Horticulture Impact Assessment Program

BA21003 Impact Assessment

June 2026

Hort Innovation

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BA21003 Multi Pest Surveillance Banana Pests and Diseases

Executive Summary

BA21003 was established to strengthen the Australian banana industry's biosecurity preparedness through coordinated surveillance, grower education, and stakeholder engagement targeting key pest and disease threats, particularly Banana Bunchy Top Virus (BBTV), Panama Tropical Race 4 (TR4), and Yellow Sigatoka. Delivered by the Australian Banana Growers' Council (ABGC) between 2022 and 2025, the project sought to reduce the risk of pest and disease spread through systematic surveillance, early detection, rapid response, and improved grower awareness and compliance.

The project aligned strongly with the Banana Strategic Investment Plan 2022-2026 by supporting industry productivity, sustainability, and resilience through enhanced biosecurity capability and industry-wide collaboration. Activities included property inspections, disease surveillance, grower engagement, training, extension, and coordination with state biosecurity agencies. These activities strengthened the industry's capacity to detect and respond to pest and disease incursions and reinforced existing disease management systems to contain and prevent the spread of endemic disease.

The primary quantified benefit relates to avoided production losses associated with BBTV containment. The project maintained extensive surveillance and eradication activities across Queensland and New South Wales, resulting in the detection and destruction of 6,735 infected plants during the project period.[1] Economic modelling compared a scenario of continued surveillance and eradication with a counterfactual scenario of uncontrolled disease spread. Drawing on published epidemiological modelling, the analysis assumes that BBTV could ultimately affect up to 81% of Australia's banana production area under uncontrolled conditions.[2] By substantially reducing the probability of widespread disease establishment, the project generated an estimated net present value (NPV) of $20.75 million and a benefit-cost ratio (BCR) of 10.61 over a 10-year period, demonstrating a strong positive return on investment.

In addition to the quantified benefit, the project generated several important but unquantified outcomes. These included improved grower biosecurity awareness and compliance, strengthened surveillance capability across multiple pests and diseases, continued suppression of Yellow Sigatoka through maintenance of industry disease thresholds, and enhanced coordination between growers, industry bodies and government agencies. These benefits contribute to long-term industry resilience and preparedness, but could not be robustly monetised due to difficulties in isolating project-specific impacts and the absence of suitable behavioural, disease incidence, and cost data.

Additionally, the investment contributed to a shift in industry culture from reliance on external inspection programs towards greater grower ownership of biosecurity. Over time, growers became more actively involved in identifying symptoms, reporting suspect plants, and undertaking destruction activities, strengthening the industry's collective capacity to manage biosecurity risks.

The assessment highlights the significant value of coordinated biosecurity investments in reducing the risk of catastrophic disease outbreaks in industries characterised by concentrated production systems and high

[1] https://www.horticulture.com.au/globalassets/resources-for-delivery-partners/project-resources/ba21003-final-report.pdf, P7.

[2] https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf

biosecurity exposure. It also demonstrates the importance of surveillance and extension activities as preventative investments that protect existing industry value rather than generating new production directly. Effective management within established control zones helps protect major production regions from incursion, safeguarding national production, supply chain stability, and industry resilience.

A key limitation encountered during the assessment was the lack of longitudinal data linking surveillance activities and grower engagement to changes in disease incidence, production outcomes, and avoided costs. While surveillance outputs were well documented, broader impacts on industry decision-making and biosecurity preparedness could not be quantified with confidence. Future investments would benefit from embedding monitoring and evaluation frameworks that collect baseline and follow-up data on grower behaviour, compliance, disease prevalence, and management costs. This would support more comprehensive valuation of the broader economic, environmental and social benefits associated with biosecurity preparedness programs. However, collecting data can be challenging, as growers are often reluctant to share disease prevalence information due to confidentiality concerns. Developing additional mechanisms that protect grower privacy while enabling data collection would strengthen future impact evaluations.

Context, objective, and details of investment

Bananas are Australia's number one selling supermarket fruit product (in volume), with over 5 million eaten daily.[3] In 2018-19, banana production was 372,000 tonnes, with a farm gate value of $587 million and contributing $1.3 billion to the national economy.[4] Queensland accounts for 94% of Australia's banana production, mostly in North Queensland around the Cassowary Coast region, south of Cairns, Atherton Tablelands and Lakeland.[5] The remainder of banana production in Australia occurs in NSW, WA, South-East Queensland and the Northern Territory.[6]

The uncontrolled spread of pests and diseases has the potential to have a catastrophic impact on the Australian banana industry.[7] The industry faces serious threats from a number of pests and diseases, specifically Banana bunchy top virus (Bunchy Top), Leaf Spot, Leaf Speckle and Panama Wilt Tropical Race 4 (TR4).[8] The banana industry in Northern Queensland is facing challenges to contain and manage TR4, specifically Panama TR4, which has the potential to devastate the entire industry.

Early detection and ongoing management of these pests and diseases allow the best opportunity to eradicate them and prevent spread, should they enter Australia. A nationally coordinated approach is required that involves participation by government, industry and individual growers.

BA21003 commenced on 1 July 2022 and was completed on 25 March 2025. The project aimed to mitigate the risk of pests and diseases through three key objectives:

— conducting multi-pest surveillance. This allows for monitoring of where pests and diseases are occurring and their abundance

— building grower capacity and education. Increasing grower knowledge through training, farm visits and

[3] Hort Innovation, 2025, Multi-pest surveillance and grower education to manage banana pests and diseases, p. 4.

[4] Ibid.

[5] Ibid.

[6] Ibid.

[7] Ibid.

[8] Ibid.

hands on participation and control activities

— strengthen engagement in the industry. Strengthen relationships between growers, government and industry stakeholders to support a coordinated biosecurity approach.

Alignment with Strategic Investment Plan

BA21003 closely aligned with, and significantly contributed towards, the Banana Strategic Investment Plan (SIP) 2022-2026.[9] The project improved productivity, competitiveness and sustainability through delivering biosecurity and pest and disease management (Outcome 1). Further, the project has built capacity, communication and collaboration within the industry through farm visits, training sessions and awareness communications, aligning with Outcome 3.

Overall, the project aligns with the outcomes of the Banana SIP by ensuring biosecurity and improving best management practices for controlling disease, enabling the Australian banana industry to be competitive. This delivers key improvements in Australia's domestic banana industry and its biosecurity.

Table 1 Project details of BA21003

Project code	BA21003
Title	Multi-pest surveillance and grower education to manage banana pests and diseases
Research organisation(s)	Australian Banana Growers' Council
Project leader	Dr Rosie Godwin
Funding period	2022-2025
Objective	To strengthen the Australian banana industry's biosecurity by delivering coordinate multi-pest surveillance and grower education to improve early detection, management and on-farm preparedness for priority banana pests and diseases.

Source: Hort Innovation

Related investments

The project was linked with 7 other investments, these are:

— BA21000 – Identifying new resistance genes for Panama Tropical Race 4: identifying new resistance genes for Panama Tropical Race 4 (TR4). This project is focused on finding genetic markers linked to resistance against Panama TR4, which will help in breeding programs by enabling early selection of resistant banana lines.

— BA21001 – Banana industry diagnostic capacity and capability building: strengthening the banana industry's ability to accurately detect pathogens by improving diagnostics and building capacity for disease identification. It also raises awareness of exotic disease threats via stakeholder engagement.

— BA21002 – New varieties for Australian banana growers: identifying and testing new banana varieties from global breeding programs, then evaluating how they perform under Australian growing conditions.

— BA21004 – Banana integrated pest and disease management program: this project's goal is to reduce reliance on broad-spectrum chemicals by developing and promoting integrated pest-disease management.

[9] Hort Innovation (2021) Banana Strategic Investment Plan

— BA24003 – Enhancing pest surveillance, grower engagement and banana biosecurity resilience: this project builds on BA21003. It aims to strengthen disease management, grower education, surveillance protocols and biosecurity resilience across Australia's banana growing regions.

— BA17005 – Management of banana pests and diseases in North Queensland: this project funded a Plant Health Liaison Officer in North Queensland to conduct surveillance for pests and diseases, educate growers and improve on-farm biosecurity. It also collected disease data and promoted best management practices.

— BA18000 – Banana bunchy top virus project, phase 4 – national surveillance and education: focusing on surveillance in established control zones, destroying infected plants and delivering education to growers and the community to prevent spread of pests and diseases.

Governance

The governance structure of BA21003 was designed to ensure strategic alignment, scientific integrity, and effective industry engagement. Hort Innovation provided oversight to ensure the project met its objectives and aligned with industry priorities. The project was funded through the Hort Innovation Banana Fund, using grower levies and contributions by the Australian Government. Australian Banana Growers' Council was the delivery partner, with Dr Rosie Godwin as the project lead.

Additionally, the project incorporated extensive stakeholder and grower engagement. This included collaboration with banana growers through regular on-farm visits, training sessions and surveillance activities that strengthened biosecurity awareness and assisted in disease management and eradication. Also, industry wide engagement occurred through presentations at grower meetings, contributions to the Australian Bananas magazine and attendance at major industry events. These engagement activities supported grower awareness of biosecurity threats and ensured connection between key stakeholders within the industry.

The governance structure supported the enabling of ongoing alignment of research activities with the needs of industry, facilitated comprehensive stakeholder engagement ensuring the collation of diverse perspectives and dissemination of information, and ensured research findings were practical and applicable to improve the banana industry biosecurity awareness and best management practices.

Impact pathway

Table 2 Impact pathway of BA21003

Pathway	Description
Inputs and activities	**Project setup and governance** • Funded by Hort Innovation using industry levies • Biosecurity authorities such as BQ (Biosecurity Queensland) and Biosecurity NSW were part of the project • The project was managed by the Project Manager and overseen by the Project Leader • Meet regularly with ABGC staff, Project Leader, communications, finance and research manager as required to ensure the project operates effectively • Draft Board reports on Project progress **Research team, collaboration and capacity building** • Australian Banana Growers' Council (ABGC) has undertaken this project, which incorporated the previous BA18000 Bunchy Top project and the BA17005 Leaf Spot and Biosecurity Preparedness • Engaging a Biosecurity Liaison Officer to work with the community and key industry stakeholders **Bunchy Top surveillance project**

Pathway	Description
	• Inspecting all banana growing properties in Southeast QLD and Northern NSW to identify presence of Bunchy Top • Ongoing monitoring of Bunchy Top presence • Ensure Bunchy Top infested plants are destroyed either by the inspection team or the grower **Leaf Spot surveillance project** • Inspecting all banana growing properties in Northern QLD to identify presence of banana leaf spot **TR4 surveillance project** • Conduct surveillance in Northern Queensland, concurrent with leaf spot inspection, for unusual plant symptoms such as TR4 and any other exotic diseases **Survey and baseline data collection** • Biosecurity Liaison Officer visited each property twice a year to inspect for pests and diseases, and collate, review and analyse data • In Northern Queensland, visit each property to assess measures taken by a grower to adopt on-farm biosecurity disease control measures • 2 field trials were conducted on 2 separate properties, a continuation of research done in BA19002. Data from the trials was sent to the research team monthly. **Extension of existing knowledge and industry engagement** • Awareness and education program was delivered to growers, consultants, collaborating partners and the community • Cooperate with ABGC Communications team to engage growers and the public to look for symptoms, use of photos via mobile phone, reporting via Facebook and Hotline for immediate diagnosis or response
Outputs	**Project planning, governance and reporting** • Monthly updates/monthly meetings with inspection staff to identify issues, plan visits to South East Queensland (SEQ) and adjust inspection schedules, chemical and equipment requirements and decide on work program to catch up and maintain inspections • Update an accurate database of contact details for all commercial growers in the operational zones **Extension, communication, and industry engagement** • Collaboration with government and Australian and International researchers to facilitate Bunchy Top regulatory control and scientific research • 3 articles published through the Australian Bananas Magazine • 21 social media posts published on Facebook and Instagram • 4 videos produced and posted through the ABGC YouTube channel • Up to date project information and resources made available on State Government biosecurity-related websites • Up to date project information and resources made available on the project's dedicated ABGC webpage • 2 grower group presentations/workshops per year • 2 community events per year • 2 government body training events per year • Increased involvement of growers in identifying symptoms of Bunchy Top and destruction of Bunchy Top plants **Data and knowledge products** • Surveillance, detection and control data across major banana production regions • 277 Bunchy Top inspections in NSW were undertaken

Pathway	Description
	• 29 Bunchy Top inspections in SEQ were undertaken **Capacity building and research capability** • Extension material for training growers and biosecurity personnel including publications such as magazine articles, bulletins and fact sheets
Outcomes	**Strengthened BBTV surveillance and early detection** • Systematic inspection of banana properties enabled early detection and rapid destruction of Banana Bunchy Top Virus (BBTV) infected plants across NSW and Queensland. • Improved surveillance coverage and follow-up visits increased detection efficiency and reduced time between infection identification and response actions. **Improved grower biosecurity compliance and awareness** • Regular engagement through on-farm visits, education, and enforcement support increased voluntary compliance with BBTV plant destruction requirements. • Growers demonstrated improved understanding of biosecurity risks and reporting requirements, contributing to stronger on-farm disease management practices **Enhanced industry surveillance capability** • A consolidated surveillance database of commercial banana properties was developed and maintained, improving targeting of inspections and tracking of disease occurrence. • Integration of BBTV, TR4 and foliar disease surveillance improved efficiency of field operations and strengthened biosecurity intelligence across production regions. **Improved knowledge and consistency in foliar disease management (Yellow Sigatoka)** • Ongoing extension and farm-level engagement supported consistent adoption of recommended Yellow Sigatoka management practices, maintaining industry compliance with prescribed leaf spot thresholds. • Improved grower awareness of de-leafing and fungicide rotation practices contributed to sustained disease suppression within existing production systems.
Impacts	**Avoided economic losses from BBTV spread** • The project reduced the risk of BBTV establishment and spread into major banana production regions through rapid detection and destruction of infected plants. • This resulted in avoided long-term yield losses and production disruption across commercial plantations, protecting farm revenue and industry gross margins. • Improved containment reduced the likelihood of widespread plantation decommissioning and replanting costs associated with uncontrolled BBTV outbreaks. **Strengthened national banana biosecurity system** • Enhanced surveillance and coordinated response improved system-wide preparedness for BBTV and other high-priority pests and diseases, including TR4. • The integration of surveillance, compliance, and extension strengthened early warning capacity and improved responsiveness to emerging biosecurity threats. **Improved compliance culture and industry coordination** • Sustained engagement between growers, industry bodies, and state biosecurity agencies strengthened voluntary compliance and improved alignment with regulatory frameworks. • Increased awareness and enforcement support improved long-term adoption of biosecurity practices and reduced reliance on reactive control measures. **Maintained foliar disease control within existing production systems** • The project supported ongoing industry adherence to Yellow Sigatoka management standards, contributing to stable disease levels within commercial production systems. • While no additional standalone economic benefit is attributed, the project reinforced existing control practices and supported maintenance of production efficiency.

Source: ACIL Allen

Cost and benefits

Costs

Cost of the investment

This project was funded by Hort Innovation. Hort Innovation contributed $1.7 million in cash and $0.28 million in overhead costs (ex-GST amounts). Table 3 shows the total nominal cash contributions across the duration of the investment.

Table 3 Nominal costs of the investment by contributing partners of BA12003

Contribution	2021-22	2022-23	2023-24	2024-25	Total
Hort Innovation – Cash	$343,377	$419,156	$628,734	$355,217	**$1,746,484**
Hort Innovation - overheads	$50,783	$66,292	$101,327	$57,798	**$276,200**
Total	**$394,160**	**$485,448**	**$730,061**	**$413,015**	**$2,022,684**

Source: Hort Innovation

The total nominal investment of $2.02 million is then adjusted for inflation to represent the real value of the investment. Adjustment for inflation is meant to present historical costs in today's dollars by making periods comparable by converting nominal values to real values by way of adjusting for changes in purchasing power due to inflation.

Costs of the investment, in nominal terms and real terms, are provided in Table 4 below.

Table 4 Real costs of the investment BA12003

Organisation	Hort Innovation	Partner organisation	Total
Nominal costs	$2,022,684	$0	$2,022,684
Real costs ($2026 financial year)	$2,158,798	$0	$2,158,798

Source: ACIL Allen, modelled using ABS's implicit GDP deflator

Benefits

Table 5 below summarises the potential benefits of the investment and categorises them into 3 streams: economic, environmental, and social impact. It provides a description of the benefits and how the investment could achieve them. The table also shows the assessment method that was used for each benefit.

Table 5 Summary of potential impacts of BA12003

Type of impact	Assessment	Description
Economic impact	Quantified	**Avoided gross margin losses from BBTV spread** – The economic benefits of BA21003 are estimated as the avoided gross margin losses associated with the potential establishment and spread of Banana Bunchy Top Virus (BBTV) across the Australian banana industry. The maximum spatial extent of BBTV

Type of impact	Assessment	Description
		spread is derived from Cook et al. (2012)[10], which estimates that under uncontrolled conditions the virus could ultimately affect up to 81% of Australia's banana production area over a 30-year period. This value represents the upper bound of epidemic spread potential and forms the basis for the modelled exposure pathway used in the economic analysis.[11] The model compares a counterfactual scenario (no surveillance and destruction activities) with a project scenario in which ongoing surveillance, grower engagement, and eradication activities reduce the likelihood of widespread BBTV establishment. This is represented through a reduction in the probability of large-scale spread from 95% in the absence of the project to 5% with the project in place, consistent with prior BA18000 assumptions and observed containment performance.[12] Observed surveillance outcomes provide empirical support for this reduced-risk assumption. Across the project period, 6,735 infected banana plants were detected and destroyed across NSW and Queensland.[13] These removals represent active reduction of infection sources within the production system and materially reduce the likelihood of secondary spread through both planting material movement and aphid-mediated transmission. Rather than being modelled as a direct yield impact, these observations are used as evidence of effective system suppression and form part of the justification for the reduced probability of uncontrolled epidemic expansion. The annual expected benefit is therefore estimated as the product of: • the modelled area at risk following the Cook et al. spread function, • the reduction in probability of uncontrolled spread attributable to surveillance and eradication activities • assumed 100% yield loss for infected plants, and • gross margin per unit of production (farm gate price minus variable production cost). This framework estimates the expected value of avoided production losses arising from reduced likelihood of BBTV establishment and widespread industry impact.
	Unquantified	**Yellow Sigatoka management and maintenance of low disease thresholds** - The project supported continued compliance with a 5% leaf spot threshold in northern Queensland through surveillance activities, including 1,933 leaf spot inspections, advisory support and coordination with Biosecurity Queensland. Maintaining low infection levels reduces inoculum

[10] https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf; https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0042391&type=printable

[11] https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf

[12] https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf

[13] https://www.horticulture.com.au/globalassets/resources-for-delivery-partners/project-resources/ba21003-final-report.pdf, P7.

Type of impact	Assessment	Description
		pressure, protects bunch size and fruit green life, and lowers the risk that severe endemic outbreaks could mask an incursion of exotic Black Sigatoka. While published literature demonstrates that higher infection levels are associated with yield and quality reductions, this benefit has not been quantified in the CBA. The project's primary contribution was to strengthen surveillance, awareness and preparedness, enabling growers to better identify and respond to disease issues as they arise. However, insufficient information was available to determine the extent to which these activities resulted in incremental reductions in infection levels, yield losses or quality impacts relative to what would have occurred in the absence of the project. Also, insufficient data availability around the proportion of farms that changed behaviour specifically due to the project, and on incremental treatment costs attributable to project engagement further reasons to this benefit being addressed only qualitatively. In the absence of defensible adoption and cost data, quantification would rely on highly assumption-driven estimates and was therefore conservatively treated qualitatively.
	Unquantified	**Improved biosecurity awareness and grower compliance -** Through twice-yearly property visits, direct engagement with growers, and extension activities, the project strengthened industry-wide awareness of BBTV, leaf spot diseases and other biosecurity threats such as TR4. Surveillance inspections also reinforced voluntary compliance with plant destruction requirements and on-farm biosecurity practices. The reported 99% voluntary compliance with recommended leaf spot thresholds in northern Queensland demonstrates strong behavioural adoption. These improvements in awareness and compliance reduce the probability of delayed detection, under-reporting, and unmanaged spread of pests and diseases. However, the economic impact of increased awareness beyond BBTV containment is difficult to isolate because disease management outcomes are impacted indirectly through grower decision making, early detection and reporting behaviours, while also interacting with other biosecurity programs, regulatory requirements and existing industry practices. As a result, attributing measurable economic gains specifically to project-induced awareness and compliance is challenging, and therefore this benefit is treated qualitatively.
Environmental impact	Unquantified	**Strengthened national banana biosecurity system -** By promoting early detection, targeted plant destruction and compliance with disease thresholds, the project contributed to reduced likelihood of large-scale disease outbreaks requiring emergency chemical use, and lower long-term environmental risk associated with uncontrolled pathogen spread. While these impacts are important for industry resilience and regional economies, they are indirect and contingent on avoided disease spread, therefore, only the primary production loss avoidance associated with BBTV exclusion has been quantified as an economic impact.
Social impact	Unquantified	**Improved compliance culture and industry coordination -** By promoting early detection, targeted plant destruction and compliance with disease thresholds, the project contributed to protection of regional employment and supply chain stability, strengthened collaboration between industry,

Type of impact	Assessment	Description
		growers and state biosecurity authorities. While these impacts are important for industry resilience and regional economies, they are indirect and contingent on avoided disease spread, therefore, only the primary production loss avoidance associated with BBTV exclusion has been quantified.

Source: ACIL Allen

Data and assumptions

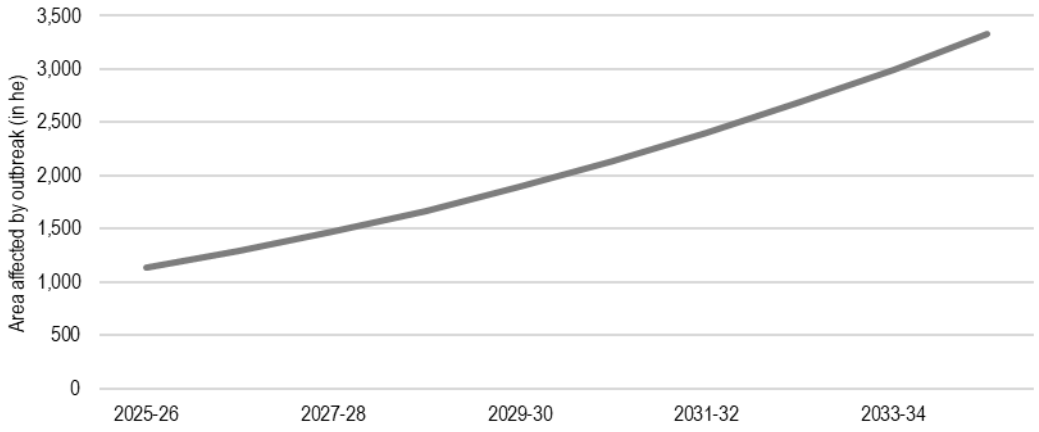
The required data, assumptions and calculations used to estimate the impacts of the investment are presented in Table 6 below. The data were sourced from project data, external sources through literature review, industry data provided by Hort Innovation and other publicly available databases. Assumptions were informed by stakeholder consultations and are designed to be conservative considering the uncertainties underlying the magnitude of the impacts.

Table 6 Data and assumptions used for BA12003

Data/Assumption	Value, source and rationale
Data	
Total banana plantation area in Australia	12,809 Ha Source: Australian Tree Crop Map Dashboard (https://www.arcgis.com/apps/dashboards/f6dd44763f0b476e8a1c2f0504fc8779)
Probability of spread	With project: 5% Without project: 95% Source: https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf Approximately 95% of national banana production occurs outside the designated BBTV control zones.[14] While surveillance and destruction activities are concentrated within these zones, their purpose is to prevent spillover into the broader production footprint. The probability differential modelled in this analysis therefore reflects the risk of system-wide spread beyond control zones, rather than infection outcomes limited to the managed areas. While BA18000 adopted a 5% probability of spread under active surveillance, to avoid overstating impact, the "with project" probability has been revised upward in sensitivity testing to reflect realistic leakage risk over time, particularly given that 95% of national production lies outside the control zones and would be exposed in the event of containment failure.
Maximum BBTV spread at the end of 30 years	81% of total production area Source: https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf
Yield	29-31 tonnes/ha

[14] https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf

Data/Assumption	Value, source and rationale
	Source: https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf Central scenario assumes a yield of 30 tonnes/ha with the low and high scenario using a yield estimate of 29 and 31 tonnes/ha respectively.
Farm gate price	$1.71/kg (in 2023-24 dollars) Source: https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf Banana prices have been particularly volatile in Australia, so sensitivity testing has considered ±20% bounds.
Production costs	$1.34/kg (in 2023-24 dollars) Source: https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/mt21015/mt21015-third-year-documents/banana-bunchy-top-virus-project-phase-4--national-surveillance-and-education-ba18000.pdf
Assumption	
Attribution	Attribution to the project: 54% based on the nominal costs of the investment as a proportion to total nominal costs of related investments. Related investments includes the following projects: • BA21000 - Identifying New Resistance genes for Panama TR4 • BA21001 - Banana Industry Diagnostic Capacity and Capacity Building • BA21002 - New Varieties for Australian Banana Growers • BA21004 - Banana Integrated Pest and Disease Management Program While cost share does not necessarily equate to proportional contribution to outcomes, it provides a transparent and consistently applied proxy for allocating benefits where multiple complementary investments contribute to shared industry-level impacts. In addition to these Hort Innovation investments, outcomes are also influenced by state biosecurity agency activities (e.g. regulatory enforcement, compliance monitoring), grower-led management practices, and broader industry biosecurity settings. Sensitivity analysis has been undertaken at 25% (low) and 60% (high) attribution to reflect uncertainty regarding the relative contribution of BA21003 compared to other concurrent contributing activities. This range captures plausible variation in the degree to which avoided spread outcomes can be attributed to this specific project.
Counterfactual	Outcomes of this project are unlikely to be achieved by organisations other than Hort Innovation, as BBTV surveillance and eradication require coordinated, industry-wide coverage across multiple jurisdictions (SEQ and NSW), sustained funding for specialised field teams, and integration with grower engagement and compliance processes. In the absence of banana industry levy investment, there is no alternative mechanism or mandate for maintaining this level of continuous surveillance intensity and coordinated response across the production system, resulting in a very low likelihood that equivalent control outcomes would be achieved.
Confidence	A 50% confidence factor has been applied to the overall expected value estimate in the CBA model to reflect uncertainty in key assumptions underpinning the projected benefits of BA21003. This includes uncertainty around the true counterfactual probability of BBTV spread, the future trajectory and speed of disease spread, the durability of containment outcomes beyond the project period, and variability in industry production and price parameters. Applying a 50% confidence weighting provides a prudent and conservative adjustment to account for

Data/Assumption	Value, source and rationale
	epidemiological, behavioural, and market uncertainties inherent in long-term biosecurity impact modelling.
Calculations	
Avoided production losses from reduced BBTV spread probability	*Area at biological risk in year t × (0.95 – 0.05) × Yield × (Farm gate price – Variable production cost)*
Logistic spread function to model affected area over time	*Area affected in year t = Maximum spread/(1+exp(-intrinsic rate of spread)*(t-t_0)* *Where r = 0.15 based on Cook et al 2012 and t_0 = 15 (inflection point)* 

Source: ACIL Allen

Net impact

A summary of the net impact of the investment is presented in Table 7 at 5% discount rate. The results show that, taking all quantified costs and benefits into account, the investment produced a positive net result. The investment has an NPV of $20.75 million and a BCR of 10.61 at 10 years after investment. While BBTV spread modelling extends over 30 years, limiting the valuation period to 10 years provides a more robust and policy-relevant estimate of benefits by focusing on the period over which assumptions regarding production area, prices, costs, and program effectiveness can be supported with reasonable confidence.

When taking only costs and benefits attributable to Hort Innovation into account, the investment generated an NPV of $20.75 million and a BCR of 10.61 at 10 years after investment completion. The benefits attributed to Hort Innovation were 100% since the project was funded solely by Hort Innovation.

Table 7 Net impact results of BA21003

	Years after investment completion		
	0	5	10
Whole investment			
PV of Costs ($m)	$2.16	$2.16	$2.16
Benefits ($m)	$0.00	$10.51	$29.62

	Years after investment completion		
	0	5	10
PV of Benefits ($m)	$0.00	$9.44	$22.91
NPV ($m)	-$2.16	$7.28	$20.75
BCR	0.00	4.37	10.61
IRR	Negative	74.4%	86.8%
MIRR	Negative	40.4%	33.7%
Attributable to Hort Innovation			
PV of Costs ($m)	$2.16	$2.16	$2.16
Benefits ($m)	$0.00	$10.51	$29.62
PV of Benefits ($m)	$0.00	$9.44	$22.91
NPV ($m)	-$2.16	$7.28	$20.75
BCR	0.00	4.37	10.61
IRR	Negative	74.4%	86.8%
MIRR	Negative	40.4%	33.7%

Source: ACIL Allen

Sensitivity analysis

Sensitivity analysis was conducted to test the robustness of susceptibility of the analysis to key assumptions and parameters. Given the uncertainty of a number of assumptions used in this CBA, sensitivity testing is important to determine the appropriateness of underlying assumptions. The results of the sensitivity analysis are presented in Table 8 below.

Table 8 Sensitivity analysis results of BA21003 at 10-year horizon

	NPV (in $M)	BCR	IRR	MIRR
Under standard assumptions (Central case scenario and 5% discount rate)	$20.75	10.61	86.8%	33.7%
3% discount rate	$23.13	11.72	86.8%	33.7%
7% discount rate	$18.68	9.65	86.8%	33.7%
Higher probability of spread in the scenario case (50%)	$9.29	5.31	46.9%	23.7%
Higher farm gate price (+20%)	$41.92	20.42	156.0%	43.7%
Lower farm gate price (-20%)	-$0.43	0.80	Negative	0.3%
Attribution rate (25%)	$8.46	4.92	43.7%	22.7%
Attribution rate (60%)	$23.32	11.80	95.4%	35.2%

Source: ACIL Allen

Key findings

The following key findings have been identified for this assessment:

- **Avoided production losses from BBTV containment represent the primary quantified benefit.** The project reduced the likelihood of BBTV spreading from 95% in the absence of intervention to 5% with ongoing surveillance, grower engagement and plant destruction activities. This reduction is applied to a biological spread curve derived from Cook et al. (2012), which estimates BBTV could ultimately affect up to 81% of Australia's banana production area under uncontrolled conditions. The quantified benefit reflects avoided gross margin losses associated with this reduced probability of widespread epidemic establishment. While surveillance data confirms the destruction of 6,735 infected plants across NSW and Queensland, the precise translation of these removals into long-term spread dynamics is uncertain and embedded within the probabilistic modelling framework.
- **System-wide surveillance and early detection capacity was strengthened across multiple pests and diseases.** The project delivered coordinated inspections across BBTV, TR4, and foliar disease risks, supported by a consolidated surveillance database and regular property visits. This improved detection efficiency, reduced response times, and enhanced targeting of high-risk properties. While these improvements contribute to reduced biosecurity risk exposure, they are not separately monetised due to overlapping effects with the primary BBTV containment benefit and limited ability to isolate marginal impacts across pests.
- **Grower compliance and biosecurity awareness were significantly improved through sustained engagement.** Regular on-farm visits, extension activities, and enforcement support increased voluntary compliance with plant destruction requirements and recommended leaf spot management practices. Reported compliance levels of approximately 99% for Yellow Sigatoka thresholds indicate strong behavioural uptake. However, while these changes reduce long-term biosecurity risk, the economic value of improved compliance beyond BBTV containment is difficult to isolate and therefore not quantified.
- **Maintained suppression of Yellow Sigatoka supported stable production systems but was not monetised.** The project reinforced existing management practices that maintain foliar disease within prescribed thresholds, supporting fruit quality, bunch size, and biosecurity readiness. However, the absence of robust adoption data, uncertainty around incremental treatment costs, and the difficulty of separating project influence from existing regulatory compliance means this benefit is treated qualitatively rather than included in the quantified results.
- **Strengthened national biosecurity coordination and preparedness capability.** Integration of surveillance, extension, and stakeholder engagement improved the overall responsiveness of the banana industry to high-priority biosecurity threats, including BBTV and TR4. These system-level benefits enhance long-term resilience but are indirect, cumulative in nature, and dependent on institutional arrangements beyond the project scope, and therefore have not been monetised.
- **Future biosecurity investments** could improve the quantification of benefits through enhanced monitoring and evaluation frameworks. While surveillance outputs such as inspections undertaken and infected plants detected were well documented, limited data were available on the extent to which project activities influenced grower decision-making, disease incidence, management costs and production outcomes. Future projects could strengthen impact assessment capability by collecting baseline and follow-up data on grower awareness, preparedness and management actions, as well as information linking surveillance activities to disease outcomes. This would support more robust quantification of the broader benefits associated with surveillance, extension and biosecurity preparedness programs.

Consultations

The following stakeholders were consulted as part of this assessment:

- Cara Jeffrey, Hort Innovation

— Rosie Godwin, Australia Banana Grower’s Council

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