

Final Report

Banana bunchy top virus project (Phase 4) – National surveillance and education

Project leader:

Dr Rosie Godwin

Delivery partner:

Australian Banana Growers' Council

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Project:

Banana bunchy top virus project (Phase 4) – National surveillance and education (BA18000)

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Level 7

141 Walker Street

North Sydney NSW 2060

Telephone: (02) 8295 2300

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Public summary

Banana Bunchy Top Virus (BBTV) is the most significant viral disease affecting bananas globally. Affected plants do not produce fruit and the disease is easily spread by banana aphids and infected planting material. If left uncontrolled, plantations can quickly become completely infected and rendered unproductive.

The overall objective of this project was to prevent BBTV from spreading outside of the BBTV biosecurity zone in Southeast Queensland (SE Qld) and the BBTV control zone in northern New South Wales (NNSW) where it currently occurs - and reduce the incidence of infection within these areas. Although BBTV has been in Australia for at least 100 years it has been successfully contained to these areas. At least 95% of the Australian industry remains free of BBTV with the exclusion benefit estimated in 2012 at A\$15.9-27.0 million.

The National BBTV Program has been operating over the last 12 years through a series of Horticulture Australia Limited and Hort Innovation-funded projects. As exclusion is cheaper and more feasible than eradication if BBTV were to spread to the northern production zone, this project (Phase 4) aimed to continue and build on the successful work of Phases 1-3 in protecting the national industry from another significant pest while making efficiencies in project management and organisation to gain budget savings.

The key outcome of this project has been that BBTV has been effectively contained to existing control zones and the national industry has been protected from a significant biosecurity threat. Effective containment of BBTV has been achieved through a program of surveillance and plant destruction within the control zone with an awareness and education program delivered to growers, consultants and collaborating partners.

Further legacy outcomes provided by this project include (i) capacity building within the industry by increasing the number of growers capable of detecting and destroying BBTV on their own farms, (ii) an increase in community awareness about BBTV through community events, and (iii) ongoing detection and destruction resources including videos to support both growers and the community. These resources are available and accessible through video streaming platforms and social media distribution networks.

It is hoped that any future R&D investment will be aimed at supporting growers share greater responsibility for effective BBTV management and its continued containment and control within its known geographical boundaries.

Keywords

Banana; bunchy top virus; BBTV; control; Australian Banana Growers' Council.

Introduction

Banana bunchy top virus (BBTV) is the most important viral disease of bananas worldwide. Affected plants do not produce fruit and if left uncontrolled, whole plantations will become completely infected. BBTV is easily spread in planting material and by the banana aphid, *Pentalonia nigronervosa*. Varietal resistance or tolerance to BBTV is not present in commercial banana cultivars and has not been identified in bananas generally.

The basic elements of control are:

- Inspecting plantations and destroying diseased plants at a frequency determined by the rate of symptom development and the sensitivity of detection.
- Preventing movement of infected planting material.
- Establishing new plantations using virus-free planting material.
- Protecting plantations from infection from outside by removing disease sources.

BBTV was introduced into Australia from Fiji more than 100 years and rapidly spread having a severe impact on production. The Australian industry at the time was located mainly in NSW and south-east QLD and large-scale disease management programs supported by government regulations, were required to enable production to continue. These management programs and the impact of BBTV have waxed and waned since then. As the major production base has moved to far north QLD and the southern industry diminished, the relative impact of BBTV on the national industry has reduced. BBTV however, still has significant impact locally in parts of south-east QLD and northern NSW, and its threat to the national industry remains high. BBTV is currently under active containment in SE QLD and northern NSW, meaning that over 95 percent of the Australian banana industry remains free of the disease.

The National Banana Bunchy Top Virus Program has been funded over the last 12 years through a series of Horticulture Australia Limited and Hort Innovation funded projects. Phase 1 and 2 of the Program (which were led by ABGC) aimed to eradicate BBTV from commercial farms by 2018. Eradication proved not to be possible given the large number of farms, presence of backyard bananas and presence of abandoned/feral bananas, but the disease was successfully contained to the control zone. The aim of Phase 3 (BA15006 and BA15007) was to contain BBTV to the control zone, eradicate from commercial farms only and suppress the disease in remaining areas within the control zone, to protect the rest of the national industry. Activities in Phase 3 were focused been on targeted surveillance and destruction of plant material on detection.

The base line surveillance frequency and intensity used throughout the three phases of the Program is centered around the number of detections recorded in the last 12 months and the time since the last detection.

In 2018, BA17001 was commissioned to analyse and model the comprehensive historical data collected during Phases 1-3 of the Program. The aim of BA17001 was to better understand the epidemiology of the virus and to inform the most economical and effective approach to surveillance and management of BBTV. There were two key findings from this project:

- Continuing the baseline scenario for surveillance and management is likely to continue to keep the disease in check.
- Most scenarios that are less stringent than the baseline have some risk of later epidemic re-occurrence and, although spread may be delayed for several years, once the incidence diverges from the baseline, the disease spreads rapidly.

If BBTV were to spread to another part of Australia particularly the north QLD production area, it has the potential to devastate the industry. Exclusion is cheaper and more feasible than eradication if BBTV were to spread outside the control zone. As outlined above, the exclusion benefit of BBTV has been estimated at more than Aus\$15.9-27.0 million in annual losses to the National industry.

It was therefore critical for the management of BBTV to be continued in this new project (BA18000) via delivery of the National Bunchy Top Virus Project (Phase 4). Phase 4 has not only provided an opportunity to continue the successful work of Phases 1-3 in containing and suppressing BBTV, but has also offered the opportunity to make efficiencies in project management and organisation.

Methodology

The main objective of this project was to prevent Banana Bunchy Top Virus (BBTV) disease from spreading outside the BBTV biosecurity zones. Specific project objectives were to:

- undertake surveillance and destruction of commercial banana plantations and residential plantations (where required), produce incidence data; and
- encourage grower self-management of BBTV in NNSW and SE Qld and deliver training and education on BBTV, via project activities and existing networks.

ABGC managed both the NSW and QLD elements as a single project and focused on delivering an effective project to ensure BBTV remained contained to the BBTV biosecurity zones. The project aimed wherever possible, to ensure commercial growers were more involved and have taken greater responsibility for BBTV management.

Implementation of a targeted and cost-effective surveillance project

A targeted and cost-effective surveillance project was instigated to contain, control and reduce the impact of BBTV in NNSW and SE QLD. The inspection strategy was informed by prior current levels of incidence in BA15006 and BA15007 and the baseline surveillance strategy developed by Rob Allen as outlined below (see [Table 1](#)). This depended on the category of farm and the infection status and data from BA15006 and 15007 to establish inspection schedules.

Table 1 - Surveillance strategy for BBTV surveillance

Farm Category	A	B	C	D	E
Number of BBTV detections in the last 12 months	0	0	1	1-10	>10
Time since last positive detection	Never	≥24 months	≤12 months	≤12 months	≤12 months
Revisit interval	12 months	12 months	1 month after infection is recorded and removed for as long as infection is recorded at successive visits. If no new infections recorded, switch to 3-month intervals for 1-12 months, then 6 month intervals for 13-24 months.		
Radius surrounding infected plantation in which surrounding backyards are checked	0	0	Based on practicalities and results from BA17001 inspection of surrounding backyards and farms will be targeted to a 0.5 km radius and within that, the areas of highest risk.		
Efficiency of visit and check	0	0	~70% overall		

When positive detections were found, the proportion of farms and backyards that were able to be inspected around an infected farm was governed by how many properties the inspection team could access. Results from BA17001 showed there to be little difference between sweep distances of 0.5 km compared to 1 km. Therefore, in this project the sweep radius and proportion of properties surveyed where possible was targeted to within 0.5 km of an infected farm and to areas of highest risk of harboring BBTV.

Standard operating procedures employed in previous projects were used for walking plantations and identifying infected plants. Treatment for aphids and destruction of plants followed the procedure outlined in the NSW Banana Bunchy Top Virus Control Order and the relevant chemical permits.

Surveillance covered by this project included:

- commercial banana plantations in NNSW and SE QLD (but not including the Bundaberg region).
- targeted surveillance where possible of non-commercial banana plantings within 0.5 km of an infected farm and along the northern line of the QLD BBTV zone (i.e. Cooroy).
- collection and management of surveillance data that could be analysed to inform program monitoring and evaluation, optimise surveillance practices, and retained for other research purposes such as determining disease latency periods.

Awareness and education program

An awareness and education program was delivered to growers, consultants, collaborating partners and the community. The two main risk pathways for BBTV spreading are via banana aphids and by movement of infected planting material. Some farms with the virus are abandoned ones, and many other detections are in residential plantings. Previously there has been little involvement or responsibility taken by growers and the community in managing BBTV. It was therefore planned that at the beginning of year one, ABGC would subcontract a social research project to be conducted by a specialist in this field of research. The aim of this work was to establish the best way to communicate information and enlist the support of growers to manage BBTV. Outcomes (see [APPENDIX 5 – Social Research Report](#)) informed the implementation of the education component of this project, and the strategy for educating growers and other stakeholders.

Growers and Consultants

A goal of this project was to increase the participation of growers in the surveillance of their farms, provide training in the detection of the disease, destruction of infected plants and management of aphids, including use of any new aphicides that become available during the life of the project, and take some ownership for management of biosecurity threats such as BBTV. This training was also to be extended to consultants and encompass activities such as one-on-one training, formal training events, field days, roadshows and participation at the 2021 Banana Industry Congress. Awareness materials such as brochures, posters, newsletters and electronic media were created and disseminated in collaboration with the ABGC Communications project.

Commercial banana farms in the BBTV zones tend to be owned and managed by farmers who have full time employment off-farm, so ABGC has recognised the limitations to transitioning the task of plant destruction to such growers. This was considered also to be the case for growers doing their own surveillance.

Biosecurity authorities

Closer collaborative relationships were fostered with biosecurity authorities such as Biosecurity Queensland (BQ) and Biosecurity NSW for improved cost-effectiveness of BBTV surveillance, management and education. This may have involved sharing data (non-confidential data only) and government staff participating in BBTV extension and training opportunities.

Exploring regulatory mechanisms to support the Bunchy Top management program initiatives included the development of a Banana Industry Code of Practice which provides more authoritative advice than an industry guideline to help growers comply with the Biosecurity Act. Codes of Practice have a special status because an approved code is automatically admissible as evidence in court proceedings.

The project has also worked closely with NSW biosecurity authorities to update their Biosecurity (Banana Bunchy Top Virus) Control Order 2021 to make it fit for purpose and harmonized with the Code of Practice. The control order is a set of requirements and measures that have been put in place to help prevent and manage the biosecurity risk posed by the spread of banana bunchy top virus (BBTV) in NSW and has application in the BBTV control zone of NSW.

High Risk Residential Plantings

Non-commercial banana plantings within 0.5 km of an infected farm and those along the northern line of the QLD BBTV zone were inspected for BBTV. This project did not aim to have commercial growers take responsibility for non-commercial disease reservoirs. The aim instead was to raise awareness of BBTV management amongst community particularly along the northern line of the BBTV biosecurity zone (e.g. Cooroy) and to a lesser extent in other areas. Based on the findings from the social research project, a range of communication material were delivered through a variety of media e.g. garden expos, local government newsletters and electronic media.

Other linkages

This project also fostered closer linkages with the National Extension Project (Qld and NSW) and Banana Industry Communication Project to disseminate information and facilitate adoption. The project undertook training of extension officers to increase their awareness of BBTV and improve their ability to detect and manage BBTV.

Results and discussion

A targeted and cost-effective surveillance program was delivered over the life of the project which successfully contained, controlled, and reduced the impact of BBTV on banana growers in the target areas of SEQ and NSW.

A total of 8159 commercial banana plants were detected and destroyed across NSW and Qld solely because of the investment in this project. Of those, 6178 were detected in the NSW Control Zone and 1981 in the Queensland Southern Biosecurity Zone. Without project control efforts, those 8159 infected banana plants would have invariably multiplied exponentially and contributed to further infestation within and to other banana growing properties in the respective control zones and potentially spread beyond those zones. Approximately 95% of commercial banana production occurs outside of those zones and remains protected.

Infection numbers from year three, where routine project implementation was disrupted as a result of COVID restrictions and extreme weather events, highlight the potential impact on the incidence of BBTV if there was to be discontinuation of external detection and destruction (project efforts) in the future (see [APPENDIX 1 – Annual plan achievements/outcomes](#) for further detail).

The effectiveness and efficiency of the surveillance program was supported by the training and retention of high-quality field staff and the development and implementation of standard operating procedures used by the surveillance crews. The project successfully trained three new BBTV detectors to address future capability risk if some existing staff were leave employment (e.g. through retirement). Further detail may be found in sections on outputs, outcomes and M&E.

Surveillance data will be collected, analysed and used to inform project strategy and future research efforts.

Extensive surveillance data was collected, analysed and used to inform project strategy as described in more detail in outputs, outcomes and the appendices. Most of the infestation recorded in commercial plantations was detected across a small number of properties in each State. These properties were the greatest draw on project resources and funds (see [APPENDIX 1 – Annual plan achievements/outcomes](#)). Communications with these property owners (or direct observation) indicate that these enterprises tend to be:

- bordering on commercial unviability because of issues unrelated to BBTV infestation,
- older growers with an uncertain transition plan to retirement or sale,
- mixed cropping where other crops are of higher priority as a result of market circumstances,
- combination of factors mentioned.

There are only two mechanisms of spread for bunchy top disease, the movement of infected banana planting material and the banana aphid. Development and promotion of a Code of Practice for planting material gives growers the reasonable and practical steps they can take to meet their biosecurity duty or obligation to minimise the risk of spreading bunchy top virus in planting material.

Control of aphids can be achieved through the proactive application of appropriate registered chemical in combination with undertaking cultural practices to deny an aphid access to material on which they can propagate (or hide). Cultural practices include stripping of dead banana leaves from a plant (de-leafing) and de-suckering (denying aphids host material present on a banana clump that will ultimately not be used for future banana fruit production) and keeping weeds low in plantations.

Proactive chemical control is not currently available to a growers, although through this project chemical companies have been provided support in field trials to enable the registration of products specifically for aphid control on bananas. Cultural practices that support aphid control in whole or in part are typically not observed as general practice within the area of operation of the project within the control zones established within Qld or NSW. On the most heavily infested properties, routine cultural practices as mentioned above are generally not being undertaken.

The project also observed that poorly maintained plantations (where there is minimal de-suckering, weed control and de-leafing to control foliar diseases), early detection of BBTV is significantly more challenging. Awareness and education resources were developed to assist growers understand the relationship between agronomic management and successful BBTV management.

An education and awareness program instigated.

The key aim of the education and awareness program was to increase the responsibility and involvement in bunchy top disease management by commercial growers, biosecurity authorities and communities in the bunchy top zone. This also included the use of planting material and improving the awareness of BBTV in areas where it is not present. This education program was informed by social research conducted at the start of the project. A great array of resources was developed and disseminated to growers, the community and other stakeholders. The quantity and range of materials developed and distributed may be found in [APPENDIX 4 – General stakeholder engagement](#) as well as in the M&E section.

Past phases of this project, which essentially provided a free service in bunchy top detection and management to a small part of the national industry to suppress the disease in those areas and protect the rest of the national industry is important however, it is a model which is expensive and no longer sustainable.

The initiatives in this project therefore have made a good start in driving a cultural change in bunchy top management to enhance the ability and responsibility of growers in the bunchy top zones to manage the disease. This will need to be supported in any follow-on project to continue to drive adoption.

Outputs

The Project has delivered significant outputs in accordance with its M&E Plan and Annual Work Plans (see [APPENDIX 1 – Annual plan achievements/outcomes](#)). A summary is provided below in [Table 2](#).

Table 2 -Output summary

Output	Description	Detail
A targeted and cost effective BBTV surveillance project that has kept BBTV contained and controlled within the designated control zones to reduce the impact of BBTV on the national industry.	A targeted and cost-effective surveillance project was instigated to contain, control and reduce the impact of BBTV in northern NSW and SE QLD. The inspection strategy was informed by prior levels of incidence in the previous project and the baseline surveillance strategy as outlined below in Table 1.	Details of surveillance outputs are provided in summary as APPENDIX 1 – Annual plan achievements/outcomes to this report. A targeted and cost effective BBTV surveillance project that has kept BBTV contained and controlled within the designated control zones.
Surveillance data has been captured, analysed and used to inform the project strategy and future research efforts.	Surveillance data was captured to document activity taken in achieving project deliverables. This was used to identify the incidence of BBTV in areas at highest risk of BBTV infection, implement the surveillance strategy and measure the success of that strategy. Further is it a driver for continual improvement and supports parallel research and development initiatives.	Surveillance data was captured during each visit within an electronic database system. Details of surveillance data collection and analysis outputs are provided in summary as APPENDIX 1 – Annual plan achievements/outcomes to this report. Use of data in delivery of the surveillance strategy and in support for scientific research is summarised in Annual Plans provided as APPENDIX 1 – Annual plan achievements/outcomes .
Extension material for training growers and biosecurity personnel. Social media for raising awareness in the community; publications e.g. magazine articles fact sheets etc.	An awareness and education program was delivered to growers, consultants, collaborating partners and the community. The approach was determined based on the findings of a social research project.	Details of extension material for training growers, biosecurity personnel and the community are provided as APPENDIX 4 – General stakeholder engagement .
Social research project report	A Social Research Project was undertaken in order to gain an insights about motivators and barriers of subtropical banana	The social research report provided specific recommendations to the BBTV project to assist in designing an effective education and awareness campaign that ensured extension effort was best directed to improving

Output	Description	Detail
	growers towards taking greater responsibility and more active participation in their own BBTV management.	<p>practice change within the banana industry and ultimately improve the efficiency of ongoing BBTV disease management.</p> <p>Findings acted as a key driver behind the development of education and awareness materials and the delivery of the campaign. A copy of the report is included as APPENDIX 5 – Social Research Report.</p> <p>An overview of engagement deliverables is provided within APPENDIX 4 – General stakeholder engagement</p>
Code of practice for planting material	The distribution of planting material infected with BBTV remains an important pathway for the spread of BBTV within and from an infected property. To address this risk, a Code of Practice was identified as a useful tool to educate growers on the risks posed through movement of planting material, best practice ways to minimise that risk, and provide a guide for growers to ensure that they are meeting their general legislative obligations to minimise that risk.	The Banana Industry Biosecurity Code of Practice for Sourcing and planting of banana plants in an area where serious pests are present was finalised on August 27, 2020 (https://abgc.org.au/biosecurity/) and aims to provide detailed guidance to growers on the use of planting material and outlines reasonable and practical steps to minimise associated biosecurity risks and protect the industry.

Outcomes

The project met key objectives throughout the life of the project – maintaining control of BBTV within designated control zones and taking steps to improve the efficiency of Project resources through active engagement with key stakeholders including industry, government and the community.

Table 3 - Outcome summary

Outcome	Alignment to fund outcome, strategy and KPI	Description	Evidence
BBTV surveillance services delivered across NSW and QLD have suppressed the incidence of BBTV within the control zone, particularly in commercial plantations, and continue to keep BBTV from spreading outside the BBTV Biosecurity zone thereby better protecting the national industry.	<p>OUTCOME 2: Increased adoption of the industry’s BMP plan that improves industry sustainability, biosecurity and environmental stewardship.</p> <p>Risk reduction for the potential incursion and/or spread of diseases due to BMP development and adoption</p>	The surveillance program was successfully delivered in SEQ and NSW according to the inspection schedule in Table 1 . This involved detection of infected plants and their destruction to prevent further spread.	<p>See APPENDIX 1 and APPENDIX 2.</p> <p>An effective, targeted and cost- effective surveillance program operating within the control zone has been delivered.</p> <p>The Project has been implemented on time, and within budget while making efficiencies.</p> <p>BBTV has continues to be contained within the control zone.</p>
Project services delivered have increased awareness, responsibility, and participation by individual	OUTCOME 2: Increased adoption of the industry’s BMP plan	The grower involvement policy was implemented in years 2&3. The heaviest infected properties	See APPENDIX 1 and APPENDIX 3 and

Outcome	Alignment to fund outcome, strategy and KPI	Description	Evidence
growers in Bunchy Top management	<p>that improves industry sustainability, biosecurity and environmental stewardship.</p> <p>Risk reduction for the potential incursion and/or spread of diseases due to BMP development and adoption</p>	<p>are now completing their own destruction activities in their own time at their own cost. Further, detection and destruction is occurring between scheduled project inspection intervals. Engagement with biosecurity authorities is ongoing. Best practice in sourcing planting material in accordance with its Code of Practice continues to be promoted.</p>	<p>APPENDIX 4.</p> <p>Greater responsibility and involvement in bunchy top disease management is being taken by commercial growers, biosecurity authorities and communities in the bunchy top zone has been delivered. This includes in the use of planting material publication of a Code of Practice. Greater awareness of Bunchy top outside the zone has been achieved through workshops, communications and materials.</p>
The national banana industry is well informed of the current status of bunchy top in Australia and the risks associated with its spread and potential impact on the industry	<p>OUTCOME 2: Increased adoption of the industry’s BMP plan that improves industry sustainability, biosecurity and environmental stewardship.</p> <p>Risk reduction for the potential incursion and/or spread of diseases due to BMP development and adoption</p>	<p>ABGC continues to act as a conduit to disseminate information about BBTV, project status and project resources through two dedicated pages on its website (https://abgc.org.au/banana-bunchy-top/ and https://abgc.org.au/biosecurity/) and through direct engagement with stakeholders.</p>	<p>See APPENDIX 3 and APPENDIX 4.</p> <p>Stakeholder training and material development and distribution has kept the industry well informed.</p>
Residential people are better informed about bunchy top and impact of the disease on the national industry and communities	<p>OUTCOME 2: Increased adoption of the industry’s BMP plan that improves industry sustainability, biosecurity and environmental stewardship.</p> <p>Risk reduction for the potential incursion and/or spread of diseases due to BMP development and adoption</p>	<p>The Project continues to engage with residential growers. Community engagement was undertaken through community events in high-risk areas and a video was published to inform and educate backyard growers as an ongoing resource.</p>	<p>See APPENDIX 3 and APPENDIX 4.</p> <p>Face to face visits with residential people, community events and resources developed and distributed have kept the residential people well informed.</p>
A more extensive data set and analysis has helped inform future efforts in BBTV R&D	<p>OUTCOME 2: Increased adoption of the industry’s BMP plan that improves industry sustainability, biosecurity</p>	<p>Data collection and utilization has been reviewed and updated and its improvement has been ongoing with a view to</p>	<p>See APPENDIX 1. Annual Plans document achievement of data set growth and</p>

Outcome	Alignment to fund outcome, strategy and KPI	Description	Evidence
	and environmental stewardship. Risk reduction for the potential incursion and/or spread of diseases due to BMP development and adoption	improving efficiency in its future use. Data is supplied to research partners to support their research initiatives.	dissemination to research partners.
Growers and other stakeholders have a greater understanding of Bunchy Top disease, its epidemiology and most effective management strategies. The risk of a potential potential incursion and/or spread of diseases has been reduced	OUTCOME 2: Increased adoption of the industry’s BMP plan that improves industry sustainability, biosecurity and environmental stewardship.	The Project continues to roll out its competency-based training program to affected growers. Communications materials produced support this initiative.	See APPENDIX 3 and APPENDIX 4.

Monitoring and evaluation

A Monitoring and Evaluation (M&E) Plan was developed for the project to ensure a foundational basis for review and evaluation and the drive continual improvement.

The Plan focussed around on key domains to be considered – Effectiveness, Relevance, Process appropriateness and Efficiency.

Key evaluation questions were developed to clarify areas of operation and consider continual improvement opportunities to be reflected in Annual Operational Plans. [Table 4](#) below provides an end of project evaluation of these key questions.

Table 4 - Key evaluation questions

Key Evaluation Question	Project performance	Continuous improvement opportunities
<p>Effectiveness</p> <p>To what extent has:</p> <ol style="list-style-type: none"> 1. Surveillance been conducted in the bunchy top biosecurity zones for the incidence of BBTV. 2. Bunchy top been contained and suppressed within the zones and prevented spread outside the zone 3. The awareness and understanding of bunchy top management among commercial growers and communities been enhanced the responsibility of growers in managing bunchy top been increased. 4. A code of industry practice for planting material been developed for industry and approved by state authorities. 	<ol style="list-style-type: none"> 1. Achieved - Project surveillance has more than met the proposed in the surveillance strategy as demonstrated in the outputs (see APPENDIX 1 – Annual plan achievements/outcomes) 2. Achieved - BBTV continues to be contained and suppressed within the zones. Spread has been prevented outside these zones as a result of project activities. 3. Achieved- The awareness and understanding of bunchy top has been significantly increased through awareness activities and materials delivered (see APPENDIX 4 – General stakeholder engagement). 4. Achieved. 97% of commercial visits are being attended by a grower. However, 	<p>The project will continue to drive a cultural change in BBTV management in BA21003 by:</p> <ul style="list-style-type: none"> • continuing to train growers in BBTV detection and management • encouraging more growers to take more responsibility for finding and destroying BBTV affected plants. • encouraging growers to undertake better agronomic care of their plantations to maximise the health of their plants and enhance the ability to detect and control aphids in their plantations.

Key Evaluation Question	Project performance	Continuous improvement opportunities
	<p>only 7% of farm visits were attended by a grower in SE QLD. (See APPENDIX 3 – Grower education and training)</p> <p>5. Achieved - A Code of Practice was produced and delivered to government authorities. The Code will educate growers in best practice and allow government authorities to consider how a person is meeting their General Biosecurity Obligation or Duty.</p>	<ul style="list-style-type: none"> • promoting the code of practice for sourcing and planting of banana material • encouraging growers to follow the code of practice
<p>Relevance</p> <p>To what extent has the project</p> <ol style="list-style-type: none"> 1. met the needs of growers, the national industry and other industry stakeholders and biosecurity authorities for managing bunchy top disease 2. Protected the major production areas from bunchy top. 	<ol style="list-style-type: none"> 1. Achieved - This project met the needs of growers in the national industry and other stakeholders by <ul style="list-style-type: none"> • increasing the knowledge of bunchy top amongst growers and other stakeholders • increasing the responsibility of growers in management of the disease. 2. Achieved – BBTV remains contained within established Control zones protecting the remaining 95% of commercial production free of BBTV. 	<p>Cultural change takes a significant amount of time and the BA21003 will continue to reinforce the initiatives of BA18000.</p> <p>Growers will continue to be supported through the project not just in the BBTV biosecurity zones but outside of these zones.</p> <p>Early detection of pests is key to successful eradication and containment programs.</p> <p>Activities to underpin knowledge and understanding of BBTV by commercial growers, stakeholders and the community are critical to the successful containment and suppression of BBTV</p>
<p>Process appropriateness</p> <p>To what extent</p> <ol style="list-style-type: none"> 1. Were target levels of engagement of growers in SEQ and NNSW achieved? 2. Was the range of communication and engagement processes used to the target audience appropriate? 3. Was content regularly provided through the communications project? 4. To what extent did this project collaborate with the national extension project in order to engage the target audience? 	<ol style="list-style-type: none"> 1. Achieved - This project met all levels of engagement of growers in SEQ and NNSW. 2. Achieved -The range of communication and engagement processes was varied and appropriate and had considerable reach. (See APPENDIX 4) 3. Achieved -Content was regularly provided to through the national communications project (See APPENDIX 4 – General stakeholder engagement). 4. Achieved -The project collaborated through the national extension project by running workshops in NQ, engaging the NSW banana extension officer to the PRG. 	<p>A new engagement strategy will be developed in BA21003 build on momentum gained in BA18000 yet address gaps in engagement and communication that were unable to be delivered because of the pandemic.</p> <p>Any future project will strengthen links with the national extension project to project to enhance the delivery of R&D and enhance engagement with the subtropical industry.</p>
<p>Efficiency</p> <p>To what degree has this project:</p> <ol style="list-style-type: none"> 1. Implemented agreed activities according to agreed schedules and budgets outlined in the research agreement? 2. Made effort to achieve value for money? 	<ol style="list-style-type: none"> 1. The project was generally very efficient in implementing agreed activities within budget and on time despite the challenges of COVID 19 and natural disasters associated with the floods. Delays have occurred only in running the planned NSW workshops outside the control zone despite challenging times. The project has addressed succession planning in terms of BBTV detection capability by training two new BBTV detectors. 2. The project made every effort to achieve value for money which is demonstrated by project activities being delivered within budget and on time. The three highest 	<p>The project will continue to strive for value for money by ensuring more growers take an active role in BBTV management. The project's grower involvement policy will be more strictly enforced to reduce inspection time associated with detection and treatment associated costs.</p> <p>Community support videos should continue to be provided, reducing the time taken to respond to false positive reports and instructing residents in infected plant destruction.</p>

Key Evaluation Question	Project performance	Continuous improvement opportunities
	contributors to BBTV infection numbers are now destroying infected plants detected on their properties. This has halved inspection time and eliminated chemical costs on their properties.	

Recommendations

- 1) Active investment in detection and destruction activity directed at growers (and the community) coupled with engagement through education and training is still required at this point in time.
- 2) Project investment should not be continued on an infested property where:
 - a grower shows no interest in being trained and investing in their own biosecurity future by the taking proactive and appropriate steps to detect and destroy infestation on their own property; and
 - containment can be achieved through lesser investment by focussing detection, destruction and training resources on surrounding properties (if any) that may be subject to an increased risk of infestation.
- 3) For a property that does not meet the criteria specified in recommendation 2), a grower is referred to the relevant State Government agency for assessment as to whether they are meeting their General Biosecurity Obligation or General Biosecurity Duty in that jurisdiction.
- 4) Any future investment continues to assist in supporting the registration of chemicals by external parties that may contribute to proactive and reactive control of aphids as the primary vector of the disease.
- 5) Any future investment continues to assist in furthering research and development into vector (banana aphid) control.
- 6) Promotion of best practice in cultural controls must continue.
- 7) Any future investment includes actively consulting with relevant State government in regard to that government playing its part in accordance with their legislation and shared biosecurity responsibility principles.

Refereed scientific publications

Nil.

Intellectual property

No project IP or commercialisation to report.

Acknowledgements

This final report acknowledges the hard work and commitment of the following project staff in delivering this project in often difficult circumstances – Dr Rosie Godwin, Grant Telford, Carena Rose, Wayne Shoobridge, Grant East, Samantha Stringer, Josh Chapman, Lachlan Hohnberg, Amardeep Singh, Ken English, David Peasley and Anne Phillips.

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Finally it acknowledges the assistance provided by ABGC support staff in particular Amy Spear and Diann Delai, the New South Wales and Queensland Governments, growers, and the community in furthering the objectives of this project.

Appendices

APPENDIX 1 – Annual plan achievements/outcomes

APPENDIX 2 – Surveillance achievements/ outcomes

APPENDIX 3 – Grower education and training

APPENDIX 4 – General stakeholder engagement

APPENDIX 5 – Social Research Report

APPENDIX 1 – Annual plan achievements/outcomes

This Appendix shows delivery of project activities in accordance with annual plans.

Year 1 outcomes

Action	Date	Outcome
Check and verify existing data from Phase 3 - No. of plantations, area, surveillance data, infection categories for NSW and SE Qld.	Throughout Year 1	Achieved
Adjust inspection schedules according to verified data.	Monthly throughout Year 1	Achieved
Hold monthly meetings with inspection staff to identify problem issues, plan visits to SEQ (monthly for BT plantations), adjust inspection schedules, chemical and equipment requirements, decide on work program to catch up and maintain inspections as per infection categories.	Monthly throughout Year 1	Achieved
Cooperate with Prof John Thomas and team to conduct field research on: <ul style="list-style-type: none"> possible aphid resistance to Confidor® aphid transmission trials - Newrybar No 73031 to investigate latency and whether BT virus can be transmitted from latent or asymptomatic plants (possible reason for the Newrybar outbreak aphid suppression spraying - Biopest Oil in 10m radius of all infected plants (Newrybar section and Eungella outbreak) to assess efficiency in reducing aphid spread (Oct - Dec 2019). 	Throughout Year 1	Achieved Some of these trials were delayed because of border travel restrictions associated with Covid 19
Educate growers in detecting BT symptoms - on site, use of magnifier, Facebook and Hotline Number.	Throughout Year 1	Achieved
Cooperate with ABGC Communications team to engage the general public in the BBTV risk area in looking for symptoms, use of photos via mobile phone, reporting via Facebook and Hotline for immediate diagnosis or response. Share regular updates, videos, experiences.	Throughout Year 1	Achieved
Re-instate full inspection capacity - advertise and employ trainee inspector (s).	By Feb 2020	Achieved
Report progress to BGA meetings (3 per year) and PRG (Biannually).	Throughout Year 1	Achieved
Meet regularly with ABGC staff, Project Leader, communications, finance, and research manager as required to ensure project operates effectively and within budget - monthly if possible.	Throughout Year 1	Achieved
Conduct workshops to educate Biosecurity staff - NSW and FN Qld and Garden Clubs in detection of BBTV symptoms. Develop education aids - Cryovac leaf, pocket magnifiers.	Three per year	Achieved Year 2 This was scheduled to occur between Jan and Jul 20 but was postponed due to Covid 19.
Report neglected or weedy (TWI) plantations to Biosecurity staff for action.	Throughout Year 1	Achieved
Review project budget quarterly and discuss any variations with Project Leader and Research Manager.	Jan 20 Apr20 Jul 20	Achieved

Year 2 outcomes –report and review of plan

Action	Achievement/ Strengths/ Opportunities
Commission a professional videographer to make two videos of bunchy top detection and destruction of plants.	<p>Achieved 2 videos produced. COVID restrictions prevented completion midway through Year 2 (see APPENDIX 4 – General stakeholder engagement).</p> <p>Strengths Despite Project longevity the videos have been produced to support ongoing industry imperatives to detect and control BBTV. Supports industry capability.</p> <p>Opportunities Production has occurred under budget. It is proposed that two additional videos are produced during Year 3 focusing on impact of BBTV from an infected grower perspective, and cultural controls supporting cultural controls supporting best practice BBTV (and other disease) control (de-suckering, de-leafing, weed control).</p>
Update and ensure an accurate data base of contact details is kept for all commercial growers in the subtropical bunchy top zone.	<p>Achieved</p> <p>Strengths Has supported on-going biosecurity information dissemination and control. Supports industry capability.</p> <p>Opportunities For the BBTV project, ensure contact information is incorporated into the ABGC AgKonect databases. This information is currently held (and can be made available to other projects which may support disease control) as a separate database.</p>
Check and update data from Year 1 including No. of plantations, area, surveillance data, infection categories for NSW and SE Qld.	<p>Achieved Complete review of all data is ongoing.</p> <p>Strengths See above. Supports industry capability.</p> <p>Opportunities See above.</p>
Adjust inspection schedules according to verified data.	<p>Achieved</p> <p>Strengths Required to continue effectively.</p> <p>Opportunities Automate from manual labour intensive system and provide for oversight and analysis.</p>
Hold monthly meetings with inspection staff to identify problem issues, plan visits to SEQ (monthly for BT plantations), and adjust inspection schedules, chemical and equipment requirements, decide on work program to catch up and maintain inspections as per infection categories.	<p>Achieved</p> <p>Strengths Required to continue. Supports ongoing continual improvement.</p> <p>Opportunities Automate from manual labour intensive system and provide for oversight and analysis.</p>
Cooperate with Prof John Thomas and Dr Kathy Crew team to conduct field research on to investigate latency and transmission.	<p>Achieved</p> <p>Strengths Supports ongoing continual improvement, efficiency and effectiveness in disease control. Drives project policy.</p> <p>Opportunities Not applicable.</p>

Action	Achievement/ Strengths/ Opportunities
<p>Educate growers in detecting BT symptoms on site (e.g. use of magnifier, Facebook, and Hotline Number), enhance growers understanding of the legislation relevant to bunchy top disease and their obligations under the law, encourage growers greater participation in management (aphid control and destruction of infested plants.)</p>	<p>Achieved Education and awareness materials produced. Project policy on grower participation issued.</p> <p>Strengths Supports ongoing continual improvement, efficiency and effectiveness in disease control. Drives project policy.</p> <p>Opportunities No requirement to include magnifier in Year 3. Support other promotional opportunities.</p>
<p>For each farm visited a record of the: a) presence of the owner/grower, b) involvement in bunchy top detection and c) level of participation in the destruction of infested plants will be kept. The goal in year 2 will be to increase involvement of growers particularly in familiarisation with symptoms of BBTV and the destruction of bunchy top affected plants. Category D&E growers will be targeted as a priority.</p>	<p>Achieved Project policy on grower participation issued. Data collected with formal data collection to be included in Konnect updates post transition from Konnect to ABGC. See APPENDIX 3 – Grower education and training</p> <p>Strengths Supports ongoing continual improvement, efficiency and effectiveness in disease control. Drives project policy.</p> <p>Opportunities Increase involvement of growers particularly in familiarisation with symptoms of BBTV and the destruction of bunchy top affected plants. Category D&E growers (and those that do not respond and those with obvious infection) will be targeted as a priority.</p>
<p>Develop a framework and operating procedure on how the project and biosecurity authorities will work together with growers to effectively manage bunchy top detections.</p>	<p>Achieved Meetings held with QLD and NSW policy and operational staff to establish a foundation for further improvement. Project resources and initiatives referenced on relevant government websites - https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/bunchy-top and https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/crop-growing/priority-pest-disease/banana-bunchy-top. Consultation on NSW BBTV Control Order. Communications pathway established.</p> <p>Strengths Supports ongoing support from biosecurity authorities and support for ongoing disease control.</p> <p>Opportunities Maintain support and focus on Industry-driven initiatives including Codes of Practice backed up by regulatory instruments.</p>
<p>Cooperate with ABGC Communications team to engage the public in the BBTV risk area in looking for symptoms, use of photos via mobile phone, reporting via Facebook and Hotline for immediate diagnosis or response. Share regular updates, videos, experiences.</p>	<p>Achieved See APPENDIX 4 – General stakeholder engagement.</p> <p>Strengths Supports ongoing support from biosecurity authorities and support for ongoing disease control.</p> <p>Opportunities Maintain support and focus on Industry-driven initiatives including Codes of Practice backed up by regulatory instruments.</p>
<p>Training of new inspection personnel</p>	<p>Achieved</p> <p>Strengths Supports project efficiency and effectiveness.</p> <p>Opportunities Not applicable.</p>

Action	Achievement/ Strengths/ Opportunities
Report progress to BGA meetings (3 per year) and PRG (Biannually).	<p>Achieved</p> <p>During this reporting period, as a result of COVID related restrictions, BGA meeting have been postponed or delayed but information continues to be disseminated through those channels whenever possible.</p> <p>Strengths</p> <p>Biannual meetings of the PRG to provide guidance and direction continue to be undertaken prior to issue of each milestone report. BGA meeting support information distribution and area specific opportunities for improvement.</p> <p>Opportunities</p> <p>Not applicable.</p>
Meet regularly with ABGC staff, Project Leader, communications, finance, and research manager as required to ensure project operates effectively and within budget - monthly if possible.	<p>Achieved</p> <p>Strengths</p> <p>Required.</p> <p>Opportunities</p> <p>Not applicable.</p>

Year 3 outcomes

Criteria/ Theme	Action	Date/Status/Justification
Capability and capacity building	Commission a professional videographer to make two videos.	Achieved
	Two additional videos to be produced during Year 3 focusing on impact of BBTv from an infected grower perspective, and cultural controls supporting best practice BBTv (and other disease) control (de-suckering, de-leafing, weed control).	<p>Two videos were completed and published during the last reporting period. During this planning period one video (https://www.youtube.com/watch?v=m5A-9V-thyY) has been produced focusing on both impact of BBTv from an infected grower perspective and cultural controls supporting best practice BBTv (and other disease) control (de-suckering, de-leafing, weed control).</p> <p>See (see APPENDIX 4 – General stakeholder engagement)</p>
	Training of new inspection staff and other personnel where required.	<p>Achieved</p> <p>One new inspector was recruited during year 3 and has very quickly developed extensive skills in BBTv detection and destruction. Another advantage of the new trainee is that he is fluent in Punjabi and can assist in training Punjabi growers in the area.</p>
	<p>Update and ensure an accurate data base of contact details is kept for all commercial growers in the subtropical bunchy top zone.</p> <p>Ensure contact information is incorporated into the ABGC AgKonec databases. This information is currently held (and can be made available to other projects which may support disease control) as a separate database.</p>	<p>Achieved</p> <p>Current contact details for growers have been updated in the database. Further, the data system has been updated to capture active/inactive status of properties in the system.</p>

Criteria/ Theme	Action	Date/Status/Justification
Maximise operational efficiency	<p>Check and update data including number of plantations, area, surveillance data, infection categories for NSW and SE Qld.</p> <p>Adjust inspection schedules according to verified data.</p> <p>Automate from manual labour intensive system and provide for oversight and analysis.</p> <p>Hold monthly meetings with inspection staff to identify problem issues, plan visits to SEQ (monthly for BT plantations), adjust inspection schedules, chemical and equipment requirements, decide on work program to catch up and maintain inspections as per infection categories.</p>	<p>Achieved</p> <p>Updates to changes in property data and status are ongoing and up to date.</p> <p>Inspection schedules are updated and steps have been taken to move away from paper based only systems.</p> <p>Project updates are sent to field staff at least monthly and emails/calls between field staff/ team leaders / and managers are ongoing.</p> <p>Changes to inspection schedules to address specific risk on properties remain flexible to address risk as it arises.</p>
Supporting science and research	<p>Cooperate with Prof John Thomas and Dr Kathy Crew team to conduct field research conducted under project BA19002.</p>	<p>Achieved</p> <p>The project has assisted in research activities undertaken under project BA19002. The project has assisted Staphyt to support registration of chemical products (Versys) for on-label use of registered chemicals to control banana aphid.</p>
Shared responsibility	<p>Educate growers in detecting BT symptoms on site (e.g. Facebook, and Hotline Number), enhance growers understanding of the legislation relevant to bunchy top disease and their obligations under the law, encourage growers greater participation in management (aphid control and destruction of infested plants).</p> <p>For each farm visited a record of the:</p> <p>a) presence of the owner/grower; b) involvement in bunchy top detection; and c) level of participation in the destruction of infested plants will be kept.</p> <p>Increase involvement of growers particularly in familiarisation with symptoms of BBTV and the destruction of bunchy top affected plants. Category D&E growers (and those that do not respond and those with obvious infection) will be targeted as a priority.</p> <p>Work with biosecurity authorities to effectively manage bunchy top detections.</p> <p>Maintain support and focus on Industry driven initiatives including Codes of Practice backed up by regulatory instruments.</p>	<p>Achieved</p> <p>Education and engagement activities are captured in APPENDIX 3 – Grower education and training and APPENDIX 4 – General stakeholder engagement.</p> <p>For each farm visited records have been captured and maintained. Growers have been involved and trained in BBTV detection and destruction where relevant and possible.</p> <p>Engagement with biosecurity authorities was on-going. During year 3 biosecurity authorities in both States have sought to review the biosecurity content related to BBTV on their websites. The project was consulted by both States and suggestions provided.</p> <p>NSW has updated their website based on</p>

Criteria/ Theme	Action	Date/Status/Justification
		Project recommendations and has supported resources produced by the Project including references to the Project's Code of Practice. Significant consultation was undertaken with the Project in the updating of the NSW Control Order for BBTV in order to greatly simplify and clarify the Order's requirements in the spirit of taking a shared responsibility approach.
Internal and external communications	<p>Cooperate with ABGC Communications team to engage the public in the BBTV risk area in looking for symptoms, use of photos via mobile phone, reporting via Facebook and Hotline for immediate diagnosis or response. Share regular updates, videos, experiences.</p> <p>Report progress to BGA meetings (3 per year) and PRG (Biannually).</p> <p>Meet regularly with ABGC staff, Project Leader, communications, finance, and research manager as required to ensure project operates effectively and within budget - monthly if possible.</p>	<p>Achieved</p> <p>For ABGC communications see APPENDIX 4 – General stakeholder engagement.</p> <p>Communication with BGAs occur routinely as part of ABGC practices. COVID restrictions have however prevented face-to-face meetings. Information on project progress is provided to the ABGC board quarterly as well as ABGC articles produced in the Australian Banana Magazine.</p> <p>Typically PRG meetings are scheduled prior to milestone reporting, however in the lead up to the end of the calendar year and the reporting date, a PRG meeting in December was not possible. A meeting however was conducted on 20 January 2022 to accommodate.</p>

APPENDIX 2 – Surveillance achievements/ outcomes

The Banana Bunchy Top Project (Phase 4) (BA18000) has completed its third and final year of activity. The project has achieved its primary objective to contain Banana Bunchy Top Virus (BBTV) to its existing containment zones in New South Wales (NSW) and Southeast Queensland (SEQ).

NSW Commercial Surveillance Activity

NSW Localities subject to commercial surveillance

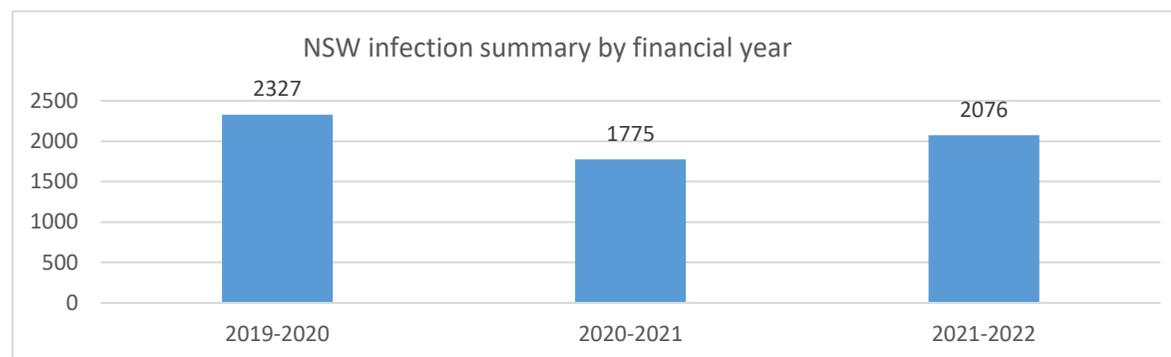
A total of **562 visits in Year 1**, **648 visits in Year 2** and **609 visits in Year 3** were conducted across the following localities within the NSW Control Zone throughout the life of this project.

LOCALITIES VISITED NSW					
BILAMBAL HEIGHTS	CUDGEN	FERNVALE	MONTECOLLUM	PALMWOODS	TERRANORA
BURRINGBAR	DUNBIBLE	GOONENGERRY	MOOBALL	PIGABEEN	TOMEWIN
BYANGUM	DUNGAY	HOPKINS CK	MOOBALL NTH	PIGGABEEN	TULLERA
CAROL	DUNOON	KYNNUMBOON	MOOBALL STH	RESERVE CK	UPPER BURRINGBAR
CHILLINGHAM	DURANBAH	MAIN ARM	NEWRYBAR	ST HELENA	WHIAN WHIAN
CONDONG RANGE	EUNGELLA	MAIN ARM	NORTH ARM	STH ARM	YELGUN
CRABBES CREEK	EUNGELLA-ZARA	MODANVILLE/NUMULGI	NUMULGI	STOKERS SIDING	

NSW Infection summary by financial year

The following graph provides an annual summary of detections in **Year 1 (July 2019 to June 2020)**, **Year 2 (July 2020 to June 2021)** and **Year 3 to date (July 2021 to 22 June)**. **A total of 6178 infected plants** were detected and destroyed on commercial banana plantations in NSW throughout the life of the project.

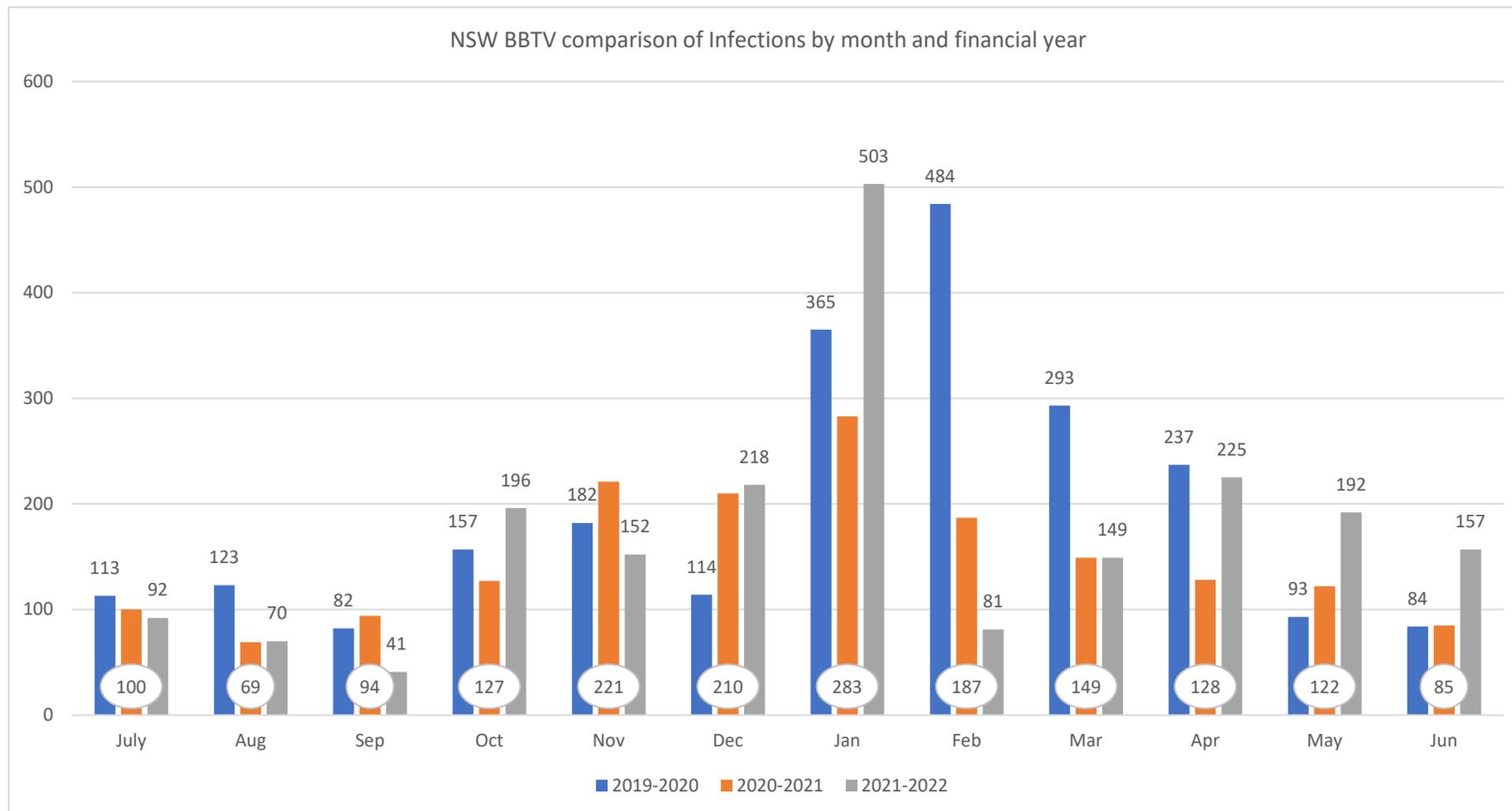
As a baseline, approximately 2000 infected banana plants were detected between July 2018 and April 2019 in the final year of Phase 3 of the previous project BA15007.



NSW Infection trends by month and financial year

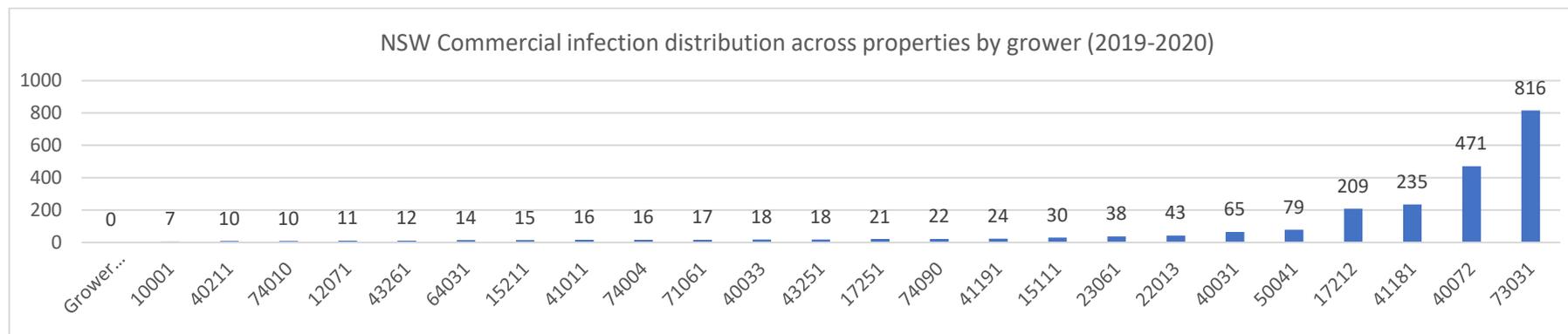
The following graph provides an overview on project progress between **Year 1 (July 2019 to June 2020)**, **Year 2 (July 2020 to June 2021)** and **Year 3 to date (July 2021 top 22 June)**. It shows infection numbers and trends by month across each year of operation of the project.

NOTE – The Grower Involvement Policy was introduced in October 2020.



NSW Overview of Year 1 – Main sources of infection by year

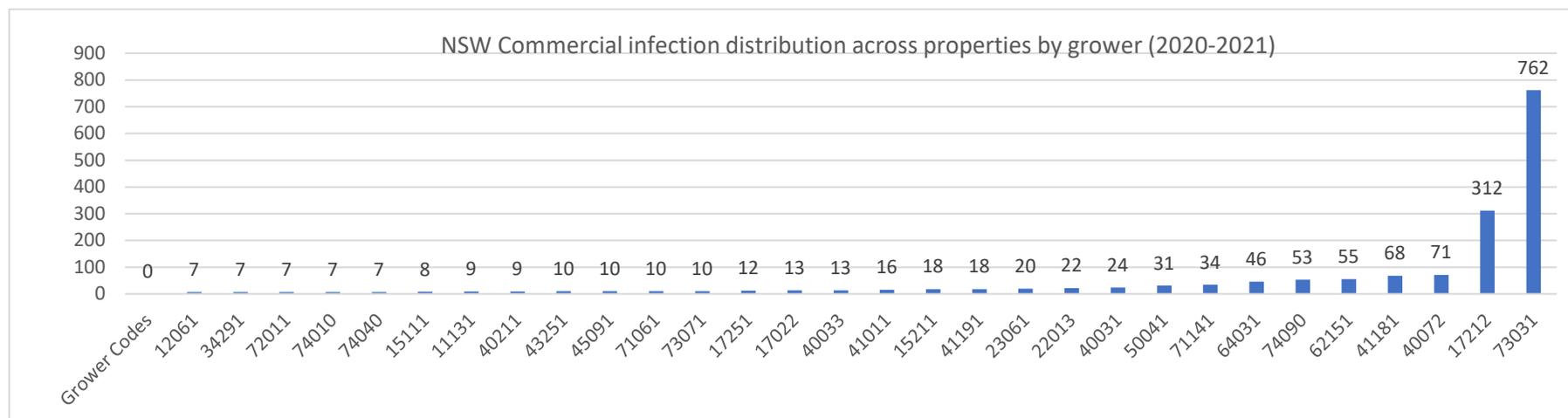
A total of 2327 infected plants were detected in Year 1. As indicated below, of these almost 75% of infected plants were detected across 4 properties, with one property (73031) accounting for 35% of total infection and another (40072) accounting for 20% of total infection. Both property owners were required to accompany inspectors and treat their own infected plants.



Total quantity of infections at each farm in NSW for FY2019-2020, excluding farms with less than 7 infections recorded (for display purposes).

NSW Overview of Year 2

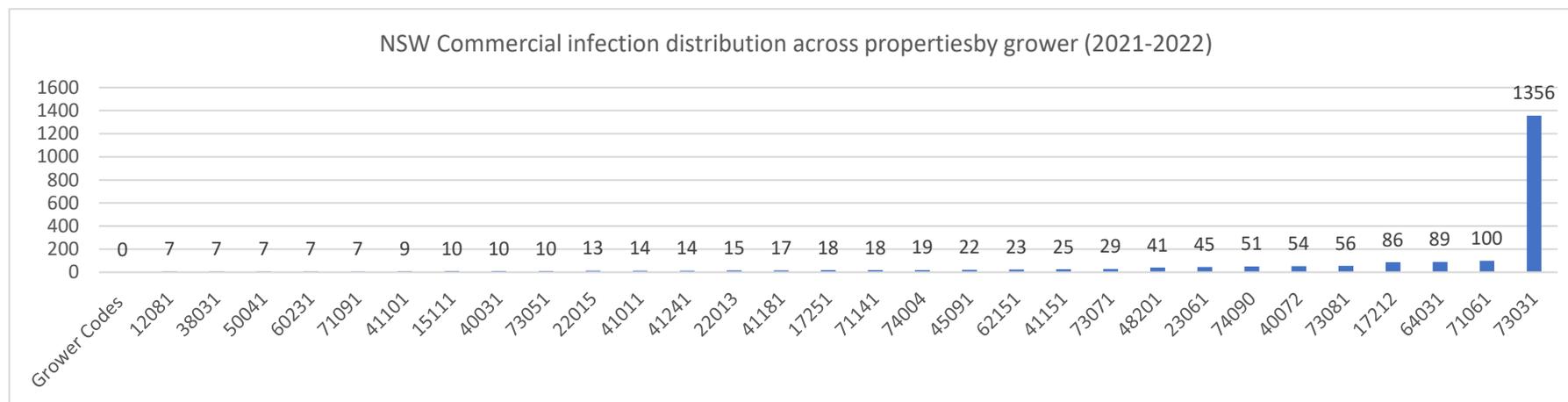
A total of 1775 infected plants were detected in Year 2. As indicated below, of these, over 60% of infected plants were detected across 2 properties, with one property (73031) accounting for 43% of total infection and another (17212) accounting for 18% of total infection.



Total quantity of infections at each farm in NSW for FY2020-2021, excluding farms with less than 7 infections recorded (for display purposes).

NSW Overview of Year 3

A total of 2076 infected plants were detected in Year 3 (to 22 June). Of these, over 65% of infected plants were detected on one property (73031).



Total quantity of infections at each farm in NSW for FY2021-2022, excluding farms with less than 7 infections recorded (for display purposes).

NSW farm category at end of project

The following Table shows the number of individual farms in each category for the purposes of applying the surveillance schedule. *End of Phase 3 for reference – CAT(A) 45, CAT(B) 94, CAT(C) 31, CAT(D) 38 and CAT(E) 24. 234 Farms.*

CAT	No. properties in each category at end of project	CAT Description	Revisit interval
A	45	BT never recorded	Annually
B	69	No detections within 24 months	Annually
C	38	No more than 1 infection in the previous 12 months	1 month after infection is recorded and removed for as long as infection is recorded at successive visits. If no new infections recorded, switch to 3 month intervals for 1-12 months then 6 month intervals for 13-24 months.
D	47	More than 1 infection in the previous 12 months	
E	5	More than 10 infections in the previous 12 months	
	204		

SE Qld Commercial Surveillance Activity

SEQ Localities subject to commercial surveillance

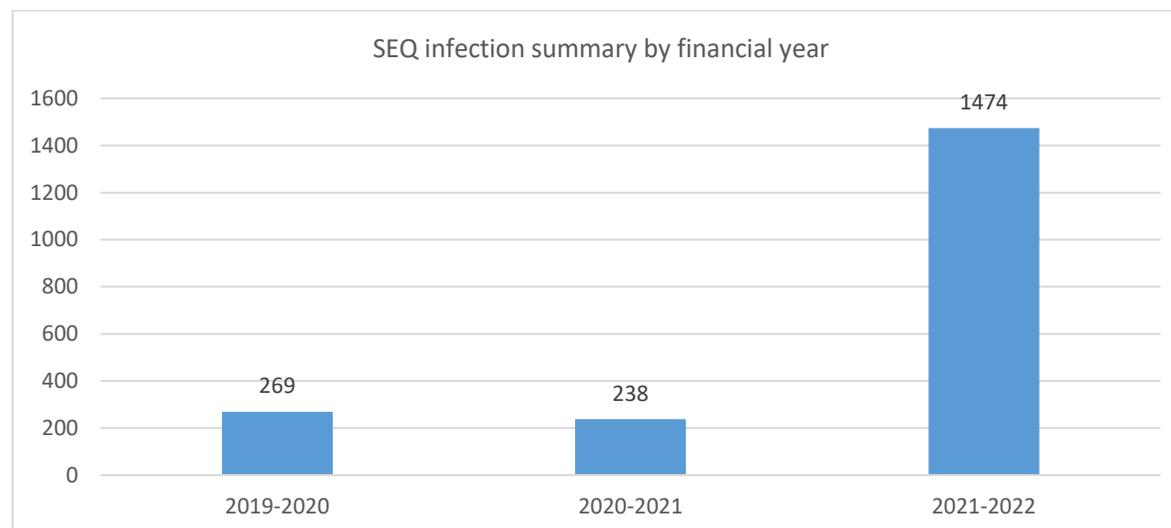
A total of **96 visits in Year 1**, **81 visits in Year 2** and **71 visits in Year 3** were conducted across the following localities within the SE QLD Biosecurity Zone throughout the life of this project.

LOCALITIES VISITED SEQ	
KULANGOOR	ROCKSBERG
MONTVILLE	TALLEBUDGERA VALLEY
MOOLOOLAH	WAMURAN
NARANGBA	YANDINA

SEQ Infection summary by financial year

The following graph provides an annual summary of detections in **Year 1 (July 2019 to June 2020)**, **Year 2 (July 2020 to June 2021)** and **Year 3 to date (July 2021 to 22 June)**. **A total of 2250 infected plants** were detected and destroyed on commercial banana plantations in SEQ throughout the life of the project.

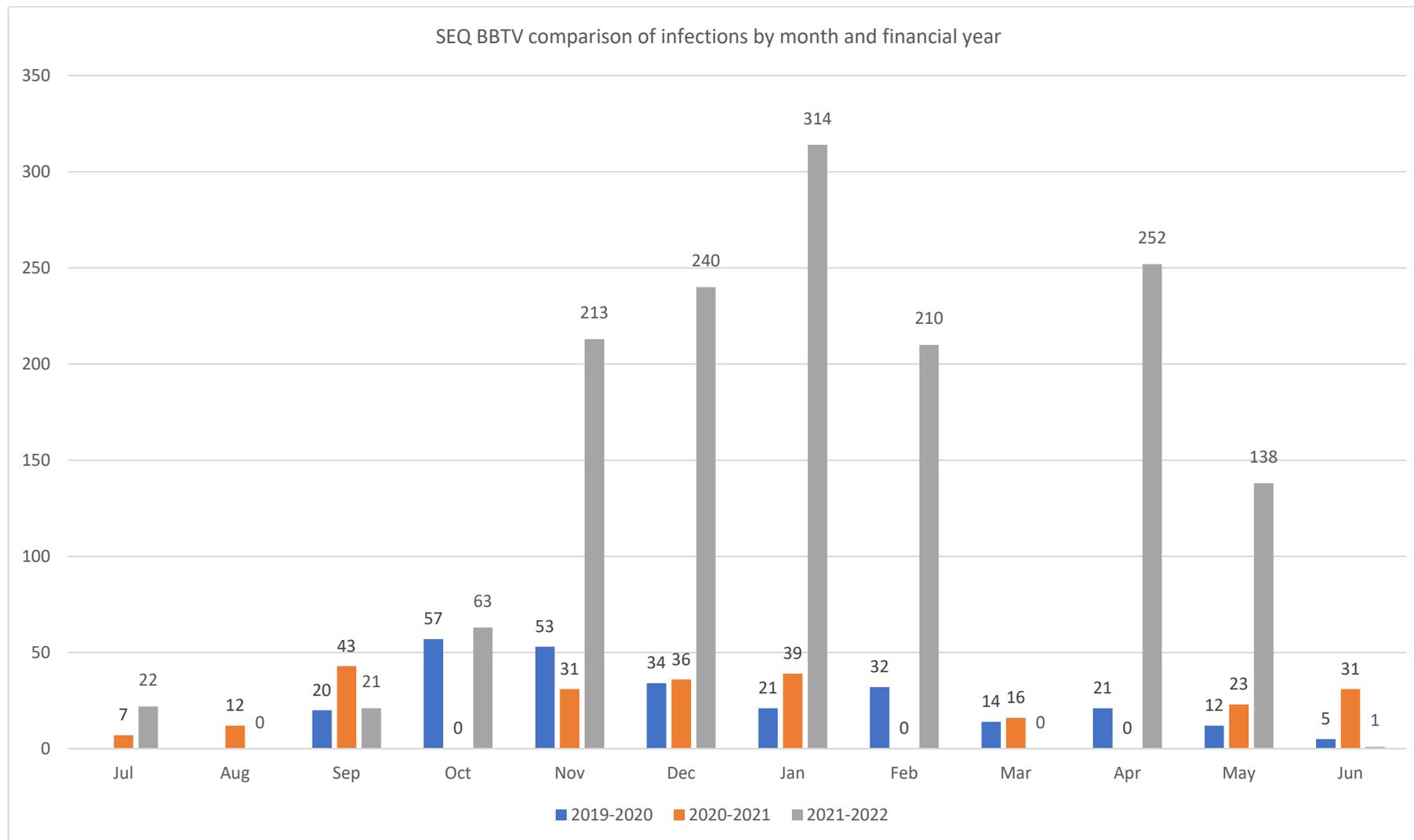
As a baseline, 225 infected banana plants were detected between August 2018 and June 2019 in the final year of Phase 3 of the previous project BA15006.



SEQ Infection trends by month and financial year

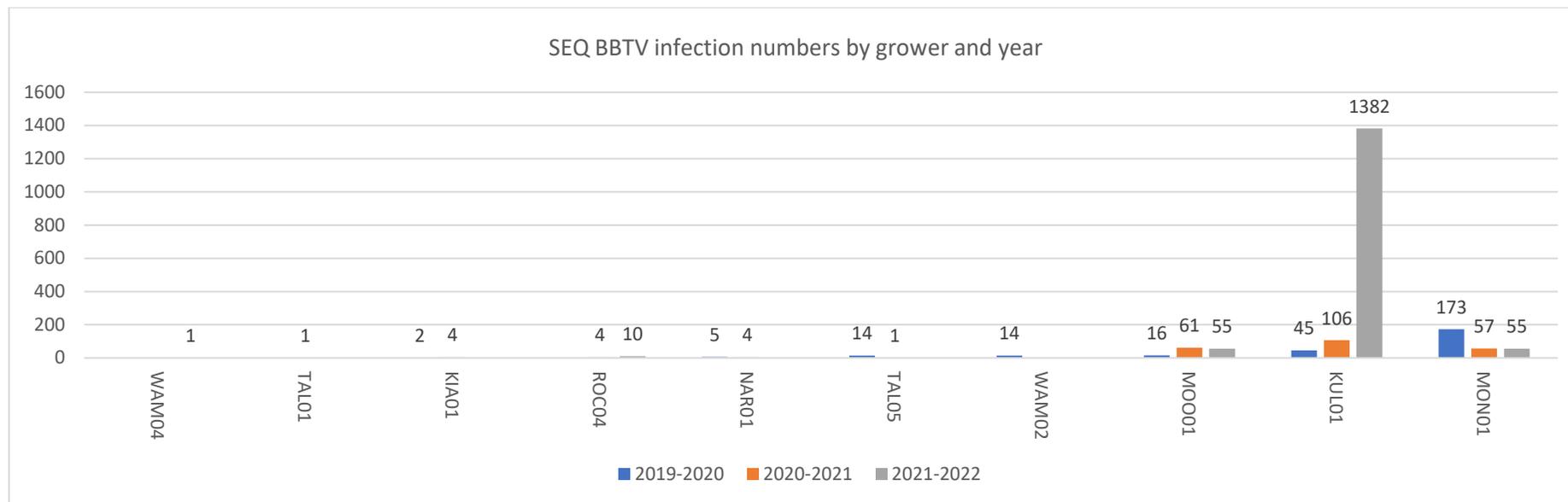
The following graph provides an overview on project progress between **Year 1 (July 2019 to June 2020)**, **Year 2 (July 2020 to June 2021)** and **Year 3 to date (July 2021 to 22 June)**. It shows infection numbers and trends by month across each year of operation of the project.

NOTE – The Grower Involvement Policy was introduced in October 2020. **NOTE** –For Year 3 high numbers are associated with one property (KUL01) which has contributed to 68% of the infestation throughout the life of the project. COVID restrictions have impacted on delivery in SEQ as a result of border restrictions.



SEQ Overview of Year 1 to 3 – Main sources of infection by year

A total of 2250 infected plants were detected in SEQ across Year 1-3. As indicated below, of these almost 68% of infected plants were detected on one property. Parts of the property have been sold however banana plants are still grown on a leased section. The owner is now required to treat their own infected plants.



SEQ farm category at end of project

The following Table shows the number of individual farms in each category for the purposes of applying the surveillance schedule. *End of Phase 3 for reference – CAT(A) 19, CAT(B) 5, CAT(C) 1, CAT(D) 5 and CAT(E) 5. 35 Farms.*

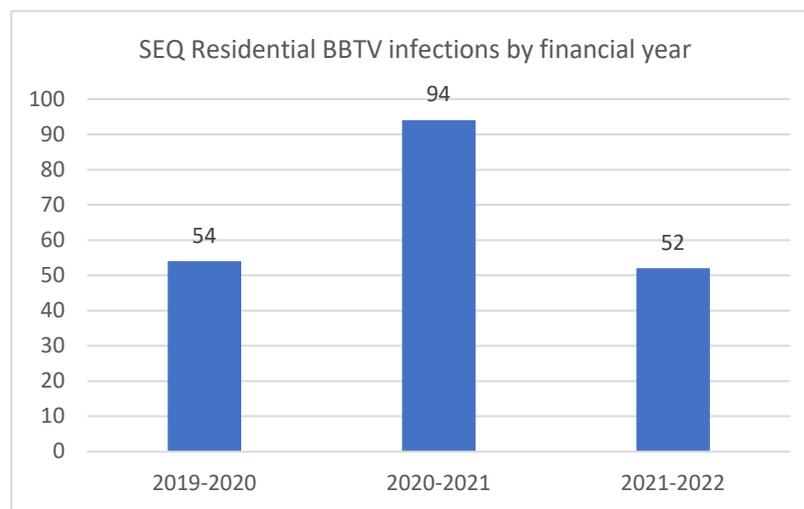
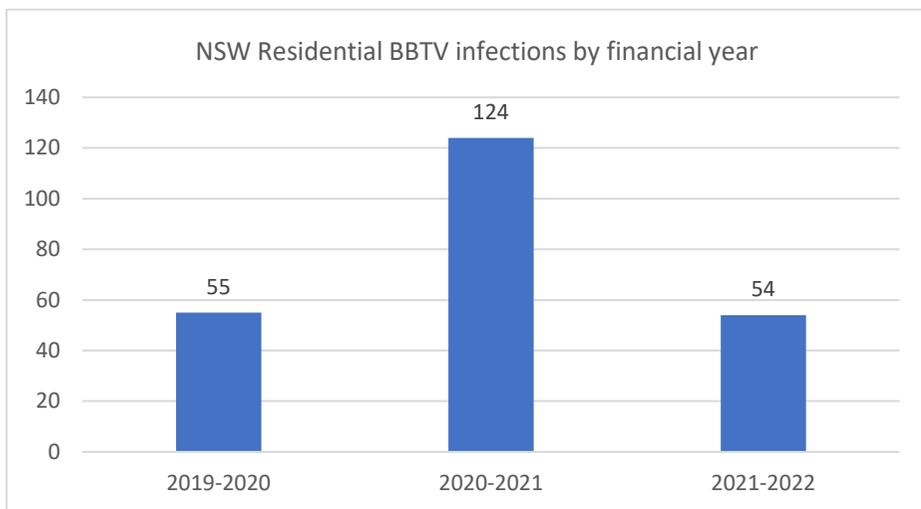
CAT	No. properties in each category at end of project	CAT Description	Revisit interval
A	35	BT never recorded	Annually
B	0	No detections within 24 months	Annually
C	0	No more than 1 infection in the previous 12 months	1 month after infection is recorded and removed for as long as infection is recorded at successive visits. If no new infections recorded, switch to 3-month intervals for 1-12 months then 6-month intervals for 13-24 months.
D	9	More than 1 infection in the previous 12 months	
E	3	More than 10 infections in the previous 12 months	
	47		

SEQ and NSW Residential Infection Status

Residential infestation in SEQ and NSW remains an issue. Identification of infestation and control remains a reporting issue with the Program focusing primarily on dealing with infestation as reported and within proximity to commercial farms.

In total, 233 infected plants were detected and destroyed in NSW over the life of the project, with 200 infected plants detected and destroyed in SEQ over the life of the project. The number of infected plants detected is not a clear reflection of the number of infected plants present within each Control zone.

As a baseline, 217 infected plants were detected and destroyed in NSW over the life of Phase 3 of the project, and 228 in SEQ.



APPENDIX 3 – Grower education and training

NSW Commercial Education and Training

The following table shows the percentage of surveillance visits undertaken during 2021-22 where a grower was present (a grower may control more than one property).

Training delivered during visits is tailored around infestation status and inspection findings. During visits where a grower is present the grower observes the inspection process. Should BBTV be present symptoms on the infected plant/plants and the destruction process can be shown and explained to the grower. In some circumstances, team members are also available to check the grower's infection equipment and answer any other questions the grower may have.

NOTE – COVID restriction have impacted on training sessions during this reporting period.

FY	NSW Inspections	Grower Absent	Grower Present
2021-2022	609	2%	98%

SEQ Commercial Education and Training

The following table shows the percentage of surveillance visits undertaken during 2021-22 where a grower was present (a grower may control more than one property).

Training delivered during visits is tailored around infestation status and inspection findings. During visits where a grower is present the grower observes the inspection process. Should BBTV be present symptoms on the infected plant/plants and the destruction process can be shown and explained to the grower. In some circumstances, team members are also available to check the grower's infection equipment and answer any other questions the grower may have.

NOTE – COVID restriction have impacted on training sessions during this reporting period.

FY	SEQ Inspections	Grower Absent	Grower Present
2021-2022	71	93%	7%

APPENDIX 4 – General stakeholder engagement

Project resource - Social Research report

This initiative sought to undertake social research to gain an understanding about motivators and barriers of subtropical banana growers towards taking greater responsibility and more active participation in their own BBTV management.

Once completed, the report provided specific recommendations to the BBTV project to assist in designing an effective education and awareness campaign that ensured extension effort was best directed to improving practice change within the banana industry and ultimately improve the efficiency of ongoing BBTV disease management.

Findings acted as a key driver behind the development of education and awareness materials and the delivery of the campaign. A copy of the report is included as [APPENDIX 5 – Social Research Report](#).

Grower resource - A Code of Practice for the sourcing and planting of banana plants

The Banana Industry Biosecurity Code of Practice for Sourcing and planting of banana plants in an area where serious pests are present was finalised on August 27, 2020 (<https://abgc.org.au/biosecurity/>) and aims to provide detailed guidance to growers on the use of planting material and outlines reasonable and practical steps to minimise associated biosecurity risks and protect the industry.

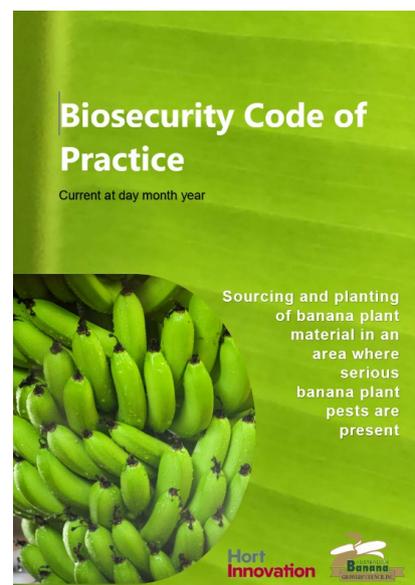
The Australian banana industry relies on its reputation for producing clean, disease free banana fruit. Pests and disease introduction and spread pose a serious risk to maintaining the viability of the industry as a whole. As pests and diseases can often be spread through natural means, for example, movement of infested aphids, a banana producer must be also be confident that all possible measures are being taken within an area on neighboring farms to minimise the risk of new infestations that create an uncontrolled risk to their business.

Significant risk occurs through the movement of new and potentially infected banana plants. Sourcing and movement of planting material is generally governed and controlled through government regulation; however, this typically only extends to movement of materials into and between biosecurity zones. Diseases considered endemic within a zone are only often subject to other regulatory mechanisms after a property has been found to be infested.

This initiative has established a framework of reasonable and practical measures that a person can rely on to minimise the risk of movement of banana pests through control and consideration of planting material.

Importantly, the Code has considered a person's General Biosecurity Obligation, or General Biosecurity Duty in controlling these risks, noting that measures applied must be practical and reasonable in the circumstances.

Although directed specifically to assist and support the BBTV project, this project will also provide a foundation for the control of other serious pests and diseases of bananas within Australia and value add to current investment.



Training and Awareness Material for Growers and the Community

The following materials have been developed:

- Facebook and high-quality photos of symptoms and use of the Bunchy Top Hotline have been a major focus of Phase 4 of the project with positive result being achieved. Some 45,000 'hits' have been achieved at a cost of less than \$12, which represents a highly cost-effective result with social media.
- Shed Poster – 'Bunchy top growers guide, here is what to look for'
- Information and Training Kit prepared for new inspectors – which includes the following:
 - National Bunchy Top Project Training Manual folder
 - Standard Operating Procedures (Inspections)
 - Simple Steps to Identify BT

- Simple Steps to Control BT
- Growers Guide Packing shed BBTV Poster
- BT Leaflet 3 page lift out
- Join the Fight leaflet 3 page foldout
- Material Safety Data Sheet
- After Treatment Information Sheet
- Biopest Oil details
- With Compliments slip for backyard residents
- Skin Cancer Safety Front cover
- Business Card

Field days/ workshops

19 November 2020 – ABGC Roadshow presentation, Murwillumbah Project Management and Operational Staff liaised with participants and provided resources – namely the project's STOP, VERIFY, REPORT, DESTROY brochure (<https://abgc.org.au/wp-content/uploads/2020/11/PRINT-BBTV-brochure.pdf>). In cooperation with roadshow organisers (and NSW banana extension officers), this resource was also provided at the roadshow event held at **Coffs Harbour on Friday 20 November 2020**.

January 2021 – Bunchy Top workshop (Coolum) – The SE QLD Inspector/Extension Officer presented a Bunchy Top awareness workshop in Coolum, in conjunction with the Coolum Lions Club. 5 Coolum residents attended. Participants learned about Bunchy Top symptoms and destruction and were able to view a Bunchy Top infected leaf. This workshop resulted in a positive Bunchy Top notification in the Coolum area.

11 May 2021 – Bunchy Top Workshop and New Biosecurity Resources, South Johnstone Research Facility, North Queensland – Topics included Bunchy Top Science and Research (Dr Kathy Crew) - Overview of bunchy top virus, Research initiatives, the Bunchy Top Project (Inspectors Samantha Stringer and Wayne Shoobridge), The Bunchy top project background, Inspection and detection skills and tips and new Biosecurity Resources (Dr Rosie Godwin), ABGC website resources, Code of Practice for planting materials and how it helps you. This workshop was attended by more than 50 people representing banana extension staff and agronomists from Agriscience Queensland DAF, extension staff from ABGC who are located in NQ, Panama TR4 Program surveillance staff from BQ, Inspectors and pathologists from Plant Biosecurity and Product Integrity BQ, private agronomists and resellers and staff from Northern Australia Quarantine Strategy.

12-14 May 2021 – Australian Banana Industry Congress – Cairns. Held every two years, Congress is a unique chance for all those involved in producing bananas to share ideas and be brought up to date with the latest cutting edge technology, innovation and essential research and developments affecting industry. Approximately 470 people attended congress... In addition to being an Exhibitor, the National Bunchy Top Project was also featured in the Congress Handbook, distributed to all attendees. Congress was picked up across a range of media including ABC Rural, Fresh Plaza, The Cairns Post, Win TV, the North Queensland Register and Good Fruit and Vegetables. The BBTV Congress stall was staffed by two very experienced project BBTV Inspectors and included a range of resources to promote understanding of BBTV. These include videos, brochures, symptom cards and infected leaf samples. Officers reported in depth discussion with at least 50 congress participants.

9-11 July 2021 – Queensland Garden Expo - Nambour. SE QLD Inspector/Extension Officer attended the Expo as a guest speaker, giving two presentations on Bunchy Top and growing healthy bananas. Approximately 40 people attended the presentations.

16 October 2021-Buderim Plant Festival. SE QLD Inspector/Extension officer attended the festival and set up a Bunchy Top Information Booth. Approximately 500 people attended the festival and approximately 30 attendees inquired at the booth

28 November 2021 - Toowong Community Garden. The R&D Manager provided a talk on banana cultivation, the industry, clean planting material, banana diseases in particular BBTV, and biosecurity zones. The Project 'Spot, verify destroy' brochure and the Project 'Bunchy top fact sheet for residential growers' was provided to attendees. Approximately 14 people attended the event.

6 December 2021 – Local Grower Field Day trial. NSW Inspectors trialled a local grower field day on an infested farm in NSW. The grower who owns the property was engaged and contacted other local growers to invite them to participate. The intent was for inspectors to 'team up' with a local grower while conducting inspections. Initially 5 growers expressed interest in attending however due to weather only one additional grower attended. The additional grower completed the workshop

with a clearer understanding on inspection procedures, BBTV symptoms and the method used to destroy infested plants. The purpose of these workshops is to provide training to local grower groups, provide maximum exposure to symptoms and allow a local grower network to call on when they need assistance. It is intended that additional similar workshops will be run regularly until the end of the project

16 December 2021 - Joint industry/ Government Surveillance Online Workshop. The R&D Manager and Dr Alison Seyb from NSW DPI provided a presentation on the bunchy top project. The workshop was organized by PHA with 40 attendees. The presentation highlighted the benefits of Industry and government working together to deliver a surveillance program for crop management in the banana industry with BBTV an endemic but contained pest.



6 December 2021 – Local grower field day



16 October 2021- Buderim Plant Festival

The Project has also maintained a presence at the ABGC roadshow presentations (workshops). Several community workshops were organized but unable to be delivered due to COVID restrictions.

YouTube engagement

Project Video - Detecting Banana Bunchy Top Virus symptoms in commercial plantations

Link - https://youtu.be/e6RgB_HUmHU

837 views published May 20, 2021. Australian Banana Growers' Council channel. 570 subscribers

This video shows you how to detect Banana Bunchy Top Virus symptoms in commercial banana farms.

Project Video - Bunchy Top Disease in Backyard Banana Plants

Link - https://youtu.be/nS-GwTVM_RE

1643 views published Aug 26, 2021 - Australian Banana Growers' Council channel. 570 subscribers

This video provides information about the disease, symptoms and how to detect them and, of course, appropriate destruction methods. Backyard banana growers in South East Queensland and Northern New South Wales have an important role to play in detecting and controlling Bunchy Top.

Project Video – Banana Bunchy Top Virus – An Industry Perspective

Link – <https://www.youtube.com/watch?v=m5A-9V-thyY>

This video gives an industry perspective, namely from Inspectors and growers on the importance of training, regular inspection and various cultural controls that contribute to the successful management of Bunchy Top in commercial plantations.

Video complete 27 July 2022.

Facebook

Banana Bunchy Top Project page.

The Banana Bunchy Top Project aims to stop the spread of one of the world's most devastating banana diseases – and we need your help. <https://www.facebook.com/BananaBunchyTopProject>

201 people like this.

217 people follow this.

Subjects posted to date on the Banana Bunchy Top Project Facebook page include:

- Don't give away or move banana plants (video).
- Use QBAN approved nursery material.
- How to take and send photos of symptoms for identification.
- Using the pocket magnifier.
- Symptoms to look for (video).
- Video on inspectors finding and showing symptoms.

Example Posts

9 September 2019 - Hello backyard banana lovers of South East QLD and Northern NSW! The Banana Bunchy Top Project aims to stop the spread of one of the world's most devastating banana diseases – and we need your help. Though Bunchy Top has been in Australia for more than a century, it's been contained to southeast Queensland and northern New South Wales. This project, run by the Australian Banana Growers' Council and funded by Hort Innovation, aims to keep it that way. **475 People reached. 45 engagements.**

17 September 2019 - Bunchy Top can be hard to spot - but these photos will give you an idea of some symptoms to keep an eye out! Keep an eye on the Facebook page for more tips on how to find Bunchy Top. **Bunchy Top symptoms album.**

20 September 2019 - Can you spot the difference? 🧐 Look through the leaf to the sun for your best chance of spotting those tell-tale 'dot dash' lines that are symptomatic of Banana Bunchy Top! **16 People reached. 3 engagements.**

3 October 2019 - If you look closely, you'll spot those tell-tale dot-dashes in this small sucker leaf 🧐 Remember: if you look through a leaf towards the sun (carefully!), you'll have a better chance of seeing any signs of Bunchy Top. **23 People reached. 11 engagements.**

9 October 2019 - What happens when Bunchy Top takes hold? This snap shows some advanced symptoms in backyard bananas - if your plants look like this, give our team a call or send us a DM! 📞 📱 1800 068 371 - Banana Bunchy Top Hotline. **21 People reached. 11 engagements.**

12 October 2019 - You can help in 3 ways! **34 People reached. 13 engagements.**

14 October 2019 - Bunchy Top is most often spread when plants are shared. Please source your banana plants from an approved QBAN Nursery. VIDEO. **8605 People reached. 52 engagements**

26 November 2019 - A great example of why it's important to let us know if you suspect your bananas have Bunchy Top! This clump of Lady Finger bananas in Buderim (Sunshine Coast) was reported via social media. **50 People reached. 17 engagements**

19 December 2019 - The National Bunchy Top Project entered its fourth phase earlier this year - and the team have hit the ground running! Project Manager David Peasley shared some insights with Australian Bananas magazine - <http://bit.ly/2MIQ03I>. **73 people reached. 13 engagements.**

8 March 2020 - We received a call about some banana plants that weren't producing bunches and just looked a bit off. The job turned in to an educational opportunity. Press play to see how it all unfolded... **4664 People reached. 17 engagements.**

6 May 2020 - We would love to hear from you. Did you spot Bunchy Top? What did you look for? What caught your eye first? Watch the clip and leave a comment below. **3466 people reached. 47 engagements.**

16 January 2021 - When looking for Bunchy Top remember to look for the dot dash pattern on new leaves. That's Morse code for 'my banana plant might have Bunchy Top'. **107 people reached. 14 engagements.**

12 May 2021 - The Hort Innovation Banana Bunchy Top Project led by ABGC was given the opportunity to conduct a

workshop to industry supporting groups last night on the science behind the disease, hints and tips on detecting the disease by experienced staff, and an overview of supporting resources. The workshop was well attended by around 40 interested persons. Stakeholder feedback was excellent. **154 People reached. 29 engagements.**

26 May 2021 - First of one of two videos being produced to assist people in understanding BBTV and the Project. Next video will specifically be directed at backyard growers. Produced by the team. Check it out. The crew in action.

https://youtu.be/e6RgB_HUmHU. **861 People reached. 58 engagements.**

16 August 2021 - The August issue of Australian Bananas was published and features an update on the Bunchy Top Project. Head to page 39 to check it out <https://bit.ly/3yJy1tG>. **78 People reached. 12 engagements.**

3 September 2021 - One for the backyard banana lovers in South East Queensland and Northern NSW! The Bunchy Top team has created a new video to take you through exactly what to look for and what to do if you suspect your plants have this devastating disease. **767 people reached. 43 engagements.**

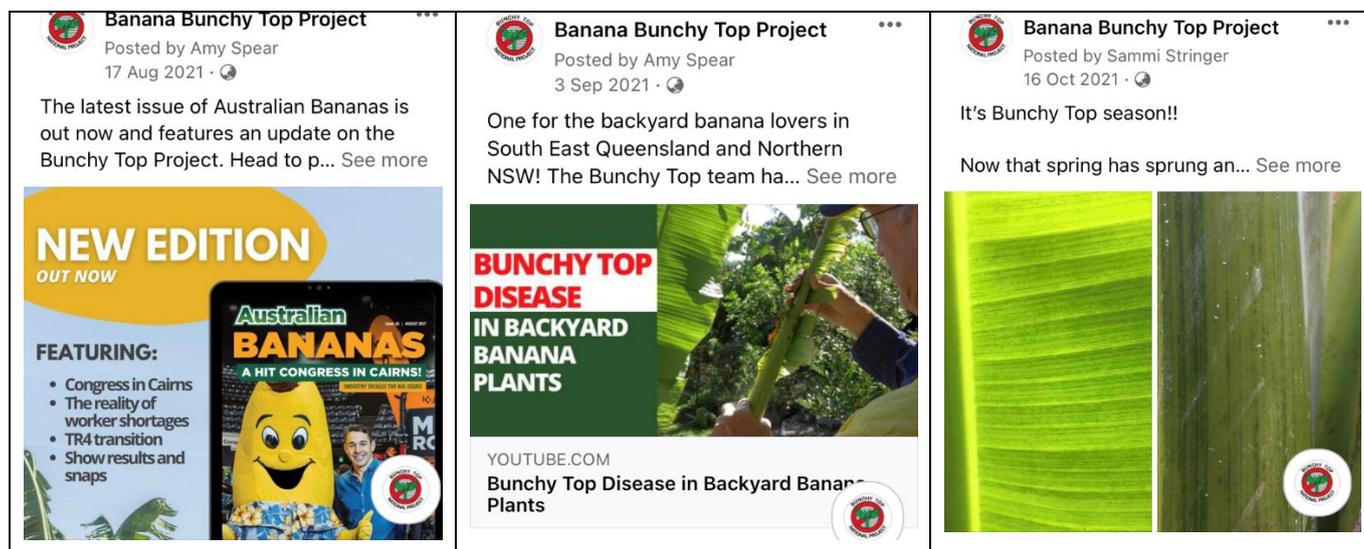
16 October 2021 - It's Bunchy Top season!! Now that spring has sprung and the weather has warmed up there is plenty of new growth and aphid activity. Keep your eyes peeled for symptoms in the new leaves coming out. If the new leaves appear shorter, narrower, standing more upright or pale around the edges, check them for the dot dash symptoms. If you're not sure, send us a message with your details and some photos of your plants and we will get back to you. **77 people reached. 12 engagements.**

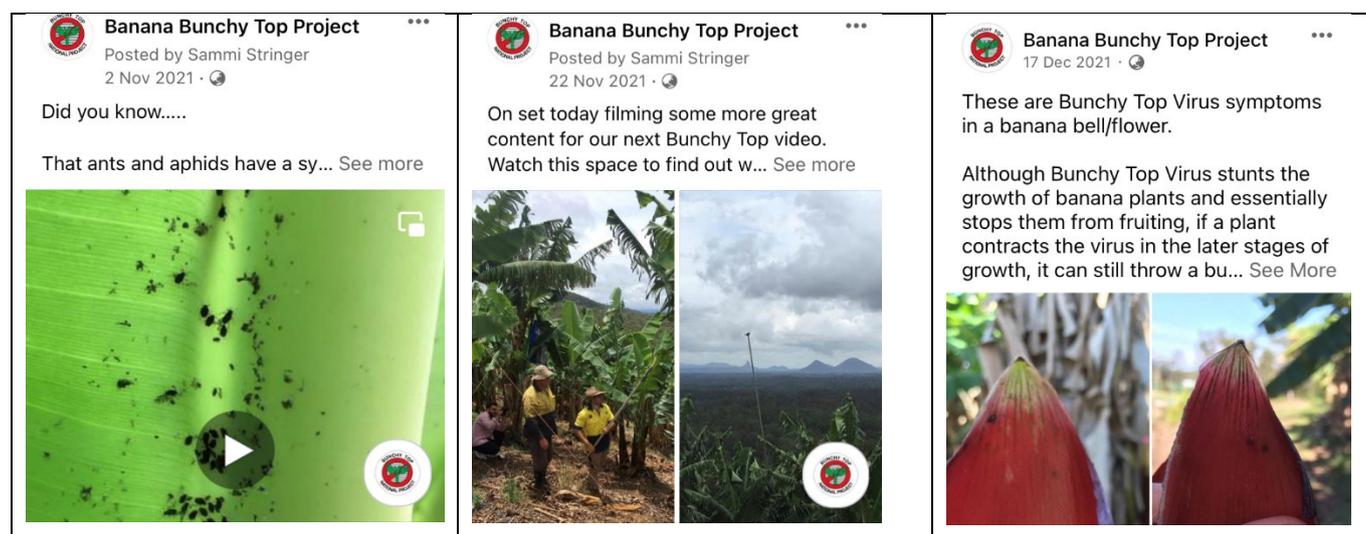
2 November 2021 - Did you know.....That ants and aphids have a symbiotic relationship, meaning they both benefit mutually from their working relationship? Aphids produce a sugary substance (honeydew) that the ants eat and in return the ants protect them from predators and parasites. Ants will even move the aphids from plant to plant. This can sometimes explain the spread of Bunchy Top from a host plant to nearby banana plants. Now the weather has warmed up and spring is in full swing, you will likely see plenty of aphid and ant activity in banana plants. This video of ants and aphids on a Cavendish plant was recently captured on the Sunshine Coast. **50 people reached. 20 engagements.**

22 November 2021 - On set today filming some more great content for our next Bunchy Top video. Watch this space to find out what it's all about. And how good is the view!! **96 people reached. 31 engagements**

17 December 2021 - These are Bunchy Top Virus symptoms in a banana bell/flower. Although Bunchy Top Virus stunts the growth of banana plants and essentially stops them from fruiting, if a plant contracts the virus in the later stages of growth, it can still throw a bunch. Usually this bunch will be small and deformed. As the banana bell is the last growing point of the plant, it too, just like the leaves, will show the dark dot dash lines that Bunchy Top is known for. These lines can generally be found in the tip of each bract of the infected banana flower. **60 people reached. 12 engagements.**

Figure 1 - Example posts





Instagram

Banana Bunchy Top Project page.

This project aims to stop the spread of a devastating banana disease & we need your help!

20 posts, 65 followers, 66 following.

ABGC Website

The Australian Banana Growers' Council continues to act as a conduit to disseminate information about BBTV, Project status and Project resources through two dedicated pages on its website (<https://abgc.org.au/banana-bunchy-top/> and <https://abgc.org.au/biosecurity/>) and through direct engagement with stakeholders.

ABGC Banana Magazine

ISSUE 57 DECEMBER 2019 – This issue of Australian Bananas Magazine features an update on the Bunchy Top Project, *Bunchy Top's next Chapter well under way* – see page 22 at <https://abgc.org.au/wp-content/themes/abgc/assets/lib/magazine/magazine.html?file=https://abgc.org.au/wp-content/uploads/2019/12/Issue-57-December-2019-EMAIL.pdf#magazineMode=true>

ISSUE 58 APRIL 2020 – This issue of Australian Bananas Magazine features an update on the Bunchy Top Project, *Modelling highlights risk of bunchy top virus spreading if baseline controls ignored & Weedy Plantations Risk to fight against Bunchy Top virus* – see pages 37 and 37 at <https://abgc.org.au/wp-content/themes/abgc/assets/lib/magazine/magazine.html?file=https://abgc.org.au/wp-content/uploads/2020/04/Issue-58-APRIL-2020-WEB.pdf#magazineMode=true>.

ISSUE 59 AUGUST 2020 – This issue of Australian Bananas Magazine features an update on the Bunchy Top Project, *Inspectors at coalface of Bunchy Top fight, Biosecurity Code of Practice* – see pages 35 and 36 at <https://abgc.org.au/wp-content/themes/abgc/assets/lib/magazine/magazine.html?file=https://abgc.org.au/wp-content/uploads/2020/08/Issue-59-AUGUST-2020.pdf#magazineMode=true>

ISSUE 60 DECEMBER 2020 – This issue of Australian Bananas Magazine features an update on the Bunchy Top Project, *Bunchy Top Project delivering results* – see page 38 at <https://abgc.org.au/wp-content/themes/abgc/assets/lib/magazine/magazine.html?file=https://abgc.org.au/wp-content/uploads/2020/12/ABGA-Issue-60-DECEMBER-2020-WEB-1.pdf#magazineMode=true>

ISSUE 61 APRIL 2021 – This issue of Australian Bananas Magazine features an update on the Bunchy Top Project, *Banana Bunchy Top challenges* – see pages 36 and 37 at <https://abgc.org.au/wp-content/themes/abgc/assets/lib/magazine/magazine.html?file=https://abgc.org.au/wp-content/uploads/2021/04/Issue-61-APRIL-2021.pdf#magazineMode=true>

ISSUE 62 AUGUST 2021 – This issue of Australian Bananas Magazine features an update on the Bunchy Top Project, *Banana New resource to help fight Bunchy Top* – see page 39 at <https://abgc.org.au/wp-content/themes/abgc/assets/lib/magazine/magazine.html?file=https://abgc.org.au/wp-content/uploads/2021/08/Issue-62-AUGUST-2021-WEB-1.pdf#magazineMode=true>

ISSUE 64 APRIL 2022 – This issue of Australian Bananas Magazine features an update on the Bunchy Top Project, *BBTV – The way forward* page 35 at <https://abgc.org.au/wp-content/themes/abgc/assets/lib/magazine/magazine.html?file=https://abgc.org.au/wp-content/uploads/2022/04/Issue-64-APRIL-2022-WEB.pdf#magazineMode=true>

Special E-Bulletins

14 September 2021 – Changes within the Bunchy Top Control Zone. <https://abgc.org.au/2021/09/17/growers-e-bulletin-changes-within-the-bunchy-top-control-zone/>

APPENDIX 5 – Social Research Report

IDENTIFYING MOTIVATIONS AND BARRIERS TO BUNCHY TOP DISEASE MANAGEMENT AMONG SUB-TROPICAL BANANA GROWERS - RESEARCH REPORT -