Australian Government
Cotton Research and Development Corporation

CGA FINAL REPORT

Part 1 - Summary Details

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

CRDC Project Number: CGA1704 **CGA: Macquaire Valley**

Project Title: Weather station access to minimise the spray drift in the Macquarie

Project Commencement Date: 1/09/2016 **Project Completion Date:** 1/05/18

Part 2 – Contact Details

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Part 3 – Final Report

Background

1. Outline the background to the project.

Given the incidence of non-target spray drift having a very significant impact across the cotton industry and particularly in the Macquaire Valley over the last 2 seasons the Macquaire Cotton Growers Association (MCGA) thought action needed to be taken to try and reduce the incidence across the valley. Discovery Ag had recently installed an extensive weather station network (every 25km across our region). The MCGA wanted to use grass roots funding to install or access weather stations that could be fitted with 10m inversion towers. We discussed the potential for accessing an existing network that could be fitted with the towers as this would be more economical.

The MCGA approached Discovery Ag and Goanna Telemetry and they were happy to collaborate on this project with the shared aim of reducing the incidence of off target spray drift in the valley. Goanna Telemetry has an existing network of weather station with a web and app-based viewing platform that we were able to access as part of the project.

How the weather stations work

Surface temperature inversions are formed when a layer of cool air at the surface is overlain by a layer of warmer air. (Under normal conditions air temperature usually decreases with height.) The weather stations monitor the Air temperature at 2m and 10m.The network can flag in our app when an Inversion risk occurs.

(Inversion risk = When 10m Air Temperature is 0.1deg C greater than the Air Temperature at 2m). The weather stations then report any inversion risk that occurred between the 10min period reporting interval.

During the ten minutes the weather station is not reporting it measures and median filters air temperature every 12 seconds. The network will identify good spraying conditions and alert when inversion conditions exist.

Objectives

2. List the project objectives (from the application) and the extent to which these have been achieved.

Select the weather station locations

The weather stations locations were selected by the MCGA Committee, the locations were based on where the cotton is grown and where spray drift has been a problem in the past.

Gain permission from farmers to use the weather stations for the network

The permission was gained from Discovery Ag and the towers were installed by Goanna Telemetry to the existing stations. Discovery Ag worked closely with the farmers who host the weather station we wanted use. The farmers where then asked if they would agree to making the data public from the weather stations. This took much longer than anticipated but access to all eight weather stations was granted.

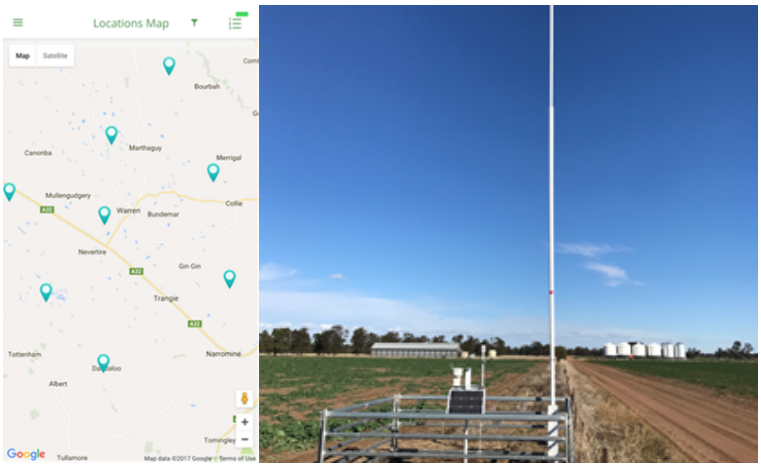

Figure 1 . Location of the weather stations around the Macquaire Valley and the inversion tower in place on farm.

Installation of the towers

The installation was an in-kind contribution from Goanna Telemetry and Discovery Ag and the grass roots grant funding was used to purchase the equipment (which included the base mount, 10m mast, rapid set cement, radiation shield, solar / air temp sensors). The towers will not require a lot of maintenance but could require the odd touch up now and again. Goanna Telemetry provided the web and app based access to the weather stations.

Discovery Ag and Goanna Telemetry should be commended as they updated their current network to show the inversion risk on their website and app version at their own cost and as in kind contribution to the project.

Summary methods and procedures

CottonInfo REO Amanda Thomas met with Tom Dowling Goanna Telemetry and John Pattison of Discovery Ag to implement a CRDC funded project that would enable most

chemical applicators in the Macquaire Valley access to free weather stations that had inversion risk capabilities. It was agreed to use the existing weather station network as much of the infrastructure was already installed. The project funds were used purchase and install the 10m poles and connect them to the existing weather stations. (see appendix 1). The weather stations were selected based on which of the existing stations in the network would provide access to sensitive areas that have experienced off target spray drift in the past, as well as areas that our other network funded by the MCGA does not cover (our other weather stations do not have inversion monitoring capabilities but are well used by the growers and contractors and are funded by the MCGA).

A summary page was developed by Amanda Thomas and Tom Dowling that outlined how to gain access to the network as well as providing some basic information around off target spray drift and outline practical steps on how to minimise it (See appendix 2).

The page was distributed to all growers and resellers in the Macquaire Valley with Julie Wise (Cotton Australia) and myself visiting resellers in the Dubbo, Trangie , Narromine and Warren areas to explain how to access the network of weather stations. A video was produced that outlines how the inversion towers work and what information they provide CLICK HERE FOR VIDEO

Outcomes

3. 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 project will have an information session for growers at the start of the season that will show growers how to access the network, we will also use social media and emails to promote the weather stations access. We will use networks of MCGA, Cotton Australia and CottonInfo to promote the project

The system was up and running on the 1st of November targeting summer fallow management after recent rainfalls. The project was promoted via an information session at the MCGA on the 30th of November 2017. MCGA also promoted the project at the AGM on the7/9/17 to the 30 guests and members. The MCGA chair Ryan Pratten promoted the project in his report at the 2017 MCGA Cotton Awards on the 10/11/17. Amanda Thomas also attended a Agriculture & Industry Community Advisory Group (CAG) meeting in Dubbo and distributed the information to the cross industry representatives attending the meeting on the 19th of September 2017. The project was promoted using social media and the Macquaire Cotton Growers Facebook page link to FB page as well as using twitter to give access to the network. There were over 20 tweets and Facebook posts with data from the weather stations stating the inversion risk on certain weather stations.

The information was sent out via the CottonInfo, Cotton Australia and Macquarie Cotton Growers Networks, growers were encouraged to share the access with neighbours. There have been 66 registered users and over 10 000 hits to the pages containing the weather station information.

The highlights of the project were the great participation from the farmers in the Valley. We also sent out access to all contractors and Aerial operators in the area. They have provided feedback that they use the network and at times it has prevented them from driving 50km out of town to go spraying when conditions were not right.

The chair of the MCGA Ryan Pratten has reported that both cotton growers and broadacre farmers see this a step in the right direction. Ryan had the following to say "We were able to come to the table with a tangible tool that would benefit everyone , and in the past it has just been a list of things we don't want farmers to do, this opened up doors and lines of

communication that have been closed in the past, it's a great collaboration where everyone chipped in and got this thing up and running The MCGA committee is hoping we can support this project into the future as the hard work has been done and it will be of great benefit in the future".

4. The highlights for participants or key learnings achieved

Access was granted to over 66 participants across the valley with participants able to get access over a 24hr period. It has become a valuable tool for many who use it to be able to have confirmation of spray conditions and other important things like how much rain fell and where. It is invaluable for contractors as they can see 8 locations across the valley and can choose which spray jobs to attend based on real time data from the network. The data also captures information on inversions and weather conditions in our Valley. Below is a graph of some of the trends that occurred in the 2016 / 2017 season. The network grants end users access to accurate historical data across the valley. The app features historical data on many data sets such as air temperature, air temperature at 10m, inversion risk, Delta T , rainfall and humidity. The website was accessed multiple times per day by users, they were able to download an app that they could access on smart phones.

We did however notice that applicators are faced with some tight windows to spray safely and effectively. Figure 2 is an example of the inversion risk and Delta T over a one week period from the "Marthaguy" weather station.

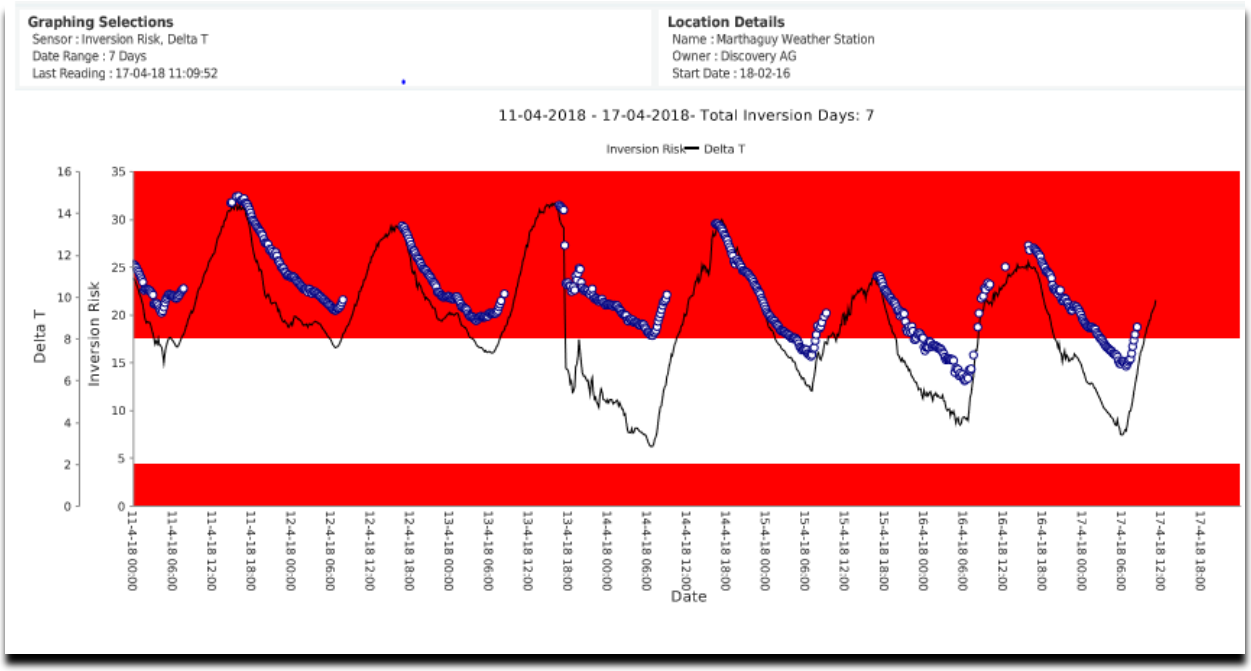

Figure 2. Inversion risk and Delta T .

Figure 2 was extracted from the Marthaguy weather station on the 11/04/18 to the 17/04/18. The blue circles show when inversion risk is high and the black line shows the Delta T. Where red is present the Delta T is not suitable for spraying. At times when the inversion is present the Delta T is too high, however there are times when the inversion is present the Delta T is in the suitable range and vice versa. This highlights that ideal conditions that meet the industry best practice are not occurring for long periods if at all in a 7-day window.

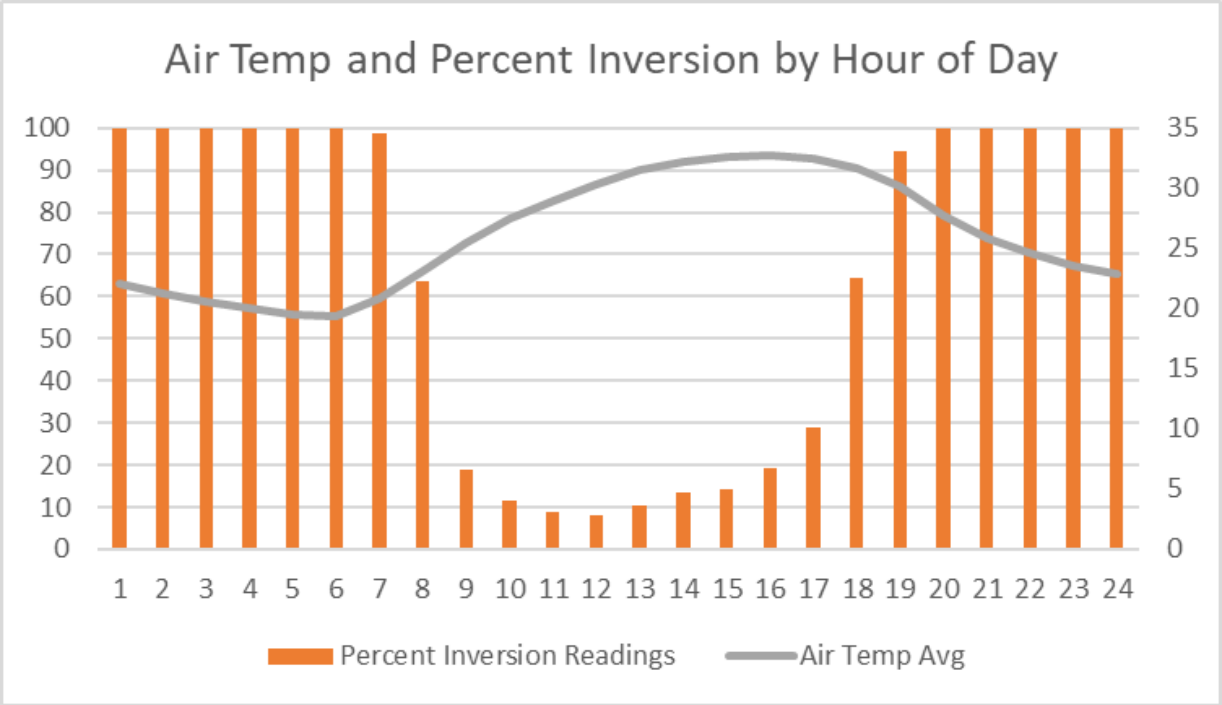

Figure 3. Marthaguy Weather Station

Figure 2 looked at the relationship between inversion conditions and Delta T . Figure 3 looks at the average (11/04/18 to the 17/04/18) inversion risk percentage and overlays temperature for the seven day period. It does show a period from 8 am to 6 pm where the inversion risk is significantly lower.

Given that some common herbicides such as glyphosate and Group I chemicals can effectively be applied in the temperature bracket that we are seeing in Figure 3 it does give evidence to support the 24 hour risk profile for summer spraying (Figure 4). This identifies the safer spraying window to be around 8am through to around 1pm in afternoon.

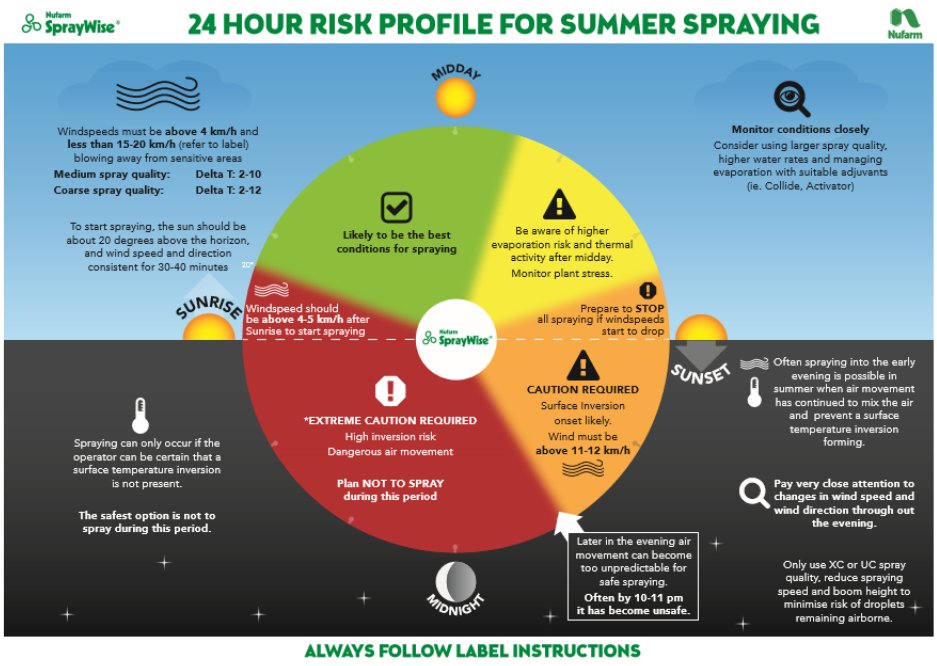

Figure 4. 24 Hour Risk Profile for summer spraying.

Conclusion

5. 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 reach of the project is hard to measure , however each season off target spray drift has been said to affect over %20 of the cotton in Australia with an impact of $20 million (2106 media release Cotton Australia) . Recent research states that much of the damage could be coming from spraying during inversion conditions. If applicators have a better understanding of what an inversion is and when and where they occur, they are less likely to spray in these conditions. This project has provided a useful tool that we can use "in season" as well as a retrospective tool that can help identify when spraying windows are occurring throughout the season.
We were aware of the challenges the industry faces and so it was important to make sure we send out succinct, accurate and consistent messages that supported access to the network. If we are able to reduce or stop the incidence of drift and improve spray efficacity it is a big win for the Industry.

The Macquaire Cotton Growers Association did not want sit back and do nothing in this space, by engaging in this project with support from our industry and commercial operators we were able to focus on providing something positive towards working to a solution. We previously focused on the 'what not to do' without providing what we should do. By having something positive and tangible to bring to the table we can gain access to and engage with participants that we previously could not.

This issue will not be magically solved in one or two seasons, it will be a long-term approach with key consistent messaging that will be backed up with access to information to make the right decisions and get desired results for all.

The MCGA feels that industry expansion is inhibited by spray drift and if we can provide solutions that are backed by our peak bodies we can overcome these hurdles and grow the cotton industry in our valley.

Feedback from participants via telephone calls stated that some did find that the two-step registration process did inhibit some end users and we would look to making this process one step if we continue the project in the future.

The take home message is that this space is very political, and emotions can run high. We need simple key messages that can make a positive impact. There are grower groups in the valley who are tackling this issue head on and they are using the weather station network as good tool and a bit of "hook " to provide something that they may not have already have or would have had to pay to get access to.

A positive was the collaboration between the MCGA, the growers, CAG, Goanna Telemetry and Discovery Ag. We all worked towards an outcome and achieved it.

The project has allowed us to look at the season historically and identify that spray windows exist and that they are line with the 24h hour risk profile for summer spraying. We have however got some research questions around the relevance of promoting Delta T as we are seeing it can be very confusing when working around inversion conditions.

We were not able to get the message out at the beginning of the season so that could have had an impact on the reduction of drift, as we were already seeing it when the information became

available. However, given that we have all infrastructure and networks and industry approvals in place, if we were to run this project next season we feel we could get outstanding results.

This was a great project with elevated levels of collaboration from both industry and commercial bodies that were working together for the betterment of the industry. It was a pleasure to be the project manager and we hope this project work is continued and improved in subsequent years. We would like to thank CRDC for the supporting this project and acknowledge that it would not be possible without the support from Goanna Telemetry and Discovery Ag and CottonInfo as many in kind hours have gone into the project.

Extension Opportunities

6. Detail a plan for the activities or other steps that may be taken:

   (a) *To tell other CGAs/growers/regions about your project*. We would be happy to do this and share our information with other CGA who may be interested in this.
   (b) *Share learnings with grower groups who were involved*. The data and analytics in this report will go into an article that will be shared with all grower groups who were involved in the project.
   (c) *To keep in touch with participants*. We have access to the email address of those who are using the network we can now send out any information that would benefit the end users.
   (d) It would be beneficial to run this project for the next season, as it did take some time to get off the ground and another season would hit home the key messages and improve the impact of the project.
   (e) Share the information with research bodies who can are interested in the historical data from last season.