a Knowledge

Valley meetings

- Sth NSW: IPM short course targeted at new growers to introduce the concept of IPM and deliver tools and information available.
  Delivery of an area early season meeting in established cotton growing areas (Hillston and Griffith) targeting consultants (primarily) and growers to discuss area wide IPM strategy; particularly targeting reduction in early season broad spectrum mirid sprays that are disruptive to Beneficial's.
- Macquarie: Delivery of an area early season meeting in established cotton growing areas (Hillston and Griffith) targeting consultants (primarily) and growers to discuss area wide IPM strategy; particularly targeting reduction in early season broad spectrum mirid sprays that are disruptive to Beneficial's.
- Upper/Lower Namoi, Gwydir and Border Rivers: continued reinforcement of IPM strategies for controlling primarily mirid and SLW. Delivery in these areas more difficult due to lack of extension staff, however utilise other industry channels such as CCA or CSD.
- Darling Downs/Balonne/Central Queensland: continued reinforcement of IPM strategies for controlling primarily mirid and SLW to be delivered at already established AWM meetings, or any other grower meeting (e.g. CGA meetings) by extension team.

Cotton tales as required looking at Pest Pressure for 2010/11, using IPM to control Cotton Bunchy Top, etc.
Delivery of pest information as required (e.g. in the instance of a new emerging pest or problem arises during the season).

3.4 Methods

Deliver the Cotton Pest Management Guide annually. Making it easy to use, available and in time for first plantings or 30 Aug.

3.4a Benefits

- Annual review of myBMP modules to update information and make easier and clearer to use; modules 2 Biotechnology, 3 IPM and 4 Pest Management. Packagers.
- Promote the use of myBMP. This will be done through promoting myBMP as a source of IPM information for growers and as a benchmarking tool. myBMP will be promoted, as appropriate, through grower meetings and publications.
- 3 articles in Spotlight and Cotton grower Magazine; a series of grower case studies looking at:
    - The use of oils as an IPM tool
    - 'No spray BGII' highlighting the use of careful sampling and following thresholds so as to not spray BGII unless necessary. Benefits of preserving Beneficial's and reducing costs.
    - Getting it wrong - the high cost of poor IPM management using SLW as an example.

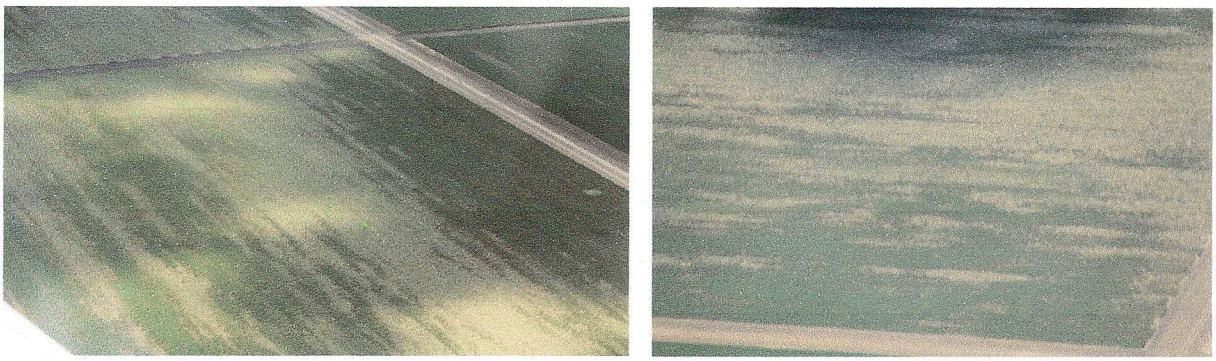
Results

4. This project has contributed to numerous field days and has developed a number of articles for the management of key pests across the cotton region. Key outputs are summarised below:
    a. Spotlight articles
        i. Spotlight - Spring: Aphid Control – limited options require wise choices
        ii. Spotlight - Spring: Early Season aphids – don't panic
        iii. Spotlight – Winter: Alarming Potential For CBT Damage
        iv. Spotlight – Winter: Growers Warned To Act Now Against Next Season's Disease And Pest Threats
        v. Spotlight – Spring: Broadmites ecology, damage, control
    b. Australian Cottongrower articles
        i. Silver Leaf Whitefly – wet conditions, late crops and displaced populations, by Ian Taylor, Richard Sequeira, Paul Grundy an Lewis Wilson, Apr-May 2012, The Australian cottongrower, pp 16-18.
    c. Cotton Tales
        i. Aphid management – Cotton Bunchy Top
        ii. Early season aphid management
        iii. Cotton response to flood
        iv. Apple Dimpling Bug in conjunction with Julie Wise
        v. Broad mites, ecology, damage, control
        vi. Managing Silver Leaf Whitefly, -wet conditions, late crops and displaced populations
    d. Flood Response Article
        i. Development of 4 page brochure –Responding to late season Flooding was developed in February 2012. This brochure covered many aspects of cotton management post flooding and was distributed as a

standalone brochure in Spotlight Magazine and also distributed by retailers to cotton growers and consultants.

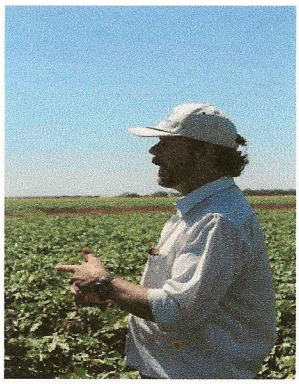
e. Cotton Pest Management Guide
    i. Updated 2011/2012 Cotton Pest Management Guide. Revision of all information in pest section including major revision to IPM section. Update to insect and mite management for the 2011 Cotton Production Manual.
    ii. Update 2012/2013 Cotton Pest Management Guide. All aspects of IPM and weed management.
f. Australian Cotton Production Manual
    i. Updated 2012/2013 edition of the Cotton Production Manual.
g. Field Days and Expositions
    i. Coordinated the Sthn NSW Cotton Expo. Lewis Wilson presented on IPM management in the cotton industry for new growers.
    ii. Presented at Macquarie Cotton Growers pre-season meeting August 2011. Highlighted management of predicted key pests for the Macquarie this season – aphids, mites and slw. Presentation put together with Lewis Wilson. Small group – 12 growers, 3 private agros, 4 reseller agros however excellent discussion around CBT threat and likelihood of slw outbreak. Agros particularly well informed of risks and current best practice management strategies.
    iii. Organise and co-ordinate field day on early season pest management and managing Pix for cutout (see photos below) with James Hill
    iv. Participate in the opening of the new gin at Hillston in May 2012 (Photos below)
h. Other events
    i. Take aerial photos of verticillium wilt affected fields at Breeza NSW (Photos below)
    ii. Cotton Bunchy Top Survey was being administered through CRDC in conjunction with Susan Maas. No follow up required by.
    iii. Strategies to manage sucking pests – A series of cotton tales focussing on aphid, SLW and broadmites were developed throughout the course of this project. Revisions to the Cotton Pest Management Guide for mirids, mites, GVB and pale cotton strainers have incorporated changes to thresholds and latest data from researchers working on these specific pest species.
    iv. Meetings with all industry entomologists were undertaken during December and February 2012 to ascertain extension support required and extension priorities for insect management.
i. A twitter network has been established for use next season @CottonIPM has been established to enable more rapid response to critical issues and to enable the extension team to follow arising issues.

j. Meetings were held with all cotton entomologists throughout Qld and NSW. During the meeting with the QDEEDI team now DAFF, the issue of the bug checker program was raised. Melina Miles and Paul Grundy had conducted this training in conjunction with Mike Stone earlier in the season. There was no requirement for an additional training program to be run, however it was suggested that maybe a back to basics course be developed for training new agronomists and bug checkers into the industry. Outcomes relating to this will be dependent on the structure of the D&D team post Cotton CRC.

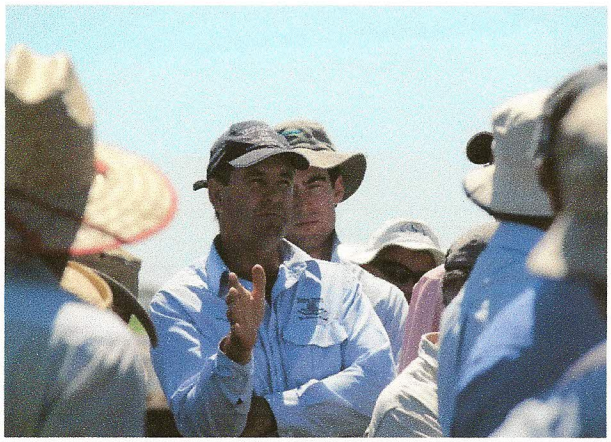


Extent of verticillium wilt in cotton fields at Breeza NSW during 2011/2012 cotton season.

Mike Bange discussing Pix application at Griffith field day 12 January 2012



Lewis Wilson providing advice on early season thrips damage



Engaged discussion among growers and consultants in Griffith

Excellent turnout with approximately 90 growers and consultants

Some parking lot!!

Getting some shade among the cotton

a.

Cotton Australia CEO Adam Kay opening the field day meeting celebrating the building of a new gin to support growers in southern NSW

Touring the new Gin complex

John Deere's new six row round module picker and baler on display at the front of the new gin

Cotton Australia's James Houlahan giving a briefing to growers on the transport of round bales

Outcomes

5. This project has contributed to the adoption of improved management practices for controlling cotton insect pests and also to the alignment of management practices with the myBMP framework.
    a. Specifically detailed management notes have been produced for:
        i. Aphids
        ii. Aphids and their interaction as vectors for Cotton Bunchy Top
        iii. Apple Dimpling Bug
        iv. Broadmites
        v. Flooded- cotton both mid and late season management
        vi. Silver leaf whitefly – late season build-up of whitefly as they disperse from defoliated crops or sprayed out weeds following extensive rain across cotton growing areas.

Two primary objectives were established for this project:

- Target 1.01 At least 50% of cotton Ha adopting industry best practice on recommended sampling and thresholds

- Target1.02 At least 50% of Ha selecting chemistry to conserve beneficial insects.

These objectives were refined however as the industry has been at 50% IPM adoption since 2003, as a benchmark of success it is hoped that this steadily improves and becomes consistently higher than 50%.

The revised objectives became:

- Greater than 50% of growers/consultants adopting the CPMG sampling and thresholds for insect pests. This will result in an improvement of the confidence that growers and consultants have to follow industry recommendations on when insect control may be necessary and can be measured by a reduction in the number of insect sprays applied 'below threshold'.
- Greater than 50% of growers/consultants using published IPM guidelines to select chemistry that conserves beneficial insects. Examples may include a reduction in the reliance of one type of chemistry (e.g. fipronil) for mirid control. Or this may be a reduction in the amount of broad spectrum early season sprays that are disruptive to beneficial insect populations.

The principal project targets have been achieved as is evidenced by the 2011 Cotton Practices Survey conducted by GHD Hassall in conjunction with the Cotton CRC Development and Delivery team. In this survey the majority of growers and consultants indicated that they selected soft chemistry that were more friendly to beneficial insects, further the majority of respondents indicated that they considered beneficial insects when making any spray decisions. The majority of respondents sampled and used industry recommended thresholds when making spray decisions, with many monitoring both pest and beneficial numbers to help determine the most appropriate management strategy. These practices align with those recommended in the Industry's myBMP program and reflect the success of the development and delivery team's efforts in promoting use of industry recommended best practices.

In relation to the use of published guidelines and those specifically published in the Cotton Pest Management Guide - this is more difficult to assess. The Cotton Practices Survey doesn't specifically ask whether consultants and growers use published IPM guidelines or sampling as described in the Cotton Pest Management Guide. The survey does however provide an indication of the most important information sources for respondents. Agronomists and consultants are described as the most important information source with 132 responses while the Cotton Pest Management Guide is 5th on the list with 16 responses. While growers obviously rely heavily on consultants, and consultants rely on other consultants and consultant networks, we are unable to clearly determine whether consultants derive their thresholds from the guidelines published in the Cotton Pest Management guide. Anecdotally, however when writing the 'Managing Silver Leaf Whitefly, -wet conditions, late crops and displaced populations' Cotton Tale, consultants that we spoke to, relied on the SLW matrix contained in the Cotton Pest Management Guide for control decisions. This indicates that at least for some issues, the Cotton Pest Management Guide is a ready source of information.

Conclusion

This project has provided valuable information on both the management of key pest species and management of flooded cotton for the cotton industry during the period 2010-2012. Specifically, the information was provided to address important issues as they arose, supplementing information contained in the Cotton Pest Management Guide and the Australian Cotton Production Manual.

- Aphid abundance increased during the 2011/12 season due to host prevalence following above average rainfalls across cotton growing areas. This caused a great deal of concern throughout the industry as Cotton Bunchy Top had been widespread during the 2010/11 season and as aphids are the vector for this disease the probability of a major CBT outbreak was high. Three cotton tales addressing Aphid management and Cotton Bunchy Top disease were prepared by this project providing industry with detailed management information.
- Apple Dimpling Bugs were problematic early in the 2011/12 season. Also known as yellow mirids, growers were unclear as to whether these insects were likely to require control. Apple dimpling bugs have the potential to damage seedling cotton however they are also useful predators of Helicoverpa eggs and mites. In low numbers they are unlikely to cause a yield reduction but may cause pin squares to be shed and as numbers increase could affect yields particularly in short season areas. A cotton Tale was produced by Julie Wise in conjunction with this project to provide management guidance.
- Broad mites, typically a rare pest of cotton and more normally found in tropical/subtropical areas were observed in high numbers during the 2011/2012 cotton season. This was primarily thought to be due to the high humidity experienced throughout much of the season as well as the very high rainfall experienced. Broadmites are difficult to control in cotton as there are no acaricides currently registered for their control, however incidental control of Broadmites has been observed when growers applied abamectin for control of two spotted mite. Additionally, petroleum spray oils provide additional control of a range of mites and insect pests.
- Significant flooding occurred throughout many cotton growing valleys late in the 2011/2012 cotton season. This presented enormous challenges to the industry particularly as cotton was at such a late developmental stage and thus management options were limited. This project led the development of a four page management brochure in conjunction with leading industry scientists, Mike Bange, Ian Rochester, Lewis Wilson, Paul Grundy, Steve Yeates and Graham Charles, reviewing physiological responses, nutrition, pest and weeds issues that may need to be addressed following such an event,
- Silverleaf whitefly also became problematic late season 2011/12. The build-up of SLW at this time in the season was atypical, and primarily resulted in the movement of adults into late maturing cotton crops following control of alternative hosts (weeds) in fallow fields when rainfall events began to

diminish. Guidelines for SLW control published in the Cotton Pest Management Guide primarily use the threshold matrix to predict expected population increase resulting from resident populations. Because SLW numbers in this case were primarily coming from non-resident populations the same set of assumptions hence control recommendations were no longer applicable. A Cotton Tale and subsequent article published in the Australian cottongrower magazine were developed with key scientists, Lewis Wilson, Richard Sequeira and Paul Grundy to address this challenging problem.

Extension Opportunities

(a) This is an extension/adoption project. All activities detailed in this project contribute to industry extension

Publications

1. A. Publications relevant to this project.

Non-peered reviewed articles

a. Spotlight articles

   i. Spotlight - Spring: Aphid Control – limited options require wise choices
   ii. Spotlight - Spring: Early Season aphids – don't panic
   iii. Spotlight – Winter: Alarming Potential For CBT Damage
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   v. Spotlight – Spring: Broadmites ecology, damage, control

b. Australian Cottongrower articles

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d. Flood Response Article

   i. Development of 4 page brochure –Responding to late season Flooding was developed in February 2012. This brochure covered many aspects of cotton management post flooding and was distributed as a standalone brochure in Spotlight Magazine and also distributed by retailers to cotton growers and consultants.

Presentations (conference, field days, workshops etc.)

a. Coordinated the Sthn NSW Cotton Expo. Lewis Wilson presented on IPM management in the cotton industry for new growers.
b. Presented at Macquarie Cotton Growers pre-season meeting August 2011. Highlighted management of predicted key pests for the Macquarie this season – aphids, mites and SLW. Presentation put together with Lewis Wilson. Small group – 12 growers, 3 private Agros, 4 reseller Agros however excellent discussion around CBT threat and likelihood of SLW outbreak. Agros particularly well informed of risks and current best practice management strategies.
c. Organise and co-ordinate field day on early season pest management and managing Pix for cutout (see photos below) with James Hill
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Part 4 – Final Report Executive Summary

This project has provided valuable information on both the management of key pest species and management of flooded cotton for the cotton industry during the period 2010-2012. Specifically, the information was provided to address important issues as they arose, supplementing information contained in the Cotton Pest Management Guide and the Australian Cotton Production Manual.

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