# EXECUTIVE SUMMARY

## 1 Introduction

1.1 Background

1.2 Purpose of this review

1.3 Approach

1.4 This report

## 2 Panama TR4 and the Far North Queensland banana industry

2.1 Australian banana industry in Far North Queensland

2.2 Panama TR4 in Queensland

2.3 History of the Panama TR4 Program

2.4 The Panama TR4 Program

2.5 Key findings

## 3 Benefit Cost Analysis

3.1 The options going forward

3.2 Comparison of options

3.3 Framing the options for the benefit cost analysis

3.4 Benefit cost analysis

3.5 Key findings

## 4 Panama TR4 Program review and assessment

4.1 What has the Panama TR4 Program achieved?

4.2 Should the Panama TR4 Program continue?

4.3 What should the Panama TR4 Program focus on and do?

4.4 Sharing responsibility and funding

4.5 Operational structure, performance and expenditure

4.6 Governance arrangements

4.7 Panama TR4 Program funding

4.8 Key findings

## 5 Recommendations and implementation

5.1 Recommendations

5.2 Implementation

## 6 Conclusions
TABLE 2.5  PANAMA TR4: RESEARCH AND DEVELOPMENT EXPENSES 16
TABLE 3.1  POSSIBLE ELEMENTS UNDER EACH OPTION 21
TABLE 4.1  RESPONSE AND PANAMA TR4 PROGRAM OBJECTIVES 29
TABLE 4.2  COST SHARING PRINCIPLES 35
TABLE 4.3  BIOSECURITY ROLES AND RESPONSIBILITIES – AN APPROACH TO COST SHARING FOR PANAMA TR4 43
TABLE 4.4  FUNDING RATIONALE BETWEEN PUBLIC AND PRIVATE IMPACTS BASED ON A SLIDING SCALE 44
TABLE 4.5  EXPENDITURE BY COST CODE PER YEAR 45
TABLE 4.6  PANAMA TR4 PROGRAM EXPENDITURE BY BUDGET ACTIVITY 46
TABLE 4.7  PANAMA TR4 PROGRAM KEY PERFORMANCE INDICATOR PROGRESS BY QUARTER 47
TABLE 4.8  TOP LINE PERFORMANCE INDICATORS FOR 2017/18 48
TABLE 5.1  ROLES AND RESPONSIBILITIES INDICATORS OF PARTIES TO THE PANAMA TR4 PROGRAM 58
TABLE A.1  PANAMA TR4 PROGRAM EXPENDITURE BY PROJECT AND EXPENSE CATEGORY A–1
TABLE B.1  DETAILED SCOPE AND CORRESPONDING SECTION IN THIS REPORT B–1

BOXES

BOX 2.1  INDEPENDENT REVIEWS OF THE PANAMA TR4 PROGRAM 8
BOX 2.2  HOW PANAMA TR4 PROGRAM CURRENTLY PLACES OB LigATIONS AND RESTRICTIONS ON PROPERTIES WITH PANAMA DISEASE 10
BOX 2.3  THE CURRENT GOVERNANCE ARRANGEMENTS FOR THE PANAMA TR4 PROGRAM 12
BOX 4.1  PLANT BIOSECURITY RESEARCH INITIATIVE (PBRI) 33
BOX 4.2  BEALE REVIEW, 2008 36
BOX 4.3  MARKET FAILURE AND PANAMA TR4 37
BOX 4.4  DEFINING THE PUBLIC BENEFITS OF THE NATIONAL BIOSECURITY SYSTEM 37
BOX 4.5  THE PRINCIPAL-AGENT MODEL AND HOW IT APPLIES TO PANAMA TR4 40
The Queensland Department of Agriculture and Fisheries (DAF) commissioned ACIL Allen to review Biosecurity Queensland’s Panama TR4 Program to establish on what basis it should continue. The Panama TR4 Program started as an emergency response to the identification of Panama TR4 in 2015. Once it was established that Panama TR4 could not be eradicated, the Panama TR4 Program shifted to control and containment and this is where it continues to focus under the Biosecurity Act 2014 (Qld). Based on desktop review, stakeholder consultation and economic analysis the key findings are:

— The efforts of the Panama TR4 Program, government, industry and others have been successful in containing the impact of Panama TR4 to three sites in one location in the Tully Valley.

— The Panama TR4 Program has successfully established arrangements that allow infected properties to continue producing bananas and access/supply their markets.

— Through “buying time” for industry and regions to adapt to Panama TR4 the estimated net benefit of the Panama TR4 Program is $2,126.1 million in 2017-18 dollars which equates to a benefit-cost ratio of 39.2:1.

— Without the Panama TR4 Program it is likely the impact of Panama TR4 will be more widespread and happen sooner.

— The Panama TR4 Program should therefore continue on the basis the industry and regions benefit from banana production.

— The Panama TR4 Program needs to be placed on a 3-5 year funding and planning horizon to operate effectively.

— The current Panama TR4 Program objectives are well constructed reflecting the need to implement activities and simultaneously developing an enduring system with industry to do so.

— All the Panama TR4 Program elements are required to deliver on the Panama TR4 Program’s objectives and considerable effort has been put in place to develop the policies and procedures to implement them.

This review makes the following recommendations to improve the Panama TR4 Program:

1. Establish a Partnership Agreement (MoU) to help build long term resilience between government and industry and clearly define the concept of shared responsibility.

2. Strengthen the role of the Panama TR4 Program Steering Committee to reflect the co-management of the Panama TR4 Program.

3. Transparently align the Panama TR4 Program’s operational model and objectives so that the Panama TR4 Program’s plan can be clearly demonstrated to stakeholders.

4. Update and publish the overall Strategy and Phases prior to the MoU development process.

5. Renew extension to banana growers and other directly affected businesses.

6. Industry must move towards an equal share of the costs of the Panama TR4 Program over the next 3-5 years at which point it should be reviewed.
1

INTRODUCTION

1.1 Background

Bananas are an important industry in Far North Queensland. Since 2015 a program has been in place as a broader response to control and contain Panama disease Tropical Race 4 (Panama TR4) which has the potential to significantly impact the industry and region. Panama TR4 is currently contained but can spread at any time. Based on overseas experience and nature of Panama TR4 it is expected to do so eventually. An on-going program to limit the rate and extent of spread is warranted given the severe impact Panama TR4 may have. This raises questions of what the Panama TR4 Program should be and how it can be organised and financed.

1.2 Purpose of this review

The Queensland Department of Agriculture and Fisheries (DAF) commissioned ACIL Allen Consulting (ACIL Allen) to address these questions through an independent review of Biosecurity Queensland’s Panama TR4 Program that is currently in place to control and contain Panama TR4.

The specific focus of the review is to:

— outline the Panama TR4 Program activities and linkages to establish context
— identify organisational, legislative and funding parameters that shape the Panama TR4 Program and wide response
— identify how elements of the Panama TR4 Program could be delivered in the future
— conduct a benefit cost analysis of the Panama TR4 Program and establish the basis for cost sharing in the future
— provide recommendations on a fair and realistic model for managing Panama TR4 going-forward.¹

Under the terms of reference, the review must consult with industry and other stakeholders but only reports to the Department. This is because the purpose of the review is to inform the Queensland Government’s decision on how best to continue the Panama TR4 Program as part of a response to Panama TR4.

Further engagement and negotiation with industry and other stakeholders by the Department will occur to determine the future arrangements for the Panama TR4 Program once the recommendations from this review have been properly considered. This is outside the scope of the review as it stands.

¹ See Appendix B for the review’s terms of reference.
1.3 Approach

The review commenced with desktop analysis of the Panama TR4 Program, adaptive management, biosecurity, Panama TR4, the banana industry and regions in Far North Queensland using a real options approach to organise the evidence and frame the project into a series of working papers. At the same time the review met with Biosecurity Queensland and the Australian Banana Growers Council (ABGC) to scope stakeholder consultation and industry engagement in the review. The draft report may be provided to ABGC for comment prior to finalisation if appropriate.

A discussion guide was developed with assistance from Biosecurity Queensland, ABGC and more than 40 stakeholders were consulted in small groups, workshops, face to face interviews or by phone. The consultation findings were combined with the desktop analysis into a design paper.

This was followed by a design workshop conducted under the Chatham House Rule with the Queensland Government (represented by DAF and Biosecurity Queensland) and industry (represented by ABGC). This allowed the preliminary findings and recommendations to be validated and tested prior to drafting this report. The workshop also reinforced the need for on-going collaboration between industry and government in managing Panama TR4.

1.4 This report

The report is structured as follows:

— Chapter 2: Panama TR4 and Far North Queensland banana industry and the history of the Panama TR4 Panama TR4 Program including the current Panama TR4 Program
— Chapter 3: Benefit cost analysis
— Chapter 4: Panama TR4 Program review
— Chapter 5: Recommendations and implementation
This Chapter presents an overview of the Far North Queensland banana industry, Panama TR4 and the history of the Panama TR4 Program including a description of the current Panama TR4 Program.

2.1 Australian banana industry in Far North Queensland

Australian banana production in 2016-17 was 414,000 tonnes with a farm gate value of $580 million. There are approximately 12,790 ha of bananas under production in Australia with nearly all (92 per cent, or 11,765 ha) located in the coastal area of Far North Queensland between Cardwell and Cairns including the Lakeland region. In 2016-17, the Far North Queensland area produced around 389,000 tonnes of bananas or 94 per cent of national production (Australian Banana Growers Council, 2018).

Other commercial production occurs between Bundaberg in southern Queensland and Coffs Harbour in northern New South Wales, Carnarvon in Western Australia, and in the tropics of Western Australia and the Northern Territory. Figure 2.1 shows banana production by state from 2010-11 to 2016-17.

The Figure shows Queensland as the major producing area. It also shows the decline in production from the Northern Territory during 2015 as a result of biosecurity measures to eradicate the banana freckle disease. In addition, Panama TR4 has been present in the Northern Territory since 1997 resulting in the destruction of a large area of plantation. Variability in the Western Australian crop is...
due to cyclonic activity which destroyed a large production area in 2011 (Australian Banana Growers Council, 2018).

AgTrends Queensland reports the gross value of production for bananas produced in Queensland in 2016-17 was $580 million with nearly all of this value produced in Far North Queensland. Table 2.1 shows the number of banana farms in Far North Queensland by their size as well as the total area of bananas under production. There are 263 banana farms in Far North Queensland. Approximately half of all banana farms are located in the Cassowary Coast.

### Table 2.1: Area of Banana Production – Far North Queensland (2017)

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of farms</th>
<th>Less than 150 ha</th>
<th>151 – 300 ha</th>
<th>301 ha or more</th>
<th>Total ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mareeba/Tablelands</td>
<td>35</td>
<td>2</td>
<td>1</td>
<td>2,072</td>
<td></td>
</tr>
<tr>
<td>Greater Tully</td>
<td>51</td>
<td>12</td>
<td>1</td>
<td>4,396</td>
<td></td>
</tr>
<tr>
<td>North of Cairns (e.g. Lakelands)</td>
<td>29</td>
<td>2</td>
<td>0</td>
<td>1,361</td>
<td></td>
</tr>
<tr>
<td>Cassowary Coast – outside of Tully</td>
<td>129</td>
<td>0</td>
<td>1</td>
<td>3,936</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>244</td>
<td>16</td>
<td>3</td>
<td>11,765</td>
<td></td>
</tr>
</tbody>
</table>

Source: Department of Agriculture and Fisheries

The industry’s economic contribution to Far North Queensland is estimated to be over 2 per cent to the regional economy and in 2010-11 was estimated to provide direct employment of 3,341 full time equivalent (FTE). The economic impact is even greater when indirect impacts are considered:

In Far North Queensland, for example, the banana industry generates a total output (directly and indirectly) of $951 million representing approximately 13.6% of total business turnover, and supports 8,384 full time equivalent jobs, 14.6% of total full time equivalent jobs in the region.

Hall, H. & Gleeson, J. (2013), p 21

#### 2.1.1 Socio economic profile

The Queensland banana industry is focussed in the two local government areas of Mareeba and Cassowary Coast in Far North Queensland. When compared to Queensland, the two areas are characterised by low socio economic indicators. For example, 73.3 per cent of residents within the Cassowary Coast fall within the two most disadvantaged quintiles, compared to only 40 per cent of the rest of Queensland.

The population of both areas are older when compared to the state average and there is a high share of the population that are Aboriginal peoples or Torres Strait Islanders. In 2016, 9.7 per cent of the community of Cassowary Coast identified as Aboriginal peoples and Torres Strait Islanders compared to only 4.0 per cent of Queensland residents. In Mareeba, this share is even higher with 13 per cent of the resident population identifying as Aboriginal peoples or Torres Strait Islanders.

The labour force participation rate which is the share of the population in employment or seeking employment in both local government areas is low. In Mareeba, there was a participation rate of 51 per cent and in Cassowary Coast the participation rate is 56 per cent compared to a participation rate of 61 per cent in Queensland as of the 2016 Census. Unemployment rates are high. In Mareeba they are 9.2 per cent (2016-17) and in Cassowary Coast they are 12 per cent compared to 6.2 per cent in Queensland.

The level of skills is low in both areas with just 37 per cent of the population holding an educational qualification in Mareeba and 38 per cent in Cassowary Coast. This compares to Queensland where 48 per cent of the population hold a qualification.


Tertiary level education.
The workforces in both areas are highly dependent on the agriculture sector for employment. At the 2016 Census, agriculture was the largest employer in both areas directly providing jobs for over 2,600 workers or 22 per cent of employed people living in the Cassowary Coast and 1,400 workers or 17 per cent of employed people living in Mareeba. The other major employers in each of the areas are those associated with providing support for a resident population such as government services and the retail sector. It is likely that many of these jobs are dependent on the agriculture industry as the major industry of employment in each of the local government areas.

The cessation of the banana industries in Queensland would cause significant economic and social disruption to the local government areas of Mareeba and Cassowary Coast where the population is dependent on agriculture and the provision of the local service industry for employment and wealth generation. The lack of employment opportunities combined with low skills levels will result in poor economic and social indicators including high unemployment and population decline.

2.2 Panama TR4 in Queensland

Panama TR4 poses a significant threat to Queensland’s banana production and the livelihoods of growers and those in the banana supply chain. Panama TR4 is ranked as the greatest threat to banana production worldwide owing to its capacity to survive for decades in the soil, and its ability to spread in infected plant material, soil and water. In other banana growing areas where Panama TR4 has been detected, the commercial industry has had to undergo major structural changes that have either greatly increased the cost of production (e.g. South East Asia) or resulted in the demise of commercial banana production in those locations (e.g. the Northern Territory).

Panama TR4, a form of fusarium wilt, *Fusarium oxysporum f. sp. cubense tropical race 4* (Foc TR4), is a fungal disease that lives in the soil and is transmitted primarily by human movement (including machinery and equipment) or plant material. It attacks the vascular tissue of a plant, but it is not transferred to banana fruit which remain safe to eat. Panama TR4 is easily spread by the movement of infected banana plants and material, and contaminated soil and water. Anything that moves soil and water can move Panama TR4 – people, vehicles, machinery, equipment and animals. Natural processes such as heavy rainfall and floods can move Panama TR4 as well. Panama TR4 cannot be eradicated and therefore requires considerable management in terms of control and containment.

On March 3, 2015 a suspected case of Panama TR4 was identified on a banana plantation in Tully, Far North Queensland. The affected property was quarantined and movement of plant material, soil, machinery, equipment and vehicles on and off the property was restricted while Biosecurity Queensland undertook a tracing, surveillance and sampling program to find the source of Panama TR4 and where it may have spread to.

In July 2017 sample tests confirmed Panama TR4 on an additional property close to the property detected in 2015. This confirmed the spread of Panama TR4 in the Tully area. A third property, in Tully, was confirmed as having Panama TR4 in February 2018.

2.3 History of the Panama TR4 Program

There have been three response phases following the initial detection of Panama TR4 in the Tully Valley in Far North Queensland, on 3 March 2015.

The “National Management Group for Panama disease Tropical Race 4” met on 16 April 2015 and agreed that it was not feasible to eradicate Panama TR4 in Queensland as there are no proven control methods available to destroy Panama TR4 (Department of Agriculture and Fisheries, 2017). All response phases have therefore focussed on surveillance for and control and containment of Panama TR4.

The stage of Panama TR4 invasion determines the type of biosecurity response. Figure 2.2 overleaf presents the generalised invasion curve which depicts the four phases of invasion and the appropriate management actions for each phase. There are two limitations of this generalised response:

— the invasion curve for Panama TR4 is unknown
Panama TR4 went from prevention to first detection and had no eradication phase – as Panama TR4 cannot be eradicated. The generalised curve can be adapted by removing the eradication phase and extending the containment phase.

**FIGURE 2.2 INVASION CURVE AND THE BIOSECURITY CONTINUUM**

Note: Panama TR4 cannot be eradicated – the diagram has been adapted to represent an extended containment phase to better reflect Panama TR4.

**SOURCE:** ADAPTED FROM BIOSECURITY VICTORIA, DEPARTMENT OF PRIMARY INDUSTRIES, VICTORIA

Biosecurity Queensland has developed response phases for the Panama TR4 Program based on the generalised invasion curve (acknowledging there is no eradication phase for Panama TR4 – as Panama TR4 cannot be eradicated). These phases also set out the funding responsibilities of government and industry. These phases are presented in **Figure 2.3**.

The initial response to the identification of Panama disease TR4 was an emergency response (**Figure 2.3**). Once it was established that Panama TR4 could not be eradicated, the Panama TR4 Program focussed on containment (Managed Response Phase) and this is where the current Panama TR4 Program continues to focus (Phase 2 in **Figure 2.3**). Due to the uncertainties in the rate of spread of Panama TR4, there is consideration as to when the Panama TR4 Program should move through the Transition to Management Phase (Phase 3 – which still has a containment focus) and shift to asset-based protection which aligns with the Panama TR4 Program’s Management Phase (**Figure 2.3**).

**FIGURE 2.3 PHASES OF THE PANAMA TR4 PROGRAM**

The following sections set out the phases of the Panama TR4 Program since the initial detection in more detail.

2.3.1 Initial emergency response

The Emergency Response mounted by the Queensland Government following the first detection in Tully was established under the Plant Protection Act 1989. The Emergency Response was declared by the Chief Biosecurity Officer on 4 March 2015.

The first infested property and a second closely linked property were quarantined using an Inspectors Direction and later movements off the property were authorised under a number of Inspectors Approvals. A pest surveillance program was authorised to determine the extent of Panama TR4 within the state.

The response aimed to confirm identification of Panama TR4, delimit the geographical distribution of Panama TR4, prevent further spread of Panama TR4, eradicate Panama TR4 from all infested sites and facilitate recovery from Panama TR4 incursion. Emergency response activities included tracing, surveillance, testing, compliance and policy/planning.

On 16 April 2015, the National Management Group found that, based on the best available scientific evidence, it was not technically feasible to eradicate Panama TR4.

The emergency response transitioned to the Panama TR4 Program on 1 September 2015. The Panama TR4 Program Strategy was developed during late 2015.

The Biosecurity Act 2014 came into force in July 2016. Under this new legislation two legislative programs were approved by the Director General to give powers to undertake surveillance across Queensland and monitoring and compliance on properties known to have disease.

2.3.2 Managed response phase

In September 2015, Biosecurity Queensland developed the “Panama disease TR4 Operational Plan—Managed Response Phase 2016–17” and then the “Panama disease TR4 Program Activity Plan 2016–17” to guide the Panama TR4 Program. Over this period five aspects of the Panama TR4 Program were reviewed independently (refer Box 2.1).

As part of the response, but outside the Panama TR4 Program, the first infested property was purchased by the ABGC through funds raised from an industry levy along with Commonwealth funding. The sale of the property was settled in October 2016 and the ABGC took ownership of the affected property and immediately ceased all farming operations. Additional state funding through the Panama TR4 Program was invested to:

— strengthen the perimeter fence of the property
— destroy the remaining banana plants on the affected property
— to establish a ground cover to prevent run-off from the property (Department of Agriculture and Fisheries, 2018).

A revised response was developed which transitioned the Panama TR4 Program to a managed response effort. A revised set of plans were developed in early 2017 including the “Panama disease TR4 Program Activity Plan 2016–17”.

During this time Panama TR4 was reported on a property in Mareeba which was investigated by the Panama TR4 Program and found to be a false positive – that is Panama TR4 was not confirmed to be present at that time.
Over the life of the Panama TR4 there have been five reviews conducted to date (excluding this review). The reviews and its key findings are summarised below:

1. In 2015, Deloitte assessed the adequacy of the end to end processes surrounding the sampling and diagnostic assessment process and associated reporting and response activities in regard to instances of TR4. Its findings were:
   - Deloitte confirmed that all policies and procedures were followed.
   - There is no single reliable and rapid molecular method of detecting Foc TR4.
   - The molecular-based diagnostic protocols published for Foc TR4 are not robust enough.
   - The Chief Biosecurity Officer (CBO) adopted a risk-based approach consistent with that taken in relation to an infected property at Tully (1IP) and declared an emergency response on receipt of a positive result.

2. In 2016, the Queensland Audit Office reviewed the Panama TR4 Program and found that the response program was working well. The report was published in March 2017.

3. In 2017, Professor Altus Viljoen (Stellenbosch University) conducted an epidemiological review of Panama TR4 which reviewed the information available on 1-IP to provide an assessment as to the source, history and distribution of Panama TR4 and to assess the spread minimisation measures.

4. In 2017, Price Waterhouse Coopers reviewed a number of biosecurity programs within the department including the Panama TR4 Program. The focus was compliance strategies and the review found that the Panama TR4 Program was mostly compliant with the strategy. Recommendations focussed on improved documentation, record management and measurement. The report was delivered in September 2017.

5. Kantar Public was commissioned in May 2017 to undertake qualitative and quantitative research to determine: ‘How effective the Panama TR4 Program communication campaign has been in raising awareness and encouraging the adoption of risk mitigation behaviours’. Kantar made the following recommendations:
   - Strong support exists amongst growers, other stakeholders and the general population to continue the communication campaign.
   - Identify ways to increase the relevance to the general community.
   - Identify ways in which the Department can improve its engagement with growers.
   - Encourage training and retraining of on-farm staff about the importance of biosecurity measures to reduce the potential for apathy.
   - More clearly demonstrate that there is a plan to contain Panama TR4.
   - Work with councils, utilities and other organisations operating around banana farms to train new staff and update existing staff on appropriate behaviours on and around farm behaviours.

SOURCE: VARIOUS, CONFIDENTIAL REPORTS.

2.3.3 Current response – managed response phase

On 26 July 2017, sample tests confirmed TR4 on one of the properties owned by Australia’s largest banana producer. A third find in February 2018 confirmed spread of TR4 in the Tully area of Far North Queensland. The current response activities aim to minimise disease spread through tracing and surveillance, compliance, communications and education and policy/planning based on the best available information.

Surveillance efforts to date indicate that Panama TR4 remains contained on the three identified sites and therefore the Panama TR4 Program is expected to remain in a managed phase response.

The five objectives of the current managed response to the Panama disease TR4 were originally developed in 2016 and then revised in early 2017. They differ because of the transition of the Panama TR4 Program from an emergency response approach as a result of the initial find to a managed approach because of the absence of any further finds. The objectives associated with each approach are presented in Table 2.2 which shows the transition from containment to management.
TABLE 2.2 MANAGED RESPONSE PHASE OF THE PANAMA TR4 PROGRAM OBJECTIVES

<table>
<thead>
<tr>
<th>2015-16</th>
<th>2016-17 revised</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Delimit the current geographical distribution of Panama TR4.</td>
<td></td>
</tr>
<tr>
<td>2. Contain Panama TR4 to infested sites and prevent its spread from those sites.</td>
<td></td>
</tr>
<tr>
<td>3. Prevent the introduction of Panama TR4 to non-infested sites.</td>
<td></td>
</tr>
<tr>
<td>4. Facilitate industry resilience, recovery and sustainability in the face of this disease incursion.</td>
<td></td>
</tr>
<tr>
<td>5. To actively engage with key stakeholder groups, to increase industry and community understanding of the Panama TR4 Program objectives and encourage active participation.</td>
<td></td>
</tr>
<tr>
<td>6. To prevent the spread of Panama TR4 through implementation of on farm biosecurity measures and early reporting of suspect cases of Panama TR4.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2015-16</th>
<th>2016-17 revised</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determine the current geographical distribution of Panama TR4 in Queensland.</td>
<td></td>
</tr>
<tr>
<td>2. Minimise the risk of pathogen spread from affected land.</td>
<td></td>
</tr>
<tr>
<td>3. Industry adjustment, resilience and management of Panama TR4 is supported through the development of robust biosecurity policies and sustainable biosecurity systems.</td>
<td></td>
</tr>
<tr>
<td>4. Engage with key stakeholder and community groups to promote understanding of Panama TR4, encourage early reporting and shared responsibility for biosecurity practice change.</td>
<td></td>
</tr>
<tr>
<td>5. Deliver a best practice biosecurity program underpinned by accurate data capture, robust diagnostic services, rigorous science, risk based decision making, sound corporate practices and encourage innovation.</td>
<td></td>
</tr>
</tbody>
</table>


2.3.4 Funding arrangements

Biosecurity Queensland responds to Panama TR4 outside national cost sharing arrangements as Panama TR4 cannot be eradicated. DAF has funded the Panama TR4 Program. As at 30 June 2016, Biosecurity Queensland had 58 FTEs allocated to the Panama TR4 Program (Queensland Audit Office, 2017). The actual expenditure of the Panama TR4 Program is presented in Figure 2.4.

FIGURE 2.4 HISTORIC PANAMA TR4 PROGRAM EXPENDITURE OVERTIME

The figure shows the increase in expenses of the Panama TR4 Program from the initial emergency response in 2015 and the transition of the Panama TR4 Program to a management phase.

In addition to government expenditure, industry funded the purchase of the first infected property in 2016 through a Commonwealth donation of $1 million and a $1.5 million loan that is being repaid through a separate temporary banana levy of $0.005 per kg administered by Plant Health Australia.
2.4 The Panama TR4 Program

The following sections set out the details of the current Panama TR4 Program in terms of its governing legislation, its objectives, governance, activities and funding arrangements.

2.4.1 Legislation

The Biosecurity Act 2014 (Qld) (the Act) is the principal legislation underpinning the Panama TR4 Program. The Act’s main objectives are to provide a framework for an effective biosecurity system for Queensland, ensure the safety of agricultural inputs and align responses to biosecurity risks with national and international obligations. Secondary objectives include improving the capacity of local governments, industry and the community to respond to biosecurity risks. Biosecurity Queensland is the lead agency operating within DAF.

General obligations

The Act imposes a general obligation on any persons dealing with, including dealing with carriers of, biosecurity matter. The objective of the obligation is to minimise the impact of biosecurity risks on human health, social amenity, the economy and the environment. Broadly, if a person knows, or ought reasonably to have known, that the biosecurity matter, carrier or activity poses or is likely to pose a biosecurity risk, then they must take all reasonable and practical measures to prevent or minimise that risk and its consequences. This includes any omission to act where that omission may, or in fact does, exacerbate the adverse effects. Failure to meet the obligation constitutes an offence and the relevant costs are recoverable.

BOX 2.2  HOW PANAMA TR4 PROGRAM CURRENTLY PLACES OBLIGATIONS AND RESTRICTIONS ON PROPERTIES WITH PANAMA DISEASE

Under the Biosecurity Act 2014, Panama disease TR4 is Category 1 restricted matter which means that there is an obligation for people who deal with matter to report suspicions/signs of disease.

Section 58 of the Biosecurity Regulation 2016 provides that a notice may be given to the owner or occupier of land to advise them that there is known to be, or there is a significant risk that, Panama TR4 is present on land or in or on a plant.

Section 58 contains the provisions to give a notice, destroy plants and adopt ‘processes and procedures’ that minimise the biosecurity risk. Failure to comply with the notice may result in a failure to discharge the general biosecurity obligation.

The notice may require the occupier to comply with certain processes and procedures to minimise the biosecurity risk posed by Panama TR4. These operational processes can be individualised to the property. The procedure for undertaking destruction is in the Queensland biosecurity manual.

The Director General has authorised two programs under Section 233. These provide powers to determine the presence and extent of Panama TR4 within Queensland and to monitor compliance with the Act.

There is no compensation available to affected growers at this time.

SOURCE: BIOSECURITY QUEENSLAND.

The Act imposes additional obligations in relation to prohibited or restricted biosecurity matter (refer to Box 2.2 above for how this relates to the Panama TR4 Program). Those obligations concern reporting, dealing with and disposing of such matter. These obligations all apply to persons, the Queensland Government and, to the extent permitted, the Commonwealth and other state governments. However, implicit in the obligation is the extent of the person’s control in relation to the biosecurity matter.

4 “Biosecurity matter” is a living thing other than a human, a pathogenic agent that can cause disease in living thing, a disease or a contaminant.

5 “Prohibited matter” is biosecurity matter not currently known to be present in the state but which would be expected to have a significant adverse effect on biosecurity if it were. “Restricted matter” is biosecurity matter present in the state which, if restrictions are not imposed on it, may have an adverse effect on biosecurity. Panama TR4 is restricted matter.
Codes of practice and guidelines
The Biosecurity Regulation 2016 prescribes steps for complying with the general biosecurity obligation in relation to specific biosecurity matters. The current regulation includes steps in relation to Panama TR4. Codes of practice may be made under the Regulation in relation to matters including additional ways to discharge the general biosecurity obligation. The DAF Chief Executive may also make guidelines for similar purposes. There are consultation requirements involved in making codes and guidelines.

Emergency and non-emergency powers
Biosecurity Queensland is the lead agency operating within DAF under the legislation.

The DAF Chief Executive may make biosecurity emergency orders that apply obligations and restrictions on persons within or in the vicinity of a specific area. The orders and declarations can include obligations to destroy biosecurity matter and restrictions on dealings and movement.

The Chief Executive may authorise surveillance, prevention and control programs in relation to biosecurity matters. Regulations may also be made to declare biosecurity zones with respect to specific biosecurity matters within the state. The Chief Executive may also appoint authorised officers to carry out activities in respect of those programs comparable to those of inspectors but during non-emergency periods. The Chief Executive may appoint inspectors to carry out relevant activities (including rights of entry, search and seizure) or direct persons to take specific actions. Failure to comply with such a direction is an offence. Persons subject to any of the above obligations or directions may apply for permits to allow specific activities to take place.

Compensation and other agreements
The Act allows the Queensland Government and other governments and/or industry to enter into compensation schemes to fund activities or make good losses (expenses) or damage as the result of the taking of biosecurity responses. There is a right to statutory compensation in the absence of such a scheme. Contributory negligence provisions apply where the party claiming compensation was partly responsible for the loss or damage.

The Act allows the Queensland Government to enter into agreements with other governments, industry and other entities (for example, water utilities) with respect to matters that promote the objectives of the Act including procedural, certification, accreditation and compliance matters.

There is no compensation available to growers affected by Panama TR4 at this time.

Other funding sources
There is no general power under legislation to levy funds for Biosecurity Queensland’s activities.6

2.4.2 Current governance
Collaborative governance and leadership is a key theme (Theme 1) of the Queensland Biosecurity Strategy 2017-2022. The Theme is guided by principles which commit Biosecurity Queensland to:

- consistency, openness and honesty
- collaboration and a commitment to put the integrity of Queensland’s biosecurity system’s collective needs beyond any individual’s needs
- fostering a culture of continuous learning and commitment to transforming the biosecurity system.

The current governance and organisational (program management) arrangements for the Panama TR4 Program are aligned with this Strategy.

The Panama TR4 Program (operational) management arrangements include 41 full time equivalent employees (FTEs) of Biosecurity Queensland currently working directly on the Panama TR4 Program on rolling contracts that expire each financial year. The Panama TR4 Program Leader reports to the General Manager of PB&PI (Plant Biosecurity and Product Integrity).

6 Currently, the program is funded by consolidated revenue only. The Program can attract/accept funding from other sources. The only income generated is a very small component from the fee associated with fruit inspected to go to NSW.
The team is based in Moresby except for the laboratory team. This team comes under the Plant Biosecurity Laboratory (PBL) and staff are tasked in line with operational requirements. They are funded from the Panama TR4 Program.

In addition, there are contractors who are involved in the delivery of key activities. Over half are contractors sourced through labour hire agencies.

The current governance is a traditional arrangement with the Panama TR4 Program reporting within the Biosecurity Queensland and DAF hierarchy through to the Director General. All staff and contractors sit within the department. Figure 2.5 overleaf presents an organisational chart and Box 2.3 below presents an overview of the Panama TR4 Program governance and committee structure as part of the broader response.

**BOX 2.3** THE CURRENT GOVERNANCE ARRANGEMENTS FOR THE PANAMA TR4 PROGRAM

- The Panama TR4 Program is guided by the Panama TR4 Response and Resilience Taskforce, which ensures that the response effort is informed by a broad range of relevant stakeholders.
- The Taskforce includes representatives from the Queensland Government, the Commonwealth, the Australian Banana Growers’ Council, the Cassowary Coast Regional Council, the Mareeba Shire Council and the Tully Support Centre.
- The Panama TR4 Steering Committee provides operational and planning oversight of the Panama TR4 Program by guiding and monitoring the Panama TR4 Program between the Department and the peak industry body, the Australian Banana Growers’ Council (ABGC). The Steering Committee includes senior departmental staff and the ABGC.
- The Panama TR4 Regional Working Group provides a platform for information sharing, collaboration and facilitation relating to the community impact and internal operational protocols associated with Panama disease. Membership includes representatives from the local councils, the ABGC, Queensland Police Service, state government agencies with operations in the local area, Ergon Energy, Sunwater, Telstra and Terrain NRM.
- The Panama TR4 Program works with researchers from both AgriScience Queensland and various universities to ensure best practice in both managing infested properties and containing the spread of Panama TR4. The control and containment program relies on scientific information and is modified as new information becomes available.
- The Panama TR4 Program works closely with the Cassowary Coast Regional Council in areas such as operational issues, planning, communications and risk mitigation.
- The Panama TR4 Program works closely with ABGC staff and board members to increase knowledge and capacity within the banana growing industry to manage Panama TR4.
- The Panama TR4 Program collaborates with service providers who work on or nearby to banana farms, including infested properties. This has included Ergon Energy and emergency services providers. Resources are allocated to ensure that services providers receive training in practices to reduce the risk of them spreading disease.
- The Panama TR4 Program collaborates with peak industry body, the Australian Banana Growers’ Council (ABGC).

*SOURCE: BIOSECURITY QUEENSLAND*
Note: There are currently 41 FTEs under the Panama TR4 Program.

* All positions under the POST Manager and Tracing and Surveillance Co-ordinator are contractor positions, i.e. IP/SP Surveillance Staff, Tracing and Surveillance Officer and Surveillance Staff.

** This number varies between 4 and 6 FTEs.

SOURCE: DEPARTMENT OF AGRICULTURE AND FISHERIES, 2017
2.4.3 Current objectives

The aim of the Panama TR4 Program is to contain the Panama disease tropical race 4 pathogen, and ensure industry resilience and sustainability through five objectives:

1. Determine the current geographical distribution of Panama TR4 in Queensland.
2. Minimise the risk of pathogen spread from affected land.
3. Industry adjustment, resilience and management of Panama TR4 is supported through the development of robust biosecurity policies and sustainable biosecurity systems.
4. Engage with key stakeholder and community groups to promote understanding of Panama TR4, encourage early reporting and shared responsibility for biosecurity practice change.
5. Deliver a best practice biosecurity Panama TR4 Program underpinned by accurate data capture, robust diagnostic services, rigorous science, risk based decision making, sound corporate practices and encourage innovation.

2.4.4 Elements

There are a number of elements in response to Panama TR4 that sit within the Panama TR4 Program and outside of it. Elements under the Panama TR4 Program are described in Table 2.3 below.

| TABLE 2.3 PANAMA TR4 PROGRAM ELEMENT DESCRIPTIONS |
|-----------------|--------------------------------------------------|
| **Elements**    | **Description**                                  |
| Tracing         | - Tracing is an in depth assessment of the risk pathways that flow to and from the known infested properties. With each new detection of Panama TR4 the activity is repeated.  
- The risk pathways have been amended over time as more information becomes available. |
| Surveillance    | - The surveillance strategy aims for early detection of Panama TR4 and is built on the linkages identified through the tracing element and is based on a statistical analysis of what is currently a low incidence disease. The growers are classified based on risk.  
- Of the 263 banana growers in Far North Queensland, approximately 120 are surveyed on a 3 or 6 monthly basis.  
- Infested properties are surveyed every 6 weeks with the aim to reduce inoculum levels through a destruction protocol.  
- There is no legislative tool to ‘force’ non-infested properties to undertake their own surveillance. |
| Compliance and Property Operations | - The aim of compliance is to minimise the risk of spread from an infested property. This is underpinned by the Biosecurity Act 2014.  
- The Panama TR4 Program’s compliance strategy is that a higher level of support and compliance activity is undertaken in the early period after detection and that the requirement will reduce over time as the business demonstrates capability and compliance.  
- Through facilitation and assistance, officers work with infested growers to enable them to comply with the requirements imposed via the notice.  
- Fruit inspection at a rate of 2% (in line with international protocols) is undertaken for all fruit moving from an infested property and for fruit travelling to NSW a certificate is issued to confirm that it is free of soil and plant material.  
- Fruit inspection currently requires 5 FTEs to undertake inspections on the 2 operating properties. *  
- Support is also provided to infested property owner to undertake destruction as required. |
| Sampling and testing | - When the on-ground surveillance identifies a plant showing signs of Panama disease the plant is sampled and if internal symptoms are identified a sample is taken. The sample is sent to Brisbane for diagnostic testing. |
Elements | Description
--- | ---
Community engagement and education | – Initially the Panama TR4 Program used grower education to improve on-farm biosecurity, it was undertaken by the ABGC through workshops and one-on-one meetings.
– A key project was the development of the Biosecurity Best Management Practice (BMP) document which is currently a hard copy or digital PDF document. There are plans to turn this into an interactive tool for growers.
– The Panama TR4 Program work in this area is focused on community awareness and education, the preparation of collateral that could be shared both in the community and the industry and the provision of formal/informal education for everyone except growers.
– This activity has evolved over time and the current focus has taken on much of the ‘extension’ work with a focus on the highest-at-risk growers and ‘being Panama ready’.

Policy and Planning | – Policy and planning focuses on policy creation, program planning, risk assessment, legislative support (and connection) and decision making.
– Provides a connection between the science/research and the Panama TR4 Program. It manages the Panama TR4 Program documents ranging from strategies, plans, decision making tools, SOPs and WIs.

Elements outside but related to the Panama TR4 Program

Research and development | – The research and development activity is outside of the Panama TR4 Program.

Industry/community support and structural adjustment | – Over time, and depending on the rate of spread, there may be a case for government assistance to aid industry and community adjustment.
– This is outside the scope of the current Panama TR4 Program but will be considered at a later stage by the Taskforce and/or ABGC.

Note: * Compliance and Property Operations actual assigned FTEs for fruit inspection has varied over time. At a peak it was 6 FTE but at the moment it is 5 FTE. There are only 4 FTE listed on the Organisation Chart (Figure 2.5).
SOURCE: ADAPTED FROM BIOSECURITY QUEENSLAND

2.4.5 Funding

Table 2.4 shows the breakdown of how the Panama TR4 budget is allocated for the 2016-17 and 2017-18 financial years. The majority of spending (49 per cent) in 2016-17 was allocated to operations and planning and policy. In 2017-18, the focus of spending was on operations (43 per cent). The Panama TR4 Program currently has 41 FTEs.

| TABLE 2.4 | PANAMA TR4 PROGRAM EXPENDITURE BY CATEGORY |
| --- | --- | --- | --- |
| | 2016-17 | 2017-18* |
| Program management | $612,753 | $250,840 |
| Business support | $780,808 | $895,070 |
| Communication and engagement | $549,296 | $596,160 |
| Laboratory | $840,304 | $795,850 |
| Operations | $1,716,424 | $2,419,287 |
| Planning and policy | $945,965 | $558,168 |
| ICA Accreditation | | $53,795 |
| Total | $5,445,551 | $5,569,169 |

Note: * 2017-18 is budgeted values as year to date actuals were not available.
SOURCE: DEPARTMENT OF AGRICULTURE AND FISHERIES
2.4.6 Research and development funding

In addition, there is separate industry/public funding of research and development through DAF, universities and Horticulture Innovation Australia, Australian Research Council (ARC) and international collaborations that contribute to the Panama TR4 Program’s objectives. This research has investigated biosecurity practices, banana varieties, soil microbiology, weed host, soil chemistry, and remote detection for the banana industry. Funding from these sources also provides extension services and funding toward the Best Management Practices Project which is a national research project which is a guide to assist banana growers with their farming practices, and the Quality Approved Banana Nursery (QBAN) project which aims to provide access to clean planting material to reduce the spread of diseases including Panama TR4.

A summary of the total research and development expenses showing direct investment and in-kind salaries and other in-kind contributions is presented in Table 2.5. There has been $25.5 million of research and development contributed toward the Panama TR4 research and development effort. Roughly half of this contribution is in the form of direct investments and the remainder is in-kind support (e.g. wages and other in-kind support). The Queensland Government has contributed $14.2 million of all research and development funding while Horticulture Innovation Australia has contributed $8.4 million.

**TABLE 2.5 PANAMA TR4: RESEARCH AND DEVELOPMENT EXPENSES**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Direct</th>
<th>In-kind</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queensland Government</td>
<td>$14,199,779</td>
<td>$3,246,864</td>
<td>$10,952,915</td>
</tr>
<tr>
<td>ACIAR</td>
<td>$822,050</td>
<td>$822,050</td>
<td>$0</td>
</tr>
<tr>
<td>Horticulture Innovation Australia</td>
<td>$8,424,823</td>
<td>$8,424,823</td>
<td>$0</td>
</tr>
<tr>
<td>Other Australian agencies</td>
<td>$1,992,305</td>
<td>$1,992,305</td>
<td>$0</td>
</tr>
<tr>
<td>Other</td>
<td>$82,082</td>
<td>$82,082</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$25,521,039</td>
<td>$12,575,819</td>
<td>$12,945,220</td>
</tr>
</tbody>
</table>

*SOURCE: DEPARTMENT OF AGRICULTURE AND FISHERIES*

2.4.7 Future response options

The current, and approved, triggers for reviewing the Panama TR4 Program are presented below, and may include but may not be limited to:

(i) five per cent of banana farms, scattered throughout North Queensland, are infested (approximately 15 properties)

(ii) 15 per cent of the banana production area in the greater Tully area or any other production areas are under quarantine due to infestation

(iii) infested properties are present in all or most of the major production areas (greater Tully, Mareeba, Innisfail and Lakeland)

(iv) there is a positive detection outside of the North Queensland production areas

*Biosecurity Queensland, Panama TR4 Program – proposed activities 2016/17.*

2.5 Key findings

The key findings from this Chapter are as follows:

— the Far North Queensland economy is dependent on agriculture of which bananas play an important part

— Panama TR4, a form of fusarium wilt, is a disease spread by human movement that cannot be eradicated and therefore requires considerable management

— Panama TR4 has been confirmed on three properties in the Tully Valley since 2015
— in other banana growing areas where Panama TR4 has been detected, the commercial industry has had to undergo major structural changes that have either greatly increased the cost of production or resulted in the demise of commercial banana production in those locations

— the Panama TR4 Program, funded by the Queensland Government, was established in 2015:
  – the initial response to the identification of Panama disease TR4 was an emergency response.
  – once it was established that Panama TR4 could not be eradicated, the Panama TR4 Program focussed on containment and this is where the current Panama TR4 Program continues to focus.

— the high levels of uncertainty as to the potential and the pattern of Panama TR4 spread means it is difficult to know how to operate and finance the Panama TR4 Program into the future

— the concept of shared responsibility which is underpinned by the *Biosecurity Act 2014 (Qld)* adds to the complexity of if, how and who should operate and fund the Panama TR4 Program going forward.

To help understand the best approach to the continuation, operation and funding of the Panama TR4 Program a Benefit Cost Analysis is presented in Chapter 3 to determine the benefit of continuing with the Panama TR4 Program and set the scene for determining how to frame the Panama TR4 Program moving forward.
One of this review’s objectives is to conduct a Benefit Cost Analysis (BCA) to inform if an on-going response is warranted.

The way a BCA works is to compare a base case (usually the status quo) with an alternative option or counterfactual.

The benefit of containing and controlling are essentially avoiding the costs associated with additional spread of Panama TR4. Avoiding additional impact on the banana industry itself is classified as a private benefit that industry must pay for – this is also called a direct benefit. The private/industry benefit is split into individual (banana grower) and industry (all banana growers) benefits. The public benefit is essentially the benefit to the economy and communities in banana growing regions as well as the whole of Australia. Avoiding the flow on impact of Panama TR4 onto the other (non-banana growing) sectors of these economies and communities is also called an indirect benefit.

The cost of containing and controlling is similarly split into public and private/industry costs. The direct costs include current general biosecurity obligations for industry (including banana growers and other land managers) and government and the additional costs they incur from Panama TR4. The indirect costs are those the impacted communities and economies, as well as Australia, incur in adjusting to both Panama TR4 control and containment and the loss of all or part of the banana industry. By convention, only direct costs and benefits are considered in a benefit cost analysis; indirect costs and benefits must be excluded.

Under the principles of adaptive management, the financial proportions/contributions will change over time as our understanding of Panama TR4 improves and Panama TR4 is either contained or continues to spread.

### 3.1 The options going forward

ACIL Allen have developed two options which are a possible response to Panama TR4 going forward. It is important to note that while both these options are possible they may not reflect a preferred or actual response. They are however, independent from each other, which enables the BCA to be calculated. Alternatives were considered but these alternatives were not discrete options in themselves rather permeations of the current Panama TR4 Program. Through an adaptive management approach any uncertainty was implicitly accounted for within each permeation and meant that the same outcome – that of some response to Panama TR4 - would result under each option.

There are three key variables to each option. These include:

- rate of spread
- time taken to reach maximum spread
the ability to mitigate or delay the risk of an outcome. All three of these variables are uncertain and assumptions need to be made to frame the options along these dimensions.

Each option (Option 1 – with a program, and Option 2 – with no program) and its discrete outcome(s) (up until the point when Panama TR4 is prevalent in a large region) is presented in Figure 3.1, and described in turn below.

**FIGURE 3.1 DISCRETE OPTIONS**

<table>
<thead>
<tr>
<th>Option</th>
<th>Consequence</th>
<th>Outcome</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1:</td>
<td>Best case scenario</td>
<td>Minimise rate of spread over time until high level spread is reached</td>
<td>Minimise impact on industry and community</td>
</tr>
<tr>
<td>Program</td>
<td></td>
<td>Minimise impact on industry and community</td>
<td></td>
</tr>
<tr>
<td>Option 2:</td>
<td>Next best case scenario</td>
<td>Faster rate of spread over time until high level spread is reached</td>
<td>Some impact on industry and community</td>
</tr>
<tr>
<td>No program</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worst case scenario</td>
<td>Fastest rate of spread over time until high level spread is reached</td>
<td>Maximum impact on industry and community</td>
<td></td>
</tr>
</tbody>
</table>

**3.1.1 Option 1 – with a program**

Implicit in Option 1 (the status quo) is an ongoing Panama TR4 Program (a program)7 with the objective of controlling the spread of Panama TR4 over time in order to minimise its impact on the banana industry and the wider community (refer Figure 3.1 above).

The program may facilitate this through a co-ordinated response to Panama TR4 using various combinations of elements such as surveillance and monitoring, control and containment, research, development and extension, and structural adjustment.

**3.1.2 Option 2 – with no program**

Option 2 is the possibility of the world with no co-ordinated Panama TR4 Program. There are two possible, discrete outcomes under a response with no program. One outcome is the worst-case scenario that may be similar to incursions overseas where Panama TR4 has spread quickly and has (or will) effectively wiped out banana production in entire areas. In some international cases however, bananas are still produced however this is usually only plausible due to the relatively cheap cost of labour in those countries, and those practices would be prohibitively costly in Australia.

The second, plausible outcome, (which sits somewhere in between the best and worst case) is that due to the efforts sustained to date, and the awareness of growers and others of Panama TR4 the outcome may be somewhat less than the worst case scenario. This may allow for substantial natural adjustment of the industry over time through geographic or product diversification for example or even harnessing market forces and allow the impacted community to adjust to the next best alternative. This may result in less impact overall on the industry and the community than the worst-case scenario.

For the purposes of the Benefit Cost Analysis this involves the immediate termination of the existing Panama TR4 Program without a replacement program. This option will lead to substantial cost...

---

7 ACIL Allen recommends that any adaptive approach is adopted which allows government and industry to rapidly mobilise and pursue alternative plans if the current Panama TR4 Program fails or is ineffective in containing Panama TR4.
savings but increases the likelihood of an acceleration in the spread of Panama TR4 and the resulting shrinkage of the banana industry in Far North Queensland.

3.2 Comparison of options

One uncertain variable, mentioned above, which can play a role in the possible outcomes of each option is risk and the ability to undertake activities to mitigate risks of, or maximise the time taken to achieve, an outcome.

3.2.1 Elements under the options – mitigating risks over time

The current response to Panama TR4 consists of a range of elements which have been designed to achieve the intended outcome of the Panama TR4 Program, mainly minimising the spread of Panama TR4 over time. The way the options have been developed makes it clear that there are distinct differences between what can be done to mitigate risks in each case. Under Option 1, a program would be co-ordinated and funded by either/or both industry and government, whereas under Option 2, some elements could continue to take place either at the cost of the individual or in a less co-ordinated manner.

FIGURE 3.2 A COMPARISON OF RISK MITIGATION ACTIVITIES UNDER EACH OPTION

SOURCE: ACIL ALLEN CONSULTING
Table 3.1 below presents the various elements and how they may be included under each option to mitigate risk and influence time taken to reach an outcome.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Option 1 – with a program</th>
<th>Option 2 – with no program</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-farm biosecurity</td>
<td>Yes, but needs to be better co-ordinated and targeted to maximise uptake and reach and reduce spread of inoculum and risk of infestation</td>
<td>Yes, but less activity without the engagement and education and less development without protocols and other tools provided under a program</td>
</tr>
<tr>
<td>Tracing and surveillance</td>
<td>Yes, but must increase efficiency and effectiveness over time in line with rate of spread</td>
<td>No, only self-assessment (non-enforceable)</td>
</tr>
<tr>
<td>Compliance and property operations</td>
<td>Yes, but must increase efficiency and effectiveness over time in line with rate of spread</td>
<td>No, only self-control/containment (non-enforceable)</td>
</tr>
<tr>
<td>Structural adjustment</td>
<td>Yes, but needs planning and preparing for now so potential benefits can be realised</td>
<td>Yes, but only “natural” structural adjustment where industry harnesses market forces and impacted community to adjust</td>
</tr>
<tr>
<td>Research and development</td>
<td>Yes, but co-ordination and collaboration may need to improve to focus effort and accelerate the realisation of outcomes</td>
<td>Yes, but potentially less co-ordinated than under a program</td>
</tr>
</tbody>
</table>

SOURCE: ACIL ALLEN CONSULTING

3.3 Framing the options for the benefit cost analysis

We assume the starting point of both options is the current situation – with three infested properties currently identified in the Tully Valley (see Figure 3.3). The two main uncertainties under each option are the rate of spread and the time taken to reach the inevitable scenario where Panama TR4 has spread to a point we assume to be a high level of spread across Far North Queensland.

To differentiate the two options, we have assumed a fixed probability of spread and have varied the time taken of choosing one option over the other over time. In each option there are different scenarios based on how Panama TR4 spreads and the likelihood of that outcome. It is assumed that for each option the next step is that Panama TR4 will spread but only in the Tully region. This is more likely than the possibility that Panama TR4 will be found to have spread to another region in Far North Queensland. It is assumed that there is a 70 per cent probability of the first scenario and a 30 per cent probability of the latter (however, in Option 1, this is assumed to take much longer due to a continued and co-ordinated response to Panama TR4).

The next decision point is moving from one of those scenarios to the next scenario. If Panama TR4 has spread only within the Tully region then the likely next scenario is that it spreads to another region (we assume the probability of this to be significantly higher (90 per cent more likely) than the alternative). The alternative is that Panama TR4 spreads from within the Tully region and extends outwards in some kind of pattern to infest a larger proportion of Far North Queensland. It is our understanding that Panama TR4 has no clear pattern to it and that it less likely to continue to follow a sequential spread. As a result, we assign the probability of going from Tully to a higher rate of spread across Far North Queensland to be 10 per cent.

Once Panama TR4 has spread out of the Tully region at either the first decision node or the second node then the likelihood that it will continue to spread to high levels across Far North Queensland is assumed to be 100 per cent. This is based on the fact that ultimately, regardless of interventions, Panama TR4 will spread to a significantly larger area, and that the only limiting factor of this is the amount of time taken to reach this point. Again, it is assumed that under Option 1 where there is a co-
ordinated response with multiple activities taking place that this will mean that reaching the end point (for the purposes of the analysis) will be considerably longer than under Option 2 with no program.

FIGURE 3.3 OPTIONS

<table>
<thead>
<tr>
<th>Option 1: Program</th>
<th>Option 2: No Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeframe = 5 years</td>
<td>Timeframe = 1 year</td>
</tr>
<tr>
<td>Probability 70%</td>
<td>Probability 30%</td>
</tr>
<tr>
<td>Spread only within the Tully region</td>
<td>Spread outside the Tully region</td>
</tr>
<tr>
<td>Probability 90%</td>
<td>Probability 100%</td>
</tr>
<tr>
<td>Spread outside the Tully region</td>
<td>High level of spread across FNQ</td>
</tr>
<tr>
<td>Probability 10%</td>
<td>Probability 100%</td>
</tr>
<tr>
<td>Timeframe = 10 years</td>
<td>Timeframe = 2 years</td>
</tr>
<tr>
<td>Probability 100%</td>
<td>Probability 100%</td>
</tr>
<tr>
<td>Timeframe = 20 years</td>
<td>Timeframe = 5 years</td>
</tr>
</tbody>
</table>

Note: The probabilities and timeframes are based on best available information.

SOURCE: ACIL ALLEN CONSULTING

3.4 Benefit cost analysis

3.4.1 Assessment of costs

Panama TR4 Program costs
The Panama TR4 Program’s costs between 2014-15 and 2017-18 were as follows:

- 2014-15: $3,217,526
- 2015-16: $6,999,644
- 2016-17: $5,445,551

The expenditure in 2014-15 was lower because the Panama TR4 Program commenced only in March 2015. The expenditure in 2015-16 was relatively high because the Panama TR4 Program was still in the emergency response phase. The average Panama TR4 Program expenditure in the four years is $5,307,972. It is assumed that this will be the annual Panama TR4 Program cost between 2018-19 and 2037-38 under Option 1 (with a program). It is assumed that the costs of a program will be zero in those years under Option 2 (no program).

Research and development costs
In the absence of data indicating otherwise, it is assumed that research and development expenditure (held constant over the twenty-year time period at current costs) in areas such as the development of a TR4-resistant banana variety will be the same under both Options 1 and 2. It should be noted that this research and development expenditure is outside the budget of the Panama TR4 Program (and is not included in the Panama TR4 Program costs discussed previously).

Grower biosecurity costs
For the purposes of this analysis, and in the absence of data, ACIL Allen have assumed the cost of on-farm biosecurity to be a yearly cost of $10,000 per grower. This reflects the marginal cost rather
than the full cost of on-farm biosecurity. ACIL Allen are using this as a proxy until data is available. In making this assumption we tested the effect on increasing and decreasing this cost relative to the overall BCR and found that there is very little effect.

Under Option 1, it is assumed that grower biosecurity costs in 2017-18 are $2.63 million (that is, $10,000 per grower multiplied by 263 growers in Far North Queensland). Thereafter, the annual grower biosecurity costs will vary from this figure in proportion to projected changes in the area of banana cultivation in Far North Queensland under this option. These projected changes will be discussed in Section 3.4.2.

Under Option 2, grower biosecurity costs are assumed to be twice as high per grower (that is, $20,000 per grower) as in Option 1 due to the growers taking on increased responsibilities and actions for minimising the risk of disease on their farms in the absence of the Panama TR4 Program. As in Option 1, annual grower biosecurity costs are assumed to vary (linearly) according to the area of banana cultivation in Far North Queensland.

The projected grower biosecurity costs under the two options between 2017-18 and 2037-38 in 2017-18 dollars are shown in Figure 3.4.

FIGURE 3.4 PROJECTED GROWER BIOSECURITY COSTS, 2017-18 TO 2037-38 ($, 2017-18 DOLLARS)

SOURCE: ACIL ALLEN CONSULTING

3.4.2 Assessment of benefits

To model the benefits of Option 2 relative to Option 1, ACIL Allen has mapped the likely spread of TR4 across Far North Queensland under both options (shown in Figure 3.3 above).

For each of the two options, the mapping is characterised by three pathways:

— **Pathway 1**: Panama TR4 progresses from the ‘Current situation’ (with three infected properties in the Tully region) to ‘Spread only within the Tully region’, and then to ‘High level of spread across Far North Queensland’

— **Pathway 2**: Panama TR4 progresses from the ‘Current situation’ to ‘Spread only within the Tully region’, then to ‘Spread outside the Tully region’, and finally to ‘High level of spread across Far North Queensland’

---

8 It is expected that actual figures will be made available by Howard Hall of Pinnacle Agribusiness by the end of 2018.

9 Doubling the grower’s biosecurity costs reduces the BCR by 0.73 and halving the costs increases the BCR by just 0.27.
Pathway 3: Panama TR4 progresses from the ‘Current situation’ to ‘Spread outside the Tully region’, and then to ‘High level of spread across Far North Queensland’.

The probabilities associated with the movement from one node to another within each pathway are shown in Figure 3.3 and discussed previously in Section 4.4. For example, under Option 1, in Pathway 1 there is a 70 per cent probability of the ‘Current situation’ progressing to ‘Spread only within the Tully region in Year 5, and a 10 per cent probability in Year 10 that Panama TR4 will exhibit a ‘High level of spread across Far North Queensland’.

In the next step of the modelling, ACIL Allen has estimated (based on our understanding of TR4 disease dynamics) the reduction in banana production in Far North Queensland over the next 20 years for each of the three pathways (from the current level of 11,000 hectares), under Option 1 and also under Option 2.

The estimated reduction in banana production over the next 20 years for each of the three pathways under Option 1 is shown in Figure 3.5. For example, in Pathway 1, in FY2023 (Year 5) there is a 15 per cent reduction in production as Panama TR4 progresses from the ‘Current situation’ (with three infected properties in the Tully region) to ‘Spread only within the Tully region’. In FY2028 (Year 10), the production loss jumps to 50 per cent as the degree progresses to a ‘High level of spread across Far North Queensland’. Thereafter, an additional 10 per cent of production is lost each year until the banana industry is completely wiped out in Far North Queensland in FY2033 (Year 15).

The estimated reduction in banana production over the next 20 years for each of the three pathways under Option 2 is shown in Figure 3.6. For example, in Pathway 3, in FY2019 (Year 2) there is a 30 per cent reduction in production as Panama TR4 progresses from the ‘Current situation’ (with three infected properties in the Tully region) to ‘Spread outside the Tully region’. The production loss worsens by 5 per cent each year in the following 4 years. In FY2023 (Year 5), the production loss hits 50 per cent as the degree progresses to a ‘High level of spread across Far North Queensland’. Thereafter, an additional 10 per cent of production is lost each year until the banana industry is completely wiped out in Far North Queensland in FY2028 (Year 10).
As banana production in Far North Queensland declines over time due to the spread of TR4, the freed-up land will likely be used to cultivate other crops (most notably sugar cane, but potentially also grain legumes, vegetables and fruits, and even forestry). To simplify the analysis, only sugar cane has been modelled as the alternative to banana production in the central case of the benefit cost analysis. It is assumed that 90 per cent of the freed-up land from former banana plantations can be converted into sugar cane plantations (without any lag or adjustment / transitional costs\(^{10}\)). Sensitivity analysis is undertaken to better understand the effect of higher value alternatives on the benefit cost analysis result in Section 4.5.4.

For the modelling, the banana yield is assumed to be 35.36 tonnes per hectare (based on 2016/17 Australian Banana Growers Council data) while the sugar cane yield is assumed to be 92.11 tonnes per hectare (based on Australian Sugar Milling Council data). The value of banana production is assumed to be $1,449 per tonne (based on 2016/17 ABGC data) while the value of sugar cane production is assumed to be $43 per tonne (based on 2014/15 ABARES data).

Based on the assumptions set out above, the projected annual value of banana and sugar cane production under Option 1 (Adaptive Management) between 2017-18 and 2037-38 in 2017-18 dollars is shown in Figure 3.7.

\(^{10}\) A lag and/or non-zero adjustment / transitional costs will increase the net benefits of Option 1 relative to Option 2. In this regard, the benefit cost analysis results can be regarded as conservative.
The projected annual value of banana and sugar cane production under Option 2 (no program) between 2017-18 and 2037-38 in 2017-18 dollars is shown in Figure 3.8.

The benefits of Option 1 relative to Option 2 are estimated by subtracting the total value of banana and sugar cane production in Far North Queensland under Option 2 from the total value of banana and sugar cane production in Far North Queensland under Option 1.
3.4.3 Comparison of costs and benefits

The present value of benefits of Option 1 relative to Option 2 are projected to be $2,181.7 million in 2017-18 dollars under a 7 per cent real discount rate. The present value of costs associated with Option 1 relative to Option 2 are estimated to be $55.6 million in 2017-18 dollars under the same discount rate.

The net present value (NPV) of Option 1 relative to Option 2, obtained by subtracting the present value of costs from the present value of benefits, is estimated at $2,126.1 million in 2017-18 dollars under a 7 per cent real discount rate. The benefit-cost ratio (BCR) of Option 1 relative to Option 2, obtained by dividing the present value of benefits by the present value of costs, is estimated at 39.2.

3.4.4 Sensitivity analysis

In the central case of the benefit cost analysis, it is assumed that the production of bananas in Far North Queensland eventually declines to zero under both Option 1 and Option 2. If the production of bananas in Far North Queensland under both options eventually declines by only 50 per cent compared with the current level, the BCR decreases from 39.2 to 21.9. (Production might not decline to zero because the industry, even if not current banana growers, could potentially set up in different locations within Far North Queensland and keep moving if infestation catches up with them despite the best on-farm biosecurity measures).

In the central case of the benefit cost analysis, a banana yield of 35.36 tonnes per hectare was assumed. If the yield is 20 per cent higher, the BCR increases from 39.2 to 47.7. Conversely, the BCR decreases to 30.8 if the yield is 20 per cent lower.

In the central case of the benefit cost analysis, a banana value of $1,449 per tonne was assumed. A banana value of $2,000 per tonne will increase the BCR from 39.2 to 55.2 while a banana value of $1,000 per tonne will decrease the BCR to 26.2.

In the central case of the benefit cost analysis, a sugar cane value of $43 per tonne was assumed. A sugar cane value of $30 per tonne will increase the BCR from 39.2 to 40.1 while a sugar cane value of $60 per tonne will decrease the BCR to 38.0.

Suppose that, instead of sugar cane being planted as the only substitute for bananas, a composite mix of replacement crops worth four times as much as sugar cane alone (that is, $171 per tonne instead of $43 per tonne) is planted in former banana plantations, the BCR will decrease only moderately from 39.2 to 30.5.

These results indicate that the BCR is much more sensitive to the assumed future value of bananas than to the value of the crop(s) planted to replace bananas in TR4-affected areas in Far North Queensland.

3.5 Key findings

The BCA shows continuing with the Panama TR4 Program has a net social benefit of $2,126.1 million (NPV, 2017-18 dollars). This equates to a benefit-cost ratio (BCR) of having the Panama TR4 Program relative to not having the Panama TR4 Program is estimated at 39.2:1.

The majority of this benefit accrues directly to banana growers as the existence of the Panama TR4 Program and its continuation means that the spread of Panama TR4 will be minimised and the industry can transition to its new position of either higher costs of production, alternative crops or a new banana over time without the considerable costs incurred with no program.

There will be indirect benefits which will accrue to the local and broader community if the Panama TR4 Program contributes to delaying or containing the spread and impact of Panama TR4. It is not possible to quantify these indirect benefits with sufficient certainty or accuracy to meaningfully assess the relative distribution of Panama TR4 Program benefits across stakeholders.

The BCA does however clearly show the Panama TR4 Program benefits clearly outweighs the costs, providing a sound rationale for it to continue.
4.1 What has the Panama TR4 Program achieved?

At the time of writing the impact of Panama TR4 is contained to three properties within close proximity to each other in the Tully Valley, three years after the first case of Panama TR4 was reported in northern Queensland. This is unprecedented compared to other cases in Australia and overseas where the spread and impact of Panama TR4 has been faster and more severe.

The efforts of the Panama TR4 Program and industry have contributed to the containment and also successfully established arrangements to allow three infected properties to continue producing bananas and access/supply their markets. This outcome has demonstrated that banana growers can continue to produce and trade when Panama TR4 is present albeit at additional cost.

The Panama TR4 Program has also contributed to increasing the level of biosecurity across the industry to reduce the risk of infestation and the potential impact on banana growers. However, this level of increase is not consistent across the industry because:

— specific site and production characteristics define and constrain what can be implemented
— different levels of banana reliance and financial circumstances influence how much is invested
— there is no objective measure of how much is sufficient to prevent a disease incursion
— maintaining motivation and effort indefinitely is challenging.

In summary the collective response has held the control and contain level on the biosecurity continuum (Phase 2: Managed Response) but has not removed the likelihood that further spread and impact will occur. The nature of Panama TR4 is such that this risk will endure indefinitely or until a commercially viable disease tolerant/resistant banana cultivar becomes available. This is not expected to happen within the near future.

4.2 Should the Panama TR4 Program continue?

The primary goal of the overall response is to “buy time” for industry and regions to adapt to Panama TR4. At this stage this has not happened because Panama TR4 has been contained sufficiently to avoid the need for full adaptation. As yet, not all the adaptation options, such as a market acceptable disease tolerant/resistant banana, have been developed.

Therefore, the Panama TR4 Program should continue as part of the broader response on the basis that the industry and regions will benefit from continuing banana production while adaptation options are developed and implemented. Without the Panama TR4 Program it is likely the impact of Panama

---

11 The first infested property was subsequently bought by the industry and shut down.
TR4 will be more widespread and happen sooner as shown by the benefit-cost analysis in the previous chapter.

4.3 What should the Panama TR4 Program focus on and do?

4.3.1 Panama TR4 Program objectives

There is a high level of support for the Panama TR4 Program and widespread agreement that it should continue amongst stakeholders consulted during the review. The aim of “containing the Panama disease tropical race 4 pathogen and ensuring industry resilience and sustainability” captures the Panama TR4 Program’s intent and remains fit for purpose.

The current Panama TR4 Program objectives have tighter scope than the original Panama TR4 Program objectives and those set for the overall Response objectives in 2015. The key changes (bold text in Table 4.1) are:

— changing the objectives for pathogen containment and prevention to minimising the risk of spread
— sharpening the engagement objective to emphasise shared responsibility for biosecurity
— limiting adaptation support to biosecurity
— introducing a quality objective (best practice) for the Panama TR4 Program.

The changes represent a natural step for the Panama TR4 Program based on its development and the rate of Panama TR4 current spread. At present Panama TR4 is contained in one part of the Tully Valley and as such a broader response as outlined in the 2015 Strategy is not warranted at this time. Similarly, tighter objectives provide the Panama TR4 Program a better lens for making best use of its limited resources. The explicit introduction of shared responsibility for biosecurity clearly signals the Panama TR4 Program cannot achieve the aim on its own and aligns it with the Biosecurity Act 2014 (Qld).

<table>
<thead>
<tr>
<th>TABLE 4.1 RESPONSE AND PANAMA TR4 PROGRAM OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response Strategy Objectives</strong></td>
</tr>
<tr>
<td>Delimit the current geographical distribution of</td>
</tr>
<tr>
<td>Panama TR4.</td>
</tr>
<tr>
<td>Contain Panama TR4 to infested sites, and prevent its</td>
</tr>
<tr>
<td>spread from those sites.</td>
</tr>
<tr>
<td>Prevent the introduction of Panama TR4 to non-infested</td>
</tr>
<tr>
<td>sites.</td>
</tr>
<tr>
<td>Facilitate industry resilience, recovery and viability</td>
</tr>
<tr>
<td>in the face of this incursion.</td>
</tr>
<tr>
<td><strong>Current Panama TR4 Program Objectives</strong></td>
</tr>
<tr>
<td>Determine the current geographical distribution of</td>
</tr>
<tr>
<td>Panama TR4 in Queensland.</td>
</tr>
<tr>
<td>Minimise the risk of pathogen spread from affected</td>
</tr>
<tr>
<td>land.</td>
</tr>
<tr>
<td>Engage with key stakeholder and community groups to</td>
</tr>
<tr>
<td>promote understanding of Panama TR4, encourage early</td>
</tr>
<tr>
<td>reporting and shared responsibility for biosecurity</td>
</tr>
<tr>
<td>practice change.</td>
</tr>
<tr>
<td>Industry adjustment, resilience and management of</td>
</tr>
<tr>
<td>Panama TR4 is supported through the development of</td>
</tr>
<tr>
<td>robust biosecurity policies and sustainable biosecurity systems.</td>
</tr>
<tr>
<td>Deliver a best practice biosecurity Panama TR4 Program</td>
</tr>
<tr>
<td>underpinned by accurate data capture, robust diagnostic</td>
</tr>
<tr>
<td>services, rigorous science, risk based decision</td>
</tr>
<tr>
<td>making, sound corporate practices and encouraging</td>
</tr>
<tr>
<td>innovation.</td>
</tr>
</tbody>
</table>

SOURCE: BIOSECURITY QUEENSLAND

4.3.2 Panama TR4 Program elements

In this section we examine the main Panama TR4 Program elements of tracing, surveillance, testing, communications and community engagement and compliance operations in terms of what they are, the benefits/outcomes and how they work to achieve the objectives of the Panama TR4 Program for Biosecurity Queensland (refer Table 4.1) in relation to the Biosecurity Act 2014 (Qld). We also assess
each element in relation to the benefits to and the objectives of banana growers. We assumed this objective is primarily to defend their properties and their businesses against Panama TR4.\textsuperscript{12}

Finally, we consider research and development, noting that this element is currently delivered outside of the Panama TR4 Program.

**Tracing**

Tracing is an in-depth assessment of the networks of the known infested properties. This is in terms of the relationships of growers with other growers and the wider community to attempt to predict the spread of the inoculum in the soil and delimit Panama TR4. With each new detection of Panama TR4 the activity is repeated and the assumptions and risks are updated with any new information.

Tracing benefits Biosecurity Queensland as it allows the creation of a risk profile based on networks to inform the surveillance strategy. If this information is communicated to growers it may also provide them with information as to their likely risk of the presence of Panama TR4 on their property. ACIL Allen understands that this activity is used internally and not communicated outside the Panama TR4 Program, this is primarily due to privacy concerns and the potential that risk profiling attributes may have a negative effect on the broader community.

Tracing helps to fulfil three of the five Panama TR4 Program objectives:

- Determine the current geographical distribution of Panama TR4 in Queensland.
- Minimise the risk of pathogen spread from affected land.
- Deliver a best practice biosecurity program underpinned by accurate data capture, robust diagnostic services, rigorous science, risk based decision making, sound corporate practices and encouraging innovation.

Tracing, may, if the information is (or can be) shared in a way that fulfils privacy requirements. It could assist banana growers to better defend their properties by better understanding their relationships with the infested property owners.

**Surveillance**

The surveillance strategy aims for early detection of Panama TR4 and is built on networks identified through tracing. The strategy is based on a statistical analysis on the current (low) rate of incidence and the information known about Panama TR4 spread. All properties are classified based on risk and are surveyed as follows:

- Infested properties are surveyed every 6 weeks with the aim to reduce inoculum levels through a destruction protocol. This currently requires 9 FTEs.\textsuperscript{13}
- Of the 263 banana growers in Far North Queensland, approximately 120 are surveyed on a 3 or 6 month basis dependent on whether they are classified as highest or medium risk. Lowest risk properties are not surveyed. This currently requires 12 FTEs.

Surveillance benefits Biosecurity Queensland by early detection of Panama TR4 as it helps to minimise spread. Banana growers also benefit from early detection of Panama TR4 as it may mean that they can continue trading for longer if Panama TR4 is detected early rather than later. Surveillance is the key mechanism that helps the industry, growers and the government “buy time”. There is both a public and a private (or mutual) benefit associated with surveillance activities.

Surveillance assists in achieving the same objectives as tracing:

- Determine the current geographical distribution of Panama TR4 in Queensland.
- Minimise the risk of pathogen spread from affected land.
- Deliver a best practice biosecurity program underpinned by accurate data capture, robust diagnostic services, rigorous science, risk based decision making, sound corporate practices and encouraging innovation.

\textsuperscript{12} It is noted that not all 263 banana growers will share this objective – some who are at the end of their careers or where it is prohibitively costly to secure their properties may have different objectives, but it is largely assumed that many are aiming to prevent the introduction of Panama TR4 to their properties.

\textsuperscript{13} These 9 FTEs also conduct compliance and inspections on infested properties.
Surveillance also helps growers to achieve their objective of defending their property and business as without surveying their banana plantations there is no measure of their defence without surveillance. It is also one of the few activities that a grower can undertake quite easily as they often survey and monitor their crops for other pests and diseases. Looking for signs of poor plant health (co-incidentally signs of Panama TR4 may be the same signs as for other plant health issues) is considered part of best business practice.

It should be noted that there is no legislative tool to ‘force’ non-infested properties to undertake their own surveillance.

**Compliance and Property Operations**

The aim of compliance is to minimise the risk of spread from an infested property through ensuring that growers comply with the legislation under the *Biosecurity Act 2014* (Qld). The focus is on infested properties.

The Panama TR4 Program aims for a higher level of support through facilitation and assistance based activities such as destruction of infected plants. This happens as soon as possible following detection to educate infested growers and aims to reduce compliance requirements over time as the business demonstrates capability and compliance.

One compliance activity involves inspection of all fruit moving from an infested property. Fruit is inspected at a rate of 2 per cent (in line with international protocols). Any fruit transported to NSW requires a certificate be issued to confirm that it is free of soil and plant material and negotiations are underway to establish a new protocol that allows for self-certification. The cost of this certificate is borne by the grower. All other compliance costs are borne by Biosecurity Queensland.

The benefits of compliance and property operations to Biosecurity Queensland are related to achieving two objectives:

- Minimise the risk of pathogen spread from affected land.
- **Industry** adjustment, resilience and management of Panama TR4 is supported through the development of robust biosecurity policies and sustainable biosecurity systems.

Infested growers benefit as the compliance and property operations allow them to continue to farm and to source income from bananas. This is a private benefit. The broader group of growers does not see the immediate benefits of this activity although may in turn also benefit if and/or when Panama TR4 is detected on their property. In terms of the general objective of a non-infested property where the grower aims to defend their property and business, the Panama TR4 Program’s compliance and property operations do not help to achieve this objective in the short run.

**Sampling and testing**

Following from the surveillance element, any plant identified as showing signs of Panama TR4 is sampled and if internal symptoms are identified a sample is taken.

The sample is sent to Brisbane for diagnostic testing.

Biosecurity Queensland and growers benefit from sampling and testing of identified plants in the same was as they benefit from surveillance activities. This activity assists with the same objectives being achieved:

- Determine the current geographical distribution of Panama TR4 in Queensland
- Minimise the risk of pathogen spread from affected land
- Deliver a best practice biosecurity program underpinned by accurate data capture, robust diagnostic services, rigorous science, risk based decision making, sound corporate practices and encouraging innovation.

The objective of growers is also assisted by sampling and testing, although this benefit may be perceived as more of a secondary benefit from the primary benefit from surveillance.
Community engagement and education

The Panama TR4 Program work in this area is focussed on community awareness and education, the preparation of information that could be shared both in the community and the industry and the provision of formal/informal education for everyone except growers.

Initially the Panama TR4 Program used grower education to improve on-farm biosecurity which was undertaken by the ABGC through workshops and on-on-one meetings. This included the development of the Biosecurity Best Management Practice (BMP) document which is currently a hard copy or digital pdf document.

There is currently a focus on ‘extension’ work targeting the highest-at-risk growers and ‘being Panama ready’. This secondary activity is more specific and targets improved on-farm biosecurity and early reporting of Panama TR4.

Community engagement and education helps to directly fulfil three objectives:

— Engage with key stakeholder and community groups to promote understanding of Panama TR4, encourage early reporting and shared responsibility for biosecurity practice change.
— Industry adjustment, resilience and management of Panama TR4 is supported through the development of robust biosecurity policies and sustainable biosecurity systems.
— Indirectly contributes to minimising the risk of pathogen spread from affected land.

The benefit of the communications activities to Biosecurity Queensland is that an important program providing targeted services to support management of a threatening and complex disease requires strong engagement with a broad range of stakeholders. This is essentially a social licence issue aimed at building and then maintaining understanding, support and participation with the Panama TR4 Program.

The educational component is valued by growers because it provides tangible support on how to manage the risk of Panama TR4. But there are practical challenges in providing this support in a way that suits all growers needs and circumstances. This includes being able resource educational support to all growers, who are often also interested in issues outside the direct focus of the Panama TR4 Program (e.g. economic diversification). Similarly, while engagement is critical, especially for surveillance, the willingness and ability for a grower to engage varies by grower and over time.

The development of best practice management plans could assist more growers and generally there is unmet demand for these educational services. Overall, there are considerable benefits to all parties from communication as strong collaboration is required with industry to achieve the Panama TR4 Program’s aim and to deliver on all the objectives.

Research and development

Research and development is integral to the success of the response but is currently managed and funded outside of the Panama TR4 Program. This arrangement stems from the Panama TR4 Program being established as an on the ground operational response which draws on the research and development as needed.

At present the Panama TR4 Program’s research, development and extension needs are coordinated and funded by DAF through Agri-Science Queensland with additional contributions from Horticultural Innovation, universities, other jurisdictions and ARC. Another possible collaboration for the future could include the new Plant Biosecurity Research Initiative (PBRI) (refer Box 4.1).
PBRI is a new partnership between the nation's plant Research and Development Corporations (RDCs), working collaboratively with Plant Health Australia (PHA), the Department of Agriculture and Water Resources (DAWR) industry, state and federal biosecurity stakeholders. The aim is to coordinate funding for research and development, deliver vital projects and attract further co-investment through a coordinated approach. Taking a coordinated approach ensures effort is aligned to broader goals and delivered with increased efficiency, avoiding duplication of effort.

Sitting outside of the Panama TR4 Program and overall Response Strategy is research and development for resistant/tolerant cultivars and development of non-Cavendish banana markets. The partial alignment of the new cultivars research and development reflects the “many irons in the fire” approach where the global search and different ideas on how to develop and commercialise the opportunity creates both fragmentation and innovation. Similarly, the success of Cavendish means it is harder for industry and the industry research and development and marketing levy to prioritise development of alternatives above the defence of the Cavendish production system and market share.

Strategically the Panama TR4 Program needs to acknowledge these additional efforts and outline how and when they can be better integrated and coordinated – following the example provided by the PBRI (Box 4.1). The renewal of the strategy is essential to confirm and refine the research and development agenda. This includes the development and extension of production alternatives for infested properties.

Conclusion

All elements assessed above are important in fulfilling the objectives of the Panama TR4 Program and many are important to fulfilling grower objectives too. The benefits from the activities of the Panama TR4 Program accrue to government and growers in different ways. Generally, there are more direct benefits for growers in surveillance and education than there are in tracing, sampling, testing, compliance and property operations and community engagement. Compliance and property operations benefit infested growers directly and allow them to continue to trade, other growers may benefit from these activities in time. Tracing activities directly benefit the government as it assists them in designing the other Panama TR4 Program elements and their strategies for achieving their objectives. Communications brings together industry and government and aids the other Panama TR4 Program elements. This is particularly important due to the high degree of uncertainty surrounding Panama TR4.

Under the Biosecurity Act 2014 (Qld) and General Biosecurity Obligation, landholders must undertake “reasonable efforts” to prevent the spread of Panama TR4 and failure to do so is an offence. Coupled with this many if not all landholders expect the Panama TR4 Program to support them in preventing Panama TR4 from occurring on their property. This is further confounded by the possibility Panama TR4 is already present but is not yet detected and that “reasonable effort” is site/business specific and difficult to define, measure or enforce in a repeatable and cost effective manner.

So, while in principle and in the legislation the Panama TR4 Program targets on-farm biosecurity and early reporting to prevent the spread of Panama TR4, in practice most of the associated activities landholders implement will also defend them from the risk of infestation. This highlights both the principle of shared responsibility and that the Panama TR4 Program cannot and should not aim to control and contain Panama TR4 on its own.

Embedded in the change to the objectives over time is the assumption that the Panama TR4 Program will, in time, undergo a transition to a new model with greater industry involvement. This is consistent with the principle and legislative obligation of shared responsibility and with the overall response’s phase structure.
There is a high degree of ambiguity and uncertainty associated with this transition. The ambiguity revolves around what shared responsibility practically means and the degree to which industry is willing and able to meet and fund these responsibilities individually and collectively. The uncertainty stems from the fact that Panama TR4 can spread at any time requiring an adaptive response by industry, regions and government. Together they make the transition harder since no one can be certain of what they need to commit to, and how future risks may be managed.

The following sections discuss the key considerations that inform transition to the new model.

### 4.4 Sharing responsibility and funding

#### 4.4.1 Are the Panama TR4 Program's phases still appropriate?

Currently the Panama TR4 Program is between Phase 2 (Managed Response Phase) and Phase 3 (Transition to Management Phase). One of the components of this shift between the phases is to move to encouraging industry to take more ownership of the Panama TR4 Program. Shifting to the next phase also brings structural adjustment into focus. This is because once the Panama TR4 Program reaches Phase 3 the shift to Phase 4 may occur at any time. This is accentuated by the uncertain nature of Panama TR4.

In order to facilitate the immediate shift from Phase 2 to Phase 3 there is a need to plan for operational changes as well as for a full transition to industry (Phase 4) before Panama TR4 spreads any further.

The full transition needs a longer term funding horizon than is currently provided by the short term funding arrangements that have been in place over the last few years. A longer term funding arrangement for Biosecurity Queensland in conjunction with its partners can assist in building and achieving the Panama TR4 Program’s objective of a best practice biosecurity program underpinned by accurate data capture, robust diagnostic services, rigorous science, risk based decision making, sound corporate practices and encouraging innovation.

Any new strategy needs to update whether the current progression of phases is the most appropriate representation of what the adaptation process is. In particular, how to address the dual need to focus on continuing the Managed Response Phase (Phase 2) and start the Transition to Management Phase (Phase 3), and at the same time prepare for On-going Management (Phase 4).14

The rationale for the dual focus is that while Panama TR4 is reasonably contained it is prudent to continue the activities associated with Managed Response and to make them more cost-effective, so it can endure longer before the costs outweigh the benefits. It is also distinctly possible that the number of infested properties will increase suddenly and significantly at any time requiring either:

- expansion of Managed Response (Phase 2) to new locations beyond Tully

- and then, moving to On-going Management (Phase 4) if there are sufficient numbers of infested properties in one location.

This means the planning for Transition and Management together is better completed now so the arrangements are in place to ensure a smoother progression to each phase as it arises.

A new strategy can integrate these by developing a new phase structure, but more importantly outlining what the associated elements are. Looking at the 2015 strategy activities there are critical assumptions around issues such as the development of cost effective surveillance and how industry plays a greater role in the response in the later phases. These all need to be reviewed.

---

14 One way of conceptualising on-going management is at the point where Panama TR4 has spread to a point where it is no longer cost-effective to continue to contain and control it, at least in a certain area. At this point, it may be best to consider declaring Panama TR4 endemic in a specific area (or zone) and to allow area freedom inside a certain zone so that growers may continue to operate with less restrictions on their movement and business operations. There may also be a staged approach to this phase as the endemic area grows over time.
4.4.2  Relationship between funding and shared responsibility

Part of the shift from Phase 2 to Phase 3 requires a review of who should pay for the Panama TR4 Program. Currently the 2017-18 financials show that the direct activities of the Panama TR4 Program are financed 100 per cent by the Queensland Government.

Since the late 1990s biosecurity in Australia has been underpinned by the concept of shared responsibility including cost sharing under the principle of beneficiary pays (defined in Table 4.2). The establishment of cost sharing deeds administered by Animal Health Australia (AHA) and Plant Health Australia (PHA) were instrumental in co-investment and decision-making, these concepts were further cemented in the Beale Report (2008) (refer Box 4.2 overleaf).

<table>
<thead>
<tr>
<th>Concept</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficiary pays</td>
<td>Beneficiary pays works when those that benefit from a good or a service can be easily defined and costs can be allocated proportionally. The most equitable approach to cost sharing but conceptually difficult with respect to biosecurity due to public good dimensions.</td>
</tr>
<tr>
<td>User pays</td>
<td>Requires a clear definition of direct users of a given good or service, costs are then allocated on the basis of intensity of use. User pays is easy to administer if users are identifiable. User pays is seen as a less equitable approach due to ‘free rider’ concerns where non-users still derive benefits from the good or service. This is enhanced because of the public good nature of biosecurity.</td>
</tr>
<tr>
<td>Risk-creator (or polluter) pays</td>
<td>This approach can only work when there is a clear and traceable link between an individual and a biosecurity threat. In the case of biosecurity, the threat is often diffuse and responsibility cannot be clearly determined, this approach is not feasible.</td>
</tr>
<tr>
<td>Capacity to pay</td>
<td>Given the associated difficulties in defining users and beneficiaries of public goods, the capacity to pay approach is easier to apply; although it may be considered to be fair it lacks an efficient outcome. This is because certain users may be subsidised by other users who are more willing or able to contribute.</td>
</tr>
</tbody>
</table>

Source: Adapted from Frontier Economics, 2008, p. 20.

The principles of cost sharing defined in the table above show how there are different possibilities and virtues for funding arrangements depending on how easy it is to articulate and define the benefits (and costs) and who they accrue to.
In September 2008, an independent panel of experts chaired by Roger Beale provided a review of Australia’s quarantine and biosecurity arrangements to the Minister for Agriculture, Fisheries and Forestry.

The Beale Review identified four main themes:

- strengthened working partnership approach along the biosecurity continuum
- transparent, comprehensive governance arrangements
- changed operational focus
- increased resources.

The Review also recommended:

- All industries should commit to sharing the responsibility and costs of pest and disease response actions, with those who are not signatories to the relevant cost sharing agreement meeting their share of a response, possibly by way of levy to recover costs.
- New governance arrangements to strengthen biosecurity partnerships in Australia including a commission of independent experts to make scientific decisions, a statutory authority to carry out day to day operations and an Inspector General of Biosecurity.

In May 2011, following the Beale Review, the Australian Government announced biosecurity services will continue to be delivered through the new Department of Agriculture and Water Resources. The premise for this decision was that resources would be focused on the delivery of more effective and efficient biosecurity systems. Other recommendations of the Beale Review were adopted and have been addressed within the current organisational arrangements and in the development of new biosecurity legislation. Alternative options suggested under the Beale Review were that a separate statutory authority and commission be established to manage biosecurity.

The concept of shared responsibility and public benefits

Under the concept of shared responsibility, biosecurity is considered to be in part a private good and in part a public good, and there should be “proportionate responsibility” for biosecurity risks which accrue to growers, industry and the community.15

One of the reasons that the government is willing to share the responsibility of biosecurity concerns is in line with the public good argument. There is a clear market failure (see Box 4.3) as a result of the public good dimensions of biosecurity and the existence of asymmetric information.

The government has a stated interest in developing regional communities and to sustain jobs and growth in non-urban areas to the benefit of the public (local community and broader society). Biosecurity disproportionally affects those who live and/or work in regional areas or agricultural or agricultural associated industries. Further, the government is prepared to contribute to fulfil its policy obligations and to ensure it doesn’t incur greater costs down the line from dislocated or fragmented communities.

Some stated public benefits of the national biosecurity system are presented in Box 4.4.

However, regardless of this the government cannot (and should not) be responsible for paying for or managing all aspects of biosecurity. In the case of Panama TR4, given the high degree of uncertainty, withdrawing government involvement now would sacrifice the costs incurred to date and the aim of the Panama TR4 Program which is essentially to assist in buying time so as to reduce the potentially catastrophic impacts that Panama TR4 can have on an economy.

Although the policies and the principles are clear, working out who pays is difficult.

The Queensland Biosecurity Capability Review notes that jurisdictions across Australia are finding it a challenge to implement the concept of shared responsibility partly due to opposition from industry

---

groups and other stakeholders and partly as there is a “failure to clearly articulate what shared responsibility is and what it looks like in practice”.16

**BOX 4.3  MARKET FAILURE AND PANAMA TR4**

Market failure is the failure of the free market to be allocative efficient or to achieve certain social goals. Market failure can occur when there is the existence of any of the following:

— public goods – goods which are non-rival and non-excludable – as is traditionally considered the case with biosecurity
— externalities or spill overs – goods/services which give cost or benefit to a third party
— merit goods – people underestimate the benefit of good, e.g. a biosecurity program
— information failure – where there is a lack of information to make an informed choice e.g. uncertainty regarding the nature and spread of Panama TR4
— Principal-agent problem – Two agents (Biosecurity Queensland and growers) with different objectives and information asymmetries (as described in Box 4.5)
— inequality – unfair distribution of resources in the free market
— factor immobility – e.g. geographical / occupational immobility

**SOURCE: ACIL ALLEN CONSULTING, 2018**

**BOX 4.4  DEFINING THE PUBLIC BENEFITS OF THE NATIONAL BIOSECURITY SYSTEM**

The Australian Government quotes the benefits of the national biosecurity system as including:

— reducing the cost of agricultural production
— reducing the impact of pests and diseases on our environment (including associated negative impacts on agricultural productivity and amenity)
— safeguarding the health of our community
— supporting animal and plant health
— supporting a profitable agricultural industry through improving and maintaining market access
— supporting a healthy and biodiverse environment underlying much of Australia’s tourism.

**SOURCE: CRAIK, W, PALMER, D & SHELDRAKE, R 2017, PRIORITIES FOR AUSTRALIA’S BIOSECURITY SYSTEM, AN INDEPENDENT REVIEW OF THE CAPACITY OF THE NATIONAL BIOSECURITY SYSTEM AND ITS UNDERPINNING INTERGOVERNMENTAL AGREEMENT, CANBERRA.**

This lack of support and guidance (including guidelines, methodology, approaches or frameworks) as to how shared responsibility and co-funding arrangements can be applied is further demonstrated in the recent (2017) Intergovernmental Agreement on Biosecurity (IGAB) Review17 which notes that the National Framework for Cost Sharing Biosecurity Activities has not yet been published and therefore is not available for use in determining who pays for biosecurity concerns. Further, except for pests and diseases covered by the AHA and PHA emergency response deeds, “there is no common understanding of the split between public and private good”.18

In the absence of clear guidelines, the application of cost sharing rests solely on the ability to distinguish between public and private benefits of biosecurity costs. To do this requires a consideration of what biosecurity means under the Panama TR4 Program, what the Panama TR4 Program does and what the benefits are. We then also need to consider who can do what and to what degree the industry is able or willing to contribute.

17 Craik, W, Palmer, D & Sheldrake, R 2017, Priorities for Australia’s biosecurity system, An independent review of the capacity of the national biosecurity system and its underpinning Intergovernmental Agreement, Canberra.
18 Ibid.
4.4.3 What is biosecurity? And how does the Panama TR4 Program manage biosecurity?

Biosecurity works to protect a region’s economy and environment from negative effects (or risks) associated with a pest or a disease, in this case Panama TR4.

The Panama TR4 Program is not designed to mitigate all risks associated with Panama TR4 and nor should it. Growers are (and should be) responsible for reducing biosecurity risks where they are reasonably able to do so. This is reflected in the concept of the general biosecurity obligation (GBO) under the Queensland Biosecurity Act (2014):

What is a general biosecurity obligation

(1) This section applies to a person who deals with biosecurity matter or a carrier, or carries out an activity, if the person knows or ought reasonably to know that the biosecurity matter, carrier or activity poses or is likely to pose a biosecurity risk.

(2) The person has an obligation (a general biosecurity obligation) to take all reasonable and practical measures to prevent or minimise the biosecurity risk.

(3) Also, the person has an obligation (also a general biosecurity obligation) -

(a) to prevent or minimise adverse effects on a biosecurity consideration of the person’s dealing with the biosecurity matter or carrier or carrying out the activity;

and (b) to minimise the likelihood of causing a biosecurity event, or to limit the consequences of a biosecurity event caused, by dealing with the biosecurity matter or carrier or carrying out the activity;

and (c) not to do or omit to do something if the person knows or ought reasonably to know that doing or omitting to do the thing may exacerbate the adverse effects, or potential adverse effects, of the biosecurity matter, carrier or activity on a biosecurity consideration.

Section 23, Biosecurity Act 2014, Current as at 30 March 2017

The GBO is used by Biosecurity Queensland for infested properties. A notice gives ‘processes and procedures’, breaching these processes or procedures is a breach of the GBO.

We consider that the GBO is separate to the Panama TR4 Program as it is a non-specific requirement under the Biosecurity Act 2014. The GBO and any associated costs are therefore external to any consideration of cost sharing arrangements for the Panama TR4 Program. This is because the GBO is also required to:

— prevent any spread of disease (Panama TR4 is only one possible biosecurity concern to banana growers – others include freckle, bunchy top, yellow and black sigatoka and moko virus)

— biosecurity is a necessary risk management strategy of any business.

The Panama TR4 Program consists of a suite of elements (see Section 4.2 for more details) some of which are legislated such as compliance and property operations, and some are not, such as communications. For the purposes of this analysis we define regulatory activities to be those that are required by legislation and those that are not required under legislation are non-regulatory activities.

Regulated activities, under legislation, include surveillance and monitoring activities under the Panama TR4 Program and subsequent control and containment requirements following confirmation of the presence of Panama TR4 on a property. These regulatory activities are required to be delivered by the government as it is difficult under the current legislation to enable other bodies to conduct these activities as the Chief Executive is required to appoint authorised officers to carry out activities in respect of those programs comparable to those of inspectors.

To be efficient, any cost recovery needs to align with the incentives of the individual or industry so as to achieve the desired outcome of the activity. For example, it may not be appropriate to recover costs from an individual who reports an outbreak of Panama TR4 as it could create a perverse incentive – whereby a grower with a suspected outbreak may chose not to report so as to avoid the cost of reporting. Further, it may also be inappropriate to recover costs when a grower is unable to mitigate risks e.g. due to the layout of their farm they are unable to fence or restrict vehicle movement. Due to

---

19 There is a provision under Section 25 of the Act to provide for ways of discharging the obligation for Panama TR4 by means of S58 of the Biosecurity Regulation 2016.
these issues it may be more feasible to recover costs on a collective/industry basis rather than recovering costs from individual growers (above and beyond their requirements under the GBO).

It is important to examine the risks and perceived behavioural controls of growers to not report suspected plants or to under report. The economic argument for this is known as ‘adverse selection’ where a grower has more information relating to a transaction that is relevant but unknown to the government.\(^{20}\) Adverse selection can occur when a grower is tasked with reporting signs of Panama TR4. If Panama TR4 is suspected and reported by the grower then the grower will incur costs (such as the cost of having part or all of their business shut down due to quarantine requirements), or if they chose not to report it they may incur a different set of expected costs (such as removing their bananas and replacing them with sugar cane). If a grower perceives those second set of costs to be less than the costs of reporting, then it is expected that the grower will choose not to report Panama TR4. Understanding these different costs is important in incentivising grower behaviour to report. Further, understanding that if a farm business is to be shut down, even temporarily, it will likely effect growers more when their fixed costs are higher (i.e. fixed costs are usually payable regardless of whether a business is operating or not). Growers with lower fixed costs may therefore have a higher incentive to report Panama TR4 than their counterparts with higher fixed costs.\(^{21}\)

It is theoretically feasible to consider the Panama TR4 Program as moving to a concept of a grower-government contract to manage monitoring and surveillance activities for Panama TR4. Panama TR4 and the potential effect Panama TR4 may have on communities in Far North Queensland provide a reason for the government to work to motivate the grower to act in the government’s best interests. This is known as the principal-agent model (see Box 4.5 for details).

Non regulatory activities are all other activities such as communications, education, extension, research and development either as a central component of the Panama TR4 Program or as part of a co-ordinated approach to buy time for the banana industry and associated communities. In the case of non-regulatory activities, even though they support the Panama TR4 Program they support the Panama TR4 Program indirectly. It is generally easier to define the direct beneficiary of non-regulatory activities, that is there are few people other than banana growers who directly benefit from communication, education, extension and research and development in relation to Panama TR4.

By splitting out the regulatory and non-regulatory activities under the Panama TR4 Program it is quite plausible that the benefit of all non-regulatory activities such as communication and extension benefits the banana industry as a whole, rather than an individual grower, and the industry should bear all costs and responsibilities for those activities.\(^{22}\)

\(^{20}\) These roles can be explained generically by what’s understood as the principal-agent model and is widely used by economists to describe the behaviour of growers and governments in relation to adverse selection and disease management (Hennesey, 2018).

\(^{21}\) Based on this information it may be prudent to develop a better understanding of growers and their cost profiles so as to target communications or audit requirements to those that are likely to be less incentivised.

\(^{22}\) research and development activities are currently funded outside the Panama TR4 Program.
BOX 4.5  THE PRINCIPAL-AGENT MODEL AND HOW IT APPLIES TO PANAMA TR4

The principal–agent model is about developing and structuring a contractual relationship (or participation/contribution in a program) so that the agent is motivated to act in the principal’s best interests. This is a possible option for increasing industry and/or individual contribution to the Panama TR4 Program.

In the case of biosecurity incursions, the principal is the government (or governmental agency (e.g. Biosecurity Queensland), mandated with preventing and controlling Panama TR4 and is acting on behalf of the public for the common good (or public benefit). While the growers (and perhaps others in the supply chain) are the agents who are generally responsible for their own (private) benefits.

Incentive problems arise when Biosecurity Queensland (the principal) wants to (or has to) delegate tasks to growers (the agents). The growers have information that is relevant to the transaction – such as how much effort the grower is putting into biosecurity to prevent disease spread – that Biosecurity Queensland cannot monitor perfectly.

These issues are probabilistic. For example, neither Biosecurity Queensland nor the growers know with any certainty whether Panama TR4 will occur. If either party knew where Panama TR4 would spread, then the appropriate response would be obvious (e.g. if an outbreak of Panama TR4 will not occur on a certain property then there would be no reason to minimise the risk of spread from that property).

However, in reality, an outbreak of Panama TR4 may occur even if the grower has best practice on-farm biosecurity while a grower who shirks responsibility may escape infection. As a result, the expected costs and benefits to both parties need to be considered.

It is assumed that Biosecurity Queensland’s overall objective here is to minimise the expected total cost of disease. Total cost includes the costs of detecting, controlling and containing Panama TR4 as well as lost consumer and producer surpluses and other market-related implications as well as any potential localised costs to the community. The standard assumption is that the government is risk-neutral and therefore seeks to minimise expected costs. Growers (agents) in comparison are often assumed to be risk-averse. If biosecurity efforts and reporting are imperfectly monitored, or if there is imperfect information about the risks faced by farms (depending on such factors as size, location and type), then only a ‘second-best’ solution can be achieved. (The first-best choice is when government has full information and could make an unconstrained decision).

Any contract between Biosecurity Queensland and growers should therefore incentivise participation. This is known as the participation constraint, and it is applicable in the case of voluntary disease management programs. Theoretically this constraint requires that grower’s expected utility from participating in the Panama TR4 Program has to be at least as great as the expected utility from not participating, that is there has to be something in it for the grower in order for them to participate in, or contribute to the Panama TR4 Program.

SOURCE: ADAPTED FROM (HENNESEY, 2018).

4.4.4  Who benefits from biosecurity in general and the Panama TR4 Program specifically?

Biosecurity risks, like any other business or production risk, need to be managed by those who incur the costs of not managing them. This is essentially the 263 banana growers in Far North Queensland. In turn, by managing or mitigating those risks, the benefit of doing so should accrue to those same 263 growers. The benefits of a strong on farm biosecurity accrues to growers in terms of access to markets and avoided business losses associated with damage to produce.

The benefits of the control and containment activities under the Panama TR4 Program are attributable to growers as the primary beneficiaries of the Panama TR4 Program. However, the spill over (public) benefits of regional community development are also sizeable (refer Figure 4.1). The potential for Panama TR4 to decimate the banana industries in Queensland would likely cause significant economic and social disruption to the local government areas of Mareeba and Cassowary Coast where the population is dependent on agriculture and the provision of the local service industry for employment and wealth generation. The lack of employment opportunities combined with low skills levels could result in poor economic and social indicators including high unemployment and population decline if the Panama TR4 Program were not to continue to contain and control Panama TR4.
Figure 4.1 Beneficiaries of Panama TR4 Program

Figure 4.2 below presents the potential relative impact of the Panama TR4 Program to different groups of stakeholders.

However, because of the nature of biosecurity the risks cannot be reduced to zero and are likely to require continued management over time. On top of this Panama TR4 is special as it is not eradicable and because to date there is no acceptable Panama TR4 resistant banana. This uncertainty results in the potential of unknown economic, social and ecological dimensions which may have direct or indirect impacts, and these also need to be considered when attributing costs.

Figure 4.2 Potential Relative Impact of Panama TR4 Program

Roles and responsibilities

The Inter-Governmental Agreement on Biosecurity (IGAB) principles for cost sharing under clause 4.1(v-vii), are:

\[ v)\text{ Activity is undertaken and investment is allocated according to a cost-effective, science-based and risk-management approach, prioritising the allocation of resources to the areas of greatest return.} \]

\[ vi)\text{ Relevant parties contribute to the cost of biosecurity activities:} \]

\[ a)\text{ Risk creators and risk beneficiaries contribute to the cost of risk management measures in proportion to the risks created and/or benefits gained (subject to the efficiency of doing so), and} \]

\[ b)\text{ Governments contribute to the cost of risk management measures in proportion to the public good accruing from them.} \]

\[ vii)\text{ Governments, industry and other relevant parties are involved in decision making, according to their roles, responsibilities and contributions.} \]


This suggests that any cost sharing arrangements need to be related to the roles and responsibilities of the different stakeholders. Adapting the roles and responsibilities suggested by Craik et al (2017) for the national biosecurity system to Panama TR4 (see Table 4.3) suggests another possible cost sharing basis for Panama TR4 Program which includes a role for local government.

What are the benefits?

The BCA in Chapter 3 shows that continuing with the Panama TR4 Program has a net social benefit of over $2 billion (NPV, 2017-18 dollars). The benefit-cost ratio (BCR) of having the Panama TR4 Program relative to not having the Panama TR4 Program is estimated at 39.2:1. The vast majority of this benefit accrues directly to banana growers as the existence of the Panama TR4 Program and its continuation means that the spread of Panama TR4 will be minimised and the industry can transition to its new position of either higher costs of production, alternative crops or a new banana over time without the considerable costs incurred with no program. This is clearly a huge benefit but to whom it exactly accrues and in what proportion is very difficult to determine. This is especially complicated in the case of Panama TR4 due to the large amount of uncertainty surrounding the nature of Panama TR4, the rate of spread and the difficulty in quantifying costs outside the government’s direct program expenditure.

There will be indirect benefits which may accrue to the local and broader community as discussed above. It was not possible to quantify these indirect benefits.
# TABLE 4.3 BIOSECURITY ROLES AND RESPONSIBILITIES – AN APPROACH TO COST SHARING FOR PANAMA TR4

<table>
<thead>
<tr>
<th>Role and responsibility</th>
<th>State government</th>
<th>Local government</th>
<th>Industry</th>
<th>Landholder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring and/or complying with Panama TR4 status to meet domestic trade obligations (e.g. bananas to NSW)</td>
<td>√</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Promoting and developing partnerships between all government, industry (across supply chain) and the community including for consultation, information dissemination and sharing of best biosecurity practices</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Maintaining capacity to respond to identified diseases</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Supporting landholders and the community to manage established diseases</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional collaboration between local councils to deal with regional biosecurity issues</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Working in and promoting partnerships with all governments, industry and the community</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Providing support and information to the local community on biosecurity management</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leading collective action to manage diseases</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Advocating biosecurity and leading initiatives in the interest of the industry</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Contributing to surveillance network for established diseases</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Managing declared and other established diseases on private land</td>
<td>√</td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Building biosecurity risk mitigation measures into normal practice</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
</tbody>
</table>

Note: State government responsibility is required for early surveillance and detection – Panama TR4 is no longer considered to be at the early detection stage.


---

Who can pay?

There is a hierarchy of who could be charged for biosecurity activities which includes individuals, collectives (such as the banana industry), the community and tax payers.

Tax payers are identified as a funder of last resort only to be considered in the case of a pure public good (biosecurity has public good dimensions but also private good dimensions) or once all other alternatives are determined impractical or not cost effective. To be efficient, any cost recovery needs to align with the incentives of the individual or industry so as to achieve the desired outcome of the activity.

For example, it may not be appropriate to recover costs from an individual who reports an outbreak of Panama TR4 as it could create a perverse incentive – whereby a grower with a suspected outbreak may chose not to report so as to avoid the cost of reporting. Further, it may also be inappropriate to recover costs when a grower is unable to mitigate risks e.g. due to the layout of their farm they are unable to fence or restrict vehicle movement.

Due to these issues it may be more feasible to recover costs on a collective/industry basis rather than recovering costs from individual growers (above and beyond their requirements under the GBO).
On balance, determining who pays for the regulatory activities appears to be best captured under the principle of capacity to pay and needs to be shared by government and industry (as the representatives of individual growers).

4.4.5 What can be done for now?

If it is determined that the non-regulatory activities under the Panama TR4 Program are the responsibility of individual or collective (industry) beneficiaries, it is then up to them to determine their willingness to pay which will depend on whether or not they see a benefit from those activities.

For the regulatory activities\textsuperscript{23} if we are unable to determine the proportionate split between beneficiaries of the Panama TR4 Program with any certainty the application of a ‘rule of thumb’ or sliding scale approach to determine the starting point and create a frame by which negotiation can take place appears to be a sensible approach. The proposed frame is presented in Table 4.4 below.\textsuperscript{24}

<table>
<thead>
<tr>
<th>Impact of Panama TR4 Program</th>
<th>Government contribution</th>
<th>Private (industry) contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significantly public benefit</td>
<td>100%</td>
<td>-</td>
</tr>
<tr>
<td>Public benefit &gt; private benefit</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Public = private</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Public benefit &lt; private benefit</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>Significantly private benefit</td>
<td>-</td>
<td>100%</td>
</tr>
</tbody>
</table>

SOURCE: IPART 2013, DEVELOPED FROM THE EMERGENCY ANIMAL AND PLANT BIOSECURITY DEEDS

There are several mitigating factors under the concept of capacity to pay that industry are currently facing such as declining terms of trade. It should be acknowledged that this is subject to market signals that change over time and are likely to be factors that are overcome in the short to medium term.

Under the premise of shared responsibility ACIL Allen suggests that the aim for the government is to transition to a 50:50 share in costs between industry and the government over the next iteration of the Panama TR4 Program (three to five years).

After the next iteration of the Panama TR4 Program (that is in three to five years) it is recommended that cost allocation be reassessed and the industry’s capacity to pay be reconsidered in light of any new information that may reduce the (currently very high) level of uncertainty.

In conclusion, it is paramount that if government and industry are to work together this will take time as well as negotiation. A cost sharing arrangement requires more than just the sharing of the costs, it requires a high level of commitment and trust to work together, this will therefore require consideration of the operational components of the Panama TR4 Program so that they are efficient and effective and a review of the governance arrangements to allow industry an enduring role in the Panama TR4 Program going forward.

---

\textsuperscript{23} As noted earlier in Chapter 3, it is possible that the activities under the Panama TR4 Program could cease and there would still be some surveillance and related activities that may take place, these would be at the expense of the individual growers. The BCA in this report shows that there is more benefit in retaining the Panama TR4 Program relative to having no program, but this does not preclude the government from taking this option or choosing to fund the Program. This analysis highlights that if the government chose to maximise that benefit then one way they could split the cost could be to only fund a portion of the current Program’s activities where it appears there is most public benefit rather than all the activities. Over time, under this proposal the government could shift the cost of these regulatory activities to industry so that over time there is no or little cost to government. The reason that the government should continue to pay for some (if not all) of these costs now is to maximise any potential benefit to the public.

\textsuperscript{24} It should be noted that this approach is suggested due to the uncertainty and lack of information available at this point in time and that as and when more information becomes available there should be consideration of valuing the individual elements of the expected net benefits of the Program for each identified beneficiary.
4.5 Operational structure, performance and expenditure

The Panama TR4 Program’s planning hierarchy consists of the overall response strategy, an annual plan and activity based cost codes. There is also a suite of protocols and procedures which guide management and operations of the Panama TR4 Program.

The adaptive nature of the Panama TR4 Program along with the short-term funding arrangements means the overall structure has been progressively developed on a risk based assessment of needs. At a project level the Panama TR4 Program now has 11 cost codes linked to the budget activities, eight more than the three created when the Panama TR4 Program was first established (Table 4.5). During that time the Panama TR4 Program has also commissioned reviews to strengthen various operational aspects (Box 2.1).

### TABLE 4.5 EXPENDITURE BY COST CODE PER YEAR

<table>
<thead>
<tr>
<th>Activity</th>
<th>2014/15</th>
<th>2015/16</th>
<th>2016/17</th>
<th>2017/18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Management</td>
<td>7-03117-01 - Panama Disease - TR 4_QLD</td>
<td>7-03117-01 - Panama Disease - TR 4_QLD</td>
<td>8100306 - PaTr4 - Program Management</td>
<td>8100306 - PaTr4 - Program Management</td>
</tr>
<tr>
<td></td>
<td>7-03117-06 - Panama-Tropical Race 4 ORC</td>
<td>7-03117-06 - Panama-Tropical Race 4 ORC</td>
<td>8100306 - PaTr4 - Program Management</td>
<td>8100306 - PaTr4 - Program Management</td>
</tr>
<tr>
<td>Training</td>
<td>7-03117-05 - Panama - TR4 ABGC Training</td>
<td>7-03117-05 - Panama - TR 4 ABGC Training</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Communications and Engagement</td>
<td>-</td>
<td>-</td>
<td>8102009 - PaTR4 - Comms and Community Egmnt</td>
<td>8102009 - PaTR4 - Comms and Community Egmnt</td>
</tr>
<tr>
<td>Laboratory</td>
<td>-</td>
<td>-</td>
<td>8102010 - PaTR4 - Laboratory</td>
<td>8102010 - PaTR4 - Laboratory</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8102273 - BQ Plant Biosecurity LIMS Project-TR4</td>
<td>8102273 - BQ Plant Biosecurity LIMS Project-TR4</td>
</tr>
<tr>
<td>Operations</td>
<td>-</td>
<td>-</td>
<td>8102011 - PaTR4 - Operations</td>
<td>8102011 - PaTR4 - Operations</td>
</tr>
<tr>
<td>Business Support</td>
<td>-</td>
<td>-</td>
<td>8102008 - PaTR4 - Business Support</td>
<td>8102008 - PaTR4 - Business Support</td>
</tr>
<tr>
<td>Planning and Policy</td>
<td>-</td>
<td>-</td>
<td>8102012 - PaTR4 - Planning and Policy</td>
<td>8102012 - PaTR4 - Planning and Policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8103121 - PaTR4 - Ind Review</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8103122 - PaTR4 - ICA Accreditation</td>
</tr>
</tbody>
</table>

SOURCE: BIOSECURITY QUEENSLAND

While the current cost code structure aligns with the Panama TR4 Program’s organisational arrangements (Figure 2.5), how the budget activities link to the elements and the objectives in terms of costs and deliverables is not clear.

The Panama TR4 Program’s total expenditure has been approximately the same over the past two years although there has been variation between cost codes (Appendix A) and activities (Table 4.6). The $300,000 expenditure in 2014/15 was for ABGC to provide extension related services to banana growers on how to respond to Panama TR4. Since then, such extension has been included as part of the Operations and Communications and Engagement cost codes of the Panama TR4 Program.
Overall labour remains the largest budget item for the Panama TR4 Program and accounts for more than two thirds of annual expenditure when employee and contracted services are combined. Contracting in labour provides the Panama TR4 Program with considerable flexibility and the ability to manage the risk from an on-going staff liability if they are not required. This is appropriate while the Panama TR4 Program operates on short-term budgets however, there are some productivity losses that are likely due to not being able to commit to staff and issues regarding re-training costs when scaling up.

More importantly the high labour costs reinforce the need to find the most efficient process available for the Panama TR4 Program’s elements and activities (refer Figure 4.3). Stakeholders consulted repeatedly showed interest in surveillance drones and cost effective inspection processes to help reduce the Panama TR4 Program’s costs or increase its productivity.

FIGURE 4.3 PANAMA TR4 PROGRAM EXPENDITURE – LABOUR COMPARED TO OTHER ITEMS

SOURCE: BIOSECURITY QUEENSLAND

One of the key challenges for the Panama TR4 Program is: how does it monitor and report progress against its objectives and plans in a meaningful and repeatable manner that captures the entirety of the effort?

At present this occurs through quarterly reports which have been in place since mid-2015 (Table 4.7).

---

**TABLE 4.6** PANAMA TR4 PROGRAM EXPENDITURE BY BUDGET ACTIVITY

<table>
<thead>
<tr>
<th>Activity</th>
<th>2014/15</th>
<th>2015/16</th>
<th>2016/17</th>
<th>2017/18*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Management</td>
<td>$2,917,526</td>
<td>$6,999,644</td>
<td>$612,753</td>
<td>$250,840</td>
</tr>
<tr>
<td>Training</td>
<td>$300,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Business Support</td>
<td>-</td>
<td>-</td>
<td>$780,808</td>
<td>$895,070</td>
</tr>
<tr>
<td>Communications and Engagement</td>
<td>-</td>
<td>-</td>
<td>$549,296</td>
<td>$596,160</td>
</tr>
<tr>
<td>Laboratory</td>
<td>-</td>
<td>-</td>
<td>$840,305</td>
<td>$795,850</td>
</tr>
<tr>
<td>Operations</td>
<td>-</td>
<td>-</td>
<td>$1,716,424</td>
<td>$2,419,287</td>
</tr>
<tr>
<td>Planning and Policy</td>
<td>-</td>
<td>-</td>
<td>$945,965</td>
<td>$611,963</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$3,217,526</td>
<td>$6,999,644</td>
<td>$5,445,551</td>
<td>$5,569,169</td>
</tr>
</tbody>
</table>

Note: *2017/18 is reported as budget allocated as expenditure for the whole year was not available.

SOURCE: BIOSECURITY QUEENSLAND.
### TABLE 4.7 PANAMA TR4 PROGRAM KEY PERFORMANCE INDICATOR PROGRESS BY QUARTER

<table>
<thead>
<tr>
<th>Objective</th>
<th>KPI</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delimit current geographical distribution of Panama disease TR4.</td>
<td>8</td>
<td>N/A</td>
<td>88%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Contain the pathogen to infested sites.</td>
<td>9</td>
<td>N/A</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Prevent the introduction of the pathogen to non-infested sites.</td>
<td>5</td>
<td>N/A</td>
<td>80%</td>
<td>80%</td>
<td>100%</td>
</tr>
<tr>
<td>Facilitate industry resilience, recovery and viability in the face of this disease incursion.</td>
<td>8</td>
<td>N/A</td>
<td>50%</td>
<td>50%</td>
<td>38%</td>
</tr>
<tr>
<td>Communications and Community Engagement.</td>
<td>5</td>
<td>N/A</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Planning, Policy and Technical Support.</td>
<td>4</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>100%</td>
</tr>
<tr>
<td>Business Support.</td>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>100%</td>
</tr>
<tr>
<td>Lab Diagnostics.</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>100%</td>
</tr>
<tr>
<td>Total 2015/16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>KPI</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine the current geographical distribution of Panama TR4 in Queensland.</td>
<td>8</td>
<td>100%</td>
<td>63%</td>
<td>63%</td>
<td>63%</td>
</tr>
<tr>
<td>Minimise the risk of pathogen spread from affected land.</td>
<td>12</td>
<td>92%</td>
<td>92%</td>
<td>92%</td>
<td>42%</td>
</tr>
<tr>
<td>Industry adjustment, resilience and management of Panama TR4 is supported through the development of robust biosecurity policies and sustainable biosecurity systems.</td>
<td>4</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Engage with key stakeholder and community groups to promote understanding of Panama TR4, encourage early reporting and shared responsibility for biosecurity practice change.</td>
<td>23</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>83%</td>
</tr>
<tr>
<td>Deliver a best practice biosecurity program underpinned by accurate data capture, robust diagnostics, rigorous science, risk-based decision making, sound corporate practices and encouraging innovation.</td>
<td>70</td>
<td>100%</td>
<td>89%</td>
<td>89%</td>
<td>77%</td>
</tr>
<tr>
<td>Total 2016/17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>117</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key activities</th>
<th>KPI</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveillance for Panama TR4 is conducted in accordance with the policies, procedures and plans.</td>
<td>4</td>
<td>100%</td>
<td>75%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>Compliance verification activities are conducted in accordance with policies, procedures and plans.</td>
<td>3</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Grower engagement and facilitation in accordance with the Industry preparedness engagement plan.</td>
<td>1</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Develop and disseminate accurate timely advice to all stakeholders.</td>
<td>1</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>N/A</td>
</tr>
<tr>
<td>Deliver, maintain and promote a point of truth.</td>
<td>1</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>N/A</td>
</tr>
<tr>
<td>Provide education and training.</td>
<td>1</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>N/A</td>
</tr>
<tr>
<td>Identify engagement opportunities.</td>
<td>1</td>
<td>0%</td>
<td>100%</td>
<td>100%</td>
<td>N/A</td>
</tr>
<tr>
<td>The Panama TR4 Program is implemented and managed in accordance with Corporate Standards.</td>
<td>7</td>
<td>71%</td>
<td>100%</td>
<td>71%</td>
<td>86%</td>
</tr>
<tr>
<td>The Panama TR4 Program is supported by sound policy direction which is specific to Panama TR4 and current legislation.</td>
<td>4</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Total 2017/18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>

**SOURCE: PANAMA TR4 PROGRAM QUARTERLY REPORTS**
Under this process the Panama TR4 Program reports against a suite of measures using a traffic light metric and a short commentary on each one.

At the measure level there has been considerable change in which areas of performance are reported reflecting both the evolution of the Panama TR4 Program and government’s reporting requirements. During the initial phase the Panama TR4 Program reported against the overall response objectives and in the last two quarters additional objectives related to managing the Panama TR4 Program were introduced.

In 2016/17 these were changed to the current objectives along with nearly three times the number of key performance indicators (117) related to 42 deliverables to provide fine grained insight and reporting on performance.

Last financial year the reporting framework shifted from objectives to 23 key activities where the performance measures are supporting activities rather than deliverables or KPIs. In the 2017/18 quarterly reports there are three top line indicators (Table 4.8) with no specifically documented linkage between them and the performance measures or Panama TR4 Program objectives. The lack of linkage reduces the transparency of the quarterly reports.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact Statement:</td>
<td>Contain Panama TR4 to the Tully Valley and ensure industry resilience and sustainability in the longer term.</td>
</tr>
<tr>
<td>Efficiency Measure</td>
<td># FTEs deliver legislated requirements for effective control and containment of Panama TR4</td>
</tr>
<tr>
<td>Effectiveness Measure</td>
<td>Panama TR4 is contained to the Tully Valley in Queensland. 50% of banana growers have implemented biosecurity measures to prevent the entry of pests and diseases carried by soil and banana plant material.</td>
</tr>
</tbody>
</table>

Table 4.7 shows a summary of the analysis of the traffic light ratings. An overall summary of the analysis is shown in Table 4.7 where green indicates the Panama TR4 Program self-reported as having met the measure that quarter and red indicates that not all the requirements were met.

The quarterly reports also provided a commentary for each measure. When the comments were reviewed a number of themes emerged:

- Surveillance targets are often delayed by weather and other priorities influencing resourcing.
- Securing access and developing working arrangements with infested properties takes time.
- There are often delays when the Panama TR4 Program needs to complete reports and information which are to be provided to the growers or the industry more widely.
- Establishing transition to industry arrangements has been slowed by the need to address immediate operational requirements (especially the new infested properties and industry purchasing IP1).
- Maintaining compliance on various internal policies and procedures remains an on-going task.

Overall the information in this section suggests the Panama TR4 Program has made considerable effort and progress in transitioning from an emergency response to a managed response phase that can deliver strategically and operationally against its objectives.

The information also indicates that while individual components have improved they are not sufficiently complete or transparent to present a coherent model. This lack of coherence was repeatedly raised during the consultations and identified in the Kantar Public report (refer Box 2.1): stakeholders and staff support the response and the Panama TR4 Program but they are not sure exactly what the plan is.

Or to put it another way, if industry is expected to share responsibility for the Panama TR4 Program it needs to know what the plan is and the business case as to why they should support and invest in it.

Structurally there are a couple of ways these can be addressed. First it is important to separate the phasing of the response from transitioning components of the biosecurity response (i.e. Panama TR4
Program) to industry. As long as the broader structural adjustment component is not explicitly part of the Panama TR4 Program or judged to be warranted by the Taskforce there will be some degree of confusion and differences between stakeholders as to whether this is needed. To achieve this the Panama TR4 Program could simply focus on engaging on its current objectives which reflects this scope. In reality this is unlikely to be sufficient and a better way to clarify the strategic position of the Panama TR4 Program is to update the overall response strategy.

Second, the Panama TR4 Program’s planning hierarchy and structure needs to be developed into a single coherent model which is internally consistent. Structurally this is reasonably straightforward in that the Panama TR4 Program should be organised on the following basis:

- Overall Response Strategy – to define the phases and role of the Panama TR4 Program
- Panama TR4 Program objectives – to outline the Panama TR4 Program’s specific scope and basis for managing performance
- Panama TR4 Program cost codes – the activities to deliver the elements and manage the Panama TR4 Program should all be placed on a project basis which specifies the key activities, how they link to the objectives, deliverables, resources etc.
- Panama TR4 Program management – organisational structure, performance standards, governance, budget, staffing etc.

The critical consideration is the degree to which the industry should be involved in specifying the Panama TR4 Program and how it can contribute. Industry is involved in two ways:

1. At a business level the 263 banana growers in Far North Queensland are an integral part of the Panama TR4 response. They have an obligation to prevent the spread of Panama TR4 and an interest in defending their property against it. In that sense they will need to comply with the regulations but also look to the Panama TR4 Program for advice. This split needs to be clearly differentiated in the Panama TR4 Program’s plan.

2. As an industry they are expected to make a greater contribution to funding the Panama TR4 Program which also opens up the opportunity to become a service provider.

Looking practically at the current activities and elements of the Panama TR4 Program the most obvious role for industry is to provide an advisory/extension related service to growers which does not have a regulatory function.

Industry could conduct surveillance but there are some issues which need to be resolved. Self-surveillance is possible but there are questions around quality and aligning incentives if growers were to do so themselves. If surveillance was outsourced to a third party there are questions around whether this would be more cost-effective and dealing with liability (e.g. Panama TR4 is found where surveillance has occurred). There are also questions around adjusting surveillance if and when Panama TR4 spreads and whether the strategy should change focus to make better use of available resources on a risk minimising basis or if more resources will be required.

Growers and other related businesses subjected to controls could undertake their own compliance with a supporting audit function provided by the Panama TR4 Program. This area is critically important given controls will become (larger) certification costs for industry and the Panama TR4 Program as Panama TR4 spreads.

All of these options are interdependent and if the industry is to take greater responsibility they need to be actively involved in the design of any new model.

### 4.6 Governance arrangements

The strategy underpinning the Panama TR4 Program assumes that governance will transition to industry under the phased approach in a reasonably short time as Panama TR4 spread and became endemic. Given the rate of spread was slower than expected the Panama TR4 Program’s governance arrangements have not changed while it continues in the Managed Response Phase. However, the adaptive response to Panama TR4 means that over time the governance arrangements need to evolve and transition to industry.

There are four drivers which will prompt the transition of governance:
— a greater role for industry arising from planning for the Transition to Management Phase
— a greater role for industry arising from industry needing to contribute to the cost of the Panama TR4 Program
— the need to move to the On-going Management Phase
— the need to introduce a significant number of specific measures to support structural adjustment in areas with high public good.

The review has established the first two drivers are pertinent and making the transition will also assist with preparedness for the On-going Management Phase at this time. Introducing other structural adjustment measures in areas with high public good is not within the Panama TR4 Program’s scope at present or required while Panama TR4 remains contained as is.

Therefore, the transition involves moving from a government led to an alternative model. We have identified two options (summarised in Figure 4.4 and Figure 4.5 below) to illustrate what a government-industry partnership model and what an industry-led governance model could entail in the future.

Any future response should continue to ensure effective governance and accountability over the longer term and is especially resilient to crisis and has the adaptive capacity to mobilise the resources required to manage a significant outbreak of the TR4 disease.

The preferred governance option should also allow the governance body or committee to set the direction, manage and monitor Panama TR4 Program risks, provide clarity for roles and responsibilities under the Act or any partnership agreements. This also demonstrates who could be responsible for the delivery of key Panama TR4 Program elements.

Each option is guided by a formal agreement which binds the actions of all parties which are signatories to the agreement. This agreement is a fundamental shift in the current arrangements which are governed by a taskforce responsible to DAF and the Minister. The content of the agreement would be contingent on the governance and accountability model chosen for the Panama TR4 Program.
FIGURE 4.4 POTENTIAL GOVERNANCE ARRANGEMENTS – PARTNERSHIP MODEL

Note: Hard lines = direct accountability and reporting relationship; Dotted lines = indirect/informal accountability and reporting relationship.
SOURCE: ACIL ALLEN CONSULTING

FIGURE 4.5 POTENTIAL GOVERNANCE ARRANGEMENTS – INDUSTRY LED MODEL

Note: Hard lines = direct accountability and reporting relationship; Dotted lines = indirect/informal accountability and reporting relationship.
SOURCE: ACIL ALLEN CONSULTING
4.7 Panama TR4 Program funding

The most significant issue is that the Panama TR4 Program does not have an on-going funding base. Therefore, irrespective of what the Panama TR4 Program does at this point it does not have the funding to continue beyond this financial year.

This means funding arrangements need to be put in place to continue the Panama TR4 Program until such time as it needs to expand or contract. Until the arrangements are put in place the Panama TR4 Program will be constrained in developing a coherent scope of work and securing the capability to do so.

At present the Panama TR4 Program’s direct costs are fully incurred by the Queensland Government. Additional costs which contribute to the Panama TR4 Program include:

— Queensland Government – PanamaTR4 Program related research and development.
— Banana industry – industry levies that fund Panama TR4 research and development (excluding disease tolerant cultivars) and the purchase/management of the first infected property through Horticulture Innovation Australia and Plant Health Australia.
— Banana growers – the additional investment made to prevent Panama TR4 under the General Biosecurity Obligation and control and containment of the infected properties.
— Commonwealth Government – matching contribution for Panama TR4 research and development (excluding Panama TR4 tolerant cultivars) through Horticulture Innovation Australia.
— other sources – additional funding from Government and other sources that contribute to Panama TR4 research and development related to control and containment (excluding Panama TR4 tolerant cultivars).

There are additional direct and indirect costs for the Panama TR4 Program and a broader response if Panama TR4 spreads. But in the immediate future the focus needs to be on how the Panama TR4 Program is funded until it does. To provide the platform the Panama TR4 Program needs to operate effectively this should be for 3 to 5 years.

No matter how the costs are determined and cost sharing principles applied there are opportunities and constraints in moving towards a different funding arrangement. These are discussed in the following chapter.

4.8 Key findings

The key findings from this Chapter are:

— The current Panama TR4 Program objectives are well constructed, reflecting the need to implement activities and simultaneously developing an enduring system with industry to do so.
— All the Panama TR4 Program elements are required to deliver on the Panama TR4 Program’s objectives and considerable effort has been put in place to develop the policies and procedures to implement them.
— It is appropriate and necessary for industry and the Queensland Government to share the cost of funding the Panama TR4 Program. They should share the direct Panama TR4 Program costs equally to align incentives for both parties.
— An interim period where the Queensland Government pays a larger proportion of costs is needed so industry can put funding arrangements in place.
— The overall plan and model that make up the enduring system is incomplete – in particular the projects and structures need to be transparently aligned with the Panama TR4 Program objectives and overall Response Strategy. This is critical for demonstrating what the plan is to stakeholders and providing the basis for negotiating tangible shared responsibility and funding between industry and government.
The previous chapters of this report cement the case for the Panama TR4 Program to continue into the future. This is necessitated due to the insidious nature of Panama TR4, the potential for unknown impacts in an unknown timeframe and the economic benefit resulting from the Panama TR4 Program.

At this stage there is too much uncertainty to define when the Panama TR4 Program will no longer be required and following the principles of adaptive management it is reasonable that the response be on-going for a minimum of three to five years before reassessing the situation. If the Panama TR4 Program is to continue and operate as efficiently and effectively as possible it needs a new framework.

The framework must start from the top and place industry and Government onto a pathway to a partnership where the ambiguity around shared responsibility is removed. This requires a fundamental shift where the current partnerships are placed on a more formal basis to create an additional plank to the procedures and capabilities already established, and will serve as the foundation for the enduring system required to deliver the Panama TR4 Program. Central to this, the new framework must clearly define roles and responsibilities as well as the financial arrangements for industry and Government to share costs.

5.1 Recommendations

This review has focused on the control and containment elements associated with managing Panama TR4. These elements require a strong governance model to ensure they remain appropriate, effective and accountable to key government, industry and community stakeholders. They also require a governance model that ensures ongoing integration between control and containment and the broader response by governments and industries to Panama TR4.

Figure 5.1 outlines the governance model proposed by ACIL Allen. The figure demonstrates how the governance of the Panama TR4 Program is distinct from the governance arrangements for the broader response to Panama TR4 but is also consistent with the existing biosecurity governance arrangements in Queensland and requirements under the Biosecurity Act 2014 (Qld).

The proposed governance model has been designed following feedback from key government and industry stakeholders who attended the design workshop in Cairns. These stakeholders held strong views that the Panama TR4 Program’s governance arrangements should reflect the ideas of shared responsibility enshrined under the Act. Stakeholders were also of the view that the Panama TR4 Program’s governance arrangements should provide efficient oversight of control and containment elements and should avoid being overly complex. They were further of the view that Panama TR4 Program governance should be somewhat distinct from the broader response to Panama TR4 but provide clear linkages to other related or complementary elements where it makes sense to do so.
The governance model below seeks to address this feedback while providing the foundations for effective performance and accountability within the context of considerable uncertainty and the requirement for considerable adaptation over time.

**FIGURE 5.1 PROPOSED GOVERNANCE MODEL**

![Proposed Governance Model Diagram]

Note: Hard lines = direct accountability and reporting relationship; Dotted lines = indirect/informal accountability and reporting relationship.

**SOURCE: ACIL ALLEN**

**Recommendation 1: Establish a Partnership Agreement (MoU)**

Implementation of a shared responsibility model for control and containment, by its very nature, requires a formal partnership between government, industry and other stakeholders who are key to the management of elements at the local level. To be effective over the longer term, these partnerships must be underpinned by strong relationships between interested parties. These relationships must be resilient enough to endure the uncertainties that are anticipated with the spread of Panama TR4.

To help build long term resilience between government and industry, it is proposed that a partnership agreement or a memorandum of understanding (MoU) is struck between key parties. The MoU’s purpose is to provide clarity about how the partnership should operate in practice, and to set the expectations of the behaviour of key parties under a shared responsibility model. The MoU is intended to provide government and industry with an instrument to resolve any disagreements about the Panama TR4 Program’s future investments or directions.

There are many models of a government-industry MoU to draw on. A basic web-search highlights hundreds of potential agreements that could be used as a framework for the Panama TR4 Program’s MoU. That being said, in this case the MoU should include the following information:

— The parties to the agreement.
— The principles of the agreement. As a principles-based document, the MoU would establish the overall framework within which the Parties work together to provide a high level of collaboration, support and service to each other.
— A purpose statement which includes a documented understanding between the parties for delivery of control and containment elements. These could include the roles of the parties, the consultation and management responsibilities of the parties and the scope of the MoU.
— The administration arrangements underpinning the MoU.
— Dispute resolution processes and grievance clauses.
— Processes for making variations to the MoU.
— The grounds for terminating or reducing the scope of the MoU.
— Process for issuing notices or formal communications under the MoU.
— Disclosure of information under the MoU. This would include agreement by the parties to share any relevant information in areas of mutual interest and consider any requests for relevant information.
— Process and timeframes for reviewing the MoU. Review periods are typically between 1-3 years depending on the nature of the MoU and the difficulties in negotiating new agreements.
— Cost sharing arrangements.

The agreement should be a matter for the Queensland Government and industry to negotiate as the key participants to the Panama TR4 Program’s delivery. However, selected local governments may be invited to participate in the MoU if they are deemed by Queensland Government and industry to be critical to the Panama TR4 Program’s ongoing delivery and success.

**Recommendation 2: Strengthen the role of the Panama TR4 Program Steering Committee**

At present the Panama TR4 Program is accountable to Biosecurity Queensland who in turn reports to the Taskforce. At an operational level the Panama TR4 Program seeks guidance from the Steering Committee and seeks advice from a Technical Reference Group.

As the Panama TR4 Program transitions to industry with associated industry funding and service delivery, the Steering Committee needs to change to reflect the co-management of the Panama TR4 Program. Under such arrangements the Steering Committee should be the key body responsible for setting the Panama TR4 Program’s direction, developing and monitoring, developing an annual work plan, identifying and managing strategic risks and demonstrating progress against key Panama TR4 Program objectives.

The Steering Committee should perform the functions of the existing Steering Committee, as well as those conducted by the Technical Reference Group. These arrangements will be similar to the existing roles of the Committee and the Group however, they will be performed by a single Committee to reduce the administrative burden of managing both committees/groups.

The Steering Committee should continue to receive quarterly reports from the projects funded under the Panama TR4 Program (see below) and meet quarterly to discuss Panama TR4 Program progress against milestones and allocated budget. A key role of the Steering Committee is to set the annual work plan and approve the funding of projects (in accordance with government and/or accepted procurement guidelines).

Steering Committee representatives should be selected on the basis of the skills required to oversee an efficient and effective Panama TR4 Program of control and containment. Selection should also be based on ensuring adequate representation is provided by any parties who provide support (financial support and significant in-kind support) to the Panama TR4 Program. This means the Steering Committee will have representatives from Government and industry who have a range of policy, technical and strategic skills/experiences.

The Steering Committee should appoint a chair person for a period of three years (to ensure alignment with standard practice) who will be held directly accountable for the performance of the Panama TR4 Program. The chair person will report directly to the Taskforce or Ministerial Council which has oversight for the broader response to Panama TR4.

The MoU will guide the decisions and actions of Committee members and parties to the agreement. However, separate terms of reference may be useful in providing additional operational direction and may need to be developed to support the Committee’s work.
Recommendation 3: Transparently align the Panama TR4 Program’s operational model and objectives

The current project structure does not align with the elements and objectives of the Panama TR4 Program in a transparent and coherent manner. This limits the Panama TR4 Program’s ability to demonstrate to stakeholders what the plan is.

To ensure the most effective operation of the Panama TR4 Program, we recommend the Panama TR4 Program’s scope of work, or annual work plan, is conceptualised and organised as a series of evolving and adaptive projects. A project portfolio approach is useful because it provides opportunities for a diverse range of Panama TR4 Program partners to deliver control and containment elements using each partner’s own systems, processes and infrastructure. This approach is, by definition, efficient as it leverages existing delivery investments/capabilities of Panama TR4 Program partners and avoids investment in new capabilities.

The approach is also consistent with the notion of shared responsibility, as it provides opportunities for local and non-government partners to deliver services and make contributions where they best support the control and containment effort.

A project approach can embrace concepts of uncertainty by adopting project management principles and practices that are agile in nature. There are many different types of agile project management. Generally speaking, they all follow a short life cycle, which repeats during each iteration. Projects are broken down into short iterations. The lifecycle of each sprint includes: planning phase; execution phase; review phase; and process of updating and repeating.

These principles and practices allow projects to be regularly reviewed and adjustments made to meet changing circumstances. Where projects are required over the longer term, their life can be extended and adapted along the way. Where projects become redundant, they can be abandoned or significantly reshaped for higher priority projects.

By placing all Panama TR4 Program elements on a project basis, the Steering Committee has a flexible yet replicable tool for managing control and containment elements over the longer term.

Recommendation 4: Update the overall Strategy and Phases

The 2015 strategy is the only public document which articulates what the overall response is. While the strategy is sound the Phases are no longer fit for purpose because the spread of Panama TR4 is slower than anticipated which means the introduction of structural adjustment measures and transition to industry arrangements look like they both happen in Phase 3.

Tightening of the Panama TR4 Program objectives in 2016/17 clarified this is not the case, but the changes are not publicly reported or widely understood by stakeholders. We recommend the Strategy, including the current Panama TR4 Program objectives are updated and published prior to the start of the MoU development process.

Recommendation 5: Renew extension to banana growers and other directly affected businesses

The Panama TR4 Program’s extension to banana growers and other parties directly affected by Panama TR4 and the control and containment activities aimed to:

— provide advice and support to meet their obligations to minimise spread of Panama TR4 from their properties or through their activities

— provide advice on how to minimise the risk of Panama TR4 spreading onto their properties.

The two purposes highlight the mutual benefit arising from shared responsibility but also the challenges the Panama TR4 Program faces in meeting demand for both extension activities. This is further confounded by each of the 263 growers having differing circumstances and willingness to participate. As the Panama TR4 Program enters its fourth year there is also increasing interest from stakeholders in seeking advice on opportunities to diversify and adapt. The Panama TR4 Program uses a targeted approach to provide the advice to growers and business based on risk which is sound but this does not address all of these needs.
The Panama TR4 Program is highly visible and there is a significant opportunity for it to play a key leadership role with industry to develop a coordinated response to extension. Such an approach also allows the Panama TR4 Program to strengthen its relationships with Agri-Science Queensland, Horticulture Innovation Australia and other research, development and extension providers in an arrangement where it can focus on the prevention of spread while others focus on the other needs using a common technical basis. Extension is also an area where a clear need can be combined with a tangible outcome to justify and arrange industry cost sharing of the Panama TR4 Program.

Recommendation 6: Industry must share the costs of the Panama TR4 Program equally over time

There is no rationale or objective basis for quantifying what proportion industry and government should contribute to the costs of the Panama TR4 Program. There is also a risk that (suddenly) requiring greater contributions will simply lead to unnecessary conflict or even worse the efficacy of what has been a successful program to date declining.

There is however a clear rationale that industry should contribute to the cost of the Panama TR4 Program and more so than it does at present on the basis that it does not currently contribute directly to the costs and that the industry clearly benefits directly from the Panama TR4 Program.

Our recommendation is that this should be based on moving towards equal sharing of the Panama TR4 Program’s costs over the next three to five years at which point it should be reviewed. This is justified on the basis that it is a starting point for negotiation and the reality that some large proportion of the $2,126 million net present value benefit will accrue directly to banana growers and the banana industry.

The cost of purchasing and managing of the first infected property the industry is paying for through the levy administered through Plant Health Australia should be included.  

There are significant opportunities and constraints to negotiating the transition to cost sharing arrangements with industry.

On the constraints side, industry will need to either reallocate existing levies or increase levies. The existing levies are allocated by Horticulture Innovation Australia independently of the Panama TR4 Program and ABGC. Any reallocation will require Horticulture Innovation Australia agreement and industry input as part of their decision process.

If additional levy income is required then the existing levies will need to be increased or a new levy introduced. Such changes require both industry and Commonwealth Government approval which will take time and involve significant cost. As a guide, levy increase can take a number of years and only succeed half the time they are proposed unless there is a high degree of support and urgency. The current pressures on profitability and viability in the banana industry creates a difficult environment in which to build support for an increase or reallocation of levies.

There are however opportunities to avoid these constraints through targeted reallocation of existing levies and seeking financial leverage that will strengthen industry ability to share the costs and support the Panama TR4 Program.

To reallocate existing research and development levies Horticulture Innovation Australia needs to consider a specific proposal. As part of scoping projects for the continuing Panama TR4 Program this is an opportunity to establish an activity that contributes to the Panama TR4 Program’s objectives but does not need to be delivered by Biosecurity Queensland. A new extension activity focused at on-farm biosecurity and delivered by industry is the most logical opportunity to pursue.

Industry and the Queensland Government should seriously consider how to access the additional matching research and development available through Horticulture Innovation Australia. The opportunity arises because the horticultural research and development levies are below the 0.5 per cent GVP cap making additional matching Commonwealth research and development funding available. This can be achieved through structuring parts of the Queensland Government appropriations so they are deemed as eligible for matching research and development contributions

25 Other costs incurred by industry do not need to be considered here because the focus is on how to fund the Program’s activities rather than growers and others.
through Horticulture Innovation Australia. Precedent exists for such approach with other RDCs and Horticulture Innovation Australia is open to scoping such an approach with industry and the Queensland Government.

There is a further opportunity to redirect existing levies from marketing to research and development so that additional matching research and development funds are available through Horticulture Innovation Australia. This approach will require industry and Commonwealth support.

In summary industry has the mechanisms available to contribute to the costs of the Panama TR4 Program but they will take considerable negotiation with Horticulture Innovation Australia and the Commonwealth to implement. Current market conditions (there have been unfavourable terms of trade and prices have been depressed following over supply as there have been no cyclones) will work against building support for any change. This can be offset, but not completely mitigated, by seeking financial leverage through Horticulture Innovation Australia to reduce the Panama TR4 Program’s cost to industry and the Queensland government.

It is reasonable to expect that activating these changes will take considerable time unless Panama TR4 spreads to create additional urgency. In the short term defining an existing activity that is best delivered outside the Panama TR4 Program and funded by Horticulture Innovation Australia is the best way for industry to start transitioning to equal cost sharing over time.

### 5.2 Implementation

Table 5.1 summarises the roles and responsibilities of those parties who will be involved in the implementation of the new framework for the Panama TR4 Program. It also identifies the transitional arrangements or activities that are required to implement the governance model and program improvements identified in this review and a proposed timeline.

<table>
<thead>
<tr>
<th>Transitional tasks</th>
<th>Who’s involved</th>
<th>Activities required to progress the transitional task</th>
<th>Timing (or duration)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publish the updated Panama TR4 Response Strategy and Current TR4 Program Plan</td>
<td>DAF(BQ)</td>
<td>Draft MoU and sign-off</td>
<td>2018 (1 month)</td>
</tr>
<tr>
<td>Develop MoU</td>
<td>DAF(BQ), ABGC, Task Force / Ministerial Council</td>
<td>Draft Committee Terms of Reference Appoint Committee Members and chair person Identify meeting schedule for 2019 Develop protocols for communication between Panama TR4 Program participants and other work streams</td>
<td>2018 (6 months)</td>
</tr>
<tr>
<td>Establish Steering Committee</td>
<td>DAF(BQ), ABGC and relevant local councils</td>
<td></td>
<td>2018 (6 months)</td>
</tr>
<tr>
<td>Transparently align the Panama TR4 Program’s operational model and objectives</td>
<td>DAF(BQ) and ABGC</td>
<td>Develop complete project plans and budgets that demonstrably link to the Panama TR4 Program objectives with SMART KPIs</td>
<td>2018 (3 months)</td>
</tr>
<tr>
<td>Develop Panama TR4 Program’s 2019 work plan</td>
<td>DAF(BQ), ABGC and local government</td>
<td>Develop priorities Scope projects Engage project partners</td>
<td>2018 and 2019 (6-9 months)</td>
</tr>
<tr>
<td>Establish new reporting and evaluation approach</td>
<td>DAF(BQ) and ABGC</td>
<td>Review existing reports Adjust where required to support the Panama TR4 Program’s adaptive management approach</td>
<td>2018 (3 months)</td>
</tr>
<tr>
<td>Transitional tasks</td>
<td>Who’s involved</td>
<td>Activities required to progress the transitional task</td>
<td>Timing (or duration)</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td>-------------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Improve on-farm biosecurity on non-infested properties</td>
<td>DAF(BQ), DAF(ASQ) and ABGC</td>
<td>Develop a joint extension strategy to improve biosecurity and implement in collaboration</td>
<td>2018 (6 months)</td>
</tr>
<tr>
<td>Establish longer term funding model or parameters of the funding model for the Panama TR4 Program</td>
<td>DAF(BQ) and ABGC</td>
<td>Negotiate funding arrangement and parameters for shared costs based on the analysis provided in this evaluation. Agreement about funding model should occur within the context of the MoU. Funding adjustments under the model would be based on the spread of Panama TR4 and would thus automatically flow. This prevents the need for the funding model to be renegotiated.</td>
<td>2018 (6 months)</td>
</tr>
<tr>
<td>Introduce and gain approval for new cost sharing arrangements</td>
<td>DAF(BQ), ABGC, Horticulture Innovation Australia and PHA</td>
<td>Negotiate agreement share costs equally. Establish transition arrangement to do so.</td>
<td>2018 (6 months) 2019 onwards</td>
</tr>
</tbody>
</table>

Source: ACIL Allen
Conclusions

ACIL Allen conducted an independent review of Biosecurity Queensland’s Panama TR4 Program. The objective of the review was to make a case for the long-term control and containment management of Panama TR4 in Queensland. This was done through a benefit cost analysis and a comprehensive desktop analysis of:

— the historical and current elements currently being undertaken by the Panama TR4 Program and linkages to other organisations working in the sphere of Panama TR4 research and education
— the funding, organisational and legislative parameters that apply to the current program and any future management plans for Panama TR4.

A series of consultations with over forty stakeholders from across the government, industry and banana growing communities helped to identify improvements for the program elements and to make recommendations as to a fair and realistic model for managing Panama TR4 going forward.

The key findings of this review are that Biosecurity Queensland’s Panama TR4 Program (with support from growers, industry and others) has been successful in controlling and containing Panama TR4. The Panama TR4 Program should continue on the basis the industry and regions will benefit in the order of $2,134.1 million from continuing banana production while adaptation options are developed and implemented. At the same time, the following improvements should be made:

— a new framework should be implemented under an MoU between Government and industry to formalise partnership arrangements and to develop a pathway for shared responsibility and shared costs for the Panama TR4 Program
— align the Panama TR4 Program’s operational model and objectives so that the Panama TR4 Program’s plan is transparent
— the Panama TR4 Program strategy be updated including the progression of phases to ensure the most appropriate representation of adaptation
— renew extension projects and look at ways to deliver this in conjunction with industry and the broader research, development and extension community
— government provision of an on-going funding base for the immediate future, with a view to begin negotiations on a cost sharing arrangement with industry moving to a 50:50 split over the next 3 to 5 years.
<table>
<thead>
<tr>
<th>Project Area</th>
<th>Activity</th>
<th>Employee expenses</th>
<th>Consultancy</th>
<th>Electricity</th>
<th>Travel</th>
<th>Employment agency fees</th>
<th>Payments</th>
<th>Others</th>
<th>Depreciation</th>
<th>Grants and subsidies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA TR4 Program Management</td>
<td>Program Management</td>
<td>$173,137.80</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$421,752.50</td>
</tr>
<tr>
<td>PA TR4 - Outsource Support</td>
<td>Outsource Support</td>
<td>$134,298.81</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$720,095.80</td>
</tr>
<tr>
<td>PA TR4 - Communication &amp; Community Support</td>
<td>Communication &amp; Community Support</td>
<td>$161,385.28</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$196,099.61</td>
</tr>
<tr>
<td>PA TR4 - Laboratory</td>
<td>Laboratory</td>
<td>$11,252.48</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$16,049.91</td>
</tr>
<tr>
<td>PA TR4 - Operations</td>
<td>Operations</td>
<td>$7,322.43</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$14,998.68</td>
</tr>
<tr>
<td>PA TR4 - Planning &amp; Policy</td>
<td>Planning &amp; Policy</td>
<td>$10,503.68</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$32,997.10</td>
</tr>
<tr>
<td>PA TR4 - Plant Biosecurity UML Project TML</td>
<td>Plant Biosecurity UML Project TML</td>
<td>$5,370.62</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$465,957.76</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$2,087,982.82</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$3,169,352.59</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Activity</th>
<th>Employee expenses</th>
<th>Consultancy</th>
<th>Electricity</th>
<th>Travel</th>
<th>Employment agency fees</th>
<th>Payments</th>
<th>Others</th>
<th>Depreciation</th>
<th>Grants and subsidies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA TR4 Program Management</td>
<td>Program Management</td>
<td>$194,058.21</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$569,859.51</td>
</tr>
<tr>
<td>PA TR4 - Outsource Support</td>
<td>Outsource Support</td>
<td>$174,224.37</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$890,099.60</td>
</tr>
<tr>
<td>PA TR4 - Communication &amp; Community Support</td>
<td>Communication &amp; Community Support</td>
<td>$28,904.85</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$280,548.89</td>
</tr>
<tr>
<td>PA TR4 - Laboratory</td>
<td>Laboratory</td>
<td>$169,377.87</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$423,925.87</td>
</tr>
<tr>
<td>PA TR4 - Operations</td>
<td>Operations</td>
<td>$9,528.32</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$152,398.48</td>
</tr>
<tr>
<td>PA TR4 - Planning &amp; Policy</td>
<td>Planning &amp; Policy</td>
<td>$12,575.30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$123,317.86</td>
</tr>
<tr>
<td>PA TR4 - Plant Biosecurity UML Project TML</td>
<td>Plant Biosecurity UML Project TML</td>
<td>$5,675.86</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$205,603.68</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$2,155,252.00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$5,489,416.98</td>
</tr>
</tbody>
</table>

**SOURCE**: BIOSECURITY QUEENSLAND PANAMA TR4 FINANCIAL RECORDS
Table B.1 shows where each component of the project scope has been addressed in this report.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Report section</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall requirement</strong></td>
<td></td>
</tr>
<tr>
<td>A review of the historical and current activities currently being undertaken by the Panama TR4 Program and linkages to other organisations working in the sphere of Panama TR4 research and education.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>A review of the funding, organisational and legislative parameters that apply to the current program and any future management plans for Panama TR4.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Consultation with the Panama TR4 Program and other relevant government agencies, the peak industry body Australian Banana Growers’ Council, growers and other relevant stakeholders</td>
<td>Conducted</td>
</tr>
<tr>
<td>Identification of how individual program elements could be delivered in the future, including a review of legislative constraints and options.</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>A cost-benefit analysis of the various elements of the program in their current form and under any proposed alternatives, including analysis of public, industry and individual benefits and costs.</td>
<td>Chapter 3 and 4</td>
</tr>
<tr>
<td>Recommendations as to a fair and realistic model for managing Panama disease tropical race 4 going forward, including which elements can be reduced or ceased and how they should be delivered, recorded and funded.</td>
<td>Chapter 4 and 5</td>
</tr>
<tr>
<td><strong>Detailed scope</strong></td>
<td></td>
</tr>
<tr>
<td>Review the historical and current activities undertaken by the Panama TR4 Program to understand and be able to articulate the current program deliverables, purpose and direction. Program activities/elements that should be considered include:</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>– Compliance</td>
<td></td>
</tr>
<tr>
<td>– Tracing</td>
<td></td>
</tr>
<tr>
<td>– Surveillance</td>
<td></td>
</tr>
<tr>
<td>– Sampling</td>
<td></td>
</tr>
<tr>
<td>– Diagnostics</td>
<td></td>
</tr>
<tr>
<td>Industry, stakeholder and broader community education, engagement and communications.</td>
<td></td>
</tr>
<tr>
<td>Understand the current funding, delivery, legislative and reporting requirements of the current Panama TR4 Program elements.</td>
<td>Chapter 2</td>
</tr>
</tbody>
</table>
### Requirement

Understand the nature of Panama disease tropical race 4 and the Queensland banana growing industry.

**Report section**: Chapter 2

Understand how Panama TR4 is likely to continue to spread within Queensland and how that will impact individual growers, the industry, the community and the wider state.

**Report section**: Chapter 2

Understand the linkages between the Panama TR4 Program and industry, as well as other bodies involved in Panama disease tropical race 4 including research and grower education.

**Report section**: Chapter 2

Understand the legislative framework under which the elements of the Panama TR4 Program are delivered.

**Report section**: Chapter 2

Consult with the Panama TR4 Program and other relevant government agencies, the peak industry body Australian Banana Growers’ Council, growers and other relevant stakeholders to gather the information that they require to undertake the work and understand the viewpoints of the different groups, in particular their capacity to contribute to a future model and objectives of a control and containment management program.

**Conducted**

Identify how individual program elements could be delivered in the future, including a review of legislative constraints and options. Where more than one option for future delivery is available, give benefits and drawbacks of the options to allow comparison. Include assessment of ceasing elements where appropriate.

**Report section**: Chapter 4 and 5

Undertake cost-benefit analysis of the various elements of the program in their current form and under any proposed alternatives identified above. Analysis should include analysis of public, industry and individual benefits and costs.

**Report section**: Chapter 3 and 4

Undertake a comparison of the control and containment options and make recommendations as to:

- What is a realistic model for managing Panama disease tropical race 4 going forward?
- What is supported by the various stakeholders?
- Are the current elements of the Panama TR4 Program appropriate going forward? Should some be reduced or ceased?
- What elements are critically needed going forward and how should they be delivered and by whom? In particular, identify ways that individuals or industry could contribute and lead on control and containment objectives.
- What legislative mechanisms exist to facilitate a new model of delivery? Are there legislative constraints that impact some options for delivery? If yes, identify legislative changes that may be necessary to support a robust transitional model.
- Over what period should transition, if any, occur? Identify realistic timeframes that consider the current financial commitments and capacities of the various stakeholders.
- Consider options for funding the program elements. Make comparisons between options and justify the recommendations going forward.
- Make recommendation as to how the program elements may be funded? For example, should there be ongoing government funding, with funding contribution from industry? How are funding decisions best justified using the cost-benefit analysis?
- Identify reporting requirements of the various elements for ongoing delivery, including an analysis of modern reporting technologies such as apps and online means.

**Report section**: Chapter 4 and 5

If applicable, include a transition plan and timeframe for implementation.

**Report section**: Chapter 5

Make recommendations about any critical Program activities that should continue to be delivered by government. Provide justification as to why elements should be delivered by government.

**Report section**: Chapter 5

---

**SOURCE**: SCOPE OF THE REVIEW, BIOSECURITY QUEENSLAND
ABOUT ACIL ALLEN CONSULTING

ACIL ALLEN CONSULTING IS THE LARGEST INDEPENDENT, AUSTRALIAN OWNED ECONOMIC AND PUBLIC POLICY CONSULTANCY.

WE SPECIALISE IN THE USE OF APPLIED ECONOMICS AND ECONOMETRICS WITH EMPHASIS ON THE ANALYSIS, DEVELOPMENT AND EVALUATION OF POLICY, STRATEGY AND PROGRAMS.

OUR REPUTATION FOR QUALITY RESEARCH, CREDIBLE ANALYSIS AND INNOVATIVE ADVICE HAS BEEN DEVELOPED OVER A PERIOD OF MORE THAN THIRTY YEARS.