



## FINAL REPORT 2015

**Choose an item.**

### *Part 1 - Summary Details*

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

CRDC Project Number: PBCRC 1501

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### **Project Title: Networking Remote Diagnostics for Australian Cotton Industry**

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Project Commencement Date: 1/07/2014 Project Completion Date: 30/06/2015

CRDC Research Program: 2 Industry

### *Part 2 – Contact Details*

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**Signature of Research Provider Representative:**

**Date Submitted:**

4 October 2015

## ***Part 3 – Final Report***

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

### ***Background***

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

Currently, pest identification is largely done in an *ad hoc* manner. A person who finds a pest may either identify it themselves or ask for an opinion from an experienced peer or peers, or in a difficult case, consult an expert. Most people, (consultants, specialists, growers, extension officers) have networks of peers and expert contacts who they consult in such cases. But in most cases, whether a person identifies a pest themselves or consults peers or experts, the identification is not recorded or if it is, it is only accessible to an individual or within an agency. Moreover, the inconvenience and logistics of handling and transporting pest specimens may often deter people from even seeking an identification. So in the current system, we fail to record valuable pest information and have limited options for identifying and diagnosing pest problems.

The PBCRC has developed a system that attempts to overcome both of these problems. We know that many pests can be identified from images and we now have wireless microscopes and cameras in mobile devices that can capture high quality, high magnification images in the field. We also have powerful software (Pestpoint) and internet connectivity that can be used to create communication networks so that people can share pest images and seek assistance for identifying pests. Pestpoint allows people to create virtual networks with their peer groups and to share, discuss, capture, store and retrieve their pest information for future reference – all from their mobile device.

The principal aim of this project is to pilot a system for remote identification of cotton pests using mobile technology, wireless microscopes and the Pestpoint software developed by the PBCRC.

### ***Objectives***

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

- a) Identify and train pilot participants - **COMPLETED**
  - a. *Milestone: At least 30 Pilot Participants trained in remote diagnostics*
  - b. *PI: All participants competent in use of technology and understand the system.*
  
- b) Trial remote diagnostics system - **COMPLETED**
  - a. *Milestone: Participants complete Pestpoint trial period*
  - b. *PI: Quality and quantity of pest identifications made using Pestpoint*
  
- c) Assess participants experience using the remote diagnostics system - **COMPLETED**
  - a. *Milestone: Evaluation activity completed*
  - b. *PI: Report from evaluation completed*
  
- d) Final report – **REPORT SUBMITTED**
  - a. *Final Report submitted*
  - b. *Final Report accepted*

## **Methods**

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

- a) **Create a virtual network.** Consultants, agronomist and plant protection experts were selected to participate in the trial. The project identified staff from Cotton Grower Services (CGS), NSW DPI, DAF Qld and CSIRO as pilot participants. Typically, a network would consist of people with a range of expertise for pest identification and would include at least one highly trained entomologist and one plant pathologist, preferably from a government agency. An administrator for the network was identified. This administrator had the ability to create a network for the group in Pestpoint, set security for the network and administer user settings, reports and create custom pest lists for the group.
- b) **Issue equipment and train participants:** Trial participants were issued with a mobile device (where they did not have them) and wireless microscopes. A workshop was conducted to teach participants how to use the microscopes and the Pestpoint software on their mobile devices.
- c) **Field Trial Period:** Participants used the system during the 2014-15 cotton season during daily operations to monitor pests. The pest group was encouraged to submit Identification Enquiries to the system and to create Pest Surveys in Pestpoint. The project team monitored usage of the system and offered assistance and advice when required.
- d) **Evaluation of the system functions:** Participants will be asked to assess their experience with the systems functionality at the end of the trial period. We need to know how well the system functions within a person's normal operational activities, so that using the system can become routine. The project team observed and collated issues that arose during the trial period, compared these with the participants experience and addressed these as necessary.
- e) **Evaluation of the system output:** We used a survey questionnaire to assess the way that interactions occurred within a network and to determine whether remote or virtual identification is effective. We also evaluated how the information that was generated from the network could be used for pest management and biosecurity purposes. The data captured by Pestpoint will obviate this analysis.

## **Results**

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

- a. *Identify and train pilot participants:* The trial included twenty seven participants including agronomists and region managers from CGS as well as specialists from CSIRO, NSW DPI and DAF Qld for the trial. Participants attended workshops and were trained in the use of the Pestpoint software for mobile and PC. Field agronomists were issued with wireless microscopes for capturing high magnification images of pests in the field and were trained to use the microscopes with mobile devices.
- b. *Trial remote diagnostics system:* A virtual network consisting of field agronomists and specialists was established in the Pestpoint software. This network provided a medium for network members to share and communicate pest problems with other members and specialists. (See Figure 1, for example) Field agronomists used mobile devices to connect with their Pestpoint network. They were able to post images of pests from the field and to share these with their network to obtain advice on pest identification and any management action that might be required in their daily operations. (See data attached File

Survey\_CottonSummaryMar2015). Pestpoint allows people to draw on the collective experience of their network members.

The screenshot displays the Pestpoint interface. On the left is a navigation menu with 'Home', 'My Flagged Items', and 'My Networks'. The 'Test Cotton' network is highlighted. The main content area shows an enquiry by Kim Duver (1 Oct 2015) with Enquiry ID 4865 in the 'Test Cotton' network, marked as 'Identified'. A large image shows a cotton leaf with brown spots. A map shows the location at 671 Wandobah Road, Gunnedah NSW 2380, Australia. A table lists specimen details: Host (Gossypium hirsutum), Affected Part (Leaf), Pest Type (Disease), and Symptom (Spot). A specialist comment from Peter Lonergan (2015-02-09) identifies the spots as *Alternaria macrospora* with high confidence. Annotations with red arrows point to 'Enquirer Pest Images', 'Specialist Comment', and 'Specialist ID'.

**Figure 1.** Shows an example of a pest enquiry summary displayed on the Home page of the Pestpoint website. Note that this enquiry is identified by a specific enquiry number, was posted in the Test Cotton Network, shows images posted by the enquirer, the response from a specialist and the identification assigned to the specimen by the specialist, including the degree of confidence for the identification.

c. Assess participants experience using the remote diagnostics system: Gary Kong and Mark Stanaway were included in the trial group as members of the CGS network in Pestpoint and so were able to follow activity in the network and facilitate where necessary. At the end of the trial period, selected participants were contacted by phone and asked a series of questions that were designed to gauge their experience with the software and the processes involved in a remote diagnostics system such as Pestpoint offers. The following sets out the process for the design of the questionnaire, the responses from participants and our interpretation of these responses in relation to the design of the Pestpoint software and the processes applied to remote diagnostics.

## Design of the Survey Questionnaire

In the fifth edition of his book, *Diffusion of Innovations*, Everett Rogers (2003) identified five criteria that determine between 49 and 87% of the variation in the adoption of new products or innovations. These criteria have been rigorously tested since the 1960's when Rogers first developed the theory of diffusion from agricultural extension. Hence, they provide a basic starting point for evaluating the potential adoption of a new product or process and in identifying the strengths and weakness in the design or concept that will lead to improvements.

The survey questionnaire for Pestpoint was designed around the following criteria:

1. *Relative Advantage* – *Is the innovation better than the product or practice it supersedes as measured by the users*
2. *Comparability with Existing values and Practices* – *Is the innovation consistent with the values and needs of the adopters*
3. *Simplicity and Ease of Use* – *Do the users find the innovation simple and easy to use.*
4. *Trialability* - *degree to which users can "dip their toe in the water" because new innovations carry with them a degree of uncertainty and apprehension from the user.*
5. *Observable Results* – *Can users see the results, because being able to see the results easily lowers the uncertainty and risk and aversion to adoption*

The questionnaire was conducted through phone conversations with individual users. A cross section of users was selected to represent field staff, agronomy consultants and specialist plant pathologists, entomologists and taxonomists. Those chosen for the survey had actively used the software during the trial period (ie sixteen of the twenty seven participants). Figure 2 shows the composition of the network and the roles of individuals. Fifteen participants completed the survey questions. The results are summarised below. The raw data for the trial, including comments and enquiries logged in Pestpoint and participants individual survey responses is provided in the attached file *Survey\_CottonSummaryMar2015*. Please note that some questions were participant specific and were answered only by specific users, such as specialists, and managers so the numbers answering questions varies accordingly. Also note that we did not attempt to determine why some participants showed little to no engagement with Pestpoint. Reasons may have been due to no pest pressure, too busy or weren't interested.

Although this was a small test group, it was a specifically targeted group (not random), it was highly representative of the mix of agronomists and specialists we would find anywhere in the sector, and participants were asked to respond to a specific piece of software that they had been specifically asked to use in the trial. Since we were evaluating the behavioural response of participants to the software, we were interested in trends rather than statistical differences. We therefore have confidence in the responses from the users in terms of the overall trend, which is similar to another group that was surveyed. In general, the answer responses were not scattered amongst the answer choices. That is, participant responses for most categories of question were strongly skewed towards a positive experience with the majority of participants answering Yes, Somewhat, Straightforward etc.

## Results of Questionnaire

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### 1. Compatibility with existing values and practices – values and needs of Adopters

The intention of these questions was to gauge whether users were comfortable with using Pestpoint as an alternative to other methods and how it fitted with current practices being employed by field staff and specialists. The responses indicate a high level of comfort with the process of sharing pest information, users felt that it was a 1. A more convenient way of sharing information than other methods, 2. That it resulted in satisfactory pest management outcomes, 3. would recommend Pestpoint to others and 3. They would like to use Pestpoint more in future. *We would conclude from this that Pestpoint is strongly compatible with existing values and practices.*

QUESTION	ANSWER
1. Are you / organization likely to use Pestpoint more in the future?	
i. Don't know	3
ii. Somewhat	1
iii. Yes	11
2. Do you feel comfortable asking for /giving advice in a network where others can see what you say?	
i. Don't know	0
ii. No	1
iii. Somewhat	2
iv. Yes	10
3. Do you feel comfortable sharing your pest information with others in Pestpoint?	
i. Don't know	0
ii. Somewhat	0
iii. Yes	12
4. Have you / organization used Pestpoint as much as you would have liked?	
i. No	6
ii. Somewhat	5
iii. Yes	3
5. In general, are pest identifications initiated through Pestpoint satisfactory for making pest management decisions?	
i. Don't know	0
ii. Somewhat	9
iii. Yes	6
6. Is Pestpoint a more convenient or less convenient way of exchanging pest advice than other methods?	
i. Don't Know	1
ii. More	11

- |   |    |
|---|----|
| 7. Would you recommend Pestpoint to others? |    |
| i. Don't know                               | 1  |
| ii. Somewhat                                | 1  |
| iii. Yes                                    | 13 |

## 2. Relative Advantage: better than innovation it supersedes as measured by users

These questions were designed to gauge the level of satisfaction with the existing processes (emails, phone, and specimens) and to compare these with the experience users had with the Pestpoint process. Users indicated that they would prefer to use Pestpoint to engage with specialists than existing technologies such as emails, phone, specimens (Questions 5, 6, ~~7~~, ~~7~~) and felt strongly that being engaged in Pestpoint networks could teach them how to better identify pests. (Question 4). There was a moderate (somewhat) to strong (Yes) feeling that Pestpoint could inform the pest management decision either directly by identifying the pest (Question 9) or indirectly by guiding what action to take. Eg send a specimen or provide further information (Question 8). *We conclude that users have a positive opinion of the Pestpoint concept as it relates to their work and that the Pestpoint software has the potential to replace existing ad hoc processes that rely on email, phone, MMS and other messaging services such as What App and Telegraph.*

### QUESTION

### ANSWER

- |   |    |
|---|----|
| 1. Are you more likely to seek a pest identification because your organisation uses Pestpoint?                |    |
| i. Somewhat   | 1  |
| ii. Yes   | 4  |
| 2. Do most samples you receive arrive with adequate collection information?                                   |    |
| i. No   | 1  |
| ii. Somewhat  | 4  |
| iii. Yes  | 2  |
| 3. Do you already have easy access to specialists outside of Pestpoint for pest identification and or advice? |    |
| i. No   | 0  |
| ii. Somewhat  | 0  |
| iii. Yes  | 5  |
| 4. Do you think that Pestpoint can be used to teach about pest identification?                                |    |
| i. Don't know   | 0  |
| ii. No  | 0  |
| iii. Somewhat   | 0  |
| iv. Yes   | 15 |
| 5. Does Pestpoint meet your record keeping requirements or do you require some additional method such as      |    |
| i. Other Database   | 2  |
| ii. Paper   | 1  |
| iii. Pestpoint  | 8  |

6. Does using Pestpoint to submit an image improve the overall process of getting a pest identified compared to just sending emails or specimens?
- |               |   |
|---------------|---|
| i. Don't know | 0 |
| ii. No        | 1 |
| iii. Somewhat | 6 |
| iv. Yes       | 8 |
7. How would you prefer to start the process of getting specialist advice, via:
- |               |   |
|---------------|---|
| i. Email      | 1 |
| ii. Pestpoint | 9 |
| iii. Phone    | 4 |
| iv. Specimen  | 1 |
| v.            |   |
8. Would Pestpoint help you to advise on whether to collect a sample?
- |              |   |
|--------------|---|
| i. No        | 1 |
| ii. Somewhat | 4 |
| iii. Yes     | 2 |
9. Would you be willing to suggest a tentative diagnosis based on an image?
- |              |   |
|--------------|---|
| i. No        | 1 |
| ii. Somewhat | 3 |
| iii. Yes     | 4 |

### **3. Result Demonstrability – the degree to which the results of using an innovation is free of physical and mental effort.**

The adoption of any new innovation will depend on the effort required to use the innovation. Innovations that demand new skills rather than using existing skills will be resisted depending on the degree of difficulty the innovation presents and the reward to the user. These questions were designed to determine if Pestpoint presented a skills barrier to users. *The results strongly indicate that users were not technically challenged by the Pestpoint software and were generally comfortable with using it in the field.*

#### **QUESTION**

#### **ANSWER**

1. Are you comfortable with using mobile devices, cameras and wireless microscopes to capture images for use in Pestpoint? If not, why and what specific problem?
- |         |   |
|---------|---|
| i. No   | 0 |
| ii. Yes | 5 |
2. Do you find Pestpoint easy to use on a mobile device in the field?
- |               |   |
|---------------|---|
| i. Don't know | 0 |
| ii. No        | 1 |
| iii. Somewhat | 1 |
| iv. Yes       | 3 |
3. Do you think the overall structure of Pestpoint is intuitive for building a diagnostic
- |               |    |
|---------------|----|
| i. Don't know | 0  |
| ii. Somewhat  | 0  |
| iii. Yes      | 15 |

#### 4. Simplicity and ease of use – as measured by users

Competence, understanding and willingness to use software varies considerably across the community. We have aimed to design a software user interface (UI) that is simple to use, requires little to no instruction and engages a wide section of the community. If we want people to adopt a new process, then the tools we provide them with must not create a barrier. These questions were aimed at evaluating the user experience with specific functions of the Pestpoint software. *Overall the users found the software simple and easy to use.*

QUESTION	ANSWER
1. How would you describe the following? 1. joining Pestpoint	
i. Confusing	0
ii. Don't know	1
iii. Straightforward	14
2. How would you describe the following? 2. logging in	
i. Confusing	1
ii. Don't know	1
iii. Straightforward	13
3. How would you describe the following? 3. submitting an enquiry with the iPad	
i. Confusing	1
ii. Don't know	4
iii. Straightforward	10
4. How would you describe the following? 4. commenting on an enquiry	
i. Confusing	1
ii. Don't know	1
iii. Straightforward	13
5. How would you describe the following? 5. creating a network	
i. Confusing	0
ii. Don't know	12
iii. Straightforward	1

*\*\* only one person had attempted to create a new network.*

#### 5. Trialability – degree to which users can “dip their toe in the water” because innovations carry with them a degree of uncertainty and apprehension from the user

These questions were aimed at determining the general “feel” that users experienced when they used the Pestpoint software and whether they felt that they were able to just “jump right in” and start using it or whether uncertainty about specific functions (addressed in Criteria 4 as Simplicity of use) caused them apprehension. *The responses from users indicate that almost all users found access to Pestpoint easy and generally were not confused or intimidated by the processes that the software offers.*

## QUESTION

## ANSWER

- |  |    |
|--|----|
| 1. How many enquiries did it take before you felt comfortable using Pestpoint?                                 |    |
| i. from start  | 7  |
| ii. one or two   | 7  |
| iii. several   | 1  |
| iv. still not comfortable  | 0  |
| 2. Were you able to easily access all of the functions that Pestpoint offers or were some functions difficult? |    |
| i. Don't know  | 0  |
| ii. No   | 1  |
| iii. Somewhat  | 1  |
| iv. Yes  | 13 |

## 6. Visibility – the degree to which an individual can see others using an Innovation

Pestpoint provides a social space for people to interact, therefore it is possible to view the social interactions in Pestpoint to get an indication of the degree to which people are aware of others using the software. The responses to the questions indicate that users were focused on pest enquiries that related directly to them (Question 3) and were not interested in “surfing” other enquiries in the Timeline (Question 2) or in exploring other people or networks in Pestpoint (Questions 4,5,6). This is surprising given that people in social networks such as Facebook are generally curious and open to exploring beyond their immediate social group. The reason that this did not occur in Pestpoint may be due to design of the software or an indication of behaviour in “professional” (work related) as opposed to social (personal) networks. It is also possible that users needed more time with the software to go beyond what they were immediately tasked with.

In addition to the questionnaire, the *actual* interactions between people in the network, captured in Pestpoint as discussions and notifications, were mapped as shown in Figure 1. Here the interactions between specialists and field agronomists are clearly visible. Looped arrows indicate comments made on enquiries from within the same organisation type. The thickness of the lines is proportional to the number of comments made from the starting organisation type to the enquiring organisation type. Figure 2 shows that there were some strong interactions around some users and that specialists were engaged with specific enquiries and with specific enquirers. There was some interaction between agronomists, however not as much as we expected. The Pestpoint facilitators had a role in guiding and helping agronomists with the process of initiating and sustaining a pest enquiry.

Unfortunately, the number of pest enquiries was limited due to the low pest pressure experienced during the season, but the mapped interactions for the enquiries that did occur shows that Pestpoint provides a fluid medium for networked communications.

*The results of the questionnaire indicate that people were willing to engage with each other using Pestpoint as a medium for communicating pest problems. The interactions map (Figure 2) shows these interactions and confirms the responses from the questionnaire.*

## QUESTION

## ANSWER

1. Do you keep an eye on what is happening in Pestpoint or only when you are notified?
- i. No 5
  - ii. Somewhat 0
  - iii. Yes 0

\*\* This double question is confusing. Answer ambiguous

2. Do you look at all enquiries in the Pestpoint Timeline or only ones that you are involved with directly?
- i. Don't know 0
  - ii. No 7
  - iii. Somewhat 2
  - iv. Yes 6

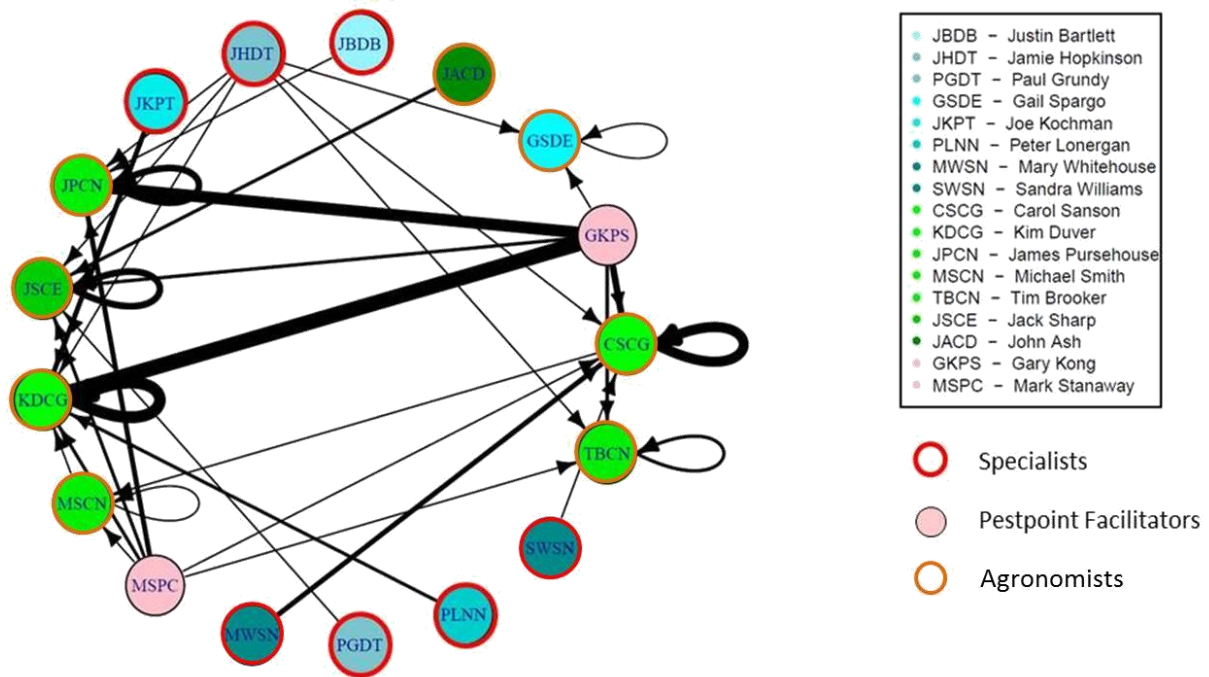
\*\* This double question is confusing. Answer ambiguous

3. Do you read enquiry comments made by others even if you are not directly in the conversation?
- i. Don't know 0
  - ii. No 1
  - iii. Somewhat 2
  - iv. Yes 12

4. Have you looked at the directory of People who are members of Pestpoint?
- i. No 8
  - ii. Somewhat 2
  - iii. Yes 5

5. Have you looked at the directory of People who are Pestpoint Specialists?
- i. No 9
  - ii. Somewhat 2
  - iii. Yes 4

6. Have you wanted to join other networks?
- i. Don't know 0
  - ii. No 14
  - iii. Somewhat 0
  - iv. Yes 1



**Figure 2.** Map showing social interactions between members of the Cotton Grower Services Pestpoint Network. Thicker lines indicate the strength of the interactions.

## 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.

**EXPECTED OUTPUT:** *Qualitative and quantitative data captured by the Pestpoint software will provide evidence of the performance of the system to facilitate remote identifications. A workshop to capture user experience at the end of the trial will help identify functionality and operational logistics of the system. Is what works and what doesn't?*

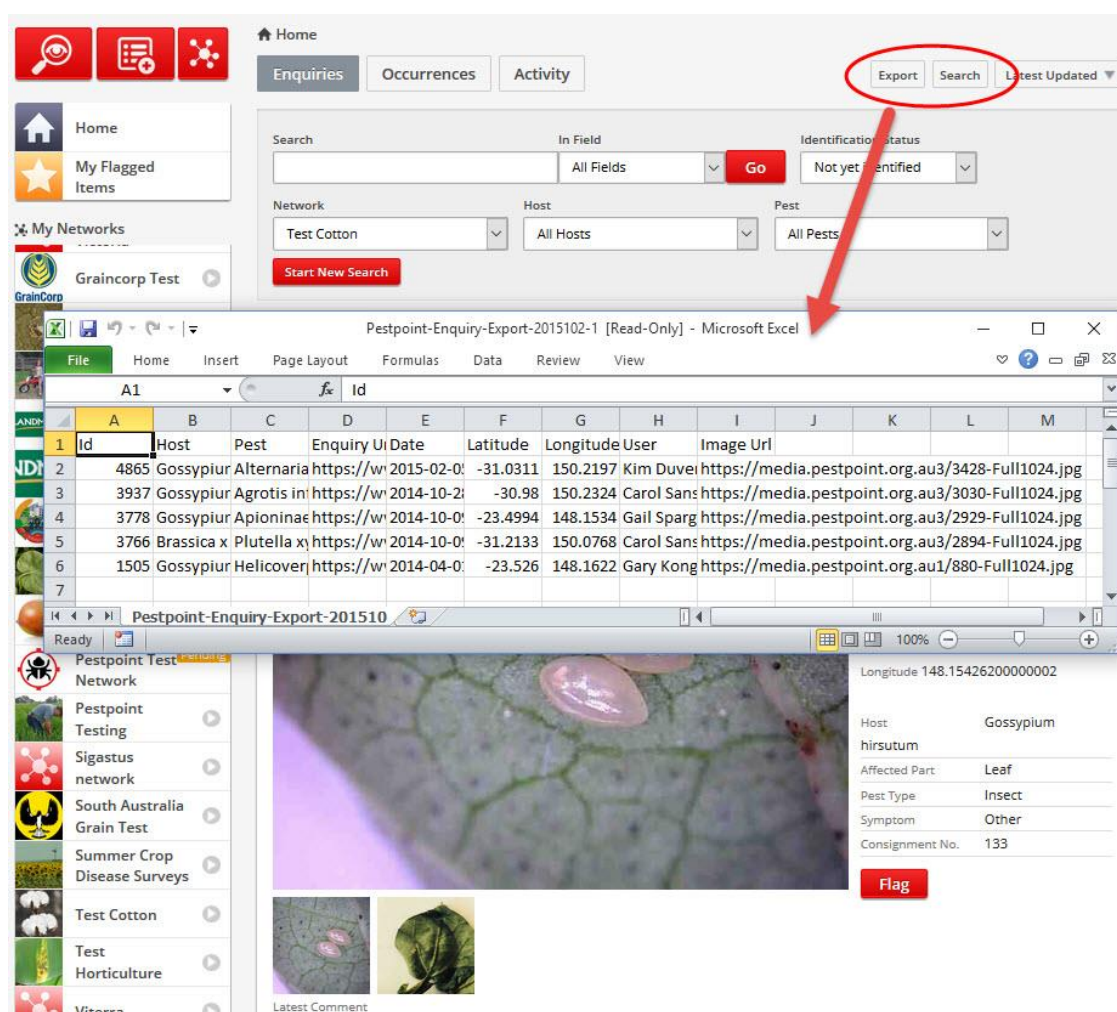
**EXPECTED OUTCOME:** *The Pestpoint system provides a mechanism to capture and aggregate pest data. Data accumulated in space and time can offer powerful insights into pest biology and subsequent pest management*

IN order to realise the Outcomes of this project, there needs to be uptake and adoption of the process of remote diagnostics using the Pestpoint software. User adoption of Pestpoint is the only way that data can be accumulated to provide a detailed catalogue of knowledge about pests locally, regionally and nationally (Expected Outcome). It is therefore critical that we design a system for this purpose that is attractive to both users and organisations. The Pestpoint concept of remote diagnostics is novel, is breaking new ground and discovering a new way of working for agronomists and specialists faced with a declining expertise base. It is therefore vital that we understand the user and the user's environment and design a system that meets their needs.

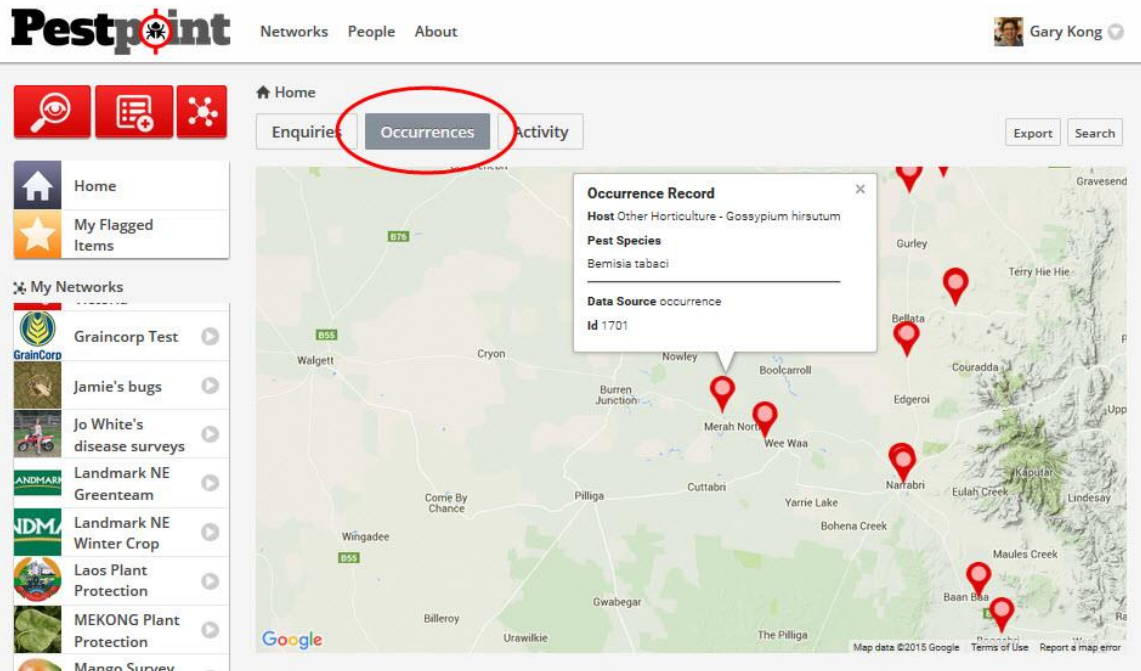
The Pestpoint trial with CGS has helped us to understand user needs and behaviour in this context so that we can modify the Pestpoint software and refine the processes where necessary according to user feedback. The completed survey questionnaire was used to capture the user experience at the end of the trial period and to detect problems/issues with

the remote diagnostics processes and the software (Pestpoint) and hardware (mobile devices/wireless microscopes) used by participants. In addition, the qualitative observations made by facilitators Gary Kong and Mark Stanaway during the trial period helped with interpreting the results of the survey and with understanding the subtle changes needed to refine both the software and the processes.

During the trial period Pestpoint aggregated pest information in a database and recorded all social interactions as separate and searchable events (see Figures 3&4). This means that data can be filtered and extracted in a variety of ways depending on the purpose (report, spatial map, chain of evidence etc.). Unfortunately, both crop acreage and pest pressure were low during the trial period so the number of data points collected is less than hoped for. Fifty pest enquiries were entered into Pestpoint during the trial period, however the quantity of enquiries was less important to our study than the user experience and their perceptions of the software and process of remote pest identification. Nonetheless, the potential of Pestpoint to provide a high level of pest intelligence as data accumulates was demonstrated, with surveyed users expressing a desire to continue using the software into the future.



**Figure 3.** Shows an example of the search and export functions in Pestpoint where data can be filtered from the database using multiple filters to isolate specific data which can then be exported to an excel spreadsheet for further analysis.



**Figure 4.** Shows a spatial map of pest records generated from data captured from pest enquiries and stored in the Pestpoint database. Note that details of each record can be displayed

The results of this trial has helped the PBCRC to evaluate its future investment in this technology and has determined from these and other findings that a commercialisation plan be developed to facilitate adoption of the Pestpoint software.

**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.**

**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?**

Prior to this project, the cotton industry had experimented with an email-type system (Pathway) to communicate and share pest information between field staff and specialists. For various reasons, this was not successful, mainly because it lacked the social networking and data management structures that were required. Pestpoint on the other hand incorporates data management with complex social networking functionality, ensuring privacy of data and personal details. It also provides structured data fields for detailed management of information coupled with the search and export capabilities needed for reporting and data analysis. The purpose of this trial was to test the Pestpoint software and the process of remote identification with cotton field agronomists and lab-based specialists.

Although the CGS group was a small trial group, the user response was generally similar to the results of another trial group involving Landmark, DAF Qld, Graincorp and Viterra. Overall, the participants in this study were generally positive about using the Pestpoint

software for initiating a remote pest identification and were encouraged by the potential of remote diagnostics to improve their work efficiency. With these results in mind, Pestpoint has the potential to provide an industry-wide solution to the problems of distance and declining expertise. Version 2.0 of the Pestpoint software will be re-designed to accommodate the feedback received during this and other trials and we encourage the cotton industry to participate in a wider trial of the software in the 2016-17 cotton season.

A commercialisation strategy for Pestpoint is being developed based in part, on the findings of this trial. Phase 2 of the Pestpoint software will be simpler to use and more targeted to allowing users to engage in communications, just as they are accustomed to using email and MMS. This is consistent with the expectations of other social media where the ability to share conversations quickly and easily is fundamental. We would hope that the cotton industry is willing to trial Pestpoint Phase

### ***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.**

We would consider proposing a wider trial of the new version of Pestpoint in the 2016 cotton season.

##### **(b) for the future presentation and dissemination of the project outcomes.**

##### **(c) for future research.**

#### **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)**

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

A video describing the problem that Pestpoint addresses was produced and can be viewed at [www.pbcrc.com.au/pestpoint](http://www.pbcrc.com.au/pestpoint)

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

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### **Summary**

The general decrease in diagnostic expertise and the increasing pressure on biosecurity surveillance and crop protection are challenging issues that will require innovative solutions. The scarcity of specialists and the remoteness of cropping lands often means that pest identification is delayed, while specialists are contacted and specimens are transported for identification.

The concept of remote diagnostics is an attempt to use digital tools and social networking to overcome these issues to some degree, by making specialists available in a virtual space and by drawing on collective experience to solve pest problems. Pest identification and /or a pest management decision can often be determined from pest and crop images, eliminating the need to send a physical specimen to a specialist and thereby speeding up the process of making a pest management decision. The scope for remote diagnostics has widened dramatically with the introduction of better imaging tools such as mobile devices and handheld wireless microscopes which can now be used in the field to capture high quality and highly magnified images of pests.

Remote diagnosis is already being performed in an *ad hoc* way by many plant health workers who use mobile devices to send pest images and messages to specialists via email and MMS. Whilst this may provide a satisfactory outcome in terms of managing an immediate pest problem, communication tools such as email and MMS have poor potential for data capture and management. Pest information that is restricted to the email format is essentially unstructured and therefore isolated from data management tools. This means that pest data confined to these formats cannot be aggregated and cannot contribute to the higher level functions that we now expect from digital systems. For pest data, these include such things as pest alerts, spatial and pattern analysis, accessible reference information, knowledge formation, reporting, archiving, community building and advanced sharing.

The Pestpoint software was developed to facilitate the process of remote diagnostics and to provide a digital format that meets the modern requirements for social networking, data management and reporting. It provides users with a virtual environment in which to create private communities or networks where members can share information about pest problems, collectively discuss problems and make pest management decisions. However, asking people to adopt a new technology always involves an incremental shift in behaviours and certain criteria have been identified in an attempt to measure whether the new technology is compatible with behaviour change or is likely to be resisted. Pestpoint and processes for remote diagnostics were trialled with a group of field agronomists from Cotton Grower Services during the 2014-2015 cotton season. The group was then surveyed in a questionnaire designed to measure the relative acceptance of the innovation and its potential for adoption.

The results of the trial indicated that overall, there was general acceptance of the process of remote diagnostics by both field agronomists and lab-based specialists and that the Pestpoint software provided a simple user interface to share pest information and to engage in networking communications to facilitate pest management decisions. These results were consistent with other industry groups who undertook a similar trial of Pestpoint. The next steps will be to refine the software according to user feedback and to begin phase 2 trials among a wider cross section of the agricultural community. The PBCRC is currently developing a commercialisation plan for licencing the Pestpoint software. For more information on Pestpoint visit [www.pbcrc.com.au/pestpoint](http://www.pbcrc.com.au/pestpoint)