



EXERCISE
BLUEPRINT



EXERCISE REPORT

ABOUT THE REPORT

The *Exercise Blueprint Report* was authored by Plant Health Australia (PHA) in consultation with the Exercise Planning Committee and at the direction of the Cotton Research and Development Corporation. The purpose of this report is to provide a summary of activities and a critical analysis of the outcomes and learnings. The information presented was informed by observations at the exercise, participant feedback and analysis of the exercise outputs.

Any feedback or questions in relation to the report, or the Exercise Blueprint activities and outcomes can be directed to PHA through the details below.

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EXECUTIVE SUMMARY

Exercise Blueprint was a biosecurity incursion simulation exercise run for the cotton industry over two days in August 2019. It examined the response by the industry to a detection of cotton blue disease, a high priority pest of the cotton industry.

To improve the biosecurity preparedness of the cotton industry, Exercise Blueprint brought together key stakeholders from the cotton industry to examine a scenario of a fictional detection of cotton blue disease in Australia. Discussions and activities during the exercise focussed on three objectives:

1. Identify the cotton industry stakeholder roles and map the communication/engagement structure during a response to a biosecurity incident.
2. Examine potential strategies for responding to cotton blue disease in a production setting and understand the consequent impacts to the cotton industry.
3. Explore strategies to mitigate the impacts of an emergency response to cotton blue disease on cotton growers.

The exercise highlighted that the existing level of preparedness in the cotton industry is overall very high, with an opportunity to build upon the existing level in a few areas. Exercise Blueprint was well received by participants, who were enthusiastic and engaged throughout. Future steps for the cotton industry are highlighted as recommendations in this report:

- Recommendation 1:** Cotton Australia, working in collaboration with CottonInfo, CRDC, QLD DAF and NSW DPI, to update the draft communications channels flow diagram Figure 3 to ensure it fits with organisational expectations, with the aim of embedding this in the Cotton Australia Biosecurity Incident Standard Operating Procedure.
- Recommendation 2:** Assess the diagnostic capability and capacity of jurisdictional and CSIRO laboratories to undertake definitive taxonomic and high throughput diagnostic testing for all cotton High Priority Pests to create a register to support surge capacity during a biosecurity response.
- Recommendation 3:** Identify and prioritise the development of a specific or generic (for multiple pests) contingency plans for High Priority Pests of cotton.
- Recommendation 4:** Include relevant information to support business continuity if pests were to establish in Australia in all new or revised contingency plans.
- Recommendation 5:** Cotton Australia should seek to promote information on the requirements and eligibility for growers to receive ORCs as a direct result of being impacted by a response to an EPP to cotton industry stakeholders more broadly.

The cotton industry should also consider a program of future biosecurity works including keeping the Biosecurity Incident Standard Operating Procedures (BISOP) current and planning future workshops and exercises around complementary scenarios to test the BISOP and preparedness.

OVERVIEW OF THE EXERCISE

Background

Exercise Blueprint was a biosecurity preparedness activity delivered for the Australian cotton industry, seeking to raise awareness of biosecurity issues and roles within the industry, test industry wide response structures and processes, and investigate the ability to develop appropriate response strategies for priority pests of the industry. The exercise builds on the outcomes of the Cotton Biosecurity Workshop, delivered in 2017 by PHA. The aim of the 2017 workshop was to build industry biosecurity capacity and provide a gap analysis for boll weevils, a high priority pest for the industry. Participants worked through the process of an incursion and eradication, with PHA facilitating the scenario. The workshop defined the reporting pathway for new or unusual pests of cotton and recommended that internal communication structures for the cotton industry be mapped. Exercise Blueprint was designed to test the reporting and communication pathways by allowing the cotton industry to work through its roles and responsibilities during a pest incursion through a simulation exercise.

The Exercise Blueprint name was selected in reference to the target pest for the exercise, cotton blue disease, and the inference that the exercise will provide input into the development of a blueprint for biosecurity preparedness in the cotton industry.

Cotton blue disease was chosen as the target pest as it is exotic to Australia and can cause severe damage in cotton plants. It is caused by the Cotton leafroll dwarf virus (CLRDV) and is transmitted by a vector that is endemic in Australia, the cotton aphid (*Aphis gossypii*). It is a major pest of cotton though has a host range that includes some legumes and other crop species.

Funding for Exercise Blueprint was provided through the Cotton Research and Development Corporation (CRDC).

Aim and objectives

The exercise was designed to achieve the following:

Aim Improve the Emergency Plant Pest response capability within the cotton industry and reduce the potential impacts to industry stakeholders through the implementation of response operation

Objectives

1. Identify the cotton industry stakeholder roles and map the communication/engagement structure during a response to a biosecurity incident.
2. Examine potential strategies for responding to cotton blue disease in a production setting and understand the consequent impacts to the cotton industry.
3. Explore strategies to mitigate the impacts of an emergency response to cotton blue disease on cotton growers.

Planning

Design and planning was led by Plant Health Australia (PHA) with guidance from an Exercise Planning Committee. This committee determined the scope and purpose of the exercise, set the aim and objectives, and provided significant input into the development of the activities and the required exercise inputs. Key organisations were identified by the CRDC to form the Exercise Planning Committee to provide relevant insight into the cotton industry, expertise in the target pest, together with expertise in policy and response operations. The committee was comprised of representatives from the following organisations:

- Cotton Australia

- CottonInfo
- Cotton Research and Development Corporation
- Darling Downs Cotton Growers/grower chair Industry Biosecurity Group
- Queensland Department of Agriculture and Fisheries (QLD DAF)
- New South Wales Department of Primary Industries (NSW DPI)
- Plant Health Australia

Structure of activities

Exercise Blueprint was comprised of several activities, delivered utilising a variety of formats including presentations, group discussions and interactive activities. Activities were undertaken over two days (Table 1). The exercise was structured to ensure engagement of participants and delivery on the agreed objectives.

Table 1. Exercise Blueprint schedule of activities

DAY 1	DAY 2
<p>Cotton pest identification Analysis of cotton plant symptoms caused by a pest or abiotic stresses to determine the ability to distinguish serious exotic pests.</p> <p>Scenario and context setting Background information on the target pest biology, distribution, impacts and eradication/management approaches. Presentation of the exercise scenario.</p> <p>Response strategy development Development of an appropriate eradication response strategy given the presented scenario. Development of response objectives, intent and detailed approaches to be implemented.</p> <p>Analysis of impacts to the cotton industry Analysis of the response strategy to identify and mitigate direct impacts to the cotton industry, from growers through to ginners, agronomists and other support services.</p>	<p>Communication structures in pest responses Verification of the communication structures used by cotton industry organisations and the Lead Agency during a biosecurity response. Covered the identification of appropriate individuals to engage and the pathways for information flow.</p> <p>Owner Reimbursement Cost (ORC) investigations Overview of ORCs under the Emergency Plant Pest Response Deed (EPPRD) and how they are implemented. Testing the application of ORCs in specific scenarios relating to the cotton industry.</p>

Scenario

The scenario centred on the fictional detection of suspect cotton blue disease on two cotton farms located in the Darling Downs region of Queensland, a major production area for cotton in Australia.

Exercise activities were set at 21 days post the initial report of suspect symptoms to an agronomist, during which the following activities had occurred:

- Initial and confirmatory diagnostics completed
- Delimiting surveillance underway
- A Consultative Committee on Emergency Plant Pests (CCEPP) had been convened and two meetings held.

These activities are summarised in the timeline at Figure 1.

Initial surveillance indicated that the suspect Emergency Plant Pest (EPP) was not widely established in the region. Expressions of symptoms on plants were at a low incidence on the Infected Premises (IPs), with the known vector (cotton aphid) present in low numbers.

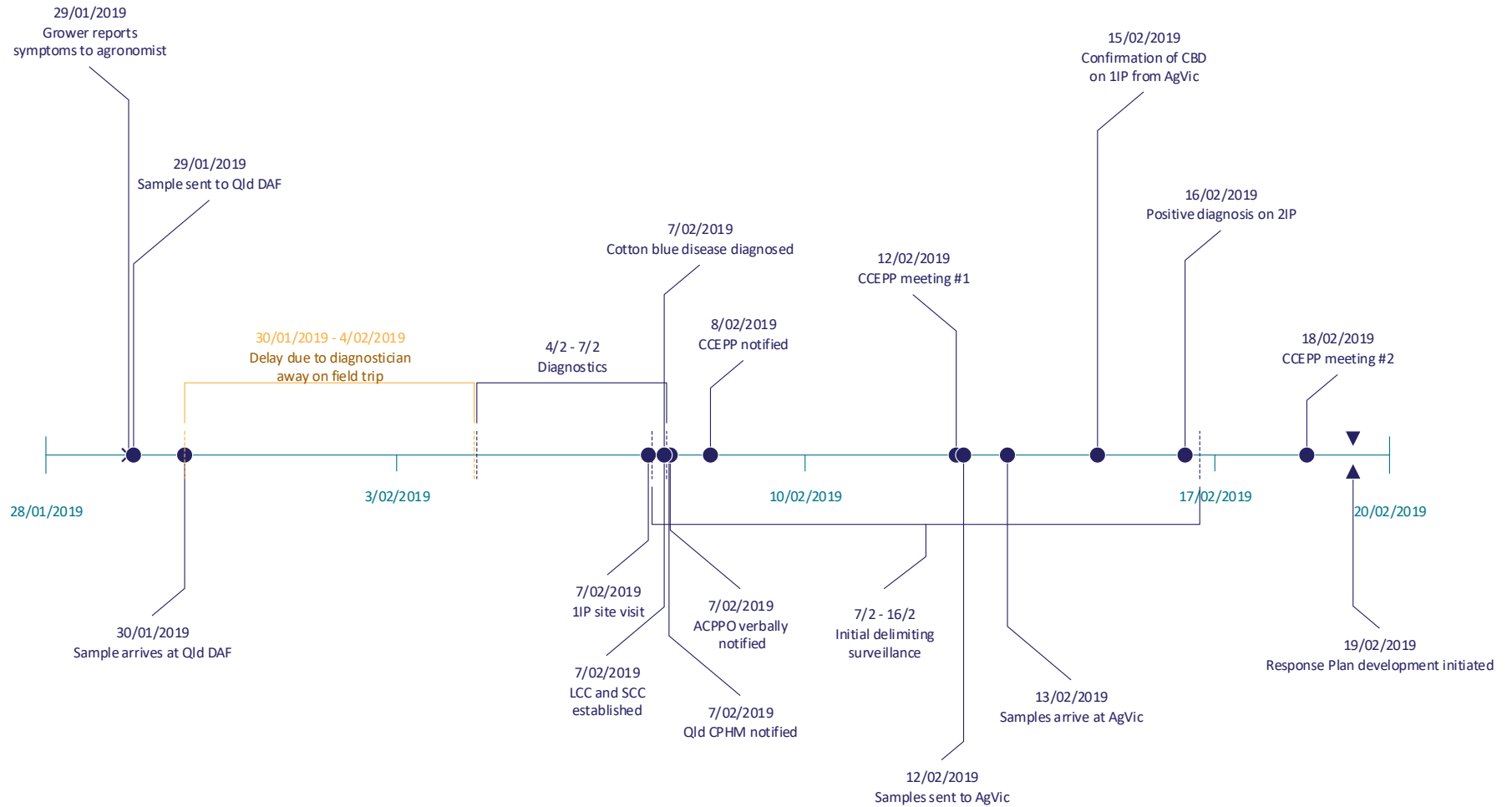


Figure 1. Scenario timeline used in Exercise Blueprint, showing key operational and decision-making activities in the 21 days of activities since suspect symptoms were reported

Participating organisations

There were 44 participants in the exercise coming from key policy, communication and research organisations in the cotton industry, together with support services and government agencies (Table 2).

A representative from the grains industry attended as they would be potentially affected by a detection of Cotton Blue Disease. Representatives from the sugar industry attended to observe the exercise, with a view to running a similar exercise for the sugar industry.

Table 2. Participating organisations

PARTICIPANT GROUP	ORGANISATIONS REPRESENTED
Cotton industry and support organisations	Cotton Australia Cotton Research and Development Corporation Cotton Seed Distributors CottonInfo Crop Consultants Australia Dalby Rural Supplies Darling Downs Cotton Growers Queensland Cotton
Government	Commonwealth Department of Agriculture New South Wales Department of Primary Industries Queensland Department of Agriculture and Fisheries
Research	CSIRO University of Queensland
Other	Grains Producers Australia Plant Health Australia Sugar Research Australia Transgenic and Insect Management Strategies Committee

EXERCISE OUTCOMES AND FINDINGS

Objective 1: Identify the cotton industry stakeholder roles and map the communication/engagement structure during a response to a biosecurity incident.

Stakeholder engagement is a critical component of an effective response to a biosecurity incident, and one that industry organisations play an important role in. Cotton Australia developed a stakeholder engagement and communications channels flow diagram through the drafting of the Cotton Australia Biosecurity Incident Standard Operating Procedures (Figure 2), which was tested through the stakeholder engagement activities of Exercise Blueprint.

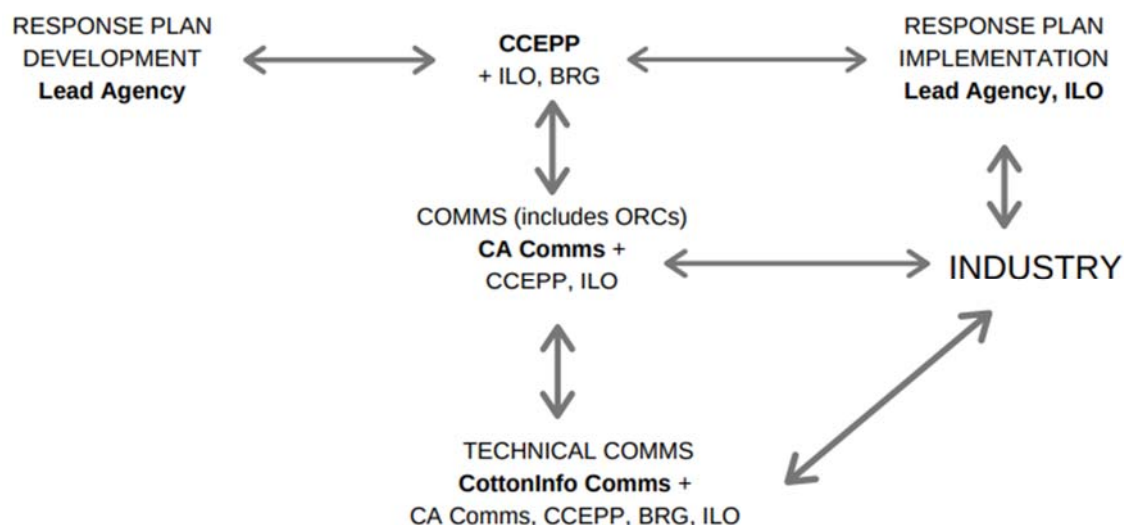


Figure 2. Pre-exercise documented communications channels in the cotton industry during a biosecurity response (abbreviations explained in Appendix 1).

The focus of these activities was centred on an initial meeting of key cotton industry stakeholders which would be led by Cotton Australia with the purpose of determining the communications needs and actions from an industry point of view. Core membership of this group was agreed at the exercise to be:

- Cotton Australia CCEPP representative
- CottonInfo Regional Extension Officer
- Industry Liaison Officer (ILO)¹
- Cotton Australia Communications Manager
- CottonInfo Communications Manager
- Lead Agency Communications Manager (QLD DAF in this case)

The exercise raised awareness of the current practice implemented in control and coordination centres run by QLD DAF of engaging relevant industry representatives in a committee that informs communications delivery during the response. Following on from this identification, it was determined that the government and industry processes should be amalgamated to form the Cotton Emergency Response Stakeholder Engagement Panel which includes representation from the Lead Agency's Communications Manager.

¹ Likely to be the CottonInfo Regional Extension Officer in the first instance

In role playing the initial meeting of the panel it was agreed that the following key topics should be discussed by the Panel:

- current status of the incident and activities underway
- likely direct and consequential impacts to the industry and individual growers
- review of the stakeholder analysis draft generated by the Lead Agency
- contact point for growers and industry stakeholders (e.g. call centre, ILO, etc.)
- point of truth website for the response (likely to be the Lead Agency's)
- key messages, including the specific messages per stakeholder group
- key roles and responsibilities for each party on the panel
- dates for information release
- panel membership to determine any additional representatives required (e.g. technical experts)
- initial panel meeting schedule.

The Cotton Emergency Response Stakeholder Engagement Panel also determined the communication channels likely to be utilised for engaging with cotton industry stakeholders (Figure 3). This gives an outline of the roles each group would be expected to play and the information they would be passing on.

Recommendation 1: Cotton Australia, working in collaboration with CottonInfo, CRDC, QLD DAF and NSW DPI, to update the draft communications channels flow diagram Figure 3 to ensure it fits with organisational expectations, with the aim of embedding this in the Cotton Australia Biosecurity Incident Standard Operating Procedure.

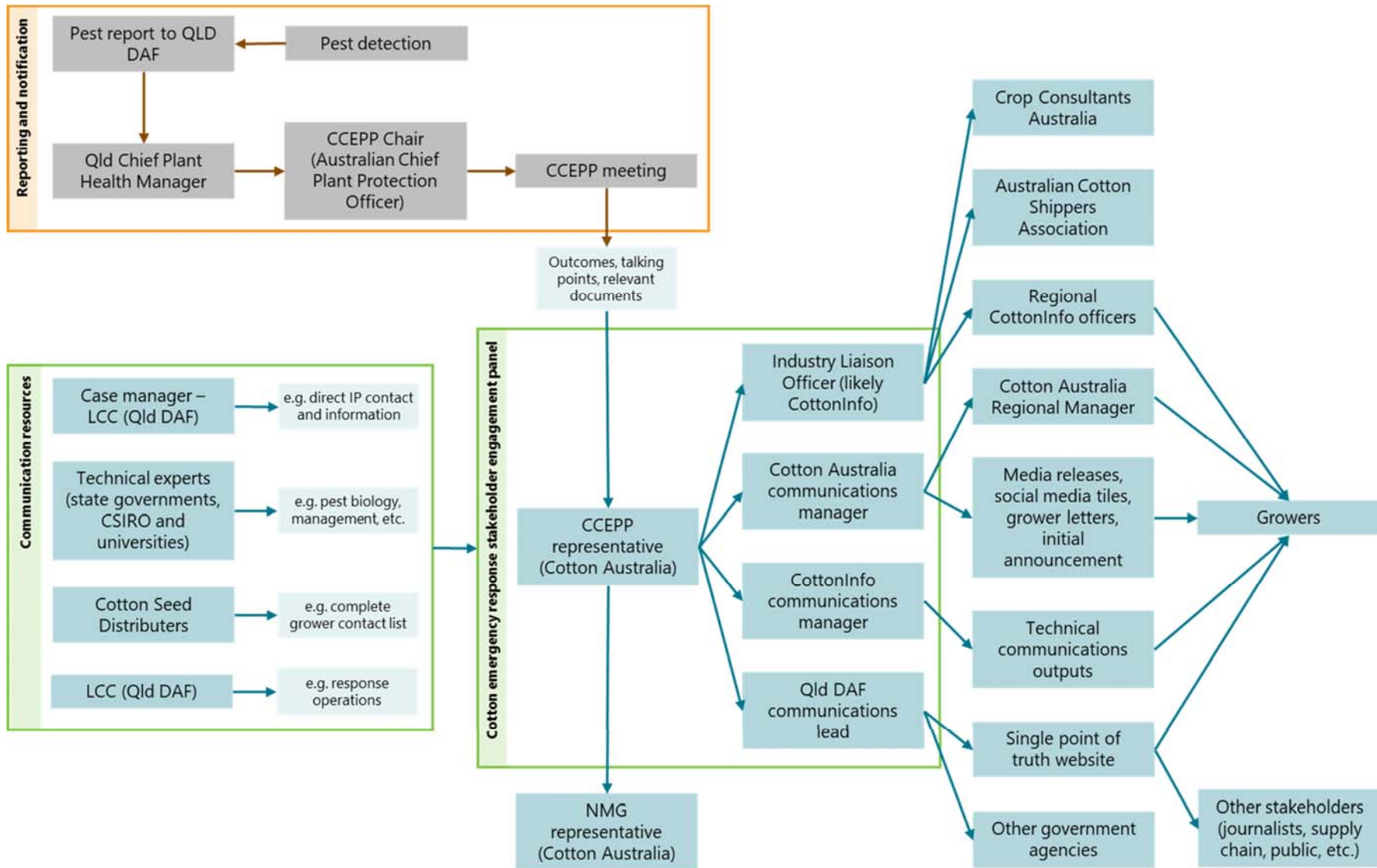


Figure 3. Response communications structure developed through Exercise Blueprint. Note that “Reporting and notification” elements are set by the EPPRD, with remaining elements determined by the cotton industry and the Lead Agency. Arrows show indicative linkages and direction of information flow, but it is likely that information will flow in both directions in many cases.

Objective 2: Examine potential strategies for responding to cotton blue disease in a production setting and understand the consequent impacts to the cotton industry.

Response strategy development

A strategy for the eradication of cotton blue disease was developed by exercise participants through a process of objective setting, establishing consensus on the intent of the response strategy and authoring elements of a response plan. An objective was set for each area of the response and is shown in Table 3.

Table 3. Response objectives set by participants

RESPONSE AREA	OBJECTIVES
Surveillance, tracing and testing	Determine how far and wide CLRDV is present Trace back and forward from the IPs Ensure diagnostic capacity is sufficient, that CLRDV can be confirmed via molecular methods
Destruction and control	Destruction of infected plants in immediate area until end of season/harvest followed by complete removal at end of season
Quarantine and movement controls	Prevent spread from property through containment and hygiene (biosecurity) on and off properties
Vectors	Aphid management through immediate spray with insecticide
Communications and engagement	Confidentiality for owners of initial properties Advice to affected region growers and broader industry to encourage reporting, surveillance and biosecurity Keep messaging positive
Other	Minimise impact to industry

The strategy was built from the objectives, with key elements of the eradication strategy as agreed at the exercise are outlined in Table 4. In some cases, the participants did not have the expertise to put forward any more detail than that an activity or action should be completed. If any of this strategy is to be incorporated into the existing CLRDV contingency plan, it should be confirmed with experts first. The distances for activity specified in Table 4 are summarised in Figure 4.

Table 4. Response strategy generated in the exercise (note: wording has been paraphrased for the report)

Surveillance, tracing and testing
<ul style="list-style-type: none"> All known CLRDV hosts on surveyed properties to be inspected and sampled, including crops and other vegetation. Visual inspection of plants for CLDRV symptoms will be the primary inspection approach. The symptoms can be confused with endemic cotton bunchy top virus and an infected plant may take time to express symptoms. The visual inspection can give an initial indication but confirmation of results by laboratory PCR testing of symptomatic and asymptomatic leaf tissue from all properties inspected will also be required. Conduct surveillance for aphids in all crops where CLRDV surveillance undertaken to determine total aphid and cotton aphid numbers, as well as collect samples for laboratory testing. The virus stays present for the life of the aphid but is not transferred to the next generation. Delimiting surveillance to be conducted on all properties with host plants growing within 20 km of Infected Premises (based on potential cotton aphid movements) and all properties linked by tracing.

Where no CLRDV symptoms are present, surveillance conducted in all host crop blocks and surrounding areas where potential weeds and volunteers could be present.

- Trace all plant material movements that have the potential to transfer aphids to and from IPs, together with all machinery and people movements to and from IPs.

Destruction of crops and pest

- Insecticide applied to crops and other host plants prior to crop destruction to minimise risk of spread.
- No host plants (cotton or alternate) grown back to back.
- When a positive detection is confirmed all potential host plants on the IP and within 1 km of the IP boundary to be destroyed.
- Where a continuous block of host plants extends beyond the 1 km radius, destruction should continue to the end of the block, where reasonable.
- Considerations:
 - Destruction of crops via harvesting prior to defoliation is not logistically possible as the machinery cannot physically push through the crop.
 - A semi-mature crop cannot be ploughed in as viable seed will not be removed from fields thereby creating a potential source of volunteer plants in future seasons.

Zoning and movement controls

- All Suspect Premises (SP) will be immediately placed under quarantine until cleared by surveillance and diagnostics.
- Restricted Area (RA) will be set at a 10 km radius circle around each IP, allowing for extensions to encapsulate continuous cotton farming areas to a maximum of 20 km.
- Movement controls will be implemented on a risk-based approach relating to what the vector can move on. This will include:
 - No movement in/out, or within RA, of any plants or plant products of all potential host species. The exception to this restriction will be ability to move harvested cotton after it has been left in place for at least six weeks following harvest to ensure all aphids caught in bales are dead.
 - Farm machinery and equipment must be cleaned and inspected prior to movement in/out, or within IPs and RA.
 - Controls on people movement (e.g. must wear overalls on farm which are not reused without appropriate sterilisation).
 - Investigations will be undertaken on other items that are yellow in colour due to aphids being attracted to this colour.

Vector suppression and management

- Knock down of insects, likely via insecticide sprays, within 5 km of infected plants, with distances extended if required to cover whole of IPs.
- Insecticide application to all aphid host plants, including in non-agricultural areas within the above zone. Product choice needs to consider resistance risk
- Aphid numbers will be monitored using traps based on advice from biosecurity officers and aphid experts.

Communications and engagement

- Proactive industry and community engagement with key messages identifying the pest and seeking support (e.g. to report symptoms) to all cotton growing regions and across the supply chain.
- Communication with other potentially affected industries.

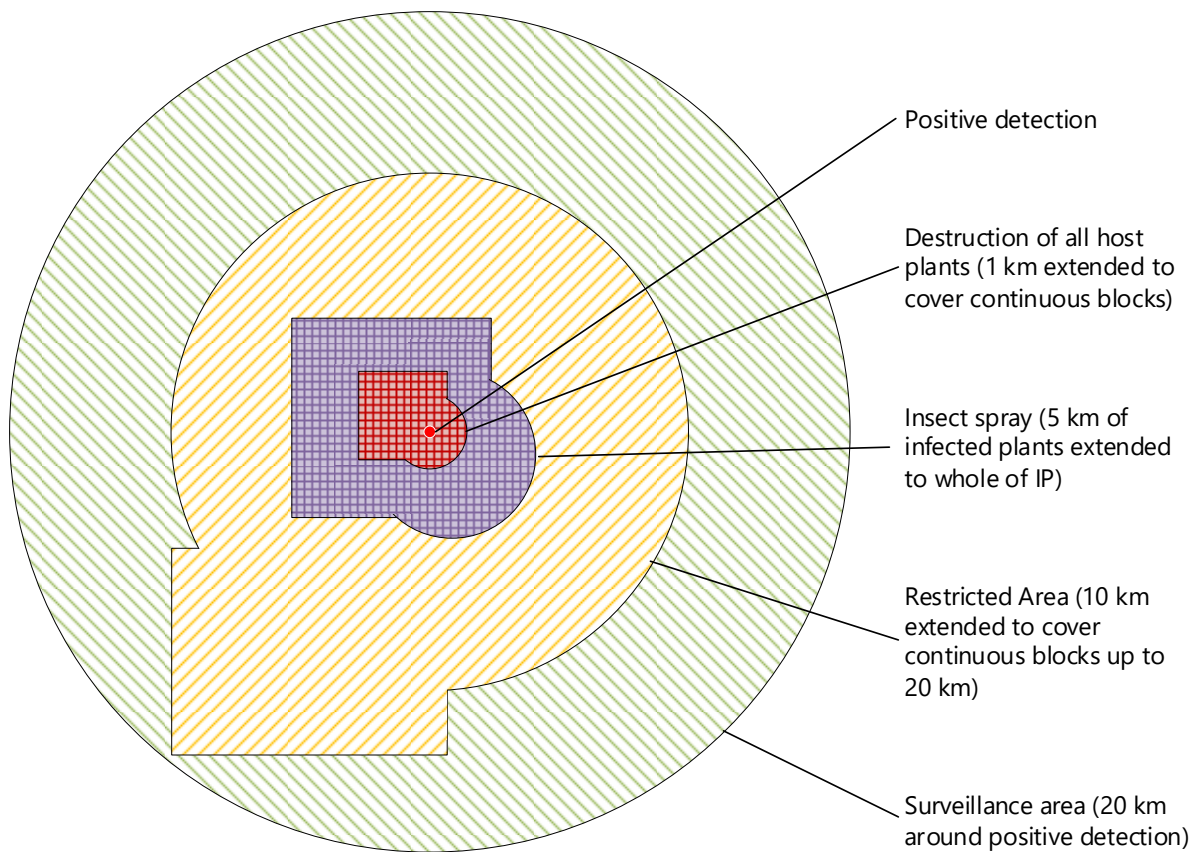


Figure 4. Representation of the activities completed over different distances from a positive detection of cotton blue disease (not to scale).

The process of setting response objectives and then agreeing on a strategy to meet those objectives was seen as valuable by participants, ensuring that the detailed strategy elements aligned to the overall objectives listed in Table 3. It also allowed participants to analyse and locate critical gaps in the cotton industry's general preparedness.

Through the development of surveillance approaches for cotton blue disease, it was recognised that it is extremely difficult to differentiate the symptoms of this virus from those of the established cotton bunchy top virus, particularly in cases where the symptoms are not severe. This was highlighted by the symptom recognition activity, where 40% of participants mistakenly identified which of the symptoms related to the exotic virus. In addition, there is expected to be multiple weeks delay between infection and expression of symptoms in cotton plants. As such, all properties surveyed would require confirmation of visual (or lack of) symptoms with PCR testing.

With the lack of ability to accurately diagnose cotton blue disease in the field, large numbers of samples will require testing by laboratories. The laboratory at Queensland DAF in Brisbane is able to process samples, but its capacity will quickly be reached in an emergency response. Expert researchers present at the exercise identified that they are often away on field visits and may not be able to assist immediately. This is a problem that will not be specific to cotton blue disease, as any pest with non-distinctive or symptomless expression will require large amounts of sample testing.

Recommendation 2: Assess the diagnostic capability and capacity of jurisdictional and CSIRO laboratories to undertake definitive taxonomic and high throughput diagnostic testing for all cotton High Priority Pests to create a register to support surge capacity during a biosecurity response.

The development of the eradication strategy was informed by the 2018 draft threat-specific contingency plan for cotton blue disease, authored by Queensland DAF. This document was recognised as an excellent preparedness tool to support the rapid development of a response strategy while acknowledging that a contingency plan can never be highly specific given the variety of possible scenarios in which a pest may be detected. Participants recognised that an assessment of cotton High Priority Pests should be undertaken to determine which targets are the highest priority for the development of contingency plans, or whether there is the potential to develop a generic contingency plan for the cotton industry.

Within the exercise, participants were given three response strategies (Appendix 2) to consider which varied from conservative to aggressive. For this exercise, participants agreed to a mostly aggressive response. Including multiple strategies with varying levels of aggression could assist with generic contingency plans, allowing additional options that can be selected for an actual response.

Recommendation 3: Identify and prioritise the development of a specific or generic (for multiple pests) contingency plans for High Priority Pests of cotton.

At the conclusion of the eradication strategy development, participants had a low confidence in the ability to successfully eradicate the pest under the scenario presented. The difficulty in accurately delimiting the pest and the ability to effectively limit the spread were the key factors in this determination.

As a result of these considerations, participants agreed that there would be significant value in the generation of a business continuity plan for cotton blue disease, which should be associated with the contingency plan. A business continuity plan is a preparedness document that outlines the approaches to pest management and control to minimise the impact on production and trade once the target pest is detected in Australia and a determination is made that it is not feasible to eradicate.

Recommendation 4: Include relevant information to support business continuity if pests were to establish in Australia in all new or revised contingency plans.

Industry impacts

In recognition of the significant impact responses to serious plant pests can have across the industry, there was a focus on the identification of impacts to industry stakeholders (Table 5) and potential modifications to the response strategy to minimise the impacts.

Table 5. Identified potential impacts to cotton industry stakeholders through the implementation of the developed response strategy

STAKEHOLDER GROUP	IDENTIFIED IMPACTS FROM THE ERADICATION STRATEGY
Growers	<ul style="list-style-type: none"> • Time required to be allocated to complying with biosecurity directions • Significant stress and emotional impacts due to stigma of being an infected farm, including the social impacts of isolation and loss of community standing • Out of pocket expenses for items that may not be eligible for payment under Owner Reimbursement Costs • Contribution to an increased levy to cover the cotton industry's share of response costs • Loss of property value from the presence of the pest on farm or in the region • Potential risk of pesticide resistance emerging or loss of integrated pest management strategies through the application of additional pesticides • Significant media attention (negative or positive), which would likely be invasive

Cotton organisations	<ul style="list-style-type: none"> • Significant increase in demands on staff time to assist with tracing, organising grower meetings and producing communications material • Staff time and associated costs for an industry liaison representative to work in the control or coordination centres
Gins	<ul style="list-style-type: none"> • Financial and staff time costs for the alteration of gin yard hygiene to meet biosecurity protocols (e.g. regulated removal of trash) • Potential for fixed bale contracts to not be met
Agronomists	<ul style="list-style-type: none"> • Loss of income from not being able to access farms in Restricted Area • Increased time and financial costs to implement biosecurity procedures when entering and leaving properties, potentially losing clients over increased time pressures • Potential for loss of reputation with individual growers or the broader industry through reporting of suspect premises

Objective 3: Explore strategies to mitigate the impacts of an emergency response to cotton blue disease on cotton growers.

Participants identified that the impacts from the implementation of the cotton blue disease response strategy would be consistent with those arising from any serious pest of the cotton industry that requires the implementation of movement restrictions and/or crop destruction. As a result, it is important that the industry and government assess the impacts and seek to instigate strategies to mitigate the impacts and support these stakeholder groups during response activities.

Review of the response strategy was undertaken by participants throughout the exercise to consider where and how the agreed response strategy could be modified to limit the potential impacts on the cotton industry.

Considerations and potential areas for altering the response strategy and how this could reduce the impact on the industry:

- Resizing the response zones
 - A smaller RA or destruction area would mean fewer growers impacted and less crops destroyed/chemical treatments required.
- Control the pest and delay harvest
 - Consider if vector control would be enough to satisfactorily limit spread of the pest until harvest.
 - If the crops are nearing maturity and the cotton can be harvested, it can still be sold as expected. Participants agreed that the vector could not survive on harvested cotton, so the bales could be moved after a few weeks when there would be no chance of live aphids remaining caught up in the bales. Sales as usual would assist in the mitigation of downstream effects. Particularly on those stakeholders who are not eligible for ORCs.
- Consider other means for reducing the financial burden on stakeholders
 - Only directly impacted growers are eligible for ORCs, but in Table 5 it is identified that every stakeholder is likely to face a financial burden as a result of the response.
 - This does not mean that compensation to impacted stakeholders cannot be provided through another means, such as a direct payment from the lead agency or industry body.
 - Participants suggested this be included as an option in the contingency plan and be considered once financial implications of the response become clearer.

These potential mitigations are options only. Each would need to be carefully considered in the event of a response with respect to the pest and the situation. Limiting impact on all stakeholders is an important factor in a response and will influence whether the response goes ahead. For a response to take place, the parties to that response must consider it both cost beneficial and technically feasible to eradicate the EPP.

Due to time restrictions the group did not reach a position on whether elements of the strategy would be amended; however, the importance of these considerations in a response were acknowledged.

Owner Reimbursement Costs

Owner Reimbursement Costs (ORCs) are a pre-agreed method to partially mitigate the impact of a response on growers. They are described in the EPPRD, providing a mechanism for the cost sharing of payments made to owners to reimburse eligible costs/losses incurred directly through activities required under a Response Plan.

ORCs in different scenarios were examined as part of the exercise and it was agreed that their provision is a considerable factor in the mitigation of impacts from a response. The eligibility for and calculation of ORCs is complex and ensuring the industry has awareness of the ORC provisions and their application is vital.

The application of ORCs and the Cotton ORC Evidence Framework to the specific scenarios examined in the exercise was effective. Participants gained an increased awareness and understanding on how ORCs are calculated and the required supporting evidence. The cotton industry is large and it is important to convey these messages to stakeholders outside of those that were able to attend the exercise. A knowledge of ORCs and their application in a response would assist in encouraging reporting and ensuring growers keep up to date records to use in ORC calculations should it be required.

Recommendation 5: Cotton Australia should seek to promote information on the requirements and eligibility for growers to receive ORCs as a direct result of being impacted by a response to an EPP to cotton industry stakeholders more broadly.

During the exercise, ORC scenarios were examined to understand what may be eligible to claim as an ORC during a response and how that might impact the cotton industry. The scenarios tested in the exercise demonstrated that the application and calculation of ORCs is not always clear cut and participants examined how aspects of the Cotton ORC Evidence Framework may be applied in the different scenarios.

The Cotton ORC Evidence Framework was approved in July 2019. It is a set of guidelines to assist in calculations of ORCs for cotton growers in the event of a response to an EPP. The guidelines describe the information needed to provide evidence to use in calculating the value of the payment which can be made to an impacted grower.

During the exercise participants reviewed the evidence requirements in the ORC Evidence Framework and made some suggestions on getting the most accurate data for:

- Estimation of yield
 - If the crop is immature (even if close to maturity) and the response plan directs that destruction will occur, it is likely that a business decision would be made to stop all inputs into the crop, and therefore a true yield would not be reached prior to destruction.
 - Harvesting an immature crop (even if close to maturity) would not produce an accurate estimation of the yield when compared to the use of grower records from prior years.
 - New technologies, such as the Cotton Seed Distributors application called BARRY (currently in testing phase) may provide a more accurate estimation of expected yield from an immature crop.
- Growing an alternate crop
 - If the response calls for no host crops grown for a period of time, the value of producing the next best alternative crop is factored into ORC calculations.
 - Not all cotton growers routinely rotate cotton with alternate crops as part of standard practice, it is largely dependent on the region and whether the crop is irrigated or not. Some growers may not have the expertise and infrastructure available to grow an alternate crop in the year of crop destruction, or in subsequent years if a cotton fallow is required under the response plan.

These considerations should be included in the next review of the Cotton ORC Evidence Framework.

Conclusion and next steps

Exercise Blueprint activities targeted identified areas of uncertainty for the cotton industry in relation to a biosecurity response. Unless otherwise specified, the recommendations in this report are assigned to the Cotton Biosecurity Reference Group (BRG), to delegate appropriately.

The communications pathway within the cotton industry was first considered at the 2017 workshop. It was worked through and updated in Exercise Blueprint (Figure 3). It is important to keep the communications structure up to date and to test it whenever possible. This may be best achieved through incorporation in the Cotton BISOP with regular scheduled reviews and tests with small scenarios.

In order to test the outputs of this workshop and to follow up on recommendations, a long-term plan of future workshops and exercises should be considered. A schedule of activities could be coordinated with BISOP reviews to keep cotton biosecurity current and prepared. Potential topics could include:

- Cotton focus in a different region
- Industry activity in the later stages of a response
- Involvement of multiple industries
- Consideration of a detection across state borders
- A focus on a pest for which a contingency plan does not already exist.

Overall the exercise was well received and demonstrated the cotton industry already has significant biosecurity preparedness in place. There is always room to do more and the cotton industry should maintain their high levels of engagement and proactive moves to increase biosecurity awareness, understanding and preparedness where possible.

APPENDIX 1. ABBREVIATIONS AND DEFINITIONS

ACPPPO	Australian Chief Plant Protection Officer
AgVic	Agriculture Victoria
BISOP	Biosecurity Incident Standard Operating Procedure
BRG	Biosecurity Reference Group
CA	Cotton Australia
CCEPP	Consultative Committee on Emergency Plant Pests
CLRDV	Cotton Leafroll Dwarf Virus
CRDC	Cotton Research and Development Corporation
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EPP	Emergency Plant Pest
EPPRD	Emergency Plant Pest Response Deed
ILO	Industry Liaison Officer
IP	Infected Premises – premises at which the pest is confirmed or believed to exist
LCC	Local Control Centre – the operations centre from which all field operations aimed at containing and eradicating the EPP are managed in a defined area
Lead Agency	The jurisdiction which is responsible for leading the conduct of a Response Plan because of the occurrence of an Incident within their jurisdiction
NSW DPI	New South Wales Department of Primary Industries
ORC	Owner Reimbursement Cost – valuation principles for the destruction of crops or other assets during the conduct of a Response Plan
PHA	Plant Health Australia
QLD DAF	Queensland Department of Agriculture and Fisheries
RA	Restricted Area – an area around an infected premise that is subject to intense surveillance and movement controls
SCC	State Coordination Centre – the emergency operations centre established at a state level, that coordinated the EPP control operations to be undertaken in that state or territory
SP	Suspect Premise – premises containing plants which may have been exposed to the pest and which will be subject to quarantine and intense surveillance

APPENDIX 2. RESPONSE STRATEGY OPTIONS

Provided to participants for consideration in Response Strategy Development activity.

STRATEGY AREA	OPTION 1 – AGGRESSIVE	OPTION 2 – MODERATE	OPTION 3 - CONSERVATIVE
Intent	Rapid implementation of robust eradication measures to limit the risk of CLRDV establishment	Rapid implementation of measures to limit the risk of CLRDV establishment	Maintain the ability to undertake eradication of CLRDV during delimitation
Assumptions	<ul style="list-style-type: none"> • CLRDV is localised to the known infected premises, and potentially neighbouring properties, and not widespread • CLRDV will be vectored by the established Cotton aphid • No new Cotton aphid strains are present 	<ul style="list-style-type: none"> • CLRDV is not widespread • CLRDV will be vectored by the established Cotton aphid • No new Cotton aphid strains are present 	<ul style="list-style-type: none"> • The extent of CLRDV spread and establishment is unknown • Eradication may not be a feasible option • CLRDV will be vectored by the established Cotton aphid • No new Cotton aphid strains are present
Surveillance, tracing and testing	<ul style="list-style-type: none"> • Target hosts <ul style="list-style-type: none"> - All known CLRDV hosts on property inspected, including crops and other vegetation • Sampling and testing <ul style="list-style-type: none"> - Visual inspection for CLRDV symptoms - Collection of symptomatic samples for PCR verification - Collection of asymptomatic samples for PCR testing (on properties with or without symptomatic plants) - PCR analysis of cotton aphids collected from all properties, whether symptoms present or not • Vector surveillance <ul style="list-style-type: none"> - Conduct surveillance for aphids in all crops where CLRDV surveillance undertaken - Score aphid (all species) numbers on cotton leaves using grading system - Identify presence/absence of Cotton aphid - Collect all aphid samples for further laboratory testing • Delimitation area <ul style="list-style-type: none"> - All properties with host crops within 5 km of known infected premises (based on potential Cotton aphid movements) - All properties linked by tracing - Where no symptoms present, surveillance conducted in all host crop blocks and surrounding areas where potential weeds and volunteers could be present • Tracing <ul style="list-style-type: none"> - All machinery and people movements to and from IPs - All plant material movements that have the potential to transfer aphids to and from IPs 	<ul style="list-style-type: none"> • Target hosts <ul style="list-style-type: none"> - Cotton and legume crops on property inspected • Sampling and testing <ul style="list-style-type: none"> - Visual inspection for CLRDV symptoms - Collection of symptomatic samples for PCR verification - PCR analysis of cotton aphids collected from properties with CLRDV symptoms present • Vector surveillance <ul style="list-style-type: none"> - Conduct surveillance for aphids in all crops where CLRDV surveillance undertaken - Score aphid (all species) numbers on cotton leaves using grading system - Identify presence/absence of Cotton aphid - Collect all aphid samples for further laboratory testing where Cotton aphid is present • Delimitation area <ul style="list-style-type: none"> - All properties with host crops within 1 km of known infected premises (based on limited potential Cotton aphid movements) - All properties linked by tracing - Where no symptoms present, surveillance conducted in all host crop blocks • Tracing <ul style="list-style-type: none"> - All machinery movements to and from IPs - All plant material movements that have the potential to transfer aphids to and from IPs 	<ul style="list-style-type: none"> • Target hosts <ul style="list-style-type: none"> - Cotton crops are primary focus, with secondary inspections of properties to survey alternate crops • Sampling and testing <ul style="list-style-type: none"> - Visual inspection for CLRDV symptoms - Collection of symptomatic samples for PCR verification • Vector surveillance <ul style="list-style-type: none"> - Score aphid (all species) numbers on cotton leaves using grading approach • Delimitation area <ul style="list-style-type: none"> - All properties with host crops within 500 m of known infected premises - All properties linked by tracing - Where no symptoms present, surveillance conducted in all cotton crop blocks and surrounding areas where potential weeds and volunteers could be present • Tracing <ul style="list-style-type: none"> - All machinery movements to and from IPs - All plant material movements that have the potential to transfer aphids to and from IPs
Destruction	<ul style="list-style-type: none"> • All potential host plants on any Infected Premises (IP) and within 1 km of the IP boundary to be destroyed <ul style="list-style-type: none"> - Where a continuous block of host plants extends beyond the 1 km radius, destruction should continue to the end of the block, where reasonable 	<ul style="list-style-type: none"> • All potential host crops on any IP to be destroyed 	<ul style="list-style-type: none"> • All cotton plants in a paddock containing an infected plant

STRATEGY AREA	OPTION 1 – AGGRESSIVE	OPTION 2 – MODERATE	OPTION 3 - CONSERVATIVE
Zoning, quarantine and movement controls	<ul style="list-style-type: none"> Quarantine IPs Restricted Area (RA) <ul style="list-style-type: none"> 10 km radius circle around each IP, allowing for extensions to encapsulate continuous cotton farming areas to a maximum of 20 km Movement controls <ul style="list-style-type: none"> No movement in/out, or within RA, of any plants or plant products of all potential host species No movement in/out, or within RA, of farm machinery and equipment 	<ul style="list-style-type: none"> Quarantine IPs Restricted Area <ul style="list-style-type: none"> 10 km radius circle around each IP Movement controls <ul style="list-style-type: none"> No movement in/out, or within RA, of any plants or plant products of all potential host species No movement in/out, or within RA, of farm machinery and equipment without prior wash-down 	<ul style="list-style-type: none"> Quarantine all IPs Restricted Area <ul style="list-style-type: none"> 5 km radius circle around each IP Movement controls <ul style="list-style-type: none"> No movement in/out of RA of any plants or plant products of known infected species No movement in/out of RA of farm machinery and equipment without prior wash-down
Vector Suppression	<ul style="list-style-type: none"> Knock down of insects, likely via insecticide sprays, within 5 km of infected plants <ul style="list-style-type: none"> Extend distance if required to cover whole of IPs and at least 2 km surrounding 	<ul style="list-style-type: none"> Knock down of insects, likely via insecticide sprays, on IPs and adjoining properties 	<ul style="list-style-type: none"> Knock down of insects, likely via insecticide sprays, on IPs
Communications and engagement	<ul style="list-style-type: none"> Proactive industry and community engagement with key messages identifying the pest and seeking support (e.g. to report symptoms) to all cotton growing regions and across the supply chain 	<ul style="list-style-type: none"> Proactive industry engagement with key messages identifying the pest and seeking support (e.g. to report symptoms) in the known impacted area (i.e. Dalby) Limited communications released to the broader industry and community stakeholders 	<ul style="list-style-type: none"> Talking points developed for national communication, with limited proactive material developed in the early stages <ul style="list-style-type: none"> Acknowledging this, information will be released by the Lead Agency where required to support operations
Deductions	<ul style="list-style-type: none"> Advantages <ul style="list-style-type: none"> High likelihood of maintaining the ability to eradicate CLRDV from Australia Limits the risk of further spread of the pathogen High confidence in actions Covers risk of vector assisted spread Disadvantages <ul style="list-style-type: none"> Risk of crop destruction without the guarantee of ORCs Significant impact to farms where CLRDV is found High impact to all plant production businesses in RA Significant costs associated with implementation, which may not be Cost Shared if Response Plan not developed/endorsed Requires substantial resources to implement May impact on international markets 	<ul style="list-style-type: none"> Advantages <ul style="list-style-type: none"> High likelihood of maintaining the ability to eradicate CLRDV from Australia Limits the risk of further spread of the pathogen Moderate impact on individual growers and industries as a whole Limits the risk of vector assisted spread Disadvantages <ul style="list-style-type: none"> Risk of crop destruction without the guarantee of ORCs High impact to all plant production businesses in RA Significant costs associated with implementation, which may not be Cost Shared if Response Plan not developed/endorsed Requires substantial resources to implement 	<ul style="list-style-type: none"> Advantages <ul style="list-style-type: none"> Low relative resource requirements Focus of operations on known infected host species Limited impact on individual growers and industries as a whole Disadvantages <ul style="list-style-type: none"> Risk of crop destruction without the guarantee of ORCs Low likelihood of finding all occurrences of CLRDV if infected alternative crops or weeds May allow pathogen to become established by not removing all sources

