Hort Innovation

Final Report

Coordination of Banana Industry R&D (Panama TR4)

Project leader:

Jim Pekin

Delivery partner:

Australian Banana Growers' Council

Project code:

BA14012

Project:

Coordination of Banana Industry R&D (Panama TR4) – BA14012

Disclaimer:

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Content

Summary

The aim of BA14012 'Coordination of the Banana Industry R&D (Panama TR4)' project was to coordinate and build knowledge and capacity within the Australian banana industry to manage and contain Panama Tropical Race 4 (TR4) fungal disease and ensure tangible outcomes for banana growers. The Australian Banana Growers' Council who employed a full-time R&D Manager to focus on the development, coordination and extension projects related to Panama TR4 research and development delivered the project.

The first case of *Fusarium oxysprorum f.sp cubense* Tropical Race 4, more commonly known as Panama TR4, was confirmed in the major growing area of North Queensland in March 2015. TR4 is a devastating disease of bananas, cannot be eradicated and is easily spread, so it was imperative to establish a containment management program and investigate ways to minimise its spread. This made the role of R&D Manager critical to the industry. It was also important that the banana industry had technical and R&D adoption expertise to provide advice to the banana industry R&D program and to work closely with Hort Innovation.

The target audience for this project was primarily the banana-growing region of North Queensland where TR4 had been confirmed. The project did however target the entire Australian banana industry in TR4 preparedness and through the provision of technical and R&D adoption expertise.

The four major areas of activities of the project encompassed were:

1. Project development and coordination in the area of Panama Tropical Race 4 (TR4) R&D.
2. Input into the extension of Panama TR4 R&D projects.
3. Input to the banana industry R&D program, including membership of project reference groups.
4. Provision of technical advice to the banana industry on key pest and disease issues.

This project produced a number of valuable outputs for the banana industry that are detailed in this report. The Banana Industry R&D Manager played a significant role in facilitating the establishment, coordination and development of the industry's major R&D investments such as the two Fusarium wilt TR4 Research projects, Improved Plant Protection Program, and the National Industry Development and Extension Program. The role was also instrumental in establishing and driving the 'QBAN transition project' to move QBAN, the banana industry's clean planting material scheme, from Biosecurity Queensland (BQ) across to a third party accredited scheme in partnership with the Nursery and Garden Industry Australia (NGIA).

The Banana Industry R&D Manager made a major contribution to the extension of R&D projects (particularly on TR4) to the growers and other industry stakeholders. One of the most significant outputs was the conceptualization and delivery of the R&D scientific program at 2017 Banana Industry Congress which had 355 participants. This included a new session of 'Science Speed Talks' featuring emerging researchers, international scientific experts on TR4, panel discussions on TR4, and poster sessions of latest R&D discoveries. Another important output was the development of a series of On-Farm Biosecurity resources for TR4 infested farms which assist farmers in their TR4 preparedness.

Through the R&D Manager role, substantial input was provided to the entire banana R&D program through membership of project reference groups and as a member of the Banana R&D Strategic Investment Advisory Panel (SIAP). The R&D Manager obtained an overview of all banana research in Australia and played a key contribution to the development of the new Banana Industry Strategic Investment plan 2017-2021, which represents the interests of the entire industry and is the blueprint for decision-making in levy investments.

Considerable technical advice was provided to the banana industry on key pest and disease issues e.g. TR4, clean planting material, Bunchy Top Virus, Banana Freckle, leaf spot, plus chemical usage, reviews and permits. Substantial advice has also been provided to BQ who deliver the Panama TR4 Program in partnership with ABGC. This has helped the implementation of policy and legislative matters including surveillance, sampling and compliance issues.

The success of the project is evidenced by the initiation and progress of a series of well-coordinated banana R&D projects delivering useful strategies to growers for the containment and management of TR4 and other pests and diseases. The containment management program in place for Panama TR4, has been successful in slowing the spread of TR4 in the banana industry. It is still contained to just three farms in close proximity in the Tully Valley. This has been unheard in most other countries where TR4 has quickly reached epidemic proportions. The achievement of this containment program is a result of a coordinated response, effective extension of knowledge to industry and its stakeholders, adoption of new biosecurity practices, all of which are underpinned by relevant

high-quality science.

The R&D Coordination project has been highly appreciated by industry members and R&D service providers alike and the mid-term review and banana R&D Strategic Investment Advisory Panel recommended its continuation for at least another three years.

It is therefore recommended that a similar project be funded to continue to facilitate and influence valuable outputs for the banana industry. This will allow the industry to maintain an efficient, effective R&D program focused on priority industry needs.

Keywords

Banana

Fusarium oxysporum f.sp cubense

Panama disease

Tropical Race 4

TR4

R&D

RD&E

Pests and diseases

Biosecurity

Introduction

Bananas are Australia's number-one selling supermarket product (in volume), with over five million eaten daily, and all of which are grown in Australia. The Australian banana industry is one of the largest in the horticultural sector with an estimated farm gate value of around $600 million annually and contributes $1.3 billion to the national economy (including indirect benefits). Ninety-four percent of Australia's 13,000 ha of banana production, occurs in North Queensland, around Tully, Innisfail, Kennedy, Atherton Tablelands and Lakeland. Production occurs to a lesser extent in New South Wales, Western Australia, South East Queensland and the Northern Territory.

Between 2012 and 2015 the banana industry had identified the need and invested in the HAL project BA11027 – *Banana Industry Extension and Research & Development (R&D) Management,* a skilled resource to accelerate the coordination, development and implementation of key R&D projects aligned to industry priorities. The project delivered excellent results in project coordination, project development, technical advice and support. At the project's conclusion, the Interim Strategic Advisory Panel (SIAP) supported a continuation of investment in this type of project but focused on Panama TR4 Coordination so BA14012 was commissioned.

In March 2015, the destructive fungal disease Panama TR4 was confirmed on a farm in the Tully Valley. Since TR4 cannot be eradicated and is easily spread, the implementation of a containment management program and finding solutions to minimise spread, was essential. Hort Innovation and the banana industry through its SIAP agreed that this project, implemented by an appropriately skilled scientist and focused on TR4, was critical to the industry. Furthermore, the industry wished to ensure that all Panama TR4 R&D was well-coordinated so tangible, adoptable outcomes could be delivered for growers. The Banana Industry R&D Manager was considered central in providing that coordination.

Lastly, the industry also wanted to be kept informed on technical matters of other important pests and diseases such as Banana Bunchy Top Virus, Banana Freckle and yellow Sigatoka, and scientific input from the R&D Manager was crucial.

Methodology

Project Initiation

The project resulted from Hort Innovation seeking Expressions of Interest from suitably experienced and capable service providers to undertake Phase 2 of the BA11027 but with a focus on project development, coordination and extension predominantly in the area of Panama TR4 R&D. The project was to develop strong linkages with service providers delivering relevant R&D projects as well as providers that promote the adoption of R&D outcomes within the industry.

The aim of the project was therefore to coordinate and build knowledge and capacity within the Australian banana industry to manage and contain Panama TR4 fungal disease. The project was to add value to TR4 work and the primary functions were advertised to be:

1. Project development and coordination in the area of Panama TR4 R&D
2. Extension of Panama TR4 R&D projects
3. Input to the banana industry R&D program including membership of project reference groups.
4. Technical advice to the banana industry on key pest and disease issues.

Hort Innovation awarded the 3-year project to the Australian Banana Growers' Council (ABGC), which commenced on the 2 August 2015. Some of the advantages of ABGC delivering the project included independence from other R&D service providers, access to accumulated corporate knowledge about the banana industry and, the extensive network of industry contacts.

The ABGC then enlisted a specialist recruitment company 'Launch Recruitment' to assist in short-listing suitable candidates. After an open and transparent recruitment process endorsed by Hort Innovation, Dr Rosie Godwin was appointed into the role of full-time 'Banana Industry R&D Manager' in October 2015.

Project Management

The Banana Industry R&D Manager project was guided by a Project Reference Group (PRG) consisting of:

The project leader	Mr Jim Pekin
A Levy Payer (Banana grower)	Ms Naomi Brownrigg
A technical Expert	Mr Stewart Lindsay
Hort Innovation R&D Manager	Ms Bianca Cairns.

The PRG met every 6 months to discuss project progress, priorities and any relevant issues arising. Informal discussions also occurred throughout the project between members of the PRG and the Banana Industry R&D Manager. The PRG endorsed the Program logic, Monitoring and Evaluation Plan, and Stakeholder Engagement Plan developed at the beginning of the project. The Banana Industry R&D Manager also provided quarterly reports to the ABGC to advise of any strategic issues surrounding R&D matters and seek advice on prioritisation and relevance to the entire industry.

An independent mid-term review was undertaken by Mr John Bagshaw (consultant) to evaluate project progress and make recommendations for the second half of the project.

Methodology to achieve project deliverables

Outlined below are the activities used to achieve the requested deliverables of the project:

1. Project development and coordination in the area of Panama TR4 R&D
    - Built a full understanding of all banana Industry R&D projects: a comprehension of work being undertaken, its relevance to industry, progress against deliverables, and scientific validity. Also to mitigate duplication of effort.
    - Relationship building: ensuring effective linkages, collaboration, issue resolution, and effective communication for two-way information flow.
    - Developed and submitted R&D concepts to Hort Innovation based on industry priorities.
    - Worked with the Nursery and Garden Industry Australia (NGIA) to collaboratively develop an accredited clean planting material scheme for the banana industry.
    - Contributed advice to the ACIAR project *Integrated Management of Fusarium wilt in bananas in the Philippines and Australia.*
    - Analysed and reviewed documents and strategies relevant to R&D e.g. in TR4 containment and

management, Banana Strategic Investment plan, biosecurity matters, chemical usage and market access.

2. Extension of Panama TR4 R&D projects
   - Relevant stakeholders were identified and a plan for engagement was developed for the project.
   - Effective linkages were formed with the National Extension Project and the Banana Industry Communications project to ensure that they were effective conduits for R&D information.
   - Communication materials were developed and distributed to appropriate audiences e.g. fact sheets, magazine articles, and in e-bulletins.
   - Organised events or provided assistance to other service providers to run field days, workshops, scientific exchanges or meetings with international experts.
   - Oral presentations were given to different forums e.g. meetings, workshops, field days, conferences, growers meetings.
   - Developed and organised the scientific program at the 2017 Banana Congress.
   - Individual meetings with growers on their farms.
3. Input to the banana industry R&D program including membership of PRGs.
   - Membership of the Strategic Investment Advisory Panel (SIAP).
   - Membership of PRGs of relevant R&D projects e.g. Plant protections program, TR4 research projects. (BA14013 and BA14014), National Development and Extension projects, National Banana Bunchy Top Virus (BBTV) Program Phase III plus others.
   - Collaborated and facilitated the establishment and progression R&D projects by providing assistance to Hort Innovation e.g. the development of the new Banana Industry Biosecurity Plan 2017-2021.
4. Technical advice to the banana industry on key pest and disease issues.
   A wide range of technical advice was provided to the banana industry and Hort Innovation through networking and the methods outline above. Frequent topics of advice included:
   - Pest and disease issues e.g. Panama TR4, BBTV, yellow sigatoka, coffee bean weevil, Banana Freckle, thrips, post-harvest diseases.
   - Banana production and supply issues.
   - Biosecurity issues such as emergency plant pests, on farm biosecurity measures, market access.
   - pest diagnostics
   - Reform of the Quality Banana Approved Nursery (QBAN) clean planting material scheme.
   - Chemical reviews, permits, usage requirements.
   - Technical support to other ABGC projects.

Project Finalization

The outputs from this project and its impact, effectiveness, appropriateness and efficiency in delivering on its objectives are described in this final report. The report will be publically available on the Hort Innovation web site.

Outputs

A large range of outputs were produced in BA14012 which are grouped under four main areas and described in detail below:

1. Project Development and Coordination
2. Industry Adoption Services
3. Technical Advisory Services
4. Communication Materials
5. General Outputs

1. Project Development and Coordination

a) **Built an understanding of and had input into the progress of all relevant TR4 projects and other banana R&D projects.** This was achieved by initiating and fostering relationships with and between banana researchers involved in Panama TR4 as well as other aspects of banana research, Hort Innovation Relationship and R&D Managers and members of the BQ TR4 response team. Reached an understanding of how all aspects of each project fitted with each other.

- **Plant Protection program** – Input to the final stages and conclusion of BA10020 *Banana Plant Protection*

Program including the final workshop 6-7th June 2016. This assessed achievements and provided a forum to discuss ideas for a follow on project. Input to the development of the new replacement projects encompassing BA16001 I*mproved Plant Protection for the Banana Industry* (particularly theme 1 *Variety Development* and theme 5 *A Program Approach*) and BA16005 *Strengthening Banana Industry Diagnostic Capacity.* Organised meetings with project leaders to assist with project development and facilitate the coordination of these new projects with existing projects.

Jointly developed a proposal with Queensland Department of Agriculture and Fisheries (DAF) for Theme 5 of the new program. The aim of Theme 5 is to foster a more cohesive RD&E plant protection program by facilitating linkages, interaction, collaboration and the exchange of ideas between researchers and industry stakeholders.

Discussed and had input into priorities for varietal development especially through the varieties sub-committee. Assisted in organising meetings and hosting of scientists from the Taiwan Banana Research Institute (TBRI) in North Queensland (NQ) in February 2018. This has assisted DAF develop a Memorandum of Understanding (MOU) and Material Transfer Agreements (MTA) for collaboration on improved germplasm.

Visited variety trials sites in South Johnstone NQ, Duranbah NSW, Coastal Plains NT multiple times to view the banana variety trials and discuss research progress with banana scientists there.

- **Panama TR4 Research Projects** Input to BA14013 Fusarium Wilt TR4 *Biosecurity and sustainable solutions* aimed at finding short to medium term solutions in preventing and managing TR4. Input into development, establishment and progress of BA14014 *Fusarium Wilt TR4 Research Project* aimed at finding long-term solutions to TR4.

  QBAN – drove the transition and development of the Quality Banana Approved Nursery (QBAN) transition project, a sub-project of BA14014. QBAN is the banana industry accredited clean planting material scheme, which because of changes in legislation, needed to be updated and transferred from BQ to an industry run scheme.

  - Coordinated meetings with BQ, AgriScience Queensland (ASQ), NGIA and QBAN businesses.
  - With NGIA, jointly developed a proposal and budget for a variation for BA14014 to allow funds to be transferred to NGIA to conduct the QBAN project in partnership with ABGC.
  - Formed a QBAN steering committee to provide advice on the transition project, organised meetings.
  - Engaged a graphic designer to develop a trademark for the new QBAN.
  - Presented information and concept plan to ABGC board and arranged for NGIA to deliver a presentation to ABGC board on QBAN and how it can be mapped across to the NIASA /Biosecure HACCP system.
  - Created and conducted a survey across the entire banana industry of attitudes and expectations to the new QBAN scheme.
  - Prepared a stakeholder/ communications plan for the QBAN transition project.
- **ABGC *TR4 On-Farm Biosecurity Extension project***- development of resources to assist growers to raise awareness of TR4 and implement on-farm biosecurity measures. Final editing, updating and collating of training modules.
- ***ACIAR*** *Integrated Management of Fusarium wilt TR4 in bananas in the Philippines and Australia* Provided technical and industry information to researchers in the Philippines and Australia as part of ABGCs role in the project. Discussed priorities for varietal development and built relationships with scientists at Bioversity International (Philippines) and Taiwanese Banana Research Institute while visiting these countries in Feb 2016.
- ***National Development and Extension Project*.** Encompassing what was BA13003 *National Banana Industry Extension project* and BA 3023 *NSW Banana Industry Development Officer* into the current BA16007. Input was provided into the progress and finalization of previous projects and the development of the current project.

Other major R&D projects

- ***The National Banana Bunchy Top Virus Program Phase* 3** (BA14011 which was split into BA15006 and BA15007). Provided technical input, relationships management and dispute resolution. Attended and had input at PRG meetings to evaluate the development of the two state based projects, evaluate the mid-term review proposal and selection of an independent mid-term review provider. Also discussed project approaches with relevant scientific experts, plan the data analysis project and.

- ***Management of Yellow Sigatoka and other disease in North Queensland*** projects BA12007 and its follow on project BA15003. Preparation of milestone reports in BA15003, preparation of final report for BA12007. Negotiation with BQ with respect to development of a memorandum of understanding for the Yellow Sigatoka Liaison Officer becoming an authorised officer under the Biosecurity Act and receiving limited inspectoral powers.
- ***Review of the national biosecurity plan for the banana industry BA15001*****:** worked closely with the service provider Plant Health Australia (PHA) to provide industry and technical information, assisted in the coordination of and participated in Technical Experts workshops to review Pest Threat tables, reviewed and provided recommendations on drafts of the new biosecurity plan. Provided advice to PHA on consultation of research experts on banana diseases.
- ***Alternative Quarantine Treatment for bananas infested with coffee bean weevil (CBW)*** **BA16010** Initiated and ran a working group with industry members, stakeholders and government agencies for 12 months, then developed a concept, assisted in the establishment the current project BA16010 to solve an important market access issue for industry.
- ***Review of Owner Reimbursement Cost Evidence Framework BA16012*** Developed a concept and helped Hort Innovation establish this project to satisfy a requirement under the Emergency Plant Pest Response Deed. Assisted the service provider AgDynamics provide industry information and facilitated meetings with growers. Reviewed and made recommendations on drafts of the new framework.
- ***Banana Industry Strategic Investment Plan (SIP) 2017-2021*** Assisted the service provider by providing technical and industry information, contacts within the industry, organised a tour of the Brisbane markets and a grower workshop in NQ (March 2017) for the consultation process. Provided feedback on the drafts of the plan as it was developed.
- **Non-levy funded projects** Facilitated the development a small number of projects by reviewing project plans, providing industry contacts, participation in meetings e.g. A QUT scientist ran a pilot study to investigate using the banana biomass waste to isolate and produce a secondary commercially valuable product (i.e. wax). The aim was to help banana growers reduce biomass waste in their farm and create an avenue for product diversification from banana.

  Also assisted CSIRO scientists initiate a Supply Chain Analysis using the banana industry as a case study. The project was aimed at identifying critical problems faced by the industry and modelling capabilities address existing issues

b) **Assisted in the development of R&D Concepts** and Request for Funding Proposals (RFPs). Examples include 'New fumigation methods for Coffee Bean Weevil', 'Review of the Owner Reimbursement Cost Evidence Framework for the banana industry', 'Banana Industry R&D Coordination'; 'Congress 2019', 'Management of banana pests and diseases in North Queensland' and 'Development of molecular markers for Fusarium resistance in banana'.

c) **Attended and had input into PRGs for the projects listed below (and their predecessors) usually twice a year for each project.**

- BA 14013 and BA14014 Panama TR4 research projects.
- BA15006 &15007 National Banana bunchy top virus program Phase 3.
- BA16001 Improved Plant Protection Program for the Banana Industry.
- BA16001 Varieties sub-committee.
- BA16007 National Banana Development and Extension Project and development of subtropical component of the National Extension Project (2 committees).
- BA16010 Alternative quarantine treatment for bananas infested with Coffee Bean Weevil.

d) **Reviewed ABGC and Biosecurity Queensland's (BQ) strategy for TR4 containment**.

- Initiated and fostered relationship with BQ's TR4 Panama Program leader, and liaised whenever necessary with relevant program staff as well as those involved at the TR4 infested properties. Worked collaboratively to continue containment of TR4.
- Attended weekly meetings and provided input as industry representative in BQ's TR4 Situation Report Committee meetings. These evolved into one-on-one weekly updates with the Panama Program leader by teleconference or face-to face.
- Assistance provided in the development of strategic documents, Standard Operating Procedures, factsheets

and resources for growers through participation in workshops, face-to-face meetings, phone calls, emails. More detail is shown below under 3(b).

- Reviewed BQs 'Risk Assessment: Potential for contamination and disease spread from Panama TR4 Program field activities'. Field visits, audits of documents, procedures and validation of the procedures on the ground.
- Attended and had input at workshops to review the Surveillance Strategy and 2018 ACIL Allen Review of the Panama TR4 Program.

e) **Analysed and reviewed Hort Innovation's Panama R&D program**- Monthly meetings with Banana industry Relationship Manager. Input provided as a member of the R&D SIAP meetings at twice yearly meetings. Informal meetings with Hort Innovation R&D Managers and membership of PRGs.

f) **Mort Johnstone Scholarship** – Involved in the selection panel for candidates. Liaised with the recipients, assisted with their farm placements, advice on scholarship requirements, and liaised with UQ scholarship administrators.

g) **Miscellaneous R&D outputs-** Participated and provided input face-to-face meetings, numerous phone call and emails for example:

- At least four ideas exchanges (seminar series) on *Fusarium* research in Brisbane and South Johnstone.
- Quarterly teleconferences for BA16001.
- Participated and delivered a talk at the TR4 project workshop in Eco Science Precinct in Brisbane in Feb 17 on the ABGC TR4 Extension project.
- Organised a workshop with growers and industry stakeholders at South Johnstone Research Station to review the Banana Industry Strategic Investment Plan (SIP) in Mar 17.
- Participated in the Panama TR4 Field days at South Johnstone Research Station in Nov 15 and May 17.
- Participated and delivered a talk on the QBAN transition project at the one-day BA14013 and BA14014 TR4 project workshop at the Brisbane Convention Centre in Brisbane in Sep 17.

2. Industry Adoption Services

a) Developed and implemented a stakeholder engagement plan for the whole project as part of the program logic framework (Appendix 1).

b) Visited farms, discussed R&D issues and built relationships with growers and supply chain members:

25	growers QLD Tully / Innisfail areas
4	growers in Lakeland area
4	growers in the Atherton Tableland
7	growers in NSW
2	growers NT
2	banana ripeners-Coffs Harbour area (Golden Dawn) and MBM Brisbane
2	banana Agribusiness Management group meetings
6	banana growers meetings (Coffs harbour, Cassowary coast, Mareeba)
2	grower workshops Innisfail/ Mareeba

c) **QBAN –** Built an effective collaborative relationship with NGIA to drive the QBAN transition project

Tissue culture businesses:

- Prepared a stakeholder/ communications plan for the QBAN transition project. (Appendix 2).
- Made at least 4 visits to Mission Beach tissue culture (the largest banana tissue culture supplier) to view production methods biosecurity adoption in response to TR4 and discuss the new QBAN scheme. Also visited Arakai Tissue Culture and Nursery on the Tablelands and met with Alan Saunders, General Manager of Agromillora Australia – a multinational tissue culture and nursery business to discuss options for the supply of clean banana planting material.
- Collaborated closely with NGIA to extend information to QBAN businesses and banana growers. This involved face-to-face meetings with the 6 QBAN businesses in NQ July 2018.
- Designed and conducted a survey of all banana growers to canvass understanding and expectations from the new QBAN scheme (Appendix 3).

d) **Joined the PRGs** and participated in meetings for:

- BA10020 Banana Plant Protection Program
- BA16001 Improved Plant Protection for the Banana Industry
- BA16005 Strengthening Banana Industry Diagnostic Capacity
- BA14013 Fusarium Tropical Race 4 – Biosecurity and sustainable solutions
- BA14014 TR4 Research project
- BA14011 National Banana bunchy top virus program Phase 3 which became BA16006 &16007.
- BA13004 National Banana Development and Extension Project and BA13025 NSW Banana Industry Development Officer.
- BA16007 National Banana Development and Extension Project.
- BA16010 Alternative Quarantine Treatment for bananas infested with coffee bean weevil (CBW)

e) Participated and delivered oral presentations at the ABGC/ DAF TR4 field day in Innisfail (Nov 2015) at the Banana Roadshows in Mareeba and Innisfail (Jun 2016).

f) Provided leadership prior to and at the 2017 Banana Industry Congress in the conceptualization, organisation and delivery of the R&D scientific program. This comprised of a new session of 'Science Speed Talks' featuring emerging researchers (chaired by the Banana Industry R&D Manager), seminars by two international, eminently regarded scientific experts on TR4, panel discussions on TR4, and poster sessions of latest R&D discoveries. Each of these sessions were delivered to the 355 participants.

g) Developed resources for growers whose farms may become infested with TR4 in the future. This was originally the generic TR4 Farm Biosecurity Management Plan developed through a variation to this project in 2017 and delivered face-to-face by consultant Shane Dullahide to a number of growers whose farms were at high risk of becoming infested with TR4. (See Appendix 4 for the report on the variation). The document has undergone subsequent revisions, improvement and expansions in-line with adjustments in legislation and in collaboration with BQ, ASQ and owners of infested properties. The generic template (Appendix 5) is available to all growers on the ABGC web site as well as a series templates and 'lessons learned' resources developed in collaboration with the infested properties owners to support future owners of infested farms.

h) Met with ABGC TR4 Biosecurity Extension project group on at numerous occasions, reviewed and had input into training modules and factsheets and gave feedback on strategies. The Banana Industry R&D Manager had input into work done by ABGC TR4 Biosecurity Extension team and Aric Science Queensland (ASQ) extension staff who developed and ran TR4 Biosecurity workshops and Banana Roadshows with banana growers. Forty workshops were conducted with 289 participants. This represented over 80% of NQ banana growers and 85% banana production. One-on-one farm visits were been offered and conducted to those that could not attend the workshops. Fifty-five farm visits were also undertaken with 50 farms provided with detailed written advice.

i) Collated data and wrote the final report for BA12007 *Management of Yellow Sigatoka in far north Queensland* project. Wrote and submitted milestone reports for BA15003 *Integrated management of Yellow Sigatoka and other diseases in North Queensland.*

3. Technical Advisory Services

a) **Hort Innovation**

- Provided advice to Hort Innovation on challenges and opportunities facing banana industry particularly in relation to TR4 projects, pest and diseases issues e.g. Bunchy top virus, Freckle, Yellow Sigatoka, insects, chemicals, any other industry challenges such as oversupply, market diversification, supply chain problems.
- Facilitated development of the Banana Industry Strategic Investment Plan (SIP) 2017-2021 by assisting the consultants who prepared the new SIP for the Banana industry; organising a workshop in NQ for consultation with growers and other industry stakeholders; providing feedback on drafts of the new Plan.
- Provided technical advice at twice yearly Hort Innovation R&D SIAP meeting e.g. delivered an oral presentation to the panel summarising the lessons learned from TR4 management in the Philippines and Taiwan.

b) **Biosecurity**

- Provide extensive advice to BQ Panama TR4 Response program.

- Reviewed and provided feedback to BQ on new 'Biosecurity Manual and Regulations', Banana Guideline and the 'Surveillance program for Panama disease TR4- detection of disease in QLD'.
- Conducted a detailed review over 3 days of BQs 'Risk Assessment: Potential for contamination and disease spread from Panama TR4 Program field activities'. A report was then prepared and submitted to the ABGC board and an article published in Australian Bananas Magazine.
- Provided advice to consultants and BQ on the development of the the Development of the Interstate Certification Agreement for fruit leaving TR4 infested farms.
- Reviewed and provided feedback to BQ on various documents including the:
    - Biosecurity Manual and Regulations
    - Banana Industry Guideline
    - Service Provider's Standards
    - A plain English factsheet developed for growers and tissue culture business to understand general biosecurity obligation when awaiting test results after suspect samples have been taken for testing.
    - 'Surveillance program for Panama disease TR4- detection of disease in QLD' and its subsequent strategy reviews.
    - 'Preparing growers for Panama disease TR4 detection- Highest at-risk grower engagement and communication strategy'.
    - 'Understanding the distribution of FOC through the peduncle and into the fruit'.
- Yellow Sigatoka: Involved with BQ in developing a Memorandum Of Understanding (MOU) for inspection services for in Queensland and training for inspection services for Yellow Sigatoka Liaison officer May 17.
- National Freckle Eradication Program: Visited the Berrima Research station NT and discussed progress with the Chief Plant Health Officer, Biosecurity and Animal Welfare, NT DPI&R.
- Participated and had input to a Biosecurity workshop for stakeholders in Darwin NT 2018
- Continued Participation in National Consultative Committee for Emergency Plant Pest (CCEPP) meetings providing technical advice and feedback on behalf of the Banana Industry. (The majority of my input is on Banana Freckle and any other relevant exotic pest incursions).

c) **Overseas institutions**

- Participated in the ACIAR Hort/2012/0972 *Integrated management of Fusarium wilt of bananas in the Philippines and Australia* trip to the Philippines to assess project progress. ABGC was a partner organisation in the project. This allowed liaison with international collaborators including industry representatives from Philippines and Taiwan, Universities researchers and members of Bioversity International.
- Visited, assessed and built relationships with Taiwan Banana Research Institute to help understand management approaches and practices in living with TR4 and facilitate sharing of technology and germ plasm (Feb 2016).
- Organised and hosted a 4 day tour of NQ growing area for TR4 eminent scientists from France and USA (invited speakers at 2017 Congress) including meetings with NQ scientists and BQ staff.
- Assisted in the organisation and hosting of scientists from Taiwan and the Philippines in NQ to develop collaborations that will assist the Australian industry gain access and develop improved banana varieties.
- Meeting were also held with banana researchers from Israel, China and Central America when they visited Australia.

d) **Agricultural Chemicals**

- Attended a workshop and provided input on the Strategic Agrochemical Review from APVMA in Canberra Nov 2015.
- Also provided advice to growers on chemical registration and use.
- Jointly with the Banana Industry Strategy Manager, organised and chaired a chemical workshop to review priorities and actions from the 2012 Strategic Agrichemical Review Process (SARP). Participants included growers, researchers, chemicals consultants and HORT INNOVATION from Qld and interstate. The Banana Industry R&D Manager wrote the report on the workshop which sets priorities and informs the industry where there are gaps in control measures (Appendix 6).

- The above report was used to inform the IPDM workshop as part of priority setting for theme 4 of BA16001 I*mproved Plant Protection for the Banana Industry* at which the Banana Industry R&D Manage participated and provided advice.
- Wrote and sent in a submission to APVMA on behalf of the banana industry in response to their decision to cancel all uses of Omethoate for the banana industry.
- Also provided advice to growers on chemical registration and use.
- Provided advice to chemical companies on needs of the banana industry, e.g Arysta, Nufarm, and BOC.

e) **Other**

- Represented the banana industry and provided input at the Horticulture and Forestry Science Stakeholders event (Dec 2015), HORT INNOVATION's Levy Payer Workshop (Feb 2016), Fresh Care Members update workshop (Sep 16), AG Vet Forum Canberra 2016, DAF Horticulture R&D meeting Eco Science Precinct (Mar 2017).
- Provided banana industry and pest and disease advice to Plant Health Australia Forums at least twice yearly.
- Attended "TR4 on-farm Biosecurity" workshop in Coffs Harbour and liaised with growers
- Attended the ABGC Banana App launch and BQs Feral Pig TR4 Brochure launch
- Conferences: Attended the Biological Farmers Conference Cairns (Oct 2016); Australian Banana Industry Congress 2017; Science Protecting Plant Health conference at the Brisbane Convention Centre (Sep 2017).
- Advice was given to ABGC quarterly – This included technical matters and general R&D issues.
- Provided advice to numerous phone and email enquiries from the stakeholders, banana industry supply chain members and research providers.
- Kept up to date with relevant literature and research in Australia and Internationally.

4. Communication Materials

- Revised and provided feedback to BQ and ABGC on fact sheets and training modules.
- Had input into a media release on the TR4 ACIAR project. This has been published both online and in the print media on the ABGC web site, Banana e- bulletin, Fresh Plaza, NQ local newspapers and online news.
- Template prepared for the development of TR4 Farm Biosecurity Management Plans.
- Participated and had input into Banana Growers Association (BGA) meetings in the Cassowary Coast and Coffs Harbour and Mareeba.
- R&D Updates were given to the ABGC board at quarterly Board Meetings.
- Oral presentations were given at Banana roadshows in Mareeba and Innisfail (2016), the ABGC workshop and BAGMAN meetings, Panama TR4 workshop Brisbane Feb 2017, BA14013 and BA14014 project meetings Sep 2017; BA14014 Mid-term review Mar 2018.
- Technical advice provided to growers at the TR4 field day in Nov 2015.
- In collaboration with staff at South Johnstone DAF, produced a booklet summarising work by all banana R&D projects. This was published and distributed at the 2016 Road Shows.
- Published articles in the Australian Bananas Magazine:

  2016

  - Living with TR4 Lessons learned from the Philippines and Taiwan
  - Thrip control chemical under review
  - Freckle eradication enters final phase
  - Chemical stocktake in Brisbane Workshop

  2017

  - QBAN scheme to be updated in 2017
  - Update on the banana freckle program in the NT
  - A new strategic Investment Plan in the Making
  - Risk assessment review into BQ field activities

- Banana Freckle Update
- Hort Innovation projects
- Breeding for disease resistance in bananas
- New QBAN signed off
- Omethoate extension

2018

- Taiwanese research visit

- Contributed to the numerous fortnightly ABGC e-bulletins sent to growers.
- Gave three radio interviews (QUT News; SEA FM Cairns; 4CA) on the importance of using clean planting material.
- Developed new ABGC fact sheets on 'Grower responsibilities with respect to aerial spray operators', 'Controlling bunch pests with Chlorpyrifos Dust- User Guide'**,** Alternative methods of bunch pest controls', 'Standards for the transport of bananas'.

5. General Outputs

- Program Logic, Monitoring and Evaluation Plan, Stakeholder Engagement Plan
- Annual work plans
- Participation and input in 6 monthly PRG meetings
- 6 monthly milestone status reports
- Mid-term review and Report
- Final Report.

Outcomes

The key objective of BA14012 Coordination of Banana Industry R&D (Panama TR4) was to build knowledge and capacity within the Australian banana industry to effectively manage and contain Panama TR4.

1. In terms of Project Coordination, the success of the project is evidenced by the initiation and progress of a series of well-coordinated banana R&D projects as detailed above. These projects are delivering useful strategies to growers for the containment and management of TR4 and other pests and diseases. Particular examples are the major investments in R&D such as the Plant Protection Program and the TR4 research projects which have been established without duplication of effort and so that research topics are complementary.

   The R&D Manager has also been instrumental in driving the establishment and progress of the QBAN transition project. The development and implementation of a new clean planting material system for the Australian banana industry (QBAN) to produce high health nursery stock is critical for ensuring the prevention of spread of diseased material (e.g. TR4 and BBTV) in planting stock. The importance of this work was stressed in the mid-term review of BA14014 the Panama TR4 Research program.

   Relationships and communication between service providers and individual researchers have been improved through this project. This was highlighted through the BA14012 Mid-term review and its survey where service providers emphasised the facilitation and communication skills of the Banana R&D Manager. Improved relationships and better communication, means that there is better exchange of scientific knowledge between researchers and a shared understanding and appreciation of technical information between different groups. The combined research effort is therefore more synergistic.

   Through this project, the Banana Industry also has a mechanism to coordinate and develop new for projects e.g. the Coffee Bean Weevil project and Review of the Owner Reimbursement Evidence Framework and others that were developed and established during the term of this project. The Banana Industry R&D Manager fields numerous enquiries and works closely with research providers on R&D matters. This ensures that new projects are targeted towards solving industry priorities and saves research providers wasting time and effort to develop concepts and projects, which are not relevant to the banana industry.

2. Industry knowledge on Panama TR4 spread and management especially disease background, identifying and reporting, disease risk pathways and on-farm biosecurity practices has significantly increased through this project. Varied activities such as TR4 field days, workshops, individual grower visits, road shows, BAGMAN meetings, tours by international visitors and the 2017 Banana Congress have all contributed to raising the knowledge and awareness of TR4 amongst the industry. There were over 100 participants at the TR4 field days run by DAF and more than 300 delegates at the Congress making these the most significant events for disseminating information over the last 3 years. Work by the subcontractor Shane Dullahide in 2017 as part of this project also contributed to increased awareness of TR4 management and containment in growers in the Tully valley which has been continued by the Banana Industry R&D Manager.

   Evaluation data following the TR4 grower workshops run by ABGC and DAF extension staff showed that 75% of participant's knowledge of Panama TR4 was improved - they had a better understanding of the disease risk pathways and understood suitable biosecurity practices. At the start of the workshops, 15% rated their current knowledge of recent banana R&D a 4 or 5 out of 5, and at the end of the workshop, 60% rated their current knowledge of recent banana R& D a 4 or 5 out of 5. Over 65% of attendees rated the events ≥ 8 out of 10.

3. The Australian banana industry has a containment management strategy in place for TR4, which has been developed by BQ in collaboration with ABGC and ASQ. This containment program has been successful in slowing the spread of TR4 in the banana industry. It is still contained to just three farms in close proximity in the Tully Valley. This has been unheard in most other countries where TR4 has quickly reached epidemic proportions. The achievement of this containment program is a result of a coordinated response, effective extension of knowledge to industry and its stakeholders, adoption of new biosecurity practices, all of which are underpinned by relevant high quality science.

   The variation to this project that has resulted in a generic template for a TR4 farm biosecurity management plan which has, and will continue, to assist in ensuring the containment management strategy is effective when additional farms are found to be infested with TR4. These plans mean that growers will not only forewarned about what to expect if they become infested with TR4, but will have thought about strategies to provide the most effective containment while continuing to trade their fruit.

4. The banana industry has implemented appropriate extension strategies for Panama TR4.
   This is mainly through the National Banana Development and Extension Project but also through efforts within this project when working synergistically with DAF Extension staff.

   The Banana Industry R&D Manager has built relationships directly with many growers and members of the supply chain. Speaking directly to growers through farm visits or at Banana Grower Association meetings ensures accurate information delivery and allows the canvassing of concerns from the grower community.

   Many R&D concepts and updates are communicated to industry via ABGC Communications project for the banana industry as well as at Congress, field days, seminars and workshops. The Banana Industry R&D Manager regularly contributed material through these extension strategies and maintains good linkages with both the extension and the communications projects.

5. Input to the banana industry R&D program was achieved by participation at Banana Industry R&D SIAP meetings and membership of nine PRGs as listed under outputs item (d). Input included scientific and technical advice as well industry information which help accelerate project development and progress since. The R&D Manager also provided assistance on organisational matters in close collaboration with Hort Innovation staff. This was evidenced by positive feedback provided by Hort Innovation staff and members of the R&D SIAP.

6. Industry and other stakeholders are more informed on key pest and disease issues (e.g. TR4, endemic and exotic diseases, chemical usage and permits) through the provision of a wide range of technical advice. Being better informed means industry has the knowledge and ability to acquire new skills, increase business productivity, meet changing business needs and therefore, achieve greater profitability and resilience.

Monitoring and evaluation

A large number of outputs and outcomes have been delivered to industry and stakeholders through BA14012. The monitoring and evaluation plan prepared for this project included a series of key evaluation questions to determine this project's impact, effectiveness, appropriateness and efficiency to assess whether industry funds have delivered benefits to growers.

Impact and Effectiveness

Feedback from R&D project leaders and other government and industry stakeholders demonstrates that this project has had a significant impact on the banana industry and has been very effective in delivering outcomes on its objectives. This was highlighted in the mid-term review (Appendix 7) where it was felt that the Banana Industry R&D Manager was a competent and effective coordinator and broker between all project partners involved in Banana TR4 R&D resulting in a more efficient suite of projects from disparate researcher providers.

The fact that the R&D Manager has an overview of all banana research domestically and internationally, allows the role to take a holistic view about managing challenges faced by industry (particularly TR4) and influencing research and biosecurity stakeholders accordingly.

The development and progress of R&D projects were accelerated by the presence of the R&D Manager since she catalyses action and partnerships, follows up information and people, organises meetings and sets deadlines. Having a dedicated industry person such as the R&D Manager drive these processes and coordinate stakeholders was seen as a benefit by all stakeholders consulted in the mid-term review.

One stakeholder noted that "If the R&D Manager's role was not there, the industry would have to rely on partisan, very busy research providers resulting in a less cohesive R&D Program less focused on industry needs".

An effective containment strategy is in place for TR4 and the rate of spread of the disease has slowed significantly. Australia is seen internationally as a model for TR4 containment since no other country affected by the disease has managed contain the spread as successfully; a credit to DAF staff and the many scientists involved in the response. The Banana Industry R&D Manager has been an effective conduit of information between BQ's Panama TR4 Program and the banana industry which has strengthened the partnership and also provided confidence to industry that response activities are sound and grounded in science.

There has been a significant increase in awareness and adoption of R&D outputs particularly about TR4 as detailed previously in this report. The Banana Industry R&D Manager is important translator of information taking highly technical concepts and communicating them back to industry in a clear understandable way. This enables the industry and Hort Innovation make more knowledgeable and informed decisions about resource allocation into banana industry R&D.

The Banana Industry R&D Manager works closely with the National Extension Project and the Banana Industry Communications Project to disseminate knowledge to industry and has been responsible for the development of a series of resources to benefit growers at risk from TR4. The role is ideally placed in ABGC to capitalize on their agile communication system and ensure information relating to R&D matters is disseminated in a rapid and timely manner to the whole industry.

The industry is better informed on key pest and disease issues through the technical advice provided by this project. All industry and R&D stakeholders viewed the R&D Manager as the 'go-to' person for information about the banana industry R&D matters generally. The current R&D Manager is a competent and experienced scientist in her own right and, as well as advice on pest and disease issues, a breadth of additional advice was provided to industry and stakeholders on aspects of molecular biology, tissue culture, research principles and experimental design, diagnostic testing, chemical registration, genetics and plant breeding.

As a neutral 3rd party, this project has assisted in the negotiating agreement between parties, and improved the understanding and appreciation of different groups. This ensures that time and money invested to meet industry challenges are not stymied by disagreements between different parties.

Appropriateness

The appropriateness of the project approach and strategies for BA14012 is evidenced by the many outcomes delivered by the project and detailed in this report. The methodology was successfully implemented and activities suitably pitched to the different stakeholders and organisations.

One stakeholder commented in the mid-term review that 'The R&D Manager represents the Australian banana industry in a range of R&D forums and consistently presents the banana industry position to all stakeholders'. Examples of this include reviewing and evaluating research proposals, research priority setting, planning, provision of technical advice, and input into extension and communication.

Other comments from stakeholders include 'The R&D Manager provides a practical 'whole-industry' perspective and has a broad view of issues' and 'The role is seen as an independent arbiter between research organisations and Hort Innovation'.

Other sentiments expressed during the mid-term review were that the role provides industry vetting for project ideas and provides information to researchers of emerging issues for the banana industry. This improves the efficiency with which projects concepts are developed and progressed.

Efficiency

The project has been efficient at implementing the agreed activities according to agreed schedules and budgets. Information gathered for six monthly milestone reports and PRG meetings was comprehensive. Project reference group meetings were a productive forum to assess the project progress and milestone reports were prepared and submitted on time.

There have been no delays to the project other than the appointment of the R&D Manager nearly three months after signing of the contract and no problems were experienced in the delivery of the project. This delay was quickly overcome by the efficiency with which the current R&D Manager became cognizant of the role and implemented project activities.

BA14012 has been highly efficient at delivering value for money. This is demonstrated by the large number of useful outcomes delivered within budget to industry as detailed in this report. The efficiency of the project is further supported by the findings of the independent mid-term review (Appendix 7) which clearly demonstrated the value of the project.

Recommendations

- Continue to provide the Australian banana industry with ongoing R&D coordination for the next 3 years through investment in a follow-on project.
- Broaden the scope of a follow-on project to include all R&D for the banana industry as well as TR4.
- Continue to build effective relationships and facilitate collaborations with research providers, growers, industry stakeholders and government bodies.
- Maintain an effective working relationship with Biosecurity Queensland Panama TR4 Program.
- Continue to work with the extension and communication projects to ensure that the latest R&D developments disseminated to industry in an accurate and timely manner.
- Continue representation of the industry and R&D at relevant forums, and meetings of relevant government departments and agencies.

Refereed scientific publications

Not applicable

Intellectual property, commercialisation and confidentiality

No project IP, project outputs, commercialisation or confidentiality issues to report.

Acknowledgements

ABGC would like acknowledge members of the Project Reference Group Mr Stewart Lindsay, Ms Naomi Brownrigg and Ms Bianca Cairns for their valuable input during this project. Thanks also Mr Shane Dullahide for his work with high risk growers in the Tully Valley and in initiating the development of the generic TR4 On-Farm Biosecurity Farm Management Plan.

Appendices

Appendix 1 Project Plan including, M&E, Stakeholder Engagement Plan, Program Logic

Appendix 2 QBAN transition project Communications Plan

Appendix 3 Results of the QBAN survey of banana growers

Appendix 4 Panama Tropical Race 4 Biosecurity Plan Report

Appendix 5 TR4 Farm Biosecurity Management Plan Generic Template

Appendix 6 Outcomes of the Chemical Workshop organised by ABGC

Appendix 7 Independent Mid-term Review of BA14012

Appendix 1 Project Plan

Project Details	
Project code:	BA14012
Project title:	Coordination of Banana Industry R&D (Panama TR4)
Project type	R&D
Service Provider:	Australian Banana Growers' Council
Industry	Banana 100%
Government Priority	Productivity and Adding Value
Project Leader:	Mr Jim Pekin
Project Period:	30 Feb 15 – 2 Aug 2018
Project Manager	Dr Rosie Godwin

1. MONITORING AND EVALUATION (M&E) PLAN PURPOSE

The purpose of this M&E plan is to

- Demonstrate the process for monitoring and evaluating progress, performance and achievement of the research agreement and how this contributes to the outcomes and deliverables for the project.
- Enable communication and reporting on progress, performance, and achievements and the resulting impacts.
- This M&E plan will be conducted by the project manager and identifies
    - Who is the coordinator of the M&E plan
    - Evaluation questions necessary for assessing achievements
    - Requirements for monitoring progress and performance
    - Stakeholder engagement plan
    - Project risks and how they will be managed

1.1 STAGES

The M&E Plan for BA14012 Coordination of Banana Industry Research and development (Panama TR4) covers the three phase cycle of preparation, implementation and review:

I. Preparation – developing the project Program Logic and using it to develop the M&E plan. This occurs at the beginning of the project.
II. Implementation – of the M&E plan providing for continual monitoring of progress, evaluation of impact and achievements and reporting to HIA. The frequency of reporting is established in the research agreement project plan and payment schedule. The evaluation process has been developed to suit the length of the project and provides for milestone, mid term, annual and final reports.
III. Review – of the M&E plan annually and at the end of the project. This will allow an assessment of progress in delivering the targets identified in the project outline; a review of management and delivery

processes, recommendations for improvements and assessment of the effectiveness of the project in delivering against outcomes specified in the project proposal.

2. SCOPE

Timeframe: Aug 2015 - Aug 2018

Purpose: The objective of this project is to coordinate and build knowledge and capacity within the Australian banana industry to manage and contain Panama Tropical Race 4 (TR4) fungal disease. The project will focus on project development coordination and extension, predominantly in the area of Panama TR4 research and development (R&D).

Background and Rationale: Two key objectives within the Australian Banana Industry Strategic Investment plan 2014/15 – 2018/19 are to "maintain a consistent and quality supply of Australian bananas whilst achieving a 5% productivity gain by 2018/19" and "improve industry capacity and R&D adoption". Three key strategies to address these objectives are:

- Implement appropriate biosecurity management strategies and information systems to facilitate supply (strategy 1.3)
- Promote adoption of appropriate R&D and facilitate other industry development activities (strategy 3.1)
- Continue to build industry skills and develop appropriate structures and resources to meet industry needs (Strategy 3.2)

This project will help address these three strategies and ultimately contribute toward the 5% productivity gains and industry capacity to adopt R&D on farm. The presence of TR4 was confirmed on one farm in the Tully valley in the major Australian banana growing area in March 2015. Since then there have been two other detections confirmed but these have been confined to the same infected property. Given the nature of Panama TR4 and the manner in which it is vectored, the instigation of a containment management program and finding ways to minimse its spread makes the role of the Banana Industry R&D Manager critical to the industry.

This project will be central in ensuring R&D in this area is well coordinated and will deliver tangible adoptable outcomes for growers and industry. The industry also needs to be informed on technical matters on other important pests and diseases for example Banana Freckle eradication and management where scientific input from industry is imperative.

The primary deliverables of the R&D Manager will be

i. Project development and coordination in the area of Panama TR4 R&D
ii. Extension of Panama TR4 R&D projects
iii. Input to the banana industry R&D program, including membership of project reference groups
iv. Technical advice to the banana industry on key pest and disease issues.

Activities:

The main activities undertaken to deliver project outcomes are:

- Research to build knowledge and understanding of the banana industry, its production and key issues being faced by industry, particularly Panama TR4 as well as all relevant RD&E projects.
- Face to face meetings and liaison with all relevant researchers, growers, HIA, stakeholders, government department and regulators and any other relevant parties.
- Membership of project reference committees and R&D advisory panels.
- Input into field days, workshops, growers meetings.

- Communications though industry newsletters, banana e-bulletins, Australian banana magazine, ABGC web site and Industry's Biennial congress.
- Professional development through attendance at relevant meetings and conferences.

Audience: The audience for project development and coordination services for Panama TR4 R&D will be research providers, HIA, government departments and regulatory authorities. Extension and communication services will be delivered to stakeholders including HIA, all growers, all banana services providers, banana agribusiness managers and nursery operators. Collaboration and communication with other related projects, national and international experts will also occur which is outlined in the stakeholder engagement plan.

Budget: The budget for the M&E plan will be part of the overall project budget.

PART 1 PROGRAM LOGIC

The project logic for BA14012 is shown in attachment 1 and is based on the information provided in the project scope.

This program logic was developed by the R&D manager and project reference committee in relation to the Banana Industry Strategic Plan 2014/15 - 2018/19. The purpose of the program logic is to set out the structure and logic of the project. From this, a M&E plan has been developed which demonstrates how activities underpin delivery of outputs, which in turn underpin achievement of the outcomes**.**

PART 2 MONITORING AND EVALUATION

Key evaluation questions involving the impact, effectiveness, appropriateness and efficiency were asked in order to determine whether industry funds achieved their objectives in delivering benefits to growers. These are detailed in the table below along with the evaluation methods and frequency, method of monitoring and methodology employed and form the basis of the M&E plan. This process will demonstrate

- What contribution has this project made to
  - building the knowledge or capacity to manage and contain Panama TR4 and other pests and diseases
  - what extent have R&D outputs been adopted by industry?

- Did the project deliver what was intended? To what extent have the industry funds achieved their objectives in delivering intended outcomes and benefits to growers?
- How relevant was this project to the needs of the growers, research providers, advisors and industry stakeholders?
- To what extent were the activities and engagement processes appropriate for the identified target audience?
- To what extent has this project delivered value for money?
- What are the risks involved with the project?

Evaluation Purpose	**Key evaluation questions**	**Evaluation methods and frequency**	**What will be monitored and when**	**Monitoring measures and methods**
Impact	What contribution has this project	This will be reviewed	The awareness amongst R&D project	Surveys will be conducted to determine how well R&D

	made to the development, coordination and extension of Panama TR4 R&D projects Is there a containment strategy in place and is it on track?	and published in the end of project report	leaders of other projects being conducted. Any collaborations or sharing of ideas that arises from their increased awareness of each other's work Presence of an up to date Containment management plan/strategy	projects are linked and complement each other in order to solve TR4 problems for the banana industry and provide an effective containment management strategy.
	To what extent have the ouputs of R&D been adopted by industry	Assessments can be made throughout the project as part of associated ABGC and HIA funded extension projects and also in the end of project review	Knowledge of Panama TR4 and how it is managed will be assessed in the Australian banana industry. These will occur throughout and at the end of the project.	This information will be obtained through surveys and interviews of growers and other stakeholders at activities such field days, growers meetings, road shows and workshops.
	What contribution has this project made to technical advice given to the banana industry on key pest and disease issues.	Mid and end of project reports	The number of technical queries, variety and quality of advice given will be monitored throughout the project.	Interviews and surveys will be undertaken with growers and research providers
Effectiveness	How effective were different project activities for project deliverables: 1.TR4 project development and coordination	Mid and end of project reports Review of minutes of project reference	The number and type of activities undertaken to facilitate project deliverables will be evaluated .	Progress in the four deliverables as a result of project activities will be discussed and evaluated by the project reference group, and different stakeholder groups . This will be reported

	2.Industry adoption and extension services for Panama TR4 projects 3. Input to the banana industry R&D program including membership of project reference groups 4.Technical advisory services and input to the banana industry R&D program.	group meetings		in milestone and end of project reports
Appropriateness	Was the project approach and strategies appropriate for: 1.TR4 project development and coordination 2.Industry adoption and extension services for Panama TR4 projects 3. Input to the banana industry R&D program including membership of project reference groups 4.Technical advisory services and input to the banana industry R&D program.	Mid and end of project reports Review of minutes of project reference group meetings	The appropriateness of different project activities for achieving project outcomes will be assessed.	Comments and feedback on the satisfaction and effectiveness of engagement will be sought from stakeholders via email and discussions. Findings will be recorded in mid term and end of project report.
Efficiency	To what extent has this project implemented agreed activities according to agreed	End of project review including progress	Actual activity progress and deliverables compared to planned progress	Project accounts and audited records of expenditure Timelines of implementation actual versus anticipated

	schedules and budgets outlined in the research agreement.	reports minutes of reference group meeting and meetings with project participants.	and deliverable. Information gathered for project meetings and reported twice yearly in milestone reports and the final report.	activities achievements and impacts. Data sources include records reports, discussions with research providers, growers and stakeholders.
	To what extent has this project achieved value for money?	Six monthly and annual evaluation of project actions and their contribution to meeting anticipated goals. End of project evaluation	Implementation of lessons learned as a result of monitoring and evaluation	Lessons learned discussed at management meetings and recorded in final report as recommendations.

PART 3 STAKEHOLDER ENGAGEMENT PLAN

The aim of the stakeholder engagement plan is to encourage wider and more positive cooperation within the project, win and maintain support from stakeholders, anticipate stakeholder reaction and build into the plan actions to win support. An effective engagement plan allows information to flow in both directions and will improve the quality of project deliverables which in turn will maximise the likelihood of project success. The benefits of engagement include the opportunity for different groups to contribute as experts in their field to policies and program development, have their issues heard and participate in the decision-making processes and allow more efficient adoption of new R&D by industry.

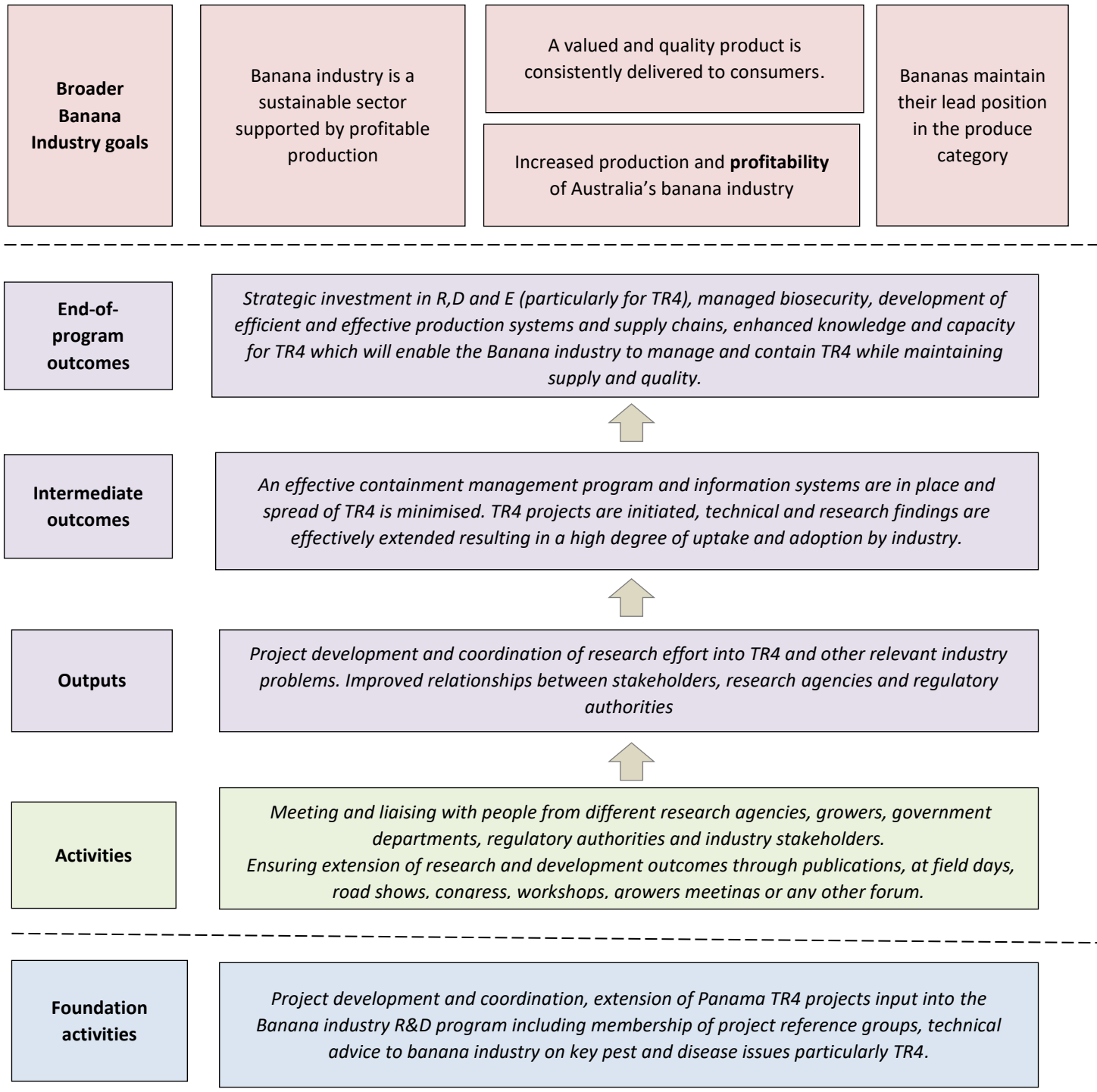
<table>
<tr><td colspan="3">Engagement Objectives
• To achieve efficient and effective project coordination, development and extension of Banana industry R&D particularly in the area of Panama TR4 and
• Enhance technical and R&D adoption in the banana industry and input into the Banana Industry R&D program.</td></tr>
<tr><td>Who</td><td>1. Stakeholders</td><td>Research providers and their individual research scientists; State and Federal departments; Regulatory authorities; Horticulture Innovation Australia; Individual growers; Growers Associations; Other Horticultural industries, peak industry bodies and their representatives; banana supply chain businesses; members of the public, ABGC colleagues</td></tr>
<tr><td rowspan="2">How</td><td>2. Level of Engagement</td><td>• Research provider and research scientists High interest / High influence
• State and federal departments High interest / High Influence
• Regulatory authorities Medium Interest/ High Influence
• Individual growers High interest / High Influence
• Growers associations High Interest/ Medium influence
• Other Horticultural industries and their representatives Low interest / Low influence
• Banana supply chain businesses Low Interest / low influence
• Horticulture Innovation Australia High interest / High influence
• ABGC colleagues High interest / High influence
• Members of the public Low Interest / Low influence</td></tr>
<tr><td>3. Proposed method of Engagement</td><td>Research provider and research scientists
Individual and group activities including meetings, attendance and input at ideas exchanges, conferences, workshops, written publications.</td></tr>
</table>

		Membership of project reference groups, Websites, bulletins circulars
		State and federal departments and Regulatory authorities Face to face meetings, membership of project reference groups, steering committees, focus groups, public comment, forums
		Individual growers Individual and group meetings, Fact sheets, web sites, bulletins, circulars, surveys, public meetings, workshops
		Growers associations Group meetings, seminars, Fact sheets, web sites, bulletins, circulars, surveys, public meetings, workshops
		Other Horticultural industries (including nurseries) and their representatives Individual and group meetings, Fact sheets, web sites, , bulletins, circulars, surveys, public meetings, forums
		Banana supply chain businesses Web sites, bulletins,.
		Horticulture Innovation Australia Meetings, project reporting, workshops, project steering committees
		ABGC colleagues Collaborations and meetings
		Members of the public Fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, forums
	4. Timing	**Research provider and research scientists** Identify and organise a series of face-to- face meetings with major banana research groups within the first 6 months of the project. Attend and have input into ideas exchanges in the form of group meetings, seminars, field days and workshops when available. Attendance and input to project reference group meetings of relevant projects – twice yearly Participation in ACIAR project trip and NQ Road Shows Ongoing is the distribution of information through the web site, e-bulletins and magazine etc.

		State and federal departments and regulators Weekly SitRep meeting with BQ - ongoing Participation in workshops in response to consultation by APVMA twice yearly Individual and group meetings with BQ about QBAN and AgriSci QLD regarding diagnostics as required
		Individual growers Individual or group activities with growers at least 4 times per year The R&D manager will have input into fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops - ongoing These will be targeted to growers.
		Growers associations Attend a meeting of a growers association at least once per year, provide advice either written or verbal as requested Have input into fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops – ongoing.
		Other Horticultural industries and their representatives Liaise with other horticultural industries through meetings, networking events, meetings, forum and workshops – as required -on going
		ABGC colleagues Meetings and collaboration on different projects and towards goals relevant for industry. This will be ongoing occurring frequently each week. Joint input into publications and representation for industry
		Members of the public Provide written or verbal advice as required and have input into any media released to the public e.g. web site and any other publications. This will be ongoing as required.
	5. Resources	The project is well resourced to meet the stakeholder engagement plan. Funds and time have been appropriately allocated
	6. Responsibilities	• The major responsibility for implementation of the Stakeholder engagement plan will be via the ABGC R&D manager and project reference group. The R&D manager will be the conduit for information flowing between all interested parties and stakeholders and to provide input into the banana R&D program.

		• Research project leaders and service providers are responsible for reporting their R&D outcomes and technical advice. The R&D manager will liaise with researchers, extension groups, national and international collaborators, • HIA funded and ABGC Extension project teams will be responsible for adoption strategies • The R&D manager will work closely with the ABGC Communications manager for the dissemination of information to industry and the general public . • The R&D manager will work collaboratively with other ABGC R&D projects and ABGC management team in stakeholder engagement activities. • It will be the R&D manager's responsibility to submit milestone, mid term, annual and final reports to HIA
	7. Key messages to communicate	Research priorities identified by industry will be communicated to research providers and HIA Cooperation and coordination of research priorities to interested parties R&D investments and outcomes will be communicated to all growers and any other relevant industry bodies to maximize adoption.
Other considerations	**8. Managing Risk**	See **Attachment 2** for the risk management plan

ATTACHMENT 1 PROGRAM LOGIC



ATTACHMENT 2 PROJECT RISK

The risk management plan for BA14012 is shown below and includes risks considered to be within the reasonable influence of the project team to anticipate and manage**.**

Risk/Threat Description *Describe the threat/risk, its sources and impacts*	**Likelihood*** *Rare, Unlikely, possible, likely, almost certain*	**Consequence*** *insignificant, minor, moderate, major, critical*	**Rating** *Low, Medium, high, severe*	**Current Controls/Contingency** *Describe what you will do to mitigate the threat/risk, source or impact to an acceptable level*	**Residual Risk** *Describe any remaining risk after application of the control / contingency. Consider whether further management strategies are needed*
Risk of rapid spread of Panama TR4 through environmental factors or non-adoption of project information	possible	major	SEVERE	Ensure that RD&E currently being conducted will also have application for a situation where TR4 is widespread. Build effective relationships with all stakeholders so that In the event of rapid spread of Panama TR4 there can be rapid reappraisal of R&D strategy that involves living with TR4. The R&D manager and this project are the prime position to facilitate this rapidly.	The spread of Panama TR4 maybe outside the control of this project as it is always possible that it already exists in other parts of north Queensland. However this project is important for maintaining the research effort into how to maintain commercial banana production in the presence of TR4 and also for slowing the spread of TR4 throughout the major banana production area.
Duplication of Panama TR4 research efforts nationally or international if projects do not collaborate or project groups are unaware of each others research.	unlikely	Minor	LOW	Good communication and engagement with different TR4 research groups should increase awareness and understanding of each groups research directions, capability and findings. Building good relationships should facilitate the coordination of	There is still a residual risk that some work may overlap but it is likely that different experimental approaches will be synergistic to results and outcomes.

				different research efforts	
R&D manager does not develop effective relationships with growers and industry	unlikely	moderate	LOW	The R&D manager was recruited using a selection panel experienced in key skills and experience required for the job. The R&D manager will be working in conjunction with a project reference committee	The risk is acceptable

The risk matrix below was used to determine the overall "Rating" of each risk listed in the table above based on your identified level of likelihood and consequence to produce a rating (severe, high, medium or low).For example: If you identified a risk consequence as minor and the likelihood as possible, the risk "Rating" is low.

		Consequence				
Likelihood		**Insignificant**	**Minor**	**Moderate**	**Major**	**Critical**
	Almost Certain	**Low**	**Medium**	**High**	**Severe**	**Severe**
	Likely	**Low**	**Medium**	**Medium**	**High**	**Severe**
	Possible	**Low**	**Low**	**Medium**	**High**	**Severe**
	Unlikely	**Low**	**Low**	**Low**	**Medium**	**High**
	Rare	**Low**	**Low**	**Low**	**Medium**	**High**

Appendix 2

QBAN transition project

COMMUNICATIONS PLAN

SEPTEMBER 2017

This project has been funded by Hort Innovation using the banana research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

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1 BACKGROUND

Access to a clean planting material is critical for reducing the spread of both exotic and endemic diseases in the banana industry particularly TR4 and Banana Bunchy top virus (BBTV). Biosecurity Queensland (BQ) have indicated that they will no longer provide the service and financial commitment to maintain QBAN and want industry to take responsibility for their own clean planting material scheme.

To effect this change, ABGC has partnered with the Nursery & Garden Industry Australia (NGIA) to update and transition the QBAN scheme across to the Nursery Industry Accreditation Scheme Australia (NIASA)/ BioSecure HACCP (Hazard Analysis at Critical Control Points) scheme. NIASA is a national BMP scheme for production nurseries, greenlife markets and growing media businesses which operate in accordance with a set of national 'best management practice' guidelines. BioSecure HACCP is the industry-specific biosecurity program (a set of protocols) designed to assist production nurseries assess their endemic and exotic pest and disease risks, and implement management strategies at critical control points. Businesses manage biosecurity risks by establishing an effective quarantine process for both imported and exported plant material. The NIASA/ BioSecure HACCP system already has national approval from all state and federal jurisdictions.

Industry is now in the process of updating and developing a replacement QBAN Scheme with a more practical and workable system that will ensure the best possible biosecurity for industry and meet the new legislative requirements in each state.

2 COMMUNICATIONS PLAN

2.1 ROLE OF THE COMMUNICATIONS PLAN

The role of the Communications Plan is to:

- Identify key stakeholders and the messages to be conveyed to them;
- Define roles and expectations of ABGC, NGIA and QBAN participants;
- Describe the activities and when they will be completed (including the rolling out of the new scheme and delivery);
- Articulate targets and measures of success.

This document is to be a living document and to be reviewed regularly during the life of the project.

2.2 ROLES OF PROJECT PARTICIPANTS

There are a number of agencies (ABGC, NGIA, DAF, QBAN businesses) who are involved in the project. Each will have a role in articulating messages about this project.

The ABGC will do the bulk of the **Communications** to the banana industry. **Communications** will ensure stakeholders are aware of this project and its benefits and help engage growers to adopt project outcomes. ABGC will also link in with NGIA and QDAF communication as required.

2.3 OBJECTIVES

The objectives of the communication of this project are to ensure:

- That growers are informed about progress and implementation of the new QBAN scheme;
- That all Australian growers, are well informed about advantages of using planting material produced under the QBAN scheme.
- That contributing stakeholders such as QDAF and BQ are kept informed and engaged in the transition.
- Publicise and actively promote QBAN businesses through the ABGC web site, Australian Bananas Magazine and any other effective communication channels.

2.4 MEASUREMENT

The aim of the project mainly about keeping banana growers informed about the changes to QBAN and the relevance to their businesses. Two measures of success will be:

(a) number of growers that are aware of and understand the changes in QBAN
(b) number of growers that have an enhanced appreciation of what is offered by QBAN.

Attendance of growers at information sessions, one-on-one training and information sessions will also provide an indication of the percentage of the industry reached. Evaluations of growers' understanding will be measured through surveys.

2.5 ISSUES TO CONSIDER WHEN PLANNING COMMUNICATIONS ACTIVITIES

Since the detection of Panama Tropical Race 4 on a property in Tully, field walks on growers' properties have largely ceased because of on-farm biosecurity measures. Other means of communicating with growers include the use of videos, grower group meetings and 'field' days at locations such as local halls. The use of information technology is one of the greatest means of communicating on a broad scale. The immediate broadcast of information via e-bulletin, SMS, the ABGC webpage and Facebook is an integral part of modern communication activities.

Some growers may see the perceive the change in QBAN as having an adverse effect of farm profitability however QBAN is aimed at providing a superior disease-tested product that growers should find cost-effective and prefer to plant thereby enhancing their on farm biosecurity and allowing them more easily to meet their General Biosecurity Obligation. Information will be targeted to ensure all growers fully appreciate the advantages offered by planting material produced under the QBAN scheme.

3 SITUATION ANALYSIS: STAKEHOLDERS, ROLES IN THE PROJECT, OUTCOME REQUIRED AND KEY MESSAGES

A summary of the key stakeholders, outcome required and key messages.

STAKEHOLDER GROUPS	ROLE IN THE PROJECT	OUTCOME REQUIRED	KEY MESSAGES FOR STAKEHOLDER
Growers	Participation in information sessions, and meetings on the use of clean planting material	- Growers are aware and understand the biosecurity issues associated with poor quality planting material and how QBAN can help them address these issues. - Growers are aware of the phases of the development of the new QBAN Scheme - Growers are aware of how to access planting material produced under QBAN to help them improve their on-farm biosecurity management. - Growers take pride in their ability to adopt clean planting material produced under the new QBAN Scheme	- The use of poor quality planting material is a biosecurity issue for the whole banana industry. - Clean planting material is one way for growers to meet requirements set by state and federal biosecurity legislation and protecting your own farms. - By using clean planting material produced under the QBAN scheme you are improving biosecurity on your farm protecting yourself from pests and diseases and therefore contributing to the improved health of the whole banana industry. - The use of QBAN material is best practice - The ABGC is working to achieve best practice improvements via a collaborative and co-operative effort with NGIA.
Horticulture Innovation Australia	Funding of the project through BA14014	-Good return on investment, improved biosecurity practices on banana farms. -Reduction in biosecurity risk associated with Banana farms in Australia. -Sustainable horticulture sector.	-Project is targeting the use of clean planting material which is a priority area of the banana industry in terms biosecurity risk. -Many banana growers are responsible and many are doing the right thing.
QBAN committee and technical Advisory Groups	Champions of adoption. Providing guidance for project activities by providing feedback and acting as a sounding board for future development.	Group knowledge is used and members feel that their input is valued. Members are advocates for QBAN. Provide advice on how to enhance QBAN development and facilitate adoption of best practice.	Your input is valued and we want to hear if there is a better way to do things.
QBAN businesses	Provide industry experience, business and technical advice	QBAN businesses embrace and adopt the new QBAN scheme	Your input is encouraged, valued and necessary for the development and improvement of the new accredited clean planting material scheme

STAKEHOLDER GROUPS	ROLE IN THE PROJECT	OUTCOME REQUIRED	KEY MESSAGES FOR STAKEHOLDER
ABGC Board	Governance and oversight. Encourage growers to adopt best practice for clean planting material	A well thought out planting material scheme that growers like and use. Able to show government, lobby groups and other industries that banana industry is responsible and proactive, and that ABGC is helping growers meet their obligations.	Worthwhile investment for ABGC and meets strategic aims of the Board. Most producers will see commercial benefit from greater biosecurity, farm efficiency and sustainability and industry reputation protection by reducing biosecurity risks.
QDAF (BQ and ASQ)	-Provision of support during project development and transition. - Advice and guidance to industry on technical and biosecurity matters.	Gradual handover of QBAN to industry (NGIA and ABGC)	QDAF kept up to date All working together to meet Govt requirements. Good news stories for Dept.
Community		Improved biosecurity practices through the use of clean planting material is an essential component for preventing and containing the spread of pests and diseases Improved economic activity and employment opportunities. Consumers continue to have faith in the banana industry.	Banana growers take biosecurity issues seriously many are working to adopt improved practices which can be more difficult and expensive. They continue to strive towards best practice improvements to enhance the sustainability of the industry.

4 COMMUNICATIONS ACTIVITIES:

4.1 RESOURCES AND ACTIVITIES

4.1.1 Key Messages

- The spread of pests and diseases such as Panama TR4, Banana Bunchy Top Virus or nematodes is a major threat to the sustainability of the banana industry. Access to clean planting material is critical for reducing the spread of both exotic and endemic diseases.
- Under state legislation in Qld and NSW, growers are responsible for managing biosecurity risks that they know about or could reasonably be expected to know about.to to reduce biosecurity threats. This means not using planting material that could possibly be infested with pests and diseases.
- ABGC, NGIA, state and federal governments want to help growers improve on-farm biosecurity management for growers by encouraging them to use high quality certified disease-free planting material as best practice.
- Extension support is available for growers to assist them in implementing practice change grants.

4.1.2 Branding and acknowledgements

It is important to recognise of all the participants contributing to the project and to acknowledge the funding by Horticulture Innovation Australia correctly.

All communication and media materials in relation to this project must promote the positive working relationships between various industry groups and government and, where possible, include these actively involved parties in media and publicity opportunities where appropriate.

All communication and media material to be emailed to either:

ABGC Communications Manager sonia.campbell@abgc.org.au or ABGC Communications officer Amy@abgc.org.au . Sonia can also be contacted on 0428 038 330. Amy's mobile is .0439 005 946.

List of communications, media, publicity and promotional opportunities may include and not limited to (e.g.): media announcement/s, interview/s, advertisement/s, promotional material/s, fact sheet/s, article/s, presentation/s.

*Industry stakeholders includes: growers, consultants, QBAN businesses

4.1.3 Details on specific activities

Target Audience	Vehicles	Responsibility	Frequency
Growers, stakeholders and community	Media Releases – sent locally and Australia-wide to television, newspapers and radio stations	Sonia Campbell Rosie Godwin	Whenever the opportunity arises Future media releases; -Project initiation -Project description and time line -Project Progress updates on project roll out Successful implementation

			Positive news story on QBAN businesses- -Extension activity work
Growers and industry stakeholders	e-Bulletin	Sonia Campbell Rosie Godwin	As required - On average, the e bulletin goes out every fortnight
Growers, industry and community	Australian Banana Magazine	Sonia Campbell Rosie Godwin	3 editions per year 1-2 articles per year Regular listing of QBAN businesses in every magazine and on ABGC Web site
Growers, industry stakeholders and community	Facebook	Sonia Campbell	Addressed daily to publicise the latest news and developments – including the media releases outlined above
Growers	Qld and NSW Banana Growers' Association	Sonia Campbell Rosie Godwin	Once per year or as required
Growers	The Next Gen Growers group	Sonia Campbell Rosie Godwin	Once per year, written communication as required
ABGC Board	Board meetings and written updates.	Rosie Godwin	At least 4 times per year
Growers and industry stakeholders	Conferences	Rosie Godwin	Investigate attending conferences which biosecurity/ plant pathology
Growers & Industry stakeholders	Banana Industry Congress	Rosie Godwin Sonia Campbell	Mid 2019
Growers/ DAF	Direct e-mail and phone contact	Sonia Campbell Rosie Godwin	Ongoing

Appendix 3

Quality Banana Approved Nursery (QBAN) Survey Results

The aim of the survey was to canvass attitudes and expectations of the new QBAN Scheme from banana growers. The survey was sent out through the banana industry e-bulletin to all banana growers in Australia. The participants then followed a link to the 10 question survey in Survey Monkey.

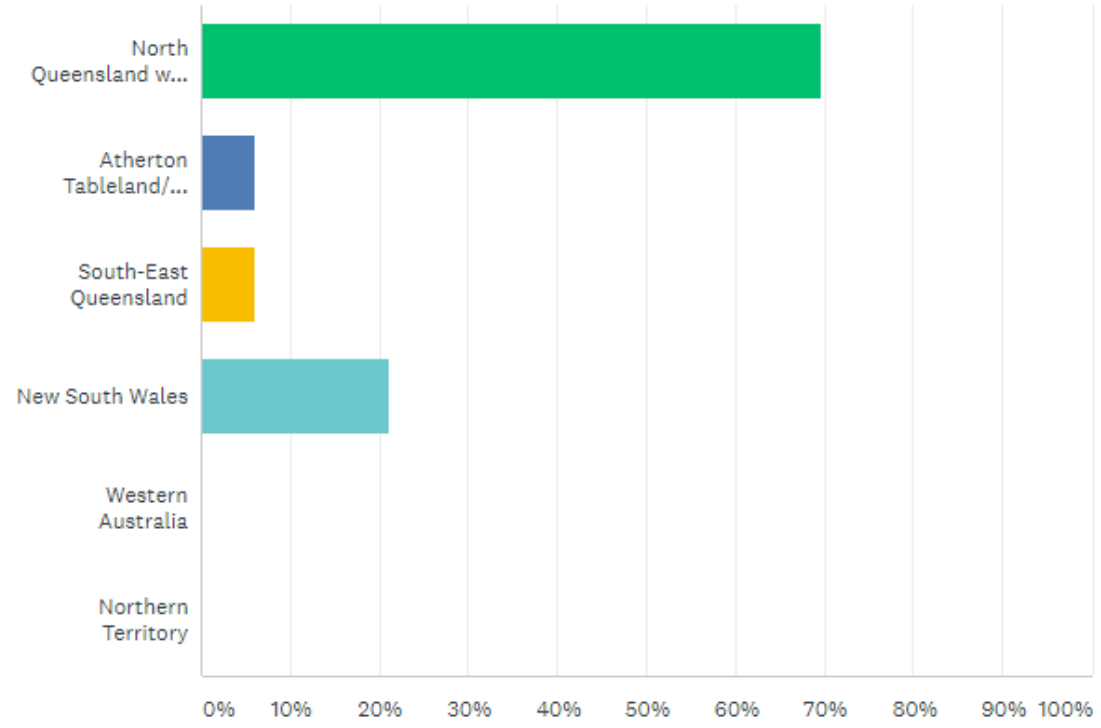
The survey was conducted in late January early February 2018 and there were 33 respondents.

1. Which banana production districts do you operate in? (Select all that apply)
33 respondents

ANSWER CHOICES–	RESPONSES (%)	RESPONSES (number)
North Queensland wet tropical coast	69.7%	23
Atherton Tableland/ Lakeland	6.06%	2
South-East Queensland	6.06%	2
New South Wales	21.21%	7
Western Australia	0.00%	0
Northern Territory	0.00%	0
Total	100%	33

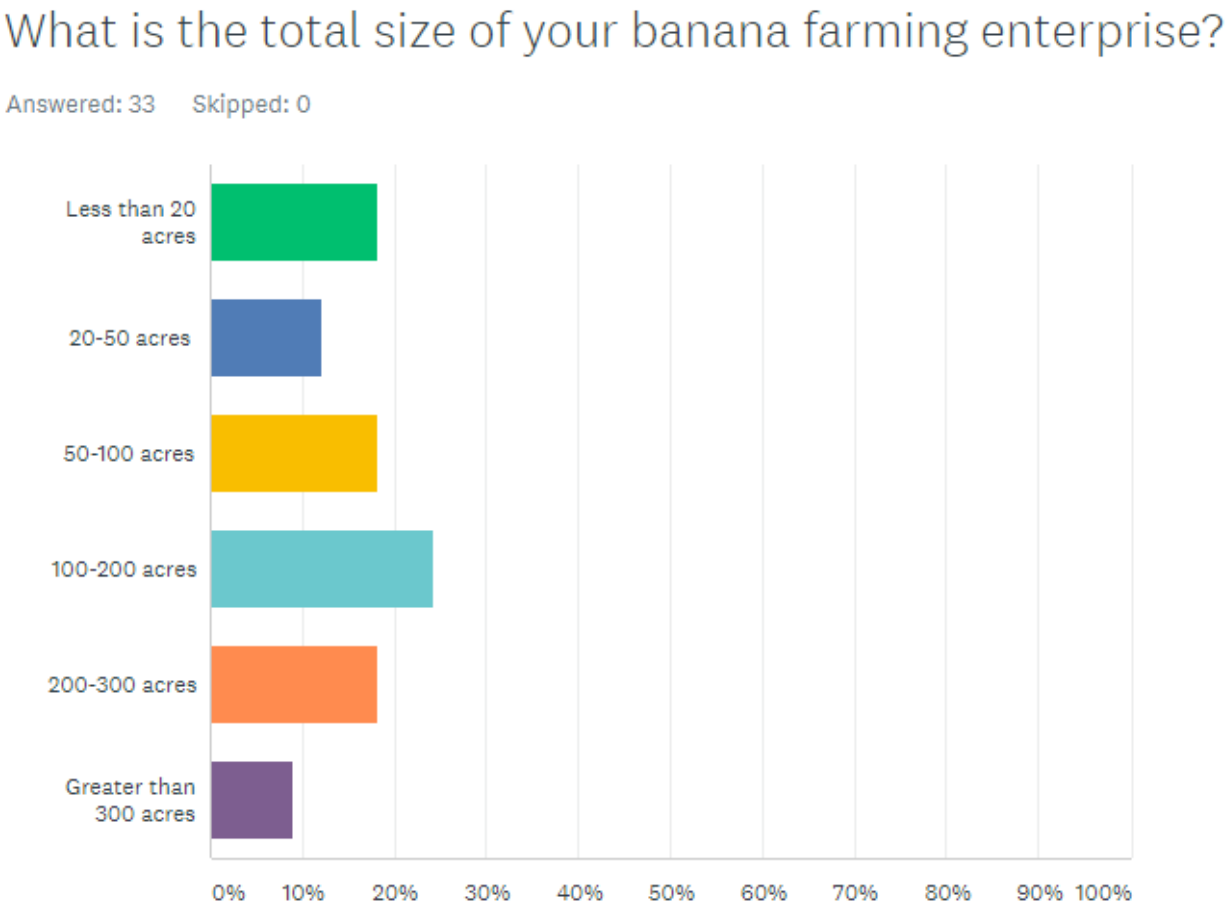
Which banana production districts do you operate in? (Select all that apply)

Answered: 33 Skipped: 0



2. What is the total size of your banana farming enterprise?

ANSWER CHOICES–	RESPONSES (%)	RESPONSES (number)
Less than 20 acres	18.18%	6
20-50 acres	12.12%	4
50-100 acres	18.18%	6
100-200 acres	24.24%	8
200-300 acres	18.18%	6
Greater than 300 acres	9.09%	3
TOTAL	100	33



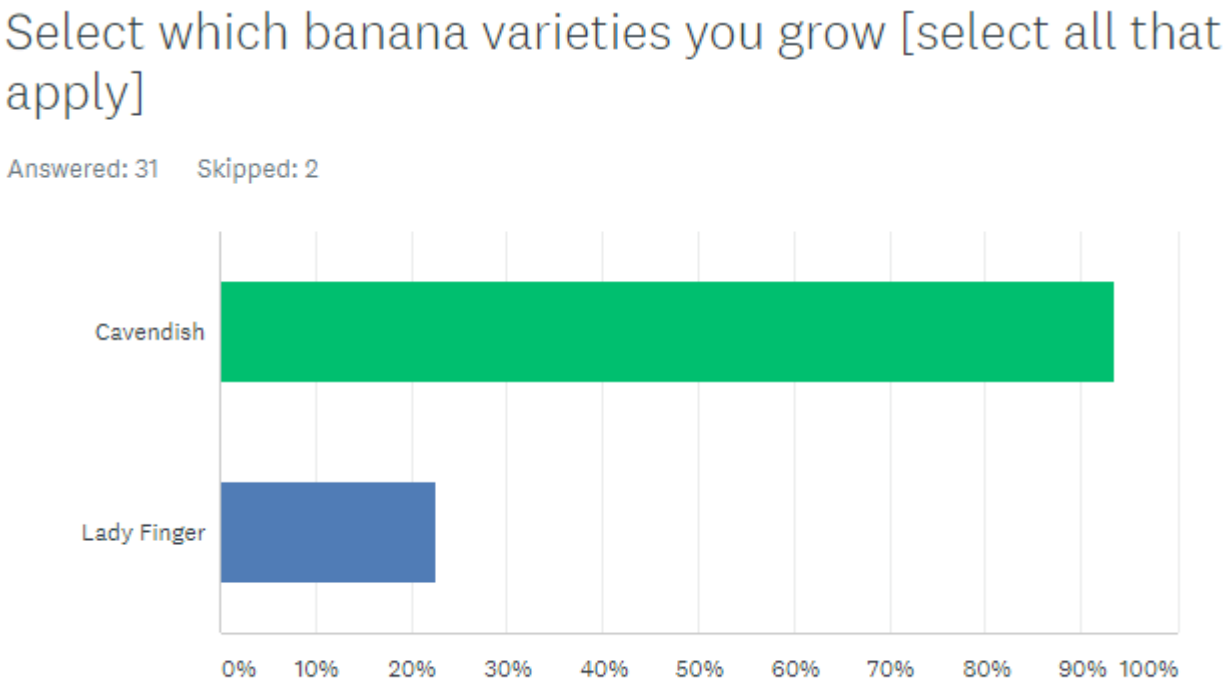
3. Select which banana varieties you grow [select all that apply]

ANSWER CHOICES–	RESPONSES (%)	RESPONSES (number)
Cavendish	93.55%	29
Lady Finger	22.58%	7
Total Respondents: 31	100	31

2 skipped

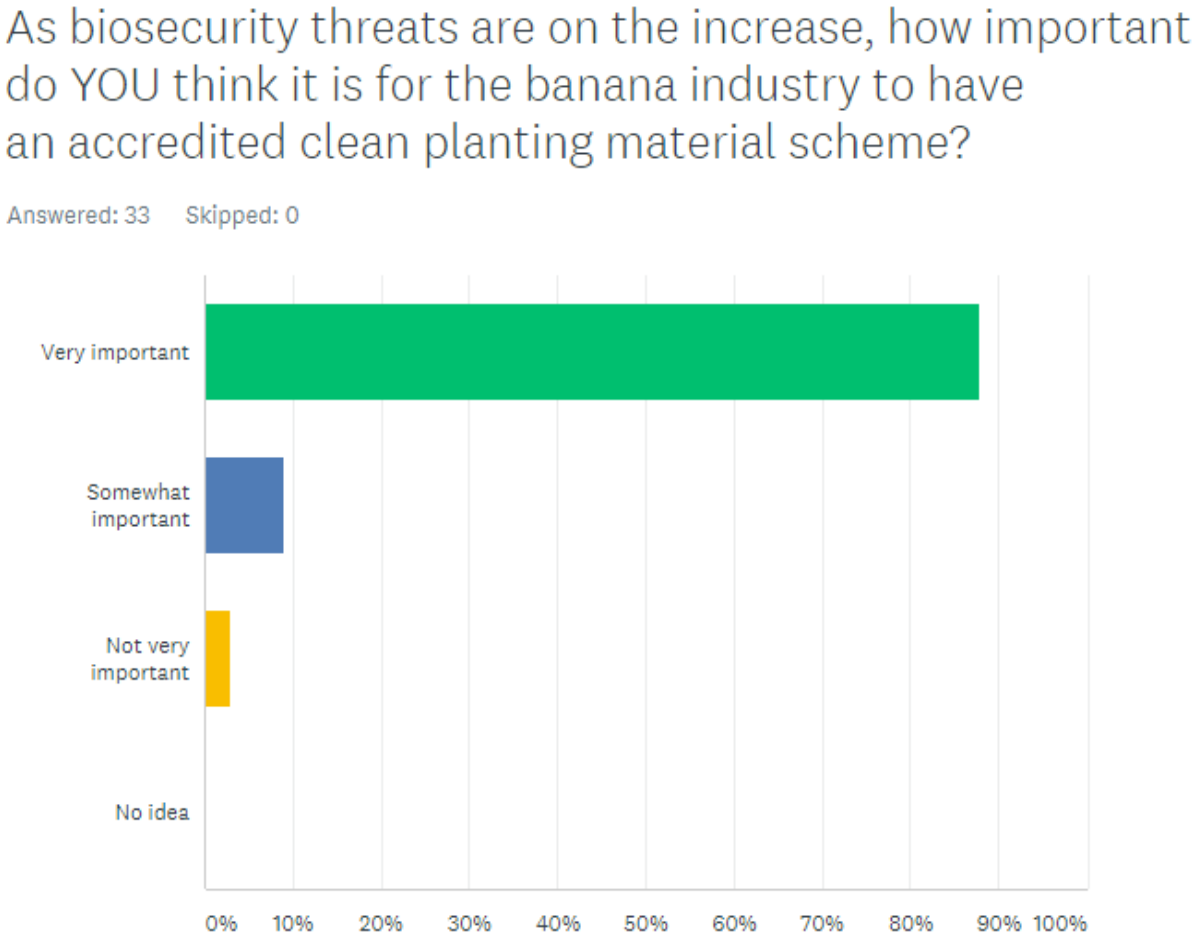
6 comments:

i. Dwarf Cavendish, Dwarf Ducass, Pacific plantain, Pisang Ceylang
ii. Ducasse
iii. Red dacca. Blue java. Horn plantain. pacific plantain. Sokrea. Ducasse. Gold finger. Hom Thom moko. Pisang ceylong. Tonga plantain.
iv. Dpm25
v. Ducasse, Plantain, Blue Java, Gold Finger
vi. I am a contractor not a grower



4. As biosecurity threats are on the increase, how important do YOU think it is for the banana industry to have an accredited clean planting material scheme?

ANSWER CHOICES–	RESPONSES (%)	RESPONSES (number)
Very important	87.88%	29
Somewhat important	9.09%	3
Not very important	3.03%	1
No idea	0.00%	0
TOTAL	100	33

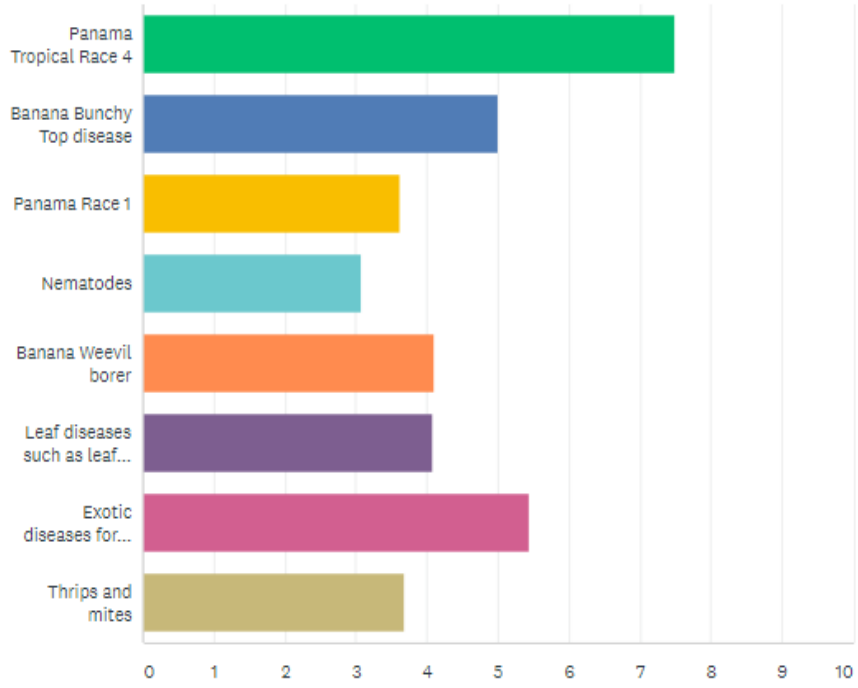


5. Which of the following banana pests and diseases concern you most [1 being most important; 8 being least important]?

	1–	2–	3–	4–	5–	6–	7–	8–	TOTAL	SCORE
Panama Tropical Race 4	80% 24	6.7% 2	10% 3	0.0% 0	0.0% 0	0.0% 0	0.0% 0	3.3% 1	30	7.50
Banana Bunchy Top disease	16.7% 5	20.0% 6	20.0% 6	0.0% 0	13.3% 4	6.7% 2	10.0% 3	13.3% 4	30	5.00
Panama Race 1	3.6% 1	18.0% 5	10.7% 3	10.7% 3	7.14% 2	0.0% 0	10.7% 3	39.3% 11	28	3.61
Nematodes	0.00% 0	0.00% 0	7.14% 2	17.9% 5	14.3% 4	17.9% 5	21.4% 6	21.4% 6	28	3.07
Banana Weevil borer	0.00% 0	14.8% 4	0.00% 0	29.6% 8	18.5% 5	14.8% 4	18.5% 5	3.70% 1	27	4.11
Leaf diseases such as leaf spot	0.00% 0	3.57% 1	21.4% 6	14.3% 4	25.0% 7	14.3% 4	17.9% 5	3.6% 1	28	4.07
Exotic diseases e.g. Freckle, black sigatoka, blood diseases	3.70% 1	37.0% 10	22.2% 6	7.41% 2	11.1% 3	7.41% 2	7.41% 2	3.70% 1	27	5.44
Thrips and mites	6.90% 2	0.00% 0	6.90% 2	17.2% 5	10.3% 3	37.9% 11	10.3% 3	10.3% 3	29	3.69

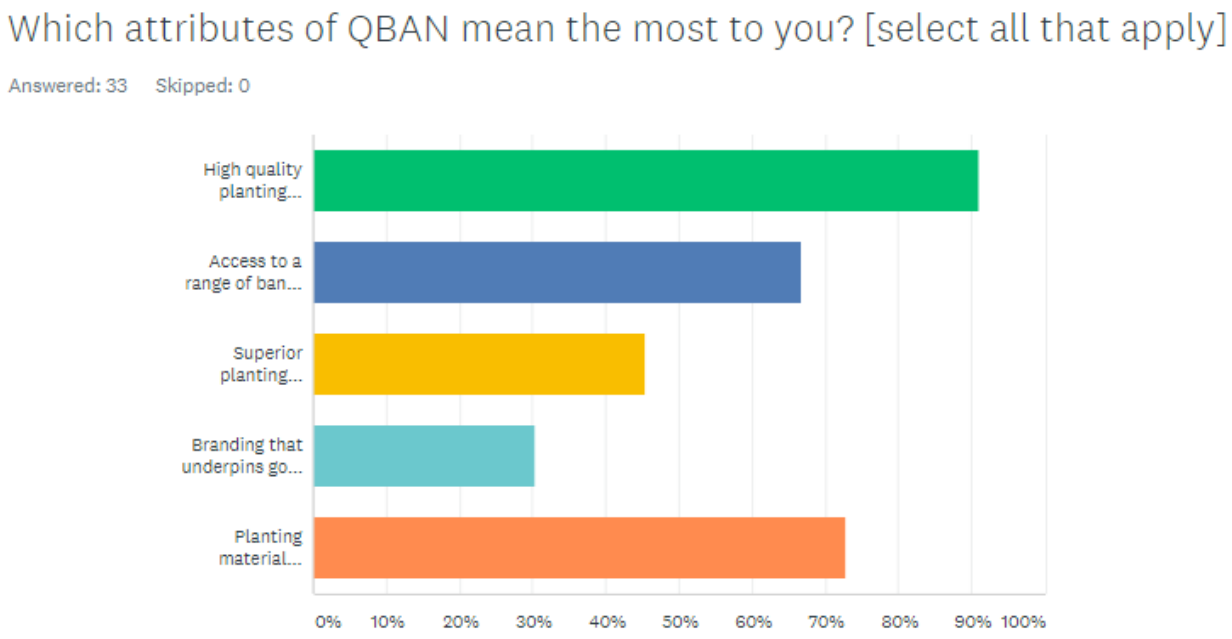
Which of the following banana pests and diseases concern you most [1 being most important; 8 being least important]

Answered: 33 Skipped: 0



6. Which attributes of QBAN mean the most to you? [select all that apply]

ANSWER CHOICES–	RESPONSES (%)	RESPONSES (number)
High quality planting material that is disease free	90.91%	30
Access to a range of banana varieties	66.67%	22
Superior planting material that you are happy to pay to access	45.45%	15
Branding that underpins good management practices	30.30%	10
Planting material produced using sound nursery and laboratory practices	72.73%	24
Total Respondents	100	33



7. What type of planting material do you use/or have used in the past two years? [Select all that apply]

1 skipped

ANSWER CHOICES–	RESPONSES (%)	RESPONSES (number)
Tissue culture derived plants from QBAN accredited nursery or lab	59.38%	19
Tissue culture derived plants from a non-QBAN lab or nursery	9.38%	3
Bits and suckers from your own farm(s)	75.00%	24
Bits and suckers from other farm(s)	6.25%	2
Total Respondents: 32		32

1 comment : I am a contractor not a grower

8. If you do not use tissue cultured plants from a QBAN nursery or laboratory why not? [If not applicable, write n/a] 33 responses

i. n/a
ii. n/a
iii. When using bits we dont get any variations in off types, fruit length and yields as we have had in tissue culture
iv. n/a
v. Poor returns =little profit =have to spend were necessarily.
vi. n/a
vii. n/a
viii. Use QBAN Nursery. Not worth the risk
ix. Have done previously, not available at other times when required
x. n/a
xi. Tissue culture seem to be weaker plants
xii. n/a
xiii. n/a
xiv. The last 2 times we used tissue culture the quality of plant was very inconsistent
xv. We always use our own plant material
xvi. Cost; unreliable delivery time
xvii. n/a
xviii. too expensive, not easy to manage b/c availability is not controllable, hard to desucker, not robust enough
xix. Money
xx. Nurseries charge too much for small amounts. Also sell your variety too others or plant them out themselves.
xxi. n/a
xxii. n/a
xxiii. n/a
xxiv. n/a
xxv. With the Panama issues I think it is safer sourcing the product from my farm. The risk of outside factors are not there. I am not depending on outside people to do the right thing
xxvi. n/a
xxvii. n/a

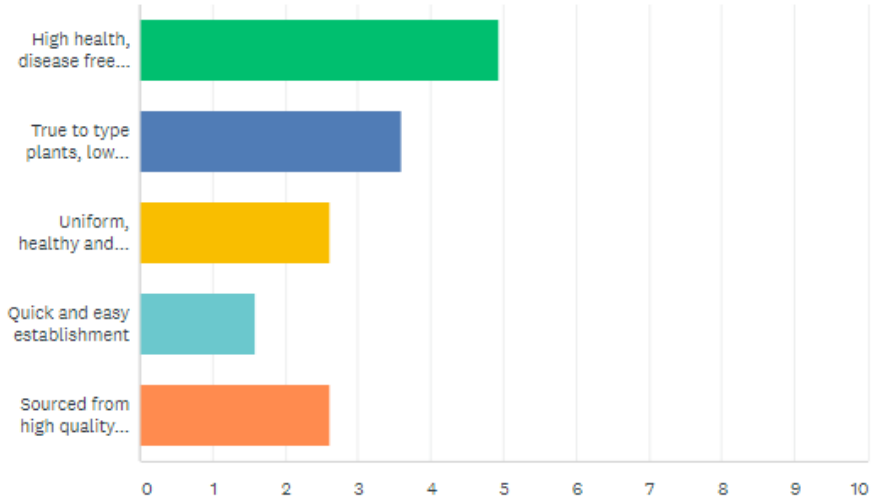
xxviii. n/a
xxix. n/a
xxx. n/a
xxxi. n/a
xxxii. It is a waste of time and can not plant in infected soils.
xxxiii. n/a

9. When clean planting material is produced under the new QBAN scheme, which of the following factors are most important to you? [1 being most important; 5 being least important]. 33 respondents

–	1–	2–	3–	4–	5–	TOTAL–	SCORE–
High health, disease free material	92.86% 26	7.14% 2	0.00% 0	0.00% 0	0.00% 0	28	4.93
True to type plants, low rate of off-types	11.11% 3	44.44% 12	37.04% 10	7.41% 2	0.00% 0	27	3.59
Uniform, healthy and robust planting material with a good root system	7.14% 2	10.71% 3	28.57% 8	42.86% 12	10.71% 3	28	2.61
Quick and easy establishment	0.00% 0	8.00% 2	12.00% 3	12.00% 3	68.00% 17	25	1.60
Sourced from high quality mother stock	3.45% 1	27.59% 8	17.24% 5	31.03% 9	20.69% 6	29	2.62

When clean planting material is produced under the new QBAN scheme, which of the following factors are most important to you? [1 being most important; 5 being least important]

Answered: 33 Skipped: 0

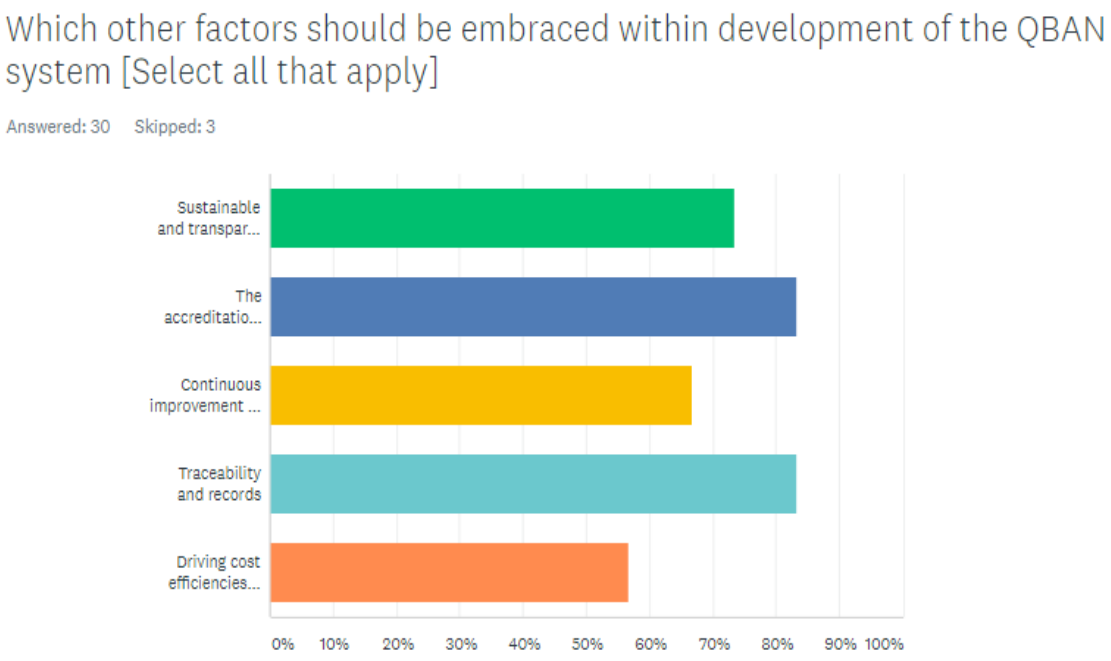


10. Which other factors should be embraced within development of the QBAN system [Select all that apply]
30 respondents 3 skipped

ANSWER CHOICES–	RESPONSES (%)	RESPONSES (number)
Sustainable and transparent governance processes	73.33%	22
The accreditation system, inspection/testing program needs have visible integrity.	83.33%	25
Continuous improvement in propagation and establishment	66.67%	20
Traceability and records	83.33%	25
Driving cost efficiencies within the tissue culture process	56.67%	17
Total Respondents		30

5 Comments:

i. Good extension to the public about accessing clean planting material and the reasons why
ii. Transparency of who has the same varity to control market stability
iii. Consistency and practicality in the biosecurity inspection at sucker collection time.
iv. not sure
v. none of the above



Appendix 4

Panama Tropical Race 4

Biosecurity Plan Report

6 October 2017

Prepared by Shane Dullahide on contract to
Australian Banana Growers' Council Inc.
M: 0438 811 285
Email: s.d.dullahide@bigpond.com

Summary

Seven Biosecurity Plans for managing Panama Disease Tropical Race 4 (TR4) were developed for banana farm businesses who considered their farms at high risk from TR4 spread; six of these were down-stream of the first TR4 infested property (1IP) and one had used machinery that had been on 1IP.

All seven farm businesses received an electronic and a hard copy of their Biosecurity Plans. Availability of growers to provide detailed information in the period of the contract made these Biosecurity Plans variable. The Biosecurity Plans were developed as a "working document", so additional information and planning may be added over time.

The most common issues for these growers were firstly, moving machinery, equipment and fruit, soil free, between non-contiguous blocks on public roads and secondly, record keeping.

Most of these growers have good biosecurity practices in place, but a lack of documentation and records to prove "clean" roads and separation between production blocks, which may become an issue for continuing production if these farms become TR4-infested.

This strategic levy investment project Coordination of Banana Industry R&D (Panama TR4) (BA14012) is part of the Hort Innovation Banana Fund.

The Project

The Australian Banana Growers' Council (ABGC) contracted the author to conduct a six-week project to develop individual Biosecurity Plans and a generic one. Biosecurity Queensland's (BQ's) regulatory requirement for Panama TR4-infested farm operators to have a Farm Biosecurity Management Plan was considered. That is, how growers would address prescribed requirements, if their farm was found to have TR4. Several growers with high risk farms were assisted to complete their individual Biosecurity Plan. The relevant schedule for this contract is shown in *Appendix 1*.

Due the time commitment needed for the development of Biosecurity Plans, no contact was made with transport operators.

ABGC contacted every grower in north Queensland to advise the opportunity to participate in this project if they thought they were at high risk of infection. A Google map of the Tully Valley topography was also considered.

Seven banana farm businesses, where most operated more than one farm, participated in the project. Six of these are at risk of TR4 infection due to their locality down-stream from 1IP and one from machinery sharing with 1IP. The names of participants and these growers' Biosecurity Plan documents were treated as confidential.

Biosecurity Planning Document

The Biosecurity Plan developed and used by ABGC for 1IP was converted to a new word document (the Biosecurity Plan Template) and a hard copy provided to growers. This

Biosecurity Plan Template is attached to this Report and was organised into operational activities which would be undertaken after a TR4 positive infection on a farm.

The Template's headings included Record Keeping, Destruction of Affected Plants, Securing the Destruction Zone, Maintenance of Destruction Zone and Securing the Farm against TR4 Spread.

Farm and packing shed maps were also provided to participating growers (where necessary) with overlay plastic sheets to enable biosecurity planning for additional structures and layouts.

Boot exchange layouts were included in some Biosecurity Plans for the packing shed to isolate farm and

shed footwear to minimise farm soil movement into the packing shed.

Key Issues

There were two main issues found:

- Difficulty clarifying how machinery and fruit could be moved between non- contiguous blocks on public roads, soil-free; and
- A need to increase the use of record keeping by growers.

The first issue is discussed in detail in Appendices 2, 3 and 4. The key point is that on an infected block or farm, no soil or plant material can be moved off that block or farm.

BQ are currently reviewing existing "prescribed" measures and will consult with ABGC prior to that work being completed. These questions are not easy to answer for BQ as they often depend on particular farm circumstances.

As for the second issue: the BQ prescribed document requirements were not well understood by growers.

The prescribed requirements of the Biosecurity Plan include growers maintaining extensive record systems of their farm activities:

1. Visitor register
2. Vehicle movement register
3. Decontamination register
4. Training register
5. Banana planting register
6. Waste disposal register

The issue of record keeping could be addressed by ABGC and/or BQ promoting the need for record keeping, in advance of TR4 spreading.

Grower interaction

Grower voluntary participation in this project was lower than ABGC anticipated. Also, growers were initially difficult to engage, but the on-farm discussions, whether Biosecurity Plan related, or in general, were well received.

These responses indicated the social and emotional effects that Panama has had on banana industry. Some growers in the region are worried about their farm eventually getting TR. Others are complacent about the risk.

Also, some uninformed ideas have thrived with some growers sceptical of TR4 presence, as spread had not progressed as initially indicated.

The growers visited had good farm-biosecurity in place, but generally poor records.

In addition, the costs of potential BQ requirements for farms with TR4 would best be considered in advance. That is, an advantage to a grower of developing a Biosecurity Plan, before TR4 is detected, is that he/she could consider the options in advance, e.g. there are cheaper ways of moving fruit from a block than building and using wash-down and drainage containment facilities at its exit point.

Growers also noted concern with the uncontrolled movement of pallets between States.

DAF relationships

The relationship developed with DAF research and extension staff and BQ staff previously made this role a seamless one. Meetings were held with these groups to keep them informed of my activities and grower issues in addressing the Biosecurity Plan, which are ongoing.

Sharing the process, Biosecurity Plan Template and issues of this project with the DAF extension team and ABGC was important, so that this work is integrated into to their TR4 project activities, and also so that any follow up questions from growers could be addressed.

Recommendations

Recent information from overseas experts, who have dealt with Panama outbreaks indicate that TR4 will eventually spread. For this reason, ABGC:

- Should publicise the need for Biosecurity Plans and encourage additional growers to develop their individual ones.
- Develop templates for the Biosecurity Plan records to assist growers prepare for TR4.
- Develop and circulate a simplified version of the prescribed requirements of the Biosecurity Farm Management Plan to assist grower understanding of the legal obligations.

- Continue to liaise with Biosecurity Queensland over its current review of the Biosecurity Plan "prescribed" measures.
- Investigate Biosecurity Plan cost sharing between grower, industry and government, which would encourage the next grower(s), who become TR4 affected to quickly put infrastructure in place that minimises TR4 spread on their farm(s), neighbours and industry.

Acknowledgements:

- Lou Lardi, ABGC for his grower encouragement to be involved in TR4 Biosecurity Plan discussions.
- DAF extension staff at South Johnstone for their discussions on grower needs for the Biosecurity Plans.
- DAF administration staff for their printing assistance.
- Jim Pekin, ABGC for editing this report.

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Further Assistance

Growers are encouraged to raise queries on this matter with Jim Pekin, CEO, ABGC: jim.pekin@abgc.org.au or phone 3278 4786

Appendix 1

The following is the relevant segment of the services contracted in this project.

1. The Services required of the Contractor are mainly to assist owners or operators of farms that at risk of being infested with Panama TR4 to develop their individual Farm Biosecurity Management Plan in advance of being required to do so (i.e before any more farms are placed under quarantine).

   The Services specifically require the Contractor to assist a minimum of ten farm businesses* to understand and document how they will address the Biosecurity Queensland regulatory requirements, if later found to be infested.

   *An individual farm business may have two or more farms supplying the one packing shed.

2. The Services required of the Contractor are also to ensure all transport operators visiting banana farms are carrying out best practice on-farm biosecurity.

Appendix 2

Routine, direct and immediate movement of banana fruit, on picking trailers, between separate parcels of affected land on or across public roads

The following are some options for moving fruit on trailers if from an infested farm, that are likely to be accepted by BQ.

They are innovative adaptations of the prescribed measures shown on p17 and 18 of the attached Biosecurity Plan Template. Most elements below (except those in bold) are currently prescribed in S12D of the Biosecurity Manual on "Routine, direct and immediate movement of vehicles, appliances and other things between closely separated parcels of affected land.

Option 1 and 2 are about moving fruit on picking trailers regardless whether a "points" system is used or not. Option 1 is ensuring the trailer is clean, so it will need to be washed first. Options 2(a) and (b) is where the trailer is moved when dirty.

Option 2 (a) is where the soil on a trailer is captured, while travelling between banana blocks and returned to the block where the soil originates.

Option 2 (b) is where the soil on the harvest trailer is captured while travelling between blocks and when it arrives at the packing shed, is washed off, contained and disinfected with a Quaternary Ammonium product.

Movement of a picking trailer that has been in contact with TR4-affected soil, on or across a public road separating parcels of affected land, is prohibited unless the item fulfils the requirements of either option 1 or option 2 below:

<u>Option 1</u>

1. an authorized officer is advised, in advance, of the requirement to move the harvest trailer between parcels of the affected land and details of the movement; and
2. is free of soil and banana plant material; and
3. has been decontaminated and inspected by a suitably experienced person, to ensure that the trailer is free of soil and plant material; and
4. is disinfected by a produce known to effective against Panama TR4; and
5. the trailer is dealt with, after decontamination, in such a way to prevent cross contamination before transit; and
6. the movement of the trailer must be carried out with the prior notice to and in the presence of an authorized officer or their delegate; and
7. the movement procedure has prior approval of an authorized officer, is documented, dated, signed by both parties; and
8. moved directly between separate affected parcels of land using the most direct route appropriate for the movement without pause or deviation.

Option 2 (a)

1. an authorized officer is advised in advance, of the requirement to move the trailer between parcels of the affected land and details of the movement; and
2. the trailer has been transferred across a set of "points" from the "dirty" farm zone, where the harvest trailer base and wheels remain, to a "clean" loading site on the access road; and
3. the access road is fenced, raised with gravel base and drained
4. is dealt with, in such a way to prevent cross contamination before transit; and
5. **is contained in transit so that soil that dislodges while in transit is securely held and cannot move outside the container; and**
6. the movement of the trailer must be carried out with the prior notice to and in the presence of an authorized officer or their delegate; and
7. moved directly between separate affected parcels of land using the most direct route appropriate for the movement without pause or deviation; and
8. **the dislodged soil in the container vessel is transferred back to and disposed on the farm "dirty" zone where the bananas were transferred from**; and
9. the banana movement procedure **and return of waste/soil to the original farm** has prior approval of an authorized officer, is documented, dated, signed by both the transferee and authorized office or their delegate.

OR

Option 2 (b)

1. to 7. is as above

8. the trailer on entry to the packing shed is held at a site which is bunded to contain soil and wash down water; and
9. the transfer vehicle "container vessel" is washed into a bunded area and the resulting soil solution is contained in a sump and treated with a disinfectant effective against Panama TR4, then disposed onto a grassed open area to allow the disinfectant solution to breakdown, before entry into drains or waterways.
10. after the fruit is hung, the harvest trailer is washed clean, spray disinfected and the resulting soil solution is contained in a sump and treated with a disinfectant effective against Panama TR4, then disposed on a grassed open area to allow the disinfectant solution to breakdown, before entry into drains or waterways.

Appendix 3

Routine, direct and immediate movement of banana fruit, between separate parcels of affected land on or across public roads

A further potential option for moving fruit across or on a public road is described below.

This is an adaptation to the prescribed measures shown on p17 and 18 of the attached Biosecurity Plan Template. Most elements below (except those in bold) are currently prescribed in S12D of the Biosecurity Manual on "Routine, direct and immediate movement of vehicles, appliances and other things between closely separated parcels of affected land.

Movement of banana fruit, that has been grown on the affected land, on or across a public road separating parcels of affected land, is prohibited, unless the item fulfils the requirements of outlined below:

1. an authorized officer is advised, in advance, of the requirement to move the banana fruit between parcels of the affected land and provided with details of the movement; and
2. the fruit bunches and fruit bags are free of soil; and
3. has been inspected by an experienced person, to ensure that it is free of soil; and
4. **the fruit is hung and transferred across from the "dirty" farm zone to the "clean" zone to avoid soil contact and contamination; and**
5. **the fruit is hung in a container, in such a way to prevent cross contamination during transit; and**
6. the fruit movement procedure has prior approval of an authorized officer, is documented, dated, signed by both parties; and
7. fruit moved directly between separate affected parcels of land using the most direct route appropriate for the movement without pause or deviation; and
8. the fruit is transferred into the packing shed from the "clean" zone to the packing shed spray washed and de-handing, in such a way to prevent cross contamination; and
9. the banana fruit movement procedure has prior approval of an authorized officer; and
10. is documented, dated, signed by both the transferee and authorized office or their delegate.

In regard to point 4 above, growers may consider other ways of moving fruit, such as via cableways. The important thing is that the fruit is cleaned of soil before exiting the block and remains free from soil.

Appendix 4

Questions Relating to Movement of Machinery

Some growers who participated in this project asked the following questions. Responses to them from BQ are in shaded italics.

1. **Clean access roads**

Does this road need to be blue metal or heavy builders' gravel or can it be constructed of river gravel?

Some farms have river gravel entrance roads which growers consider to be clean or part of the public road as long as it fenced and well drained with no crossover farm traffic. Also, many of the regional roads are river gravel on which growers and fruit harvest vehicles travel.

Any road building material is acceptable, if it provides a separation between the property's pre-existing soil as a road material and the clean zone (top of the road), this includes the ensuring that no soil below the top road material seeps through to the top road material. Ongoing monitoring and maintenance will be required to ensure the road is maintained to the clean standard.

2. **Use of a Disinfestation Shuttle or Dip**

Many growers have a shuttle for disinfestation spraying at the farm entrance/exit, e.g. for truck access to the packing shed. Is this sufficient for an infected farm?

Could this shuttle and spray rig be replaced with a drive-through dip using the same Sterimax-type disinfectant?

The critical element is to ensure that soil and plant material is removed prior to disinfection. Whatever mechanism is adopted an inspection process is required to ensure that the soil and plant material free status is achieved (then disinfected) prior to leaving the Affected Land (an IP).

3. **Using Roll-on Roll-off Trailers**

Consider a harvest trailer truck that drives off one farm or block after being disinfected,

drives on the main road, then enters another farm block, but remains on the "clean" fenced and drained access road, and is loaded by a slide on points system: Can it drive back on the public road to the packing shed or does it need to be firstly washed down and disinfected, before entering the public road?

Any appliance that has been in contact with the Dirty Zone on the Affected Land (IP) must have all soil and plant material removed and then disinfected prior to being able to leave the Affected Land (IP). This includes any roll-on roll-off picking trailers.

4. Dismantling machinery so it can be moved off an infested farm

In the Biosecurity Manual (and which is similarly mentioned in the attached Biosecurity Plan Template, attached): what is meant by machinery having to be "dismantled to the extent necessary for thorough cleaning, decontamination and inspection" and to what extent is this necessary for continual road crossings?

The critical element is to ensure that soil and plant material is removed prior to disinfection and this can be a complex procedure that may require dismantling to ensure the soil and plant material free status. This process may take significant time to achieve. To assist growers, it is recommended that newly infected premises (IPs) would dedicate time to the following:

- *Reviewing their machinery that routinely leave the farm to identify if there is a process/ system that could be implemented, so some or all machinery no longer needs to leave the farm; and/or*
- *Considering thorough initial cleaning of machinery that will need to leave the farm. That machinery may have gross contamination material (e.g. soil) accumulated over time and become compacted. So, an investment in time cleaning at the beginning will make it easier for future cleaning activities to more readily achieve the clean standard; and*
- *Putting processes in place to prevent contamination: like sealing up small places where soil may be difficult to remove; like education for harvest crews so no leaf material is left on roll-on roll-off trailers; like installing mud guards over wheels to reduce the contamination on the underside of the roll-on roll-off trailers.*

Appendix 5

Insert business logo here

On-Farm Biosecurity Management Plan

Version (insert number) , (insert date)

Farm Name	
Address	
Contact Details	Phone: Email:

Template Version: 16 July 2018

Contents

How to use this document

This On-farm Biosecurity Management Plan template is intended for banana growers whose farms have been infested with Panama disease Tropical Race 4. A Biosecurity Management plan is one of the requirements of a notice given by Biosecurity Queensland. The biosecurity plan template can also help other banana growers minimise the risk of introducing or spreading disease on their property. It should be completed in conjunction with the *Banana best management practices* (BMP) document or with expert advice.

The biosecurity plan template includes guidance on how to mitigate risks posed by various aspects of farming operations. Each aspect has a checklist for the grower to complete for their current farming practices. The checklist in conjuntion with the Biosecurity BMP will identify where the farm is operating at a high standard of biosecurity and will highlight any areas that need to be improved.

For each aspect of banana farming, the grower should provide additional comments on how their farm is mitigating the risk of the disease, or provide a plan (e.g. timeframes, costs, strategy) for implementing improvements.

If you require assistance in putting together your On-farm Biosecurity Management Plan, you should contact Australian Banana Growers' Council at www.abgc.org.au

1. Property information

1.1 Details

The table below provides the contact details and basic information about the property to which this biosecurity plan relates.

Owner / Occupier	
Business name / ABN / ACN	
Lot / Plan	
Street Address	
Property area (ha)	
Tenure	

1.2 Land use and overview of farming systems

(Insert land use and provide an overview of your farming systems. For Example. The farm is mostly comprised of banana production but there is a small area under papaya production (2ha))

The total property has an area of (insert area of total property) and (insert area under banana production) is currently under banana production

A farm map is located on page (insert page number of map).

1.3 Farm

(Insert image of farm map/s. If you don't have a farm map you can easily get a satellite image of your property from Queensland Globe https://qldglobe.information.qld.gov.au/)

Show:

- Banana production area
- Other land use areas
- Location of infected plants
- Packing Shed
- Other sheds (e.g. machinery storage)
- Residences
- Location of pumps/bores
- Roads
- Dedicated Clean Road/s
- Fencing
- Access
- Signage locations

Figure 1. Farm Map

1.4 Packing shed

Insert map/sketch of your packing shed. Below are some tips for what to include on your map:

- It is helpful to include key elements of your shed on the map (e.g. the area where bunches are hung), troughs, pallet stackers, loading docks)
- The zoning of your shed – showing clean and dirty zones
- The location of biosecurity infrastructure (e.g. footwear exchange, footbaths, block walls, physical dividers etc.)
- The direction of movement in your packing shed (e.g. arrows which show the direction of fruit movement from paddock to loading)

Figure 2. Packing shed layout

2. Roles and responsibilities

(Insert name of owner/manager) is responsible for:

- Abiding by the requirements in the Notice of presence of Panama Disease Tropical Race 4, including destruction activities.
- Reporting any significant issues or breaches of the requirements specified in the notice to a Department of Agriculture and Fisheries Inspector.
- Training staff working on (insert name of farm) to respect and ahere to adopted procedures
- Updating this plan as necessary and adherence to this Farm Biosecurity Management Plan.

Department of Agriculture and Fisheries inspectors are responsible for:

- Auditing processes on site of (insert name of farm) and maintaining records of compliance e.g. checklist
- Giving and assessing compliance with Notice of presence of Panama Disease tropical race 4.

Important Industry Contacts:

Australian Banana Growers' Council

Name	Role description	Contact Details
Dr Rosie Godwin	Research and Development Manager	3278 4786
Sonia Campbell	Communications Manager	0428 038 330

Department of Agriculture and Fisheries

Name	Role description	Contact Details
Rhiannon Evans	Panama TR4 Program Leader	4091 8141
Jodie Bocking	Property Operations and Surveillance Team Manager	4091 8163 0476 852 415

3. Risk Mitigation

The aims of the risk mitigation steps described in this section are to:

- Minimise the spread of Panama disease tropical race 4 within the property.
- Prevent the spread of Panama disease tropical race 4 to other properties.
- Comply with the processes and procedures described in the notice of presence of Panama disease tropical race 4.
- Enable destruction and maintenance activities to occur while managing the risks posed by the disease.
- Minimise the spread of other biosecurity risks onto or within the property.

The checklists below are adapted from the *Banana best management practices* guideline and should form a basis for your On-farm biosecurity management plan. You may wish to include more or less practices identified to effectively mitigate the risks of spreading the disease on to or within your property. Please refer to the guideline in the development of your plan.

3.1 Use of the Land

Insert comments: e.g Discuss whether you have only bananas, mixed cropping, cattle etc., and how many parcels of land you might have.

3.2 Restricting access

☐ Is the property fenced around the boundary, or are there natural barriers in place (for example river frontage) to restrict access to people and machinery?

☐ Is animal movement restricted (for example feral, native and domestic animals and livestock)?

☐ Is fencing maintained to a suitable condition to ensure access is restricted?

☐ Do you have clear signage to direct people (for example visitors or deliveries) to correct access and parking areas?

Insert comments:

3.3 Zoning

☐ Are zones established to differentiate between clean and dirty areas (A dirty zone would include a banana production area. A clean zone is separate from the banana production area and is free from plant material, soil and mud)?

☐ Are the zones separated with a clear barrier, such as a fence and/or signage?

Insert comments:

3.4 Clean Access Roads and Parking Areas

☐ Do you have a dedicated clean access road which has been separated from the banana production area?

☐ Is it designed to ensure it remains clean by keeping the surface free from soil and plant material?

☐ Is your clean access road separated with fencing and signage to restrict movement from the banana production zone?

☐ Are access roads in to clean zones such as packing sheds, residences and associated parking areas maintained as clean?

☐ Do you ensure your clean access road is free from weeds?

☐ Do you use chemical methods only to control weeds?

Insert comments on how you achieved your clean access roads and parking areas:

3.5 Wash-down and Decontamination Sites

☐ Have you established a wash-down and decontamination site for vehicles, machinery and people?

☐ Are they located at all exit/entry points between clean and dirty zones (except designated clean roads)?

☐ Are the facilities adequate to complete cleaning to remove soil and plant material?

☐ Is clean water used for wash-down and decontamination procedures?

☐ Do you use a recommended product for disinfection against Panama disease?

☐ Are the facilities regularly maintained?

☐ Can you control and contain waste water to prevent it from entering all waterways and clean zones?

Insert comments:

3.6 Tools, Vehicles, Machinery and People Movements

- ☐ Do you have a cleaning and decontamination procedure for tools, vehicles, machinery and people prior to them exiting a dirty zone?
- ☐ Do you limit unnecessary movement of tools, vehicles, machinery and people from the dirty zone?
- ☐ Have you considered alternative routes to limit movement between zones?

Insert comments to describe how you manage tools vehicles machinery and people movement:

3.7 Waste Management

- ☐ Does all waste material from the banana production area (including leaves, bells, discarded fruit, pseudostem material, bunch stalks, bunch bags, string and soil) remain on the property in a dirty zone?
- ☐ Is all other general waste sent to a regulated waste disposal facility?
- ☐ Is general waste accessible for collection via a dedicated clean access road and considered in the development of zoning plans?

Insert comments:

3.8 Record Keeping

- ☐ Do you have banana planting records?
- ☐ Do you have fruit consignment records?
- ☐ Do you have records of vehicle and machinery including their movements, cleaning and decontamination?
- ☐ Do you have clean access road maintenance records?
- ☐ Do you have a visitor and staff register?

- ☐ Have your staff been trained or briefed on Panama disease?
- ☐ Do you have a farm map showing production areas, roads, boundary fences, dedicated clean access roads, zoning, waste disposal locations and key infrastructure?
- ☐ Do you have records of destruction activities undertaken to meet the requirements of the Notice. See section 4.

See Appendices to obtain templates for record keeping.

Insert comments:

3.9 Fruit Movement

- ☐ Do you ensure that only the fruit that has had no contact with the ground is harvested?
- ☐ Is fruit transported to your packing facility in a clean condition (free from soil and plant material)?
- ☐ Are packaging consumables (for example carton boxes, pallets, containers, plastic wrap) free from soil and plant material?
- ☐ Do you undertake inspections to ensure your fruit is free from soil and plant material prior to it exiting the property?

Insert comments:

3.10 Incident Response

- ☐ Do you have procedures in place in the event of an incident occurring that presents a risk to your on-farm biosecurity?
- ☐ Are staff trained in these procedures or know who to notify?
- ☐ Have you developed scenarios or identified weaknesses in your biosecurity management procedures?

Insert comments: examples of incidents are any that might compromise the requirements of your biosecurity notice e.g. cattle escape, personel forget change their boots, clean zones become contaminated with soil or plant material etc.

3.11 Emergency Access

The landholder should undertake prior planning with emergency services to develop procedures for emergency access. This includes ambulance, police, fire emergency services, state emergency services, electricity providers, local council.

The property must be listed on any appropriate databases as to the presence of the disease and the need for precautions. This includes any other organisations such as those listed above that make records relating to future emergency access.

In the event of an emergency event, follow on farm biosecurity procedures where practical and notify an inspector appointed under the Biosecurity Act 2014 as soon as possible.

Insert emergency access procedures, including contact details and map showing appropriate entry location for emergency services:

Figure 3. Emergency Access Map

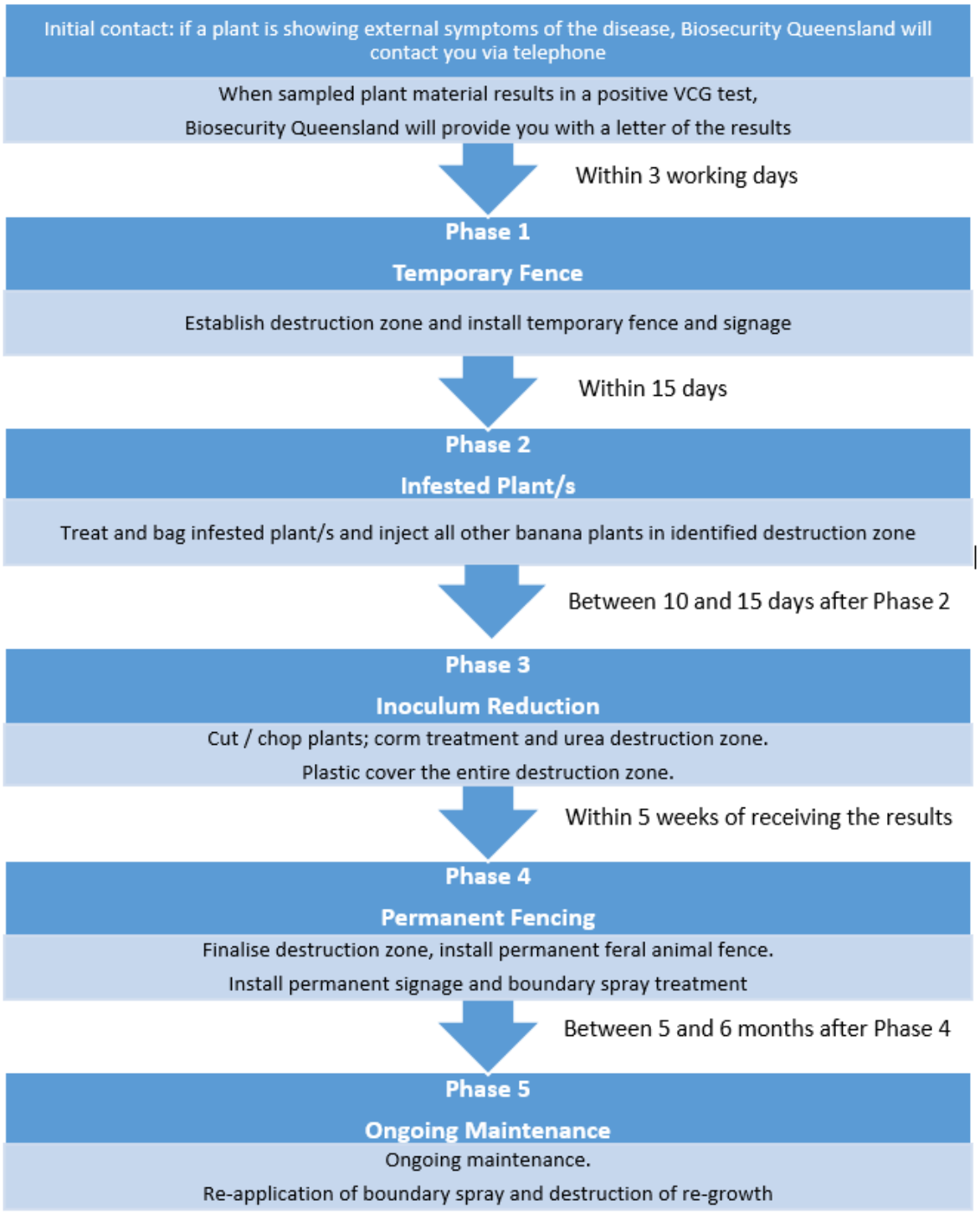
(Insert map)

4. Processes and procedures that minimise risk of spread of disease from affected land

The following requirements are part of a layered hazard control approach to minimise the risk of disease spread from (insert name of farm). These processes and procedures are:

4.1 Destruction Activities and timeframes

A time frame for destruction activities that may be required to be implemented is shown as an example below:



Insert copy of 'Panama TR4 Program – Record of destruction activities' for general requirements and phases of destruction for infected and non-infected banana plants. Biosecurity Queensland will provide instructions specific to the affected land subject to a notice.

4.2 Notice of presence of Panama disease tropical race 4

Insert copies all given notices of 'Presence of Panama disease tropical race 4'. Biosecurity Queensland may amend the notice and provide you with an amended copy. You should keep a record of all notice documentation.

4.3 Tracing and Surveillance Activities

The Panama TR4 Program will conduct tracing activities, including requiring property owners, contractors and/or employees to complete a questionnaire to determine potential pathways for disease spread.

Property owners should keep records of tracing questionnaires and answers.

Insert comments regarding what type of records you are keeping and where records are located.

The Panama TR4 Program will conduct surveillance activities on properties identified as medium or highest at-risk, as detailed in the surveillance frequency letter given by Biosecurity Queensland.

Growers who conduct their own regular surveillance may extend the viability of their farm through early detection and containment of the disease. Staff should be encouraged to check for symptoms of the disease through their day-to-day activities (informal surveillance) or dedicated and planned inspections (formal surveillance).

Property owners should keep records of surveillance activities on their property.

Insert comments regarding what type of records they keep on surveillance e.g. dates, who came, what they found etc.

Insert copies of documentation regarding tracing and surveillance

5. Appendix: Record Keeping Templates

5.1. Farm Operational Processes or procedures that minimise biosecurity risks of disease spread.

Note: In the future, the planned on-line biosecurity BMP will help easily fill these gaps for growers as it would be capable of generating a current farm management plan specific for on-farm biosecurity.

For example – Farm zoning and separation; wash-downs or decon-stations, boot exchanges, shed procedures, farm procedures, fencing, signage, training, record keeping.

1	
2	
3	
4	
5	
6	
7	
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9	
10	
11	
12	

5.2.Planting Material Records

Banana planting records that, as a minimum, record the type of planting material used, whether it was completely soil free, details of where and when the material was sourced from and locations where and when the material was planted.

Date planted	**Locations & quantity** of material planted. e.g. 4000 plants, Block 7	**Type of Planting material** (Tissue culture/ bits/suckers)	**Source** (where & when was the material sourced?)	**Description** (Soil free?/ Healthy?)	**Other comments**

5.3. Vehicle and appliance decontamination and movement register

This register applies to all vehicles/appliances

- exiting the affected land or
- moving from the dirty zone to the clean zone.
- appliances and any other things leaving the destruction zone.

Decontamination means free of all plant material, soil or anything that may carry TR4 then effectively disinfected using an approved sanitizer.

Date	**Time**	**Vehicle/ Appliance Rego**	**Vehicle/ Appliance Details**	**Movement**		**Decontamination** Tick when completed			**Name and signature of person who conducted the decon/ movement**	
				From	**To**	Plant removal	Detergent	Sanitiser	**Name**	**Signature**
						☐	☐	☐		
						☐	☐	☐		
						☐	☐	☐		
						☐	☐	☐		
						☐	☐	☐		
						☐	☐	☐		
						☐	☐	☐		

5.4. Contractor/ Supplier and Visitor Register

Note - In the BMP it is suggested that you would only need date reason for visit, time in, time out, contact number, and property details of last contact with banana fruit or plants as some of these people shouldn't be coming on farm so you wouldn't need vehicle registration and decon etc.

Date	Name		Vehicle Rego	Entry Time	Decon on Entry	Vehicle Inspected	Decon on exit	Exit Time	Notes
	Business	Visitor							
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		
					☐	☐	☐		

5.5. Staff Training Register

Type of Training: ..... **Trainer:** .....

Date	Name	Signature		Date	Name	Signature

5.6. Machinery and Farm Vehicle Register

Land Parcel:

ZONE Clean/Dirty etc	**Type of machine/ vehicle**	**Make and model**	**Registration number**	**ZONE** Clean/Dirty etc	**Type of machine/ vehicle**	**Make and model**	**Registration number**

5.7 Fruit Movement/Consignment Records and Market Requirements

Insert records or Plant Health Certificates etc.

5.8 Sign templates

Download printable farm gate signage for Panama disease tropical race 4

https://publications.qld.gov.au/dataset/panama-disease-tropical-race-4-grower-kit/resource/9e5728a9-918d-4bb2-9447-01771c4ac5c1


QUARANTINE
WARNING
Land affected by
Panama disease tropical race 4
NO UNAUTHORISED ENTRY
FOR ENTRY PERMISSION CONTACT:


QUARANTINE
WARNING
Land suspected to be affected by
Panama disease tropical race 4
NO UNAUTHORISED ENTRY
FOR ENTRY PERMISSION CONTACT:

Appendix 6

Banana Industry Chemical Workshop
August 12 2016- 9:30am – 4pm
EcoSciences Precinct Room GA604 Dutton Park, Brisbane

Summary of discussion

Participants

ABGC	Rosie Godwin (R&D Manager), Michelle McKinlay (Strategy Manager)
Banana Growers:	Paul Inderbitzen (NQ), Peter Molenaar (NSW), David Pike (NSW)
Researchers:	Andre Drenth (Plant Pathologist) Lynton Vawdrey (Plant Pathologist), Donna Chambers (Entomologist), Jenny Cobon (Nematologist),
Others:	Matt Weinert (NSW IDO), Kevin Bodnaruk (Chemical Consultant), Jodie Pedrana (HIA R&D Manager)
Apologies	Richard Piper (Scientific Advisory Services)

1. Reassessment of SARP priorities and review of control options set in 2012.

The group reviewed the priorities pest and diseases outlined in the original SARP and the following changes **highlighted in bold** below were recorded. There was also discussion about control options the main points being noted as follows.

Priority Diseases:

Common Name	Pathogen /Scientific Name	Comment
High		
Banana freckle	*Phyllosticta cavendishii; Phyllosticta maculata*	
Bunchy top	*Banana bunchy top virus*	
Crown rot	*Colletotrichum musae, Fusarium spp., Musicillium theobromae*	
Fruit speckle	*Fusarium oxysporum and F. semitectum*	
Fusarium wilt (Panama)	*Fusarium oxysporum f.*sp. *cubense*	
Black Sigatoka	*Mycospharella figiensis*	
Yellow Sigatoka - leaf spot	*Mycospharella musicola*	
Moderate		
Anthracnose- post harvest	***Colletotrichum musae***	Affects banana fingers and is less of a problem than crown-end rot.
Bacterial corm rot	*Erwinia spp.*	Associated with beetle borer damage in NSW
Bacterial rot, pseudo stem soft rot	*Erwinia spp.*	Erwinia is a minor intermittent problem in QLD – enters the plant via the cigar leaf.
Base (Butt) rot	*Chalara paradoxa*	
Leaf speckle	***Mycospharella musae***	Variety dependant - controlled incidentally- affects lower leaves
Mokillo - Bacterial finger tip rot	***Enterobacter cowanii* and *Pantoea agglomerans***	Occasional appearance. Affects all commercial cultivars – Fruit pulp is discoloured with a bad taste.

		Pinched fingers have a negative affect on fruit marketing. Not much R&D has been done on this and more is needed.
Low		
Deightoniella Fruit spot /pinhead black spot	*Deightoniella torulosa*	Rare in NQ. Linked to crop hygiene
Deightoniella Leaf spot - cordana	*Deightoniella torulosa*	Rare in NQ. Linked to crop hygiene
Ripe fruit spot (post harvest)	*Gloeosporium spp.*	
Squirter (post harvest)	*Nigrospora musae,*	

Disease Control Options:

Anthracnose, AND Crown rot, and other post harvest diseases

- **'Octave'as Prochloraz as Manganese Chloride complex (Gp 3)** was considered to be an action priority out of those listed in the SARP. It is not registered for bananas however an MRL is in place and it is reported to have a less offensive odour than Prochloraz currently being used.
  Action: Make an Enquiry to APVMA to see if there is any issue with using Prochloraz as the manganese chloride complex
- **'Scholar' (Fludioxonil) Syngenta (Gp 12)** was suggested as an alternative post-harvest fungicide.
  It is a Gp 12 fungicide, currently registered for post harvest treatment of mangoes, citrus, pome fruit, stone fruit, kiwi fruit, pomegranates.
  Action: Investigate what is required to gain access to this chemical (label/permit).
- **Pyrimethanil (Gp 9) –** could also be useful for post harvest as it is used this way for Citrus. It is already registered for bananas for controlling leaf diseases.
- **Adepidyn (Gp7)** is a new fungicide active from Syngenta, in the chemical class of carboxamides. registered in USA and has MRL in bananas. We already have Luna another Gp 7 registered in crop.
- **Thiabendazole** (Gp 1) should not be pursued as the way it is applied is detrimental to biological controls. Some data exists to show it is ineffective against major pathogens.

Peter Trevorrow and Kathy Grice (DAF Mareeba) are currently evaluating sanitisers for control of crown rot.

Fruit Speckle

- **Metiram (Gp M3)** is registered in all states for bananas- for fruit speckle, leaf spot, cordana leaf spot However it is the same Group as Mancozeb and both are under review in 2016.

Panama *Fusarium oxysporum f.* sp. *cubense* still no effective fungicides available for any of the races.

Leaf Speckle – Controls for leaf speckle should be applied under the canopy as the disease infects the older leaves. Generally this disease is incidentally controlled with yellow Sigatoka treatments.

Black Sigatoka We need to ensure we have effective chemical controls in place in case there is another incursion. It is possible to get Biosecurity 'Emergency Use' Permits in place for future exotic pests and disease incursions. Some efficacy data will still be required. Lynton Vawdrey provided a list of possible chemicals after the meeting (see Appendix 1).

Action: Investigate what needs to be done to ensure we have access to effective chemicals for future incursions.

Yellow Sigatoka.

- **Luna** (Fluopyram, Gp 7) has been registered for bananas since the 2012 SARP was prepared. It is being used and working well.

- Lynton Vawdrey provided a list of possible chemicals after the meeting (see Appendix 1).
- ***Bacillus subtilus*** as 'Serenade' has shown a level of disease control and may be suited to the organic industry.

Action: Investigate how this applies to the organic industry.

Mokillo – current control is to discard fruit as they are unmarketable.

Kevin Bodnaruk also provided the name of another possible fungicide: Spiroxamine which is registered in Australia (Prosper) for use in grapes against powdery mildew.

Action: Seek advice from Lynton about the efficacy against relevant banana fungal pathogens.

Priority Insects:

Common Name	Scientific Name	Comment
High		
Aphids- banana	*Pentalonia nigronervosa*	Ubiquitous - Only a problem as Bunchy top virus vector
Moth Banana scab	Nacoleia octasema	A big problem in NQ – affects the appearance of the fruit.
Borer – Banana Weevil	*Cosmopolites sordidus*	Priority problem in all areas
Borer - Sugar Cane Weevil	***Rhabdoscelus obscurus***	Not much is known about this pest. More R&D required.
Cane grub / white grub	*Lepidota spp.*	seasonal
Mites – 2 spotted (red)	***Tetranychus urticae***	**NSW – on fruit; QLD – on leaves Chemicals don't give good ctrl**
Mite - Strawberry (banana) spider mite)	*Tetranychus lambi*	
Thrips – banana flower	*Thrips hawaiiensis*	
Thrips - rust	*Chaetanaphorthrips signipenis*	
Coffee Bean Weevil	***Araecerus fasciculatus***	A problem for loads going to WA.
Moderate		
Black Soldier fly	***Hermetia illucens***	A problem in NSW in top of bunch so spray may be ineffective.
Sugar cane bud moth	*Opogona glychaga*	
Thrips	*Thysanoptera*	
Low		
Caterpillars	Lepidoptera	
Caterpillars	*Spodoptera litura*	
Cockroaches		Cosmetic damage
Fruit Fly		
Mealy Bug	*Pseudococcidae*	
Mites		
Mites Passionvine	*Brevipalpus phoenicis*	
Scale		
Thrips banana silvering	*Hercinothrips bicinctus*	
Wasp –Paper nest		

Insect Control Options:

Aphids Imidacloprid is the main control chemical

- **Dimethoate (Gp1B)** is on the way out

- **Sulfoxaflor (Gp 4A)** (Transform) – no intention of registering in bananas

Banana Scab Moth

- **Chlorantraniliprole (Gp 28)(Coragen)**
  Action: High priority to Investigate potential
- **Juvenile hormone analogues** are also alternatives but need very good timing or mixed with other chemicals – therefore there may be problems with these.
- **SusCon Ribbon (Imidicloprid)** manufacturer may cancel production if not enough orders. It is used more in NSW than in NQ. Also controls rust thrips, russet moth and sugar cane bud moth by controlled release by placement in the bunch. Problems with low efficacy in NQ with pest load, high temperatures and bunch bags with holes. The group supported its continued use.
  Action: Contact manufacturer to see what information they require for maintaining production.

Banana Weevil Borer –The control options listed in the SARP are still relevant. Imidicloprid is under review in Canada

- **Chlorantraniliprole (Gp 28)(Coragen)** High priority to Investigate potential. Some weevil registrations in other crops. US registration in bananas.
- **Indoxacarb (Gp22A)(Avatar)** High priority to investigate potential. Dupont are happy to look at registration but growers will need to pay for the trials.
- **Fipronil** – I made a note that we should contact the registrant to extend the use into other states however when I looked on APVMA web site it was approved for use in all states. Was it a particular use that needed to be approved in all states?
- **Bifenthrin –** Need trials done in NSW as it is used differently there.

Black Soldier Fly – affects the appearance of the fruit. Good trash blankets attract the flies and this is a problem when trying to get good ground cover to manage soil and nutrients run off.
This needs R&D but it may not be a chemical solution. It currently is not a problem in NQ but there needs to be a solution ready in case it does become a problem.

Cane grub/white grub – RDCs have made a commitment to investigate the problem across industry. SRA is funding work in banana and sugar industry. Is Donna Chambers able to advise ABGC of progress as this research is undertaken?

Strawberry (banana) spider mite

- **Bifenazate- (Gp UN)** – has registration for controlling mites of pome and stone fruits, cucurbits, strawberries, papaya
- **Wettable sulphur –** dusting sulphur is registered for use in bananas PER9409 (in QLD and NSW) but not wettable sulphur. Wettable sulphur is registered for controlling mites in many other crops and would be useful for bananas.
- **Tetramic Acids (Gp 23)**- Bayer has the only one in Australia – Spirotetramat – see below .

Mites in general especially 2 spotted mites are particularly a problem but many chemicals are ineffective. There are resistance issues. Chemicals (Macozeb) cause females to lay lots of eggs.

Banana Flower thrips

- **Acephate (Gp 1B) and Chlorpyrifos (Gp 3A)** are currently available but have been targeted for review.
- **Methomyl (Gp 1A)** not available and has also been targeted for review and therefore do not pursue.
- **Omethoate (Gp1B)** has been reviewed and the recommendation is for all uses to be cancelled apart from barrier spraying in ornamentals. ABGC is currently preparing a submission to APVMA to retain bell injecting.
- **Spinetroam (Success) -** currently available for rust thrips and sugarcane bud moth in bananas but not flower thrips

- **Spirotetramat (Movento Energy) (Gp23)** has been registered for bananas but also contains imidicloprid**.** Cannot be used after bell emergence**.** Registered in bananas for control of banana rust thrips and weevil borer by stem injection - can inject plant crop 3 months before bell emergence or followers 3 months after harvest of mother plant. Not registered for flower thrips
- **Action: Investigate the potential to register Spirotetramat (Movento Energy) for flower thrips.**

Rust Thrips - Similar comments to Flower thrips –see above

- **Spinosad** – not registered for bananas

Priority Nematodes:

Common Name	Scientific Name	Comment
High		
Nematodes - lesion	• ***Pratylenchus goodeyi*** • ***Pratylenchus coffeae***	These species are increasing winter/cooler climates. Not yet found in NQ but it could be present as it has taken 20 years to build to high levels in NSW. This could be happening in NQ.
Nematodes – burrowing	*Radopholus similis*	summer
Nematodes – root knot	*Meloidogyne spp*	
Nematodes – spiral	***Helicotylenchus multicinctus***	
Moderate		
Nematodes - reniform	*Rotylenchulus reniformis*	
Low		
Nematodes – spiral	*Helicotylenchus dihystera*	

- **Control options:** are limited. Nematode problems in bananas are quite specific to this crop therefore specific chemical solutions are required.
- **Oxamyl (Gp 1A) 'Vydate'** Dupont - is registered in all states and available for control of nematodes (burrowing and spiral) and weevil borers in bananas (supply was disrupted for a while in the US).
- **Fenamiphos (Gp 1B**) QLD NSW and WA – registered only for banana planting material -control of parasitic nematodes.
- **Turbufos (Gp 1B)–** registered for burrowing nematodes and banana weevil borer but causes mite flares and is expensive
- **Cadusafos –** available for spiral, burrowing in bananas
- **Biologicals -** could also be a possible control mechanism. Some might need registration even if biological.

Kevin Bodnaruk provided some extra information on potential nematicides after the meeting as follows:

- **Fluensulfone, Abamectin (Gp 6) –** (Nimitz) – Adama Registered in Australia in capsicum, chili, cucurbits, eggplant, okra and tomato for root knot nematode. Also approved in the US for root-knot, lesion and sting (*Belonolaimus* spp.) nematodes.
- **Fosthiazate** ISK – Have recently (April 2016) applied to the APVMA for an active constituent approval. This is one of the first steps moving towards seeking a product registration. It is marketed overseas as Nemathorin and is supposed to have activity against cyst, root-knot, root lesion and free-living nematodes. Kevin had a quick look and there are papers indicating activity in bananas against nematodes and weevils as well. It also appears to be registered for use in bananas internationally (Kevin also included the South African label if any one would like to see it – contact Rosie).
  Action- approach registrant to include bananas on the label.
- **Fluopyram** Registered in the USA (Velum Prime) for the suppression of nematodes in potatoes. There is also a mixture Velum Total that is a combination of fluopyram and imidacloprid for use as a soil application in cotton and peanuts against nematodes and a range of insect pests and diseases.
- **Tioxazafen** – (Monsanto) Being developed as a seed treatment for nematodes in cotton, soya beans and maize in the US. It is supposed to be active against cyst, root knot, reinform, lesion and needle nematodes. It is a

disubstituted oxadiazole, which represents a new class of nematicidal chemistry. Kevin believes the first registrations will be in the US early next year.

- **Action**- Investigate whether this can be used in-crop for bananas.

Priority Vertebrate pests:

Common Name	Scientific Name	Comment
High		
Birds	*Avian spp.*	
Feral pigs	*Porcine*	
Fruit bats	*Pteropodinae*	
Possum	*Diprotodontia*	
Rats, mice	*Rattus rattus and Mus spp.*	Major pests and carry leptospira bacteria hazardous to workers – baits not very effective
Wallabies	*Macropus spp.*	

Control options: limited

Birds and fruit bats

- **Sonic nets** –
  Action: Investigate potential with a company that recently contacted ABGC.

Rats and Mice – most controls are ineffective

- **Coumatetralyl** (Racumin 8, Bayer) – now registered for use in crop for pineapple, macadamias and sugarcane –
  Action: investigate potential for use in bananas

Priority Weeds:

Common Name	Scientific Name	Comment
High		
Blackberry nightshade	*Solanum nigrum*	
Black oats	*Avena strigosa*	Tolerance to Round Up
Feathertop Rhodes grass	*Chloris virgate*	
Mexican white eye	Richardia sp.	
Nauva sedge	*Cyperus spp.*	A big problem in NQ
Rye grass (herbicide Resist)	*Lolium spp.*	
Trad	*Tradescantia albiflora*	

Herbicide options: The only available herbicides to control grasses are from one group therefore can only be used once in the crop cycle. Therefore, investigate alternatives

- **Paraquat** (Gp L) is under review because of OH&S concerns. Syngenta is defending it
- **Fluazifop-P** (Gp A) (Fusilade Forte) is available and registered for bananas in NSW QLD, NT and WA
- **Saflufenacil** (Sharpen) (Gr G) BASF - new - registered for broadacre but not banana crops
  Action: Investigate potential for use in bananas
- **Pendimethalin** (Stomp) (Gp D) issues with resistance in grasses

Growth Regulators:

Priority	Scientific Name	Comment
High		
Sucker control		
Destruction of banana plants		

- **Ethephon** is registered and available to use for nurse suckering (PER14966 is valid until 31 Mar 2018). The problem is it is only registered in QLD instead of all states with bananas. Residue work will need to be done before permits can be issued as work has been done with Cavendish variety but not using other

varieties. Trials will be needed and Matt Weinert might be able to help with this. This was seen as a moderate priority.

- **Kerosene** neat – is missing for destruction purposes – more effective than diesel but more expensive. **Action:** Investigate possibility of a permit.

2. Ag Vet Collaborative Forum – overview and importance to industry: Briefing by Jodie Pedrana (HIA)

The size of the Australian market for AgVet chemicals is small on a world scale**.** The Federal Government has committed $8 million over 4 years (2014-2018) to help farmers gain improved access to safe and effective Agvet chemicals. As part of the initiative, the AgVet Collaborative Forum was set up to allow industries to share their access needs with each other and chemical companies. The forum

- establishes an official Australian crop grouping list and guidelines
- assists in the listing of priority needs for industries
- provides assistance grants to help fund the generation of sufficient data to support applications to APVMA for chemical uses identified as a priorities by the forum e.g migrating permits to product labels.
- Only RDCs can apply for grants - applicants can apply for up to $50K to maintain, broaden or gain new access to an Agvet chemical use through a minor use permit, or $100Kto seek a new use of a chemical product.

The forum has been organised annually to date
Round 1 (2015): $1.7 mil was available - few RDCs were represented at the forum -only HIA and GRDC.
Round 2 (2016): ~$2.4 mil available- many RDCs and registrants participated in the forum therefore there is more competition.
Round 3 (2017) funding is planned but not guaranteed.
APVMA also has a project to fill in data gaps, which could be beneficial to the banana industry.

Advice to industry:

1. Ask the hard questions of registrants - Why are their products not registered in all states?
2. The banana industry needs to identify and consolidate our medium and long term priorities, identify any gaps in chemical controls and provide information to HIA in time for the next the AgVet Forum (held in May 2017)
3. Think about ways that we can align our chemical needs to those of other crops to make chemical companies more interested in developing or registering products or to be successful in obtaining grants from the Australian Government.

2016 priorities to pursue for a grant through the Ag Vet Forum were discussed by the group and determined to be:

1. Chlorantraniliprole (Gp 28)(Coragen): to control scab moth
2. Indoxacarb (Gp 22A) Avatar: to control banana weevil borer

Action: HIA's Jodie Pedrana will investigate possibilities of preparing a grant application on behalf of the banana industry for these products. The deadline for these grants is the end of September.

4. Implications of Chemical Reviews in Australia and overseas. Briefing by Kevin Bodnaruk

Reviews are undertaken to reassess the risks and determine if regulatory changes are necessary to ensure that the chemicals can continue to be used safely and effectively. Changes may include modification to uses, or removal chemicals from the market.

Internationally: reviews can occur when there are:

a. Reviews of MRLs (maximum residue limits)–This can occur when
    - Registrants don't want to support older products so the MRLS for these products gradually disappear. The data for the MRL can be lost unless another registrant comes forward and if not the MRL is lost.

- MRLs can become out of date because toxicology knowledge has changed. Therefore products disappear because the MRLs have disappeared.

b. Risk assessments (RA) are conducted overseas e.g. in Europe and if RAs deem specific chemicals to be hazardous overseas it may have knock on effect causing market access problems for Australian growers exporting to these countries. This may result in some chemicals not being used any more. This is not likely to be a significant problem for our banana industry unless we begin exporting.

Australia: APVMA conducts reviews which must be completed within a stipulated time frame approx. 18 months. This means industries only have a limited amount of time to gather required data to submit to the review. APVMA does conduct a scoping study prior to the start of the review and this is the time to start getting the data together. In 2015 APVM developed a list of 19 chemicals types which have been targeted for review. The top 5 prioritised for review are

a**. Dithiocarbamates** – detailed scoping to start in 2016 e.g Mancozeb, Metiram etc.
b. **2nd generation anticoagulant** rodenticides
c. **Cyanazine and simazine** (herbicides)
d. **Phorate** (organophosphate insecticides)
e. **Metal Phosphides** (only those used for grain treatment)

<u>Recommendations</u> for industry

Reviews

- Monitor what is happening within Australia and overseas
- When APVMA announces a scoping study, the industry needs to get involved. Kevin will tell ABGC if the reviews are relevant to the banana industry.
- Residue trials required by APVMA are extensive and can be expensive $80-100K

Permits

- Registrants need to be incentivised to move their products onto label. Industry should consider ways to give them the incentive.
- Approach APVMA to be reclassified as minor industry. Minor use classification is <10K ha.
  The Sunflower industry managed to be reclassified as a minor industry and they grow 40-60K ha.

Justify why the banana industry wants permits – e,g. resistance is a good case.

Summary and next steps

- The ABGC R&D and Strategy Manager will summarise the workshop discussion and findings then distribute to the group for comment.
- Actions items will be driven by the R&D manager in consultation and with input from relevant group members.
- Outcomes will be reported to the group as they occur.
- Future meetings and discussion will be convened as needed.
- Please address any questions or comments to ABGC (contact detail below)

Rosie Godwin R&D Manager Australian Banana Growers' Council M: 0407 746 469 E: Rosie.Godwin@abgc.org.au	Michelle McKinlay Industry Strategy Manager Australian Banana Growers' Council M: 0427 987 499 E: michelle@abgc.org.au

Appendix 1

Possible alternative chemicals for yellow Sigatoka and black Sigatoka Control (provided by Lynton Vawdrey)

Company	Product name	Active ingredient	FRAC Code
Bayer	Prosard 420 SC Prosper Antracol Baycor	prothioconazole+tebuconazole spiroxamine propineb bitertanol	3 5 M3 3
BASF/Nufarm	Delan 700 WG Pristine Calixin Boscalid	dithianon boscalid+pyraclostrobin tridemorph boscalid	9 7, 11 5 7
DuPont	Fontelis Sanction 25	penthiopyrad fluzilazole	7 3
Syngenta	Cogito Reflect Alto	tebuconazole+propiconzole isopyrazam cyproconazole	3 7 3
Colin Campbell Chemicals	Syllit	dodine	U12

Currently used overseas to control black Sigatoka (Source : www.frac.info)

Appendix 7

Mid-term Review

Project BA14012 (Banana Industry R&D Manager)

Prepared by:

John Bagshaw
JSB Hort Services
January 2017

Evaluation process

Fifteen stakeholders from industry, the research community and government who have had dealings with the Research and Development (R&D) Manager were interviewed by telephone. The R&D Manager was also interviewed in depth. These interviews were followed up by an on-line survey sent to 14 stakeholders to provide quantitative data about aspects of the R&D Manager's role. Eleven responses were received.

Introduction and background

The current banana industry Research & Development (R&D) Manager was appointed full-time in October 2015 funded by this Horticulture Industry Australia (HIA) project for a three-year period.

The primary deliverables for this position according to Schedule 1 of the Research Agreement with HIA were:

- Project development and coordination in the area of Panama disease TR4 (TR4) R&D
- Extension of Panama TR4 projects
- Input to the banana industry R&D program (including membership of project reference groups)
- Technical advice to the banana industry on key pest and disease issues.

Supporting these deliverables the banana industry R&D Manager was expected to "become and remain up to date on Australian and International banana research", "commit to the HIA industry development network and information systems and support HIA membership processes" and "where possible, interact with other industries and learn from them".

At the time of the R&D Manager's appointment, the banana industry in North Queensland was 8 months into dealing with an outbreak of Panama disease TR4 on one farm at Tully and the previous R&D Manager had moved on about 6 months before. Responding to this potentially calamitous outbreak had captured the industry's time and attention and the new R&D Manager was thrust into TR4 response issues as well as meeting her responsibilities under the research agreement.

The industry's day-to-day liaison with Biosecurity Queensland about response to TR4 was largely undertaken by the Industry Strategy Manager over the 6 month period in the absence of an R&D Manager. The current R&D Manager took over these roles when she was appointed, including a participant in weekly BQ situation report meetings.

A number of R&D projects including those relating to Panama disease TR4 were already underway when the R&D Manager was appointed. Planning for the new Banana Plant Protection Program (BA16001) and a new National Banana Development and Extension Project had just started when the R&D Manager was appointed. She continues to have input into these projects as a member of the project reference groups.

The R&D Manager spends about 60% of her time on TR4 issues (R&D, and response) and 40% of her time on other R&D issues.

Work Deliverables

Project development and coordination in the area of Panama Tropical Race 4 (TR4) R&D

The R&D manager started in her position when the TR4 outbreak response was well underway. She took on many of the day-to-day roles liaising with Biosecurity Queensland (BQ) and others about TR4 response issues, providing technical input to Biosecurity Queensland and other stakeholders involved in the TR4 response.

Activities

Details are provided in project milestone report 104 to HIA (**Appendix 1**)

Along with her role in the TR4 outbreak response, the R&D manager has been very active building knowledge about her role in project development and coordination, developing R&D networks, and visiting R&D stakeholders and banana growers since her appointment.

Impact and effectiveness

Feedback from TR4 R&D project leaders and other government and industry stakeholders about the impact and effectiveness of the R&D manager is as follows:

- A competent and effective coordinator and broker between all the project partners involved in TR4 research and development resulting in a more efficient suite of projects from disparate research providers. This role is accepted and, indeed, valued by these providers partly because she represents a neutral, independent industry 'voice'.

  The R&D Manager also has an overview of all banana research in Australia and overseas allowing her a holistic view about managing TR4 and influencing research and biosecurity stakeholders accordingly. It was pointed out by one stakeholder that R&D projects not funded by HIA tend to "be left out of the loop". The R&D Manager role is ideally placed to ensure all R&D is communicated to all stakeholders.

  All industry and R&D stakeholders viewed the R&D Manager as the 'go-to' person for information about banana industry R&D matters generally, and the conduit for communication about R&D matters between industry and R&D stakeholders.

- The banana industry is a full project partner in the Australian Centre for International Agricultural Research (ACIAR) TR4 project. The R&D Manager represents the industry (providing industry input) on this project and has been active in the planning of the ACIAR project. She visited the Philippines and Taiwan to learn about TR4 R&D there as part of an ACIAR project.

- The R&D Manager is an important link between researchers and the industry. She takes highly technical concepts and communicates them back to industry in a clear, understandable way. This enables the industry (and HIA) to make more knowledgeable and informed decisions about resource allocation into banana industry R&D. One grower commented that this skill has "prevented the grower leadership group always being on the back foot".

- The R&D Manager is able to provide timely information on R&D issues quickly to the whole industry using their flexible and agile industry communications system (e-bulletins, emails, newsletters and industry magazine).

- The R&D Manager is an excellent resource for chasing up information and people for progressing project plans. A research project leader in North Queensland noted that it was good to have the R&D Manager in Brisbane near other Brisbane-based R&D providers. This enables face-to-face discussions which is better for working through complex issues.

- The R&D Manager has arranged for overseas TR4 researchers to visit university researchers in Brisbane for exchange of ideas and for visitors to see university trials.

- Since her appointment the R&D Manager has driven the continuing banana nursery certification transition planning. She has coordinated the process involving the State Department of Agriculture and Fisheries (DAF), Nursery & Garden Industry Australia (NGIA) and the banana industry (including nursery businesses).

  The R&D Manager has been a critical catalyst to move the process forwards with all stakeholders, organising meetings and setting deadlines. The R&D Manager, along with the NGIA Manager, mapped out a budget and work plan and presented it to DAF to add to a project variation now submitted to HIA.

  Having a dedicated industry person (the R&D Manager) drive the process and coordinate stakeholders is seen as a benefit by all stakeholders. It is not core business for other stakeholders who are also busy with other responsibilities.

- One stakeholder noted, "If the R&D Managers role was not there, the industry would have to rely on partisan, very busy research providers resulting in a less cohesive R&D program, probably less focussed on industry needs". The R&D Manager has a very important 'bringing together' role.

The R&D Manager has also been an effective conduit between BQ and the industry related to BQ's TR4 response activities: Two examples (reported by BQ staff) of her involvement are:

- There were some industry concerns about BQ's level of hygiene during surveillance and response activities. The R&D Manager became involved to 'audit' BQ's decontamination protocols on the ground as their staff moved between farms. She also visited the BQ centre at Moresby to inspect processes and procedures there. She reported her technical assessment of BQ hygiene protocols back to industry, indicating a high level of confidence in their hygiene practices. The R&D Manager was seen by all as an independent, unbiased, technically competent observer representing industry. Her critical analysis allayed concerns (at least to a manageable level) from industry about BQ's hygiene activities.

- BQ developed protocols for taking samples from the property infected with TR4 for research purposes (a sensitive issue with industry). The R&D Manager provided feedback on the protocol and took BQ's needs and strategies for sampling to the industry. She was the conduit between BQ and industry providing confidence to industry that the protocol was technically robust allowing the activities to proceed.

  Other comments from BQ staff:
- "The R&D Manager should spend more time fully understanding BQ's processes and activities. For example, a week spent at BQ Moresby would enable this. Then the R&D Manager would be better

equipped to communicate BQ activities, philosophy and issues to the banana industry leadership group and the broader industry".

- "The R&D Manager should continue to be a catalyst for a stronger partnership between BQ and the banana industry".

Appropriateness

The following feedback from TR4 R&D project leaders and other government and industry stakeholders provides insight about how the R&D Manager ensures appropriateness of R&D:

- "The R&D Manager represents the Australian banana industry in a range of R&D forums. She presents the banana industry position to all stakeholders".

- For example, she has reviewed and commented on TR4 research proposals about how they meet industry objectives and has provided advice on how to make them more applicable to industry needs. The R&D Manager is involved in research priority setting (she sits on many R&D project steering committees) and ensures that R&D meets industry needs. Most recently she has done this in planning with the project leaders for the new Banana Plant Protection Program (BA16001).
- In discussions with BQ staff about their TR4 response program, they note that the R&D Manager has consistently presented the banana industry's interests and views.

- In the planning for transition of banana nurseries to a new certification program, the R&D Manager has provided a practical industry perspective and a broad view of issues (and is "politically savvy").

- "The R&D Manager is an independent industry arbiter between research organisations and HIA".

- "The role provides early industry vetting for project ideas. This prevents researcher effort being wasted on developing a project that won't 'fly' with the industry".

- "The R&D Manager is able to communicate to researchers what is seen by the banana industry as emerging issues".

Input to the banana industry R&D program (Including membership of project reference groups)

Project Reference Groups

The R&D Manager is a member of project reference groups and attended meetings for the following R&D projects:

- BA10020 Banana Plant Protection Program
- BA13004 National Banana Development and Extension Project
- BA14013 Fusarium Tropical Race 4 – Biosecurity and sustainable solutions
- BA14014 TR4 Research project in order to help develop Panama TR4 extension strategies and their adoption
- BA15006 & BA15007 National Banana bunchy top virus program Phase 3
- BA13025 NSW Banana Industry Development Officer.

Coffee Bean Weevil project

This project is to gain biosecurity access to Western Australia by testing and getting approval for a new treatment against Coffee Bean Weevil on bananas sent to Western Australia (that is less damaging to the fruit).

The R&D Manager chairs and drives the project working group for this project. In this role she organises and runs project team teleconferences, records and distributes meeting information. She also prepared a situation report on the issue of Coffee Bean Weevil for distribution to relevant stakeholders. She is also the main contact with West Australian biosecurity authorities. She has written and sent a funding application to HIA to fund this project.

The R&D Manager's involvement, because she represents the whole of industry, means the benefits accrue to the whole banana industry.

Bunchy Top

The R&D Manager is on the project reference group for BA15006 and BA15007. She has accessed, organised and distributed technical information relevant to Bunchy Top on behalf of the Bunchy Top project team.

Yellow Sigatoka

The R&D Manager works closely with the Yellow Sigatoka industry officer and prepares the milestone and final reports for this project in collaboration with the officer.

Input into extension of TR4 R&D projects

The R&D Manager is on the project reference group for the existing National Banana Development and Extension Project and for the new developing extension project.

The R&D Manager has supported the DAF banana extension leader by providing good information about research principles and practice, and statistical validity for demonstration trials as part of DAF's extension program to the banana industry. She has also provided an independent perspective on general extension

activities from outside the 'extension' mould. The DAF banana extension leader commented that "The R&D Manager is a very important link between DAF extension, industry and other R&D project players".

The R&D Manager is on the planning committee for the 2017 Banana Congress and has provided 'outside the box' ideas for presenting technical TR4 information to the Congress. The R&D Manager has coordinated these planning meetings.

The R&D Manager gave presentations to growers at DAF's series of national Roadshow meetings about TR4 information gathered from a visit to the Philippines and Taiwan. The R&D Manager, a banana grower and a DAF researcher visited these countries to learn more about how farms deal with TR4 outbreaks and to discuss TR4 R&D issues (including TR4-resistant variety breeding programs) with researchers.

The State and Commonwealth government-funded banana industry TR4 Extension project was well underway when the R&D Manager was appointed. The project's objective was to build knowledge of TR4 and on-farm biosecurity with banana growers.

Through workshops and farm visits, the TR4 On-farm Extension project team provided comprehensive training about TR4 and on-farm biosecurity practices to 251 North Queensland (NQ) banana farms (representing 89% of NQ banana growers). The project also provided training and information to growers and agribusinesses in New South Wales and Western Australia, and to agribusiness providers and transport companies in NQ.

This project is now finished and project staff have moved on or moved into other roles in the industry. During the project the R&D Manager had met with the project team on several occasions for debriefing and to offer support. The R&D Manager also provided feedback on extension materials developed as part of the project and has edited and improved a draft workshop module entitled "Living with TR4". She is currently the industry custodian of all workshop modules, fact sheets and other extension materials developed during the project.

Technical advice to the banana industry on pest and disease

Responses from stakeholders during discussions provide examples of the R&D Manager's role in providing technical advice:

- The R&D Manager is a conduit between Biosecurity Queensland and the banana industry in relation to the TR4 response. One example of impact from this role is technical discussions between the R&D Manager and BQ resulting in BQ re-thinking some of their protocols and procedures (for example, their decontamination process) for more effective and practical outcomes. BQ staff also contacted the R&D Manager asking for technical input about biosecurity concepts and ideas. The result was better outcomes that provided maximum benefit to BQ and to the industry.

  The R&D Manager has effectively communicated the technical rationale behind BQ processes to industry leaders thus adding to their confidence that BQ's activities are grounded in sound science. In return, the R&D Manager's scientific background "puts the industry in a good stead" in interactions with BQ decision-makers.

  Her role has thus made the whole communication process between Biosecurity Queensland and the industry much more efficient and effective.

- The R&D Manager has provided feedback on aspects of molecular science to TR4 research leaders during development of their project proposals. Having a background in molecular science means she has a lot to contribute in this area, and is important in preparing robust research methodologies.

- During an ACIAR-funded fact-finding trip to the Philippines and Taiwan, the R&D Manager was very good at asking incisive questions of breeders developing TR4-resistant varieties. These questions elicited important information that otherwise may not have emerged.

- The R&D Manager has referred research leaders and growers to technical specialists for advice and information during the development of the new Banana Plant Protection program.

- The R&D Manager has provided significant technical input into incorporating the banana industry nursery accreditation scheme (QBAN) as an add-on to the nursery industry accreditation program (NIASA). She has also added to technical understanding and awareness of managing banana source planting material for tissue culture, with all the biosecurity issues involved.

- "An excellent resource for information gathering and brokering. Her technical background allows her to gather highly technical data from her networks".

- The R&D Manager has "provided good solid technical advice on the methodology for screening and testing for TR4" to the grower leadership group and to BQ. She has also provided good technical input into a flagged epidemiology review of TR4 by BQ.

- The R&D Manager's knowledge of molecular biology and research principles has been very valuable to the banana industry leadership group. For example, without her input growers (who lack technical expertise concerning TR4) would have been unable to question and clarify BQ's TR4 testing processes. Informed feedback from the industry to BQ led to improvements in the testing process.

- Comment from a member of the grower leadership group: "The R&D Manager is doing a great job overviewing and keeping the industry informed of chemical registration issues". In this role the R&D Manager co-facilitated (with the Industry Strategy Manager) a chemical workshop involving relevant industry stakeholders as part of a review of chemicals used in the banana industry. She had also prepared and submitted a review of Omethoate on behalf of the industry to the Australian Pesticides and Veterinary Medicines Authority.

General characteristics of the R&D Manager

Interviews with a range of stakeholders identified the following general characteristics of the R&D Manager that were greatly appreciated:

- "Asks insightful questions about technical aspects of TR4 response activities and the general banana industry R&D program. The 'why' questions were very helpful, prompting stakeholders to re-consider some of their technical thinking. The R&D Manager knew what technical questions to ask". (This was a common theme among all the stakeholders interviewed for this review).

- "Very good at searching out and assessing technical information from the right people, then organising and packaging it in a logical easily understandable way. Also prompt at communicating the information to relevant people. A grower explained that they are time–poor (focussing on their core business of running a banana production and marketing business) and not usually scientifically trained at a level to fully understand some of the intricacies of scientific research. The R&D Manager is skilled at translating technical information into common language and summarising it for them".

- "Tactful in dealing with a wide range of people in the research community".

- "Approachable, explains technical things well, inclusive, has good networks in the R&D field".

- "Asks 'the right' questions to understand an issue then contributes to clarity of thinking".

- "Sees things from all sides, a good arbiter".

- "Has acquired an excellent overview of all research work with bananas. Good for providing an overall picture of banana R&D work".

- "Has a good work ethic and has a good way of dealing with people. Works well with everyone".

Comments about the role of the R&D Manager (by interviewed stakeholders)

- "The R&D Manager is a catalyst for action and cooperation. And helps the industry maintain a focus on the future".

- "The R&D Manager has a role to ensure HIA funded projects meet milestones and reporting requirements".

- "The R&D Manager provides an unbiased technically-grounded influence on decision-making by industry leadership. Can focus the industry leadership on scientifically based decision making where appropriate".

- "The R&D Manager has a broad understanding of industry issues. Able to provide an industry 'reality check' for people and groups that want to interact with the industry but only have a very narrow 'specialist' view of industry issues".

- "The R&D Manager is a neutral and industry-based person; ideal for facilitating interaction and cooperation between the R&D groups".

- A NSW grower and the NSW Industry Development Officer felt that the R&D Manager should "take a more nation-wide approach to R&D in the banana industry, and consult more with NSW & WA about their issues". This needs to be viewed in the context of the size of the banana industry in those States.

Summary of a survey conducted with stakeholders (percent of responses)

A small survey of key stakeholders that have had dealings with the R&D Manager was undertaken concurrently with interviews. (11 responses were received from 14 surveys sent to stakeholders). The object of the survey was to collect some quantitative data about the banana industry R&D Managers role and performance.

	Never	rarely	A reasonable amount	Often	Daily
How often do you communicate with the R&D Manager?	0	0	36%	54%	9%

	Not at all	A bit	A reasonable amount	Very much	Extremely
How much do you value the R&D Manager as a part of your professional network	0	0	0	20%	80%
How useful was the advice or information provided by the R&D Manager?	0	0	18%	27%	55%
To what extent has the R&D Manager contributed to TR4 Research, Development & Extension?	0	0	22%	45%	33%
How useful do you think the R&D Manager's role is in the banana industry's R&D program generally?	0	0	0	25%	75%

Recommendations

Continue regular R&D coordination meetings involving all researchers (including those research programs not funded by HIA). These meetings were considered to be very valuable by researchers.

Transition of banana nursery certification from QBAN to NIASA: Involve and consult with the banana industry nurseries as much as possible in all stages of planning and implementation, explaining the rationale and addressing concerns.

The R&D Manager to be a full member on the HIA Strategic Investment Advisory Panel for R&D. The R&D Manager has developed a deep and broad knowledge of banana R&D in her role and would provide a valuable contribution to deliberations and evaluations of R&D projects. Being a full member would allow a more certain formal contribution to having an efficient, effective R&D program focussed on priority industry needs.

Be strategic when prioritising time. Focus on facilitating innovation for the industry. This is difficult to justify, for example, if there is an exotic disease outbreak requiring emergency response actions, however under 'normal' operating conditions it is important for the R&D Manager role.

From a grower member of the banana industry leadership group: "The R&D Manager should stay longer in the position to build better relationships with growers and other stakeholders. This allows people in the industry to get a better understanding of the R&D Managers role and what the R&D Manager is able to do for the industry/individual growers".