



## ***Part 3 – Final Report***

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

### ***Background***

#### **1. Outline the background to the project.**

BGC has provided training on application and drift management to the cotton industry for over a decade. During this time BGC has sort to raise awareness of drift reduction techniques and to put in place a training program that is well accepted by the industry. BGC believes it had achieved those goals.

The aim of this project was to develop a path to transition the existing workshop program to an industry based (fee for service) accreditation/endorsement that meets the needs and expectations of cotton growers.

### ***Objectives***

#### **2. List the project objectives and the extent to which these have been achieved, with reference to the Milestones and Performance indicators.**

##### **1.1 At least 3 trainers identified in year 1 by 1/9/2012**

Three trainers from industry were identified in year 1 and received initial training and limited co-delivery. They included: Trent Findlay – Darling Downs, Mary Obrien – Darling Downs, Simon Williams – Gwydir. Trent Findlay has co-delivered workshops with Bill Gordon at Surat and Dalby. Mary O'Brien co-delivered over 6 workshops with Bill Gordon.

Simon Williams was delayed due to health issues, it was intended that he would return to the program in year three, however this did not happen.

##### **1.2 A further 2 trainers identified in year 2 by 1/9/2012**

Three D & D Team Members received further training in application and drift management: Kieren O'Keeffe, John Smith and Ian Taylor. Kieren O'Keeffe facilitated Application and Drift Management Workshops at Hillston and Darlington Point in October, 2013.

To date none of the three have attempted to deliver workshops independently of Bill Gordon, nor have they sort further training.

In year 3 BGC recruited Dr Jorg Kitt, who delivered a number of workshops in Cotton Growing areas. BGC also started working with Annabelle Guest, conducting trials and upskilling her to deliver spray workshops.

If required in future, I would anticipate that Jorg Kitt and Annabelle Guest would be the individuals most likely to continue delivery of workshops and extension activities related to pesticide application.

1.3 At least 1 additional trainer identified in year 3 by 1/9/2014

**Discontinued due to variation to produce a number of legacy outputs as outlined in objectives 7.1-7.6**

2.1 1 professional development workshop delivered in year 1.

- Two Professional Development (train the trainer) workshops were held in conjunction with training for a GRDC funded project (those who will also specialise in Cotton have received additional specialist training).

2.2 1 professional development workshop delivered in year 2

- A two day professional development workshop for D & D team members was conducted in Narrabri on June 4 & 5, 2013. Where Ian Taylor, Kieren O’Keeffe and John Smith attended.

2.3 1 additional professional development workshop delivered in year 3 to selected trainers by September 2014

**Discontinued due to variation to produce a number of legacy outputs as outlined in objectives 7.1-7.6**

3.1 At least 6 spray drift workshops (leading to accreditation) delivered in year 1 by BGC and selected trainers

- 7/8/12: Bill Gordon conducted a workshop / field day at Inverness, Gurley to discuss drift events in the Moree area, and to outline issues with Night Spraying, surface temperature inversions, sprayer setup and deposition, and legal requirements for spraying. The meeting was attended by over 65 participants, with 47 growers and 14 advisors in attendance.
- 29/8/2012: Quandialla, NSW: A workshop for NEW cotton growers and their neighbours. This workshop was to support new growers that had experienced Phenoxy damage on more than one occasion during their first season.
- 4/9/2012: ACRI, Narrabri: A workshop for advisors as a part of the UNE cotton production course.
- Two Application and Drift Management Workshops for Cotton Growers and their neighbours were held at Goondiwindi (12/12/12) and Rowena (7/3/13).
- Two pilot workshops (of 2 days each split over 3 months) were held at Chinchilla and Dalby in Qld (in conjunction with Cotton Australia and the Darling Downs Cotton Growers Association) to provide drift reduction training and additional training leading to accreditation (commercial spray contractors license in Qld). All participants who submitted assessments obtained their commercial contractors licenses. This process consisted of growers completing the application and drift management workshop, gathering additional evidence from their enterprise (which are all tasks that are a requirement of the myBMP pesticide module). This was followed by an additional day of training and assessment to cover WHS and risk management strategies (also aligned with my BMP). These workshops were also supported by Darling Downs CGA and Cotton Australia.

Four (4) additional workshops co-funded from this project, with GRDC as the primary source, were completed in cotton growing areas in year one, these include:

- 26/3/2013 Waverly, Spring Ridge, 45 Participants
- 4/2/2013, Ballata Golf Club, 35 participants
- 13/12/2012, Surat “the Hub”, 21 participants
- 11/12,2012, Mungindi “Tundunna”, 8 participants

The GRDC cash contribution towards these workshops was \$12,000 + GST, the CRDC cash contribution from this project was \$3,270 + GST.

### 3.2 At least 6 spray drift workshops (leading to accreditation) delivered in year 2 by BGC and selected trainers

Four workshops entirely funded by CRDC were delivered in year 2,

- September 3, 2013 Narrabri: ACRI–UNE Cotton Production Course, 24 advisors.
- October 22, 2013: Hillston (facilitated by Kieren O’Keeffe), 19 participants
- October 23, 2013: Darlington Point (facilitated by Kieren O’Keeffe), 29 participants
- December 2, 2013, St George (facilitated by Jane Hill).

Evaluation data and participants lists have been supplied previously.

Additional Workshops:

8 workshops completed in cotton growing areas were co-funded from this project in year 2, with GRDC as the primary source. Financial contribution from this project was equivalent to the cost of 2 workshops fully funded by CRDC. The locations for the workshops that were selected for support from this project were based on the incidence of spray drift, groups of relatively new growers, or they were areas identified as areas of need by Cotton Australia, where Sandy Young facilitated 5 of the workshops (indicated with an asterix\*),

The additional co-funded workshops were held at: Wee Waa: “Blue Gums”, 15/7/2013, 15 participants: \*Quirindi: “Goonoo Goonoo”, 27/8/2013, 31 participants: \*Walgett: Sports Club, 28/8/2013, 28 participants: \*Moree: TAFE Facility, 29/8/2013, 42 participants: \*Narrabri: Auscott, 2/9/2013, 40 participants: \*Goondiwindi: “Alcheringa”, 4/9/2013, 44 participants: Condobolin: Sports Club, 11/9/2013, 13 participants: Berrigan, Sports Grounds, 10/10/2013, 7 participants

The GRDC cash contribution towards these workshops was \$24,000 + GST, the CRDC cash contribution from this project was \$6,600 + GST.

### 3.3 At least 2 spray drift workshops in year 3 by BGC and trainers by 30/6/2015

Two application and drift management workshops were held. The first was at Narrabri on 2/9/2014 at Narrabri, with 22 participants (mostly consultants and advisors). The second was held at Moree on September 18, 2014 with a total of 14 participants (half of the participants were spray contractors, the remainder were growers and one advisor) All participants were under 45 (except for the consultant).

A 2-day workshop was delivered for Cotton D&D members at the ACRI in April 2015. The key topics were spray drift management and the use of vegetative barriers on cotton farms. A resource package including presentations, industry guidelines and scientific papers was provided to those present.

- 4.1 4 sprayer evaluations conducted by 30/6/2013
- Sprayer evaluations were delayed in year one due to the availability of appropriate equipment to complete testing to international standards.
- 4.2 4 sprayer evaluations conducted by 30/6/2014 (in addition to 4 from first year)
- A total of 8 sprayer evaluations for cotton growers have been completed by Graham Betts, the final data provided by Graham Betts of ASK GB has been uploaded to the D&D folder marker “sprayer testing”.
  - Results of the sprayer testing were used to prepare the case study on pesticide input efficiency for the cotton info website supplied to Meg Strang in June 2015.
- 5.1 At least 2 outputs, 1 publication and 1 decision support tool will be developed in year 1 by 30/6/2013
- Bill Gordon has completed a smart phone and tablet based app for calculating logistical and mixing requirements, nozzle selection and the sprayers automatic rate control settings for banded and directed spraying undertaken by Cotton Growers. Version 1.0.45 of the ispray band spray calculator is available on Google Play and the Apple istore as a free APP for tablets and smart phones.
  - Two articles were written, one on BMP for over the top herbicide applications and the other on BMP for defoliation which were distributed in e-newsletters.
- 5.2 At least 2 outputs, 1 publication and 1 decision support tool will be developed in year 2 by 30/6/2014
- Bill Gordon has written an article for the Cotton Spotlight Magazine on summer fallow spraying titled “The unintended consequences of higher spraying speeds” which was submitted on November 18<sup>th</sup>, 2013.
  - Bill Gordon has provided reviews for my BMP pesticide module, Pest Management Guides in 2014.
  - The banded spray calculator was updated for new IOS versions and updated on the Apple istore
- 5.3 **This objective was replaced with objectives 7.1 to 7.6**
- 6.1 At least 2 cotton industry functions attended in year 1
- Bill Gordon attended the initial D & D meeting held in Brisbane.
  - Dan Hickey presented at the National Cotton Grower of the Year Field Day at “Yambicully” to launch the ispray banded spraying APP.
  - Bill Gordon attend the cotton trade show to discuss the Banded Spraying App and future training options with growers, industry and trade show attendees.
- 6.2 At least 2 cotton industry functions attended in year 2

- Bill Gordon attended the 2 day D & D meeting held in Sydney, June 2013.
  - Bill Gordon has held two meetings with growers, advisors and resellers in the Rowena area regarding a large scale drift (initially blamed on a cotton grower), to discuss how the event happened, and to discuss how to predict and hopefully prevent similar incidents in the future.
- 6.3 At least 2 cotton industry functions attended in year 3
- Bill Gordon prepared an article and gave a presentation for the CCA meeting in July 2014 related to efficacy and speed
  - Bill Gordon gave presentations at 2 dry land Cotton field days organised by Monsanto on the Liverpool plains in February 2015
- 7.1 Conduct revision of spray application section of Cotton Production Manual and Cotton Pest Management guide.
- These reviews have been completed for 2015
- 7.2 Develop new fact sheets on spray application in cotton system.
- At fact sheet on the use of Vegetable Barriers on Cotton Farms has been completed and supplied to Stacey Vogel to facilitate final formatting consistent with cotton info templates
  - A case study on pesticide input efficiency (based on sprayer testing results) was supplied to Meg Strang in June 2015 for inclusion on the cottoninfo website.
- 7.3 Develop drift management resources including Power points/handouts for extension staff
- A number of power point presentations have been posted to the D & D team shared Dropbox in a folder labelled “Spray Application” for the D&D team to use as required. These can be added to in future as requested by D&D team members
  - A case study outlining a spray drift investigation at Rowena has been posted to the D&D team drop box folder.
- 7.4 Rewrite relevant sections UNE production course
- In 2014 BGC supplied UNE with all presentations, resources and reference materials used in the Pesticide workshop for advisors. BGC has also contributed to the development of assessment items. However, despite a number of requests to UNE, the course notes were not supplied before June 30<sup>th</sup> 2015. It is my understanding that UNE still wish to review this document at some time in the future.
- 7.5 Produce short U-tube clips on ‘how to’ segments for application to cotton (e.g. banded spraying, defoliation, shielded spraying)
- A U-tube clip on vegetative barriers was completed with a professional film crew and will be posted to the GRDC website, links to this clip will be supplied when it becomes available on line. While GRDC provided funding

for the production and editing of this clip, Bill Gordons time, travel and expenses for this clip was funded from this project

***Due to the non-completion of the additional U-tube clips BGC will reduce the final invoice by 3 days x \$1600+GST***

7.6 Conduct major revision of the myBMP application module and produce or refine Resources for each item including CHAMP template

- BGC has supplied comments on all checklists items and supporting documents to Rachael Holloway and has reviewed the CHAMP document.

***As BGC did not complete the entire review, the final invoice will be reduced by an amount the equivalent of 4 days x \$1600 +GST per day***

**The final instalment amount of \$17,375+GST has been reduced to \$6,175 + GST to reflect a reduction of 7 days in total @ \$1600+ GST, (total reduction of \$11,200+GST) for the reduced outputs for objectives 7.5 and 7.6.**

### ***Methods***

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

The approach taken in this extension project was to develop and disseminate information related to application technology and spray drift management directly to growers, advisors, trainers and applicators through the delivery of workshops and through the development of resources and publications.

To develop the human capacity for future delivery a 'train the trainer' approach was adopted, with candidates identified from a range of positions within the industry and the existing extension team. This included providing initial training to existing trainers (providers of chemical user accreditation), existing D&D Team members, Suppliers of Application equipment and private consultants, followed by mentoring and co-delivery opportunities.

Only one candidate proceeded to the co-delivery phase, however they did not succeed at independent delivery.

While this outcome is true for the attempt to increase capacity for the cotton industry, a similar approach to developing capacity for the grains industry (funded by GRDC, and delivered by BGC) has been successful in developing 6 individuals (from an initial intake of over 30 candidates) who have independently organised and delivered numerous workshops throughout Australia.

Hence the model and approach to building capacity used in this project were sound (as demonstrated by the GRDC project), The major limiting factor was that we were not able to recruit individuals to the project with an appropriate level of experience within the cotton farming system. Those individuals that were recruited from industry and the D&D team already had positions and commitments that did not allow them to commit to obtaining the necessary skills and knowledge to independently deliver the program.

## *Results*

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

It became apparent throughout the delivery of this project that the intended approach of upskilling existing industry personnel in an area of specialised technical expertise was not going to result in the desired increase in human capacity. Without the security of ongoing work, it proved difficult to get individuals to commit to the ongoing professional development and self-education required to be proficient in application technology and drift management.

For further details on outputs against each objective, see section 2.Objectives.

## *Outcomes*

### **5. 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 outputs of this project did not directly contribute to the preliminary aim of transitioning the workshops from the RDC funded model to a user pays model. Without a legislative driver or requirement for individuals to attend (which was anticipated when the project was developed) it is difficult to see that this model will be able to be sustained.

The attempt to increase the human capacity to facilitate the delivery of application and drift management workshops for the cotton industry did not result in any individuals independently delivering the workshop (that has already been developed by BGC).

As an alternative approach, a variation was made to produce a number of legacy items in year three of the project, such as resources, presentations and publications for the D&D team and growers to access in the future. The majority of these items were completed, however where items were not able to be completed the final instalment for this project has been reduced to reflect the time that had been allocated to those tasks.

### **6. Please describe any:-**

- a) technical advances achieved (eg commercially significant developments, patents applied for or granted licenses, etc.);**
- b) other information developed from research (eg discoveries in methodology, equipment design, etc.); and**
- c) required changes to the Intellectual Property register.**

These outcomes are not relevant to this particular extension based project

## *Conclusion*

### **7. 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?**

This project has highlighted the difficulties in trying to build the human capacity in a highly specialised area, where technical training or formal qualifications are not available in Australia. The required level of expertise in pesticide application technology to deliver extension activities requires a great deal of specialisation. It has proven difficult to upskill the individuals willing to participate in this program to an appropriate level of proficiency, where they can independently deliver extension activities with the required level competence or confidence.

It is likely that the cotton industry will need to continue to seek the services of individuals with expertise in spray application, when or as the need arises in the future. Currently this capacity does exist for research (through CPAS). However such skills in extension are currently very limited within Australia.

The need to contract services as required may appear to be a reactive approach; however it is likely that it will remain difficult to take a proactive approach until formal education or professional development pathways become available to produce individuals with the skills and motivation required for the delivery of extension programs related to spray application and spray drift management.

#### **Take home message:**

All RDC's will need to invest in the development of application technology skills for tertiary students and graduates. I would recommend the urgent provision post graduate scholarships or internships in areas related to application technology for recent graduates, or the formation of linkages with overseas universities with students currently working in this area.

## *Extension Opportunities*

### **8. Detail a plan for the activities or other steps that may be taken:**

- (a) to further develop or to exploit the project technology.**
- (b) for the future presentation and dissemination of the project outcomes.**
- (c) for future research.**

- There is no plan by BGC to further exploit project outputs
- As this is the last project that will be delivered by BGC, there are no plans for future presentations or dissemination of research.
- Cotton copies of presentations used and other resources have been posted to the D&D dropbox folder for future use by D&D team members

### **9. A. List the publications arising from the research project and/or a publication plan. (NB: Where possible, please provide a copy of any publication/s)**

- A factsheet was produced on the use of vegetative barriers to minimise spray drift on cotton farms.
- Pesticide Input Efficiency Case study to be posted on the cottoninfo website

### **B. Have you developed any online resources and what is the website address?**

- The Ispray Banded Spray Calculator APP, which is available on the apple store and google play.

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

This extension project has delivered 24 application and drift management workshops to over 500 cotton growers, advisors and applicators.

A summary of the exit surveys obtained from 467 of the participants, showed:

- 49% of the participants were under 35 years old, and 74% were under 45
- 62% of the participants had not attended one of the workshops before
- 99% of the participants stated that they had definitely gained new information from the workshop.
- 98% of the participants said they would recommend that others attend the workshop

Two of workshops conducted resulted in the participants gaining chemical user accreditation and commercial spray operator's licence in Queensland. This was achieved utilising the resources that have already been developed for the application and spray drift management workshops. This demonstrated that the resources can easily be adapted to lead to accreditation, it just requires skilled trainers to be able to do that.

Two (2) professional development workshops, along with mentoring and co-delivery opportunities were provided to 6 individuals recruited from the cotton industry to build capacity in spray application. Unfortunately none of these people went on to independently deliver the drift management workshop.

Three workshops were delivered to students enrolled in the Cotton Production Course through UNE. Resource packs and related materials were supplied at each workshop.

Annual reviews of the pesticide application sections of industry publications including the pest management guide and cotton production manual were completed. Contributions were made to updating the pesticide module and related resources for myBMP.

Four articles related to pesticide application were prepared for industry journals (e.g. Cotton Spotlight Magazine) and presentations were given at six industry functions.

A two (2) day workshop for D&D team members on the use of vegetative barriers to reduce spray drift was developed and delivered, along with a detailed resource pack. A factsheet on the use of vegetative barriers on cotton farms was also prepared.

A total of 8 sprayer tests against the EU standards were completed by Graham Betts of ASK GB. Only one of the sprayers tested that are currently used in cotton systems would have passed the EU standards. A case study based on the results was prepared on pesticide input efficiency for the cotton info website.

A band spray calculator APP, which can determine nozzle size, logistical requirements, tank mixing amounts and spray controller inputs was released on the apple store and google play.

Bill Gordon has made available a number of resources and presentations developed for the D&D team to utilise after he completes his work for the industry on June 30<sup>th</sup>, 2015