



# FINAL REPORT 2014

## *Part 1 - Summary Details*

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**CRDC Project Number:** CRC1212

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**Project Title:** National Extension Development and Delivery  
– Crop Protection

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**Project Commencement Date:** 1/7/2011      **Project Completion Date:** 30/6/2014

**CRDC Program:** 4 People

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**Signature of Research Provider Representative:** \_\_\_\_\_

**Date Submitted:** \_\_\_\_\_

## ***Part 3 – Final Report***

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### ***Background***

A national extension program was originally coordinated through the Cotton Research Development Corporation (CRDC), and facilitated through the Development & Delivery Team. This was transitioned into a joint venture with CRDC, Cotton Seed Distributors and Cotton Australia in 2012, to deliver extension through a new CottonInfo Team with Susan Maas (CRDC) as the national target lead responsibility for Crop Protection and Biosecurity. This project was developed to build on the preceding successful regional extension projects delivered in Central Queensland, however following the resignation of Susan Maas from QDAFF in June 2012, the project was revised to focus on the delivery of national extension in crop protection in accordance with the changed industry CottonInfo program. Essential project activities were continued by Gail Spargo (the project technical officer) in consultation with Susan Maas and Paul Grundy (QDAFF), until the appointment of Ngaire Roughley as the new Development Extension Officer with the Queensland Department of Agriculture, Fisheries & Forestry in July 2013.

### ***Objectives***

The primary target of the project was the adoption of volunteer/regrowth cotton best management practices by industry with an on ground impact such that the majority of area under cotton would:

- Have effective management of volunteer regrowth cotton
- Be compliant with industry best practice as defined by the BMP guidelines for disease management including farm hygiene practices

On-ground success was to be monitored using grower surveys, disease surveys, and Cotton Grower Association (CGA) surveys with supporting data from myBMP.

Specifically, the revised project aimed to:

- Lead and co-ordinate a cotton industry-wide campaign for the best management of volunteer and regrowth cotton
- Support project management and research activities in DAQ1204, “Management of mirids, stinkbugs and Solonopsis mealybugs”
- As required, provide technical support to cotton crop protection research projects needing to establish and manage sites in Central Queensland
- If required, respond to new/emergency cotton crop protection issues in Central Queensland

### ***Methods***

The specialist extension component of this project developed and delivered specific resources and publications to support best practice within the industry BMP framework, with a focus on volunteer regrowth and farm hygiene practices. The extension strategy concentrated on

ensuring growers and agronomists were aware of the issues and were able to identify barriers to adoption. Training could then be delivered or research needs identified as appropriate.

The extension strategy also involved strategic collaboration with research, particularly on crop protection issues, and included the communication of research to the wider industry as well as support to industry capacity building and communication (such as Fuscom). Direct collaboration with research scientists incorporated field research trials, demonstrations and evaluations, literature and research reviews. The extension officer built on established successful relationships with growers, researchers, agribusiness, regional NRM bodies and stakeholders in order to enable the development and implementation of effective delivery strategies that resulted in the adoption of agreed targets. In addition, the project collaborated with industry and commercial partners to support the development of major industry publications, such as the Cotton Pest Management Guide.

With the assistance of the Technical Officer, Gail Spargo, the extension officer Ngaire Roughley also supported and facilitated regional trials in collaboration with researchers Moazzem Khan and Paul Grundy (“management of mirids, stinkbugs and Solenopsis mealybug” (DAQ1204) and “strengthening the Central Highlands cotton production system” (DAQ1401) respectively).

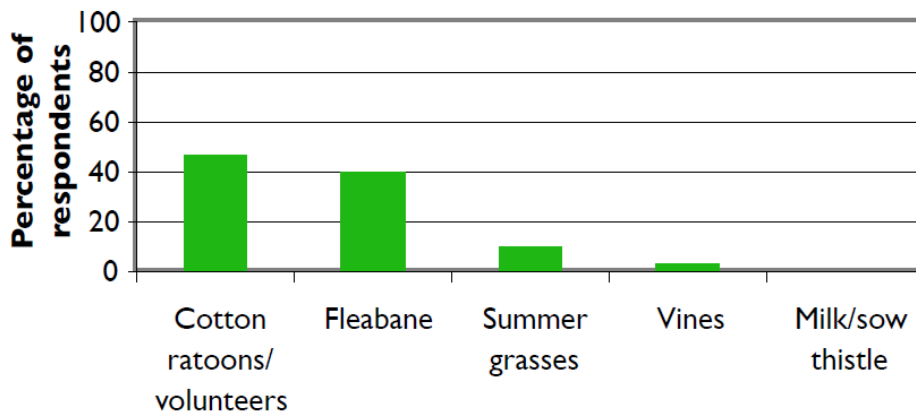
### ***Results and Outcomes***

*Objective no. 1: Lead and co-ordinate a cotton industry-wide campaign for the best management of volunteer and regrowth cotton.*

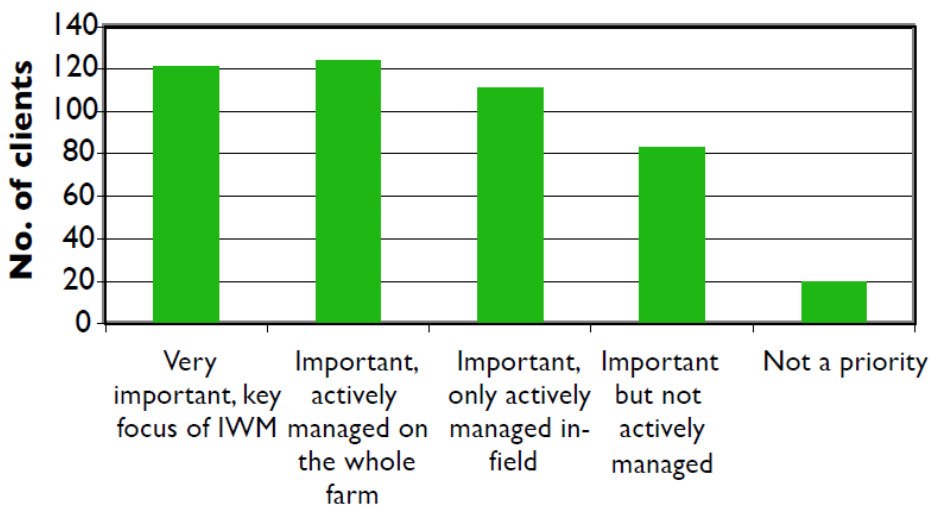
<b>Milestone no:</b>	<b>Outcomes:</b>
<i>1.2: Meet with key R&amp;D and agribusiness stakeholders in the cotton industry and work with them to design and ratify the campaign</i>	Continued collaboration with commercial product developers (e.g. Nufarm) as well as local agribusinesses (e.g. CHCG&IA) and the wider industry (e.g. CottonInfo team, CCA, CRDC, NSW DPI, QDAFF) to focus the campaign and deliver project activities.
<i>1.2: Implement the campaign</i>	Discussed below.

### Current status of volunteer and ratoon cotton in the Australian cotton industry

Most growers and consultants recognise the risks that volunteer and ratoon cotton pose to the industry. In the 2011 Crop Consultants Qualitative Survey, cotton ratoons/volunteers were identified as the weed having the greatest impact on client’s profitability (Figure 1). In the same survey, only a small proportion of cotton clients did not see controlling cotton as a priority (Figure 2).



**Figure 1: Weeds with the greatest impact on clients' profitability (2011 CCA Qualitative Survey)**



**Figure 2: Importance to clients of controlling volunteer cotton (2011 CCA Qualitative Survey)**

Unfortunately it appears that effort and intention is still not achieving the desired result. In the 2013 Crop Consultants Qualitative Survey 85% of respondents identified that volunteer and ratoon cotton had either stayed at similar levels or become more prevalent.

The annual disease survey supports these observations, by collecting information on the occurrence of surviving volunteer cotton (Table 1).

**Table 1: The occurrence of volunteer cotton plants surviving from the previous season on farms in NSW and Queensland as measured during the early season (October to December) disease survey**

Year		Along channels, roads, fences	In fallows and rotation crops	In the current crop (regrowth from stubs/ratoons)	Farms with volunteers/ratoons
Spring	NSW	44%	22%	60%	80%

<b>2013</b>	QLD	42%	25%	46%	67%
	<b>Total</b>	<b>43%</b>	<b>23%</b>	<b>56%</b>	<b>76%</b>
<b>Spring 2012</b>	NSW	41%	27%	74%	82%
	QLD	54%	9%	54%	71%
	<b>Total</b>	<b>44%</b>	<b>21%</b>	<b>43%</b>	<b>79%</b>
<b>Spring 2011</b>	NSW	44%	36%	56%	71%
	QLD	44%	8%	20%	52%
	<b>Total</b>	<b>44%</b>	<b>26%</b>	<b>43%</b>	<b>64%</b>

While the prevalence of volunteers and ratoons has remained relatively stable (allowing for seasonal variation), there is evidence that awareness of the importance of effective control is increasing as a result of the campaign. In the 2012 Crop Consultants Qualitative survey, 19% of respondents identified control of volunteers/ratoons as the most valuable element of the Bollgard RMP, after refuges and pupae busting/trap crops. Some of the comments suggested that unmonitored volunteers (e.g. along roadsides) are a particular cause for concern, as they may be hosting undetected *Helicoverpa* leading to increased resistance. In the same survey, 35% of respondents identified volunteer or ratoon cotton as the second most important factor in managing back to back cotton crops, after nutrition management.

The success of the campaign was also measured through grower surveys, such as the Central Queensland Irrigated Cotton survey conducted by the Central Highlands Cotton Growers & Irrigators Association (CHCG&IA) and CRDC in the winter of 2012, where growers indicated cotton volunteers as the main weed impacting on profitability, and requested that future crop protection research, development and extension needs be prioritised. In the 2014 disease survey grower questionnaire, 80% of respondents indicated that control of volunteers is extremely important to their farming system, while the remainder nominated it as somewhat important.

#### Project activities

The dissemination of research has occurred primarily through industry publications such as CRDC's "Spotlight" magazine. Over the course of this project, 15 articles were contributed to the magazine relating to the impacts of volunteer and ratoon cotton, and recommended industry best practice strategies (refer to publications list).

Susan Maas took on the role of technical editor of the 2011/12 Cotton Pest Management Guide. Reviews were conducted in collaboration with the CottonInfo team, CRDC communications officers, researchers and numerous others in the industry (including Greenmount Press), and technical information on control of ratoons and volunteers was added, and the IPM section completely revised. Subsequent issues maintained these chapters, which were reviewed annually by Susan Maas, Gail Spargo and Ngaire Roughley in collaboration with Nufarm (commercial partner). The relationships that were developed and fostered throughout this process have allowed the potential for future collaborative trial work.

The 2012/13 edition of the Cotton Production Manual also saw the inclusion of a volunteer and ratoon management chapter including "10 reasons why volunteer and ratoon cotton must go" as well as related chapters on integrated disease management and Come Clean Go Clean. These chapters have also been reviewed annually by the Development Extension Officer (refer to publications list).

Additional industry technical contributions have included:

- Organisation of Northern CQ Dryland Field Walk (May 2012). Ratoon and volunteer management focus with guest speaker from Nufarm reviewing trials and addressing other picking and marketing concerns. Attended by 6 growers, 6 agronomists and 4 industry representatives. Growers discussed past issues and concerns, and were able to identify what they could do in the coming season to improve crop destruction.
- Participation in a roadside cotton management meeting at St George (August 2013) Attended by local agronomists and cotton growers, as well as representation from the Balonne shire, Queensland Department of Transport and Main Roads, SunWater, Queensland Cotton gins, and local transport businesses. Outcomes from the meeting were used to develop an action management plan (in collaboration with Sally Dickinson, Border Rivers CottonInfo Regional Development Officer), which is currently under review.
- “Wanted dead or alive – cotton volunteers” advertisement for inclusion on the Cotton Pest Management Guide and Cotton Production Manual (2012, 2013).
- Participation in CottonInfo teleconferences and team meetings (2013, 2014).

Verbal discussions both in formal (meetings) and informal settings have also facilitated the exchange of information. Dissemination of CQ-based research and extension information through interaction with relevant researchers, industry representatives and growers has occurred at various local and industry-wide events such as:

- The Australian Cotton Conference (2012)
- The Australian Cotton Research Conference (2013)
- UNE Cotton Production Course intensive school (2013)
- CottonInfo teleconferences and team meetings (2013, 2014)
- Crop Consultants Australia (CCA) seminars (2011, 2012)
- Grower of the Year field day (2014)

*Objective no. 2: Support project management and research activities in DAQ1204, “Management of mirids, stinkbugs and Solonopsis mealybugs”*

<b>Milestone no:</b>	<b>Outcomes:</b>
<p><i>2.1: Work with the project Technical Assistant, providing day-to-day supervision to ensure CQ-based project activities are implemented</i></p>	<p>Gail Spargo commenced as the project technical officer in December 2011, and with the support of Susan Maas and Ngaire Roughley, has undertaken considerable field work supporting mealybug research and other farming systems solutions.</p> <p>Mealybug trials have investigated various chemical and seed treatment control options, and have also analysed population dynamics throughout the growing seasons. Weekly mealybug monitoring took place throughout the winter periods, with few sites identified despite the sometimes heavy presence of volunteer and ratoon cotton (presumably due</p>

	to the dry winter conditions).
<i>2.2: Undertake day-to-day communication with principal researcher and supervisor on progress of CQ-based project activities</i>	Regular phone, email and face to face communication was maintained throughout the project, ensuring that research activities were implemented according to correct industry protocols.
<i>2.3: Work with project team to develop communication messages for cotton consultants and growers about the management of Solenopsis mealybug</i>	Industry technical contributions included: <ul style="list-style-type: none"> <li>• Participation and presentation of relevant mealybug information at QDAFF IPM forums (2011, 2012, 2013)</li> <li>• Participation and presentations of relevant mealybug and mirid information at a combined Emerald area-wide meeting in December 2011, attended by 24 growers and 3 industry personnel. As a result of the information and discussion at this meeting, growers and consultants generally adhered to the recommended soft IPM approach – and while mealybugs were present in the Central Highlands during the 2011/12, high beneficial insect populations prevented significant damage.</li> </ul>

*Objective no. 3: As required, provide technical support to cotton crop protection research projects needing to establish and manage sites in Central Queensland.*

<b>Milestone no:</b>	<b>Outcomes:</b>
<i>3.1: Work with principal researchers to coordinate and conduct regional on-farm trials and/or monitoring each season</i>	<p>The project was initially established to deliver national extension in crop protection, with a strong regional focus on linking Central Queensland growers with research and facilitating best management practices within the area. The Development Extension Officer worked with principal researchers to continue to foster and utilise strong links within the local industry, particularly cotton grower associations (Central Highlands, Dawson Valley, Belyando and Biloela), Area Wide Management Groups (East Nogoia and West Nogoia), local agribusinesses (resellers, pesticide applicators, processors) regional NRM bodies (Fitzroy Basin Association (FBA), Central Highlands Regional Resources Use Planning Cooperative (CHRRUP) and Cotton Australia.</p> <p>Specifically, the Development Extension Officer participated in the establishment,</p>

	<p>weekly monitoring and harvest of Paul Grundy's early planting trial (2013, 2014) (DAQ 1401); and provided technical support and assistance to other miscellaneous trials based in Central Queensland including Jamie Iker's (Spackman Iker Ag Consulting) plant density trials (2012) (SIAC1301), Paul Grundy's volunteer cotton survey (2013) (DAQ 1301), CSIRO Bollgard® trait trial (2013, 2014) (CSE1202), and Monsanto/CSIRO Helicoverpa egg collections (2012, 2013) (CSE1103).</p>
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Technical support and general crop protection extension was delivered through the project via:

- Attendance and participation at regional Cotton Growers Association meetings, including involvement and support on multiple issues such as planting window extensions and research proposals (2011, 2012, 2013)
- Authorship and distribution of 8 "CQ Cotton Tales" newsletters to communicate locally relevant research and industry issues to growers and consultants in Central Queensland
- Bi-monthly authorship of CQ regional summaries to the Australian Cottongrower magazine (2011, 2012, 2013)
- Authorship of the annual season summary for the Australian Cottongrower magazine (2011, 2012, 2013)
- Technical support to a number of FBA funded myBMP workshops as well as demonstrations of Cottassist software to a number of individual growers (2011, 2012)
- Technical input into a variety of CHRRUP projects linked to myBMP (including a written review of 16 projects in 2011 in and 21 projects in 2012)
- Participation in the Cotton CRC crop protection impact review in Narrabri (2012)
- Organisation and presentation at end of season review with Emerald growers and consultants (June 2012)
- Collaboration with Cotton Australia representatives and local consultants to develop a Dawson/Callide grower flood damage assessment after the 2012/13 season
- Collaboration with Central Highlands Cotton Australia regional manager, Renee Anderson to deliver a workshop to identify key concerns of Emerald growers (2012)
- Collaboration with CHG&IA research and technology committee to develop the 'Central Queensland Irrigated Cotton Survey' to help identify what Central Queensland growers can do to increase the reliability of irrigated cotton yields, discuss the limits to profitability of irrigated cotton growing, and target research and extension needs for the area (2012).
- Collaboration with QDAFF researchers Melina Miles and Paul Grundy (QDAFF) to present a 'bug checker training' day, which was well attended by consultants/bug checkers and growers looking to update their insect identification skills and knowledge in an informal, hands-on format (December 2012)

- Organisation of a growth regulant (pix) field walk presented by Paul Grundy with a follow up article ‘Regulate growth for the right reasons’ produced by Susan Maas for Spotlight magazine (2012)
- Support and participation at Cotton Seed Distributors field walk with presentations from John Marshall (CSD), Paul Grundy and Jamie Iker at “Braylands” Emerald (2013)
- Support and participation at 3x field walks with Paul Grundy and Jamie Iker to demonstrate progress of the early planting trial at “Orana” Emerald (2013)
- Organisation of Emerald Irrigation Area farm tour for Theodore growers visiting Emerald, including collaboration with 2PH for a shared presentation, farm tour and lunch with participants from the Grape Connections conference (2011)
- Collaboration with the CHCG&IA and Cotton Australia to deliver and present at the Emerald “Teach the Teacher” bus tour (2012, 2013)
- Support and participation in CSIRO mini field to fabric workshop in Emerald (2013)
- Support and participation in a Cotton Australia bus tour of the Emerald Irrigation Area (2013)
- Support and participation in the CHCG&IA R&D meeting (2013)
- Support and participation in the release of the Cotton Australia Subsidence Impact Report in the region (2013)
- Support and participation at IPM, biodiversity and myBMP workshops at Comet and Theodore, organised by Liz Alexander (Blue Dog Agribusiness) (2013)
- Collaboration with Cotton Australia and CHCG&IA to organise and facilitate a pre-season meeting with Emerald growers and consultants to discuss relevant research updates, including the Bollgard II planting permit extension (August 2013)
- Support and participation in 3 small grower group meetings organised and facilitated by CottonInfo’s Central Queensland Regional Development Officer Geoff Hunter with presentations from Mike Bange (CSIRO) and David Hall (Pursehouse Rural) (November 2013)

*Objective no. 4: If required, respond to new/emergency cotton crop protection issues in Central Queensland.*

<b>Milestone no:</b>	<b>Outcomes:</b>
<i>4.1: Provide regional intelligence, coordination and response for industry on emerging crop protection issues in CQ</i>	The Central Queensland Development Extension Officer is often a first point of contact for emerging crop protection concerns, operating as a liaison between growers, researchers, biosecurity officers and the wider industry. The Development Extension Officer worked with a range of industry stakeholders to develop and implement local responses to a range of crop protection issues, as listed below.

The project was well positioned to provide regional intelligence, coordination and response to a number of crop protection issues including:

- Cotton Bunchy Top (CBT) – the “Last Chance to Act” campaign was developed in 2011 in collaboration with QDAFF senior pathologist Dr Murray Sharman to promote best management practice of cotton volunteers and ratoons. The campaign included a press release, ABC radio interview and an electronic risk assessment survey and training video, developed to support the annual CCA survey. 48 growers from 5 regions were interviewed as part of the CCA CBT campaign, with 83% of participants rating good control of volunteer and ratoons as important or very important. 42% believed they would have no problems with control of volunteers and ratoons. No participants identified that they couldn’t control volunteers and ratoons, however more than half did identify that they would have some difficulty. 98% of participants identified that as a result of the risk assessment survey they had changed practices, including 17% who indicated that they would discuss concerns about CBT with neighbours or local cotton grower associations. The Development Extension Officer assisted Dr Sharman in his property visits around Emerald, and also in consulting with any growers with concerns.
- Phenoxy herbicide drift and other crop damage - response to the notification of several instances of phenoxy hormone damage to young cotton over the 2011/12 season, by providing advice to growers and collaborating with local QDAFF Farming Systems and Biosecurity officers in the development of an information fax for distribution throughout the CQ QDAFF Farming Solutions network
- Boll rot investigations throughout the 2011/12 season, including monitoring assistance with CSD row spacing and variety trials
- Come Clean Go Clean – protocols developed in collaboration with Cotton Australia and Biosecurity Queensland and promoted across the wider industry. For example, Susan Maas presented a plant disease and Come Clean Go Clean message at the Southern Cotton Growers Expo in Griffith in 2011, with a number of follow up enquiries from interested growers. The Development Extension Officer also utilised the opportunity to discuss the potential for cross promotion with representatives from southern NSW rice growers and the NSW DPI. This collaboration allowed for the development of stickers and other materials were to focus on all farm machinery. The project also worked in collaboration with the CHCG&IA and Cotton Australia to train two new machinery inspectors in 2011, an action which was integral to the Central Highlands Come Clean Go Clean campaign.
- “What’s wrong with your crop” campaign – based around the Cotton Symptoms Guide edited by Susan Maas, Duncan Weir and Stephen Allen and launched at the March 2012 Cotton CRC Science Forum. The guide was updated and expanded information on diseases and disorders with strong cross discipline participation to include disease, biosecurity, nutrition etc. 4,280 copies were printed with support from the Sygenta Cruiser fund and 8 resellers, a strong indication of industry support. The guide was promoted in the Autumn 2012 edition of Spotlight, with messages targeted early in the season to encourage growers and consultants to conduct field surveys. The guide was also made into an app which was released at the 2012 Cotton Conference.
- QDAFF cotton disease survey – the Development Extension Officer and Technical Officer provided continued assistance to the pathology team during their surveys around Emerald, and also throughout the Darling Downs, Dirranbandi, St George and

Thallon areas in 2014. Regular contact with the pathology team has developed and maintained good relationships and ensured that the project is kept up to date with emerging disease issues across the wider industry. In 2011, the Development Extension Officer facilitated a review of Integrated Disease Management (IDM) strategies, which included the recommendation for volunteer and ratoon cotton incidence to be included in the early season disease survey.

- Investigation of Reniform nematodes at Theodore – the project assisted in the distribution of information to consultants in the Dawson and Callide catchment areas.

The project provided industry leadership in communication of national crop protection and biosecurity issues, with extensive collaboration with other cotton researchers and organisations. The Development Extension Officer has provided continued support of numerous events and organisations such as:

- Fusarium Wilt of Cotton Research and Extension Coordination Committee (Fuscom) – participation in Fuscom meetings included the presentation of disease extension summaries and the facilitation of biosecurity discussions, as well as strong involvement in the 2011 review of Fuscom protocols for the seed production and F-rank trial protocols.
- CCA – continued support of CCA activities has included suggestions of industry material for newsletters and speakers for forums. For example, in 2012 the Development Extension Officer responded to concerns about Sclerotinia by providing an article for the CCA newsletter and organising for a pathologist to present at the May forum. The Development Extension Officer also presented at this seminar, and provided assistance in developing a CCA researcher contact list.
- CottonInfo team – continued collaboration with Border Rivers Regional Development Officer to develop and monitor adoption of volunteer control strategies such as the proposed provision of a CGA-funded backpacker chipping team to contract out to interested growers.

*Objective no. 5: Six monthly and final reporting to CRDC*

<b>Milestone no:</b>	<b>Outcomes:</b>
<i>5.1: Reports provided on time (31 May and 30 November each year)</i>	Five biannual reports were submitted

### ***Conclusion and future extension opportunities***

The project has been successful in delivering a campaign to increase awareness of the prevalence of volunteer cotton, as a significant threat to crop protection and biosecurity. The associated risks of volunteer cotton have been well integrated into various other pest, weed and disease messages, with recent survey data indicating that the majority of growers rate control of volunteers as either extremely or somewhat important. However, this increase in industry awareness has not translated into an on-ground change, with recent surveys demonstrating the presence of volunteer, ratoon and feral cotton to be unacceptably high throughout all cotton growing areas.

Building on the work of this and other previous crop protection projects, it is strongly recommended that future research and extension is undertaken in collaboration with industry researchers, commercial product development specialists (chemical companies and tillage implement manufacturers) and interested growers/consultants to refine volunteer cotton control tactics. This should also incorporate the development of information to better demonstrate the linkage between volunteer cotton and pest management issues, as well as the documentation and promotion of management guidelines for volunteer cotton and associated pest issues.

Cotton continues to be a key player in the Central Queensland irrigated farming system, with the ongoing presence of a Development Extension Officer offering the opportunity to maintain a focus on regional priorities, as well as contributing to national crop protection extension issues.

## **Publications**

Spotlight articles:

- “Growers warned to act now against next season’s disease and pest threats” – Winter 2011
- “Managing ratoons and volunteers” – Winter 2011
- “Alarming potential for CBT damage” – Winter 2011
- “Fighting on after flood”
- “Aphid control – limited options require wise choices” – Spring 2011
- “Early season aphids – don’t panic” – Spring 2011
- “What wilt is that?” – Spring 2011
- “Put your best foot forward” – Summer 2011/12
- “Know your enemy – attack strategically” – Summer 2011/12
- “Regulate growth for the right reasons” – Summer 2011/12
- “What’s wrong with your crop” – Autumn 2012
- “Come clean at harvest” – Autumn 2012
- “Rogue cotton has a new nemesis” – Spring 2013
- “Win the war against volunteers – timing and vigilance” – Summer 2013/14
- “Rogue cotton: free luxury accommodation for next season’s pests and diseases” – Autumn 2014

Australian Cottongrower magazine:

- “Overwintering strategy of solenopsis mealybug” (by Moazzem Khan, Melina Miles, Susan Maas, Kristy Byers and Gail Spargo – October/November 2012
- “Understanding Solenopsis mealybug damage on Bollgard II” (by Moazzem Khan, Kristy Byers and Gail Spargo) – October/November 2013
- “Volunteer cotton: an increasing source of concern” – February/March 2014
- “Biodegradable film for earlier boll filling” (by Paul Grundy, Steve Yeates, Jamie Iker, Gail Spargo and Ngaire Roughley) – April/May 2014
- Bi-monthly district reports – 2011, 2012, 2013, 2014
- Annual season reviews – 2011, 2012, 2013

Cottontales:

- 12/9/2011 – 2011/12 extension package; planting considerations
- 27/9/2011 – Clean up last year’s cotton plants; CottonMaps; water use efficiency indices: a snippet to dazzle at the next party (written by Lance Pendergast)
- 13/10/2011 – Day degree update; cold shocks; replant considerations; disease survey coming up
- 26/10/2011 – Day degree update; aphid management (in collaboration with Sally Ceeney and Lewis Wilson)
- 15/11/2011 – In season nutrition monitoring (written based on fact sheet by Duncan Weir)
- 9/12/2011 – Apple dimpling bugs; what is Pix (mepiquat chloride)?; northern Pix experience – think like a plant
- Pre-season 2012 – Spray drift

Miscellaneous contributions to:

- Cotton Pest Management Guide – Susan Maas took on the role of editor in 2011/2012, and included a new section on volunteer and ratoon management which has been reviewed annually
- Cotton Production Manual – inclusion an annual review of section on Come Clean Go Clean and volunteer and ratoon management, including “10 reasons why volunteer cotton must go” in 2012/13; annual review of the disease section.
- Cotton Symptoms Guide edited by Susan Maas, Stephen Allen and Duncan Weir
- Cotton Symptoms Guide app

### **Intellectual property and commercialisation**

No new IP was created for this project.

### ***Part 4 – Final Report Executive Summary***

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This project was jointly funded through a QDAFF and CRDC partnership to provide a development and delivery extension program focused on national crop protection in cotton based farming systems, whilst also providing regional extension support within Central Queensland.

As part of the broader crop protection and biosecurity area within a farming system extension strategy, the project addressed targets relating to volunteer regrowth and farm hygiene practices. The extension strategy for these targets was focused on ensuring growers and agronomists were aware of the issues and were able to identify barriers to adoption, and to deliver training or identify research needs as appropriate. The extension strategy also involved strategic collaboration with research, particularly on crop protection issues, and included the communication of research to the wider industry as well as support to industry capacity building and communication

The project has been successful in delivering a campaign to increase awareness of the prevalence of volunteer cotton, as a significant threat to crop protection and biosecurity. The associated risks of volunteer cotton have been well integrated into various other pest, weed and disease messages, with recent survey data indicating that the majority of growers rate control of volunteers as either extremely or somewhat important. However, this increase in industry awareness has not yet translated into an on-ground change, with recent surveys demonstrating the presence of volunteer, ratoon and feral cotton to be unacceptably high throughout all cotton growing areas. Building on the work of this and other previous crop protection projects, it is strongly recommended that future research and extension is undertaken to refine volunteer cotton control tactics.