Hort Innovation

Final Report

Banana Strategic Industry Development

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Australian Banana Growers' Council

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BA13023

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Summary

The *Strategic Investment Plan for the Australian Banana industry (2014/15 – 2018/19)* was prepared for the banana industry in May 2014. This document highlighted a number of emerging priorities for the industry that included:

- pest and disease management protocols;
- environmental stewardship;
- workplace health and safety innovation;
- banana variety development; and
- food safety.

However the industry did not have any existing capacity to consider and respond to these priorities. This lack of capacity was identified as a risk by banana growers and action was taken to develop a strategic industry development capacity that focused exclusively on the banana industry. The (then) Research and Development Corporation for Horticulture, Horticulture Australia, approved that a Banana Strategic Industry Development project (BA13023) be funded using levies paid by banana growers. As part of the project, the Industry Strategy Manager (ISM) was employed by the Australian Banana Growers' Council in June 2015. The purpose of this role was to provide growers with insight and advice on those priority areas identified above as well as provide a mechanism for growers to contribute to relevant state and national debates.

Within the first year of this project, two major events occurred that had a significant impact on the project – the detection of Panama Disease – Tropic Race 4 (TR4) in Tully, north Queensland and aerial footage that alleged banana farms were polluting the Great Barrier Reef (GBR). As a result of the workload generated by these complex issues, it was decided that the project would no longer include the topics of workplace health and safety; banana varieties and food safety and it was varied accordingly.

This project, the first of its kind for the banana industry, has produced a number of positive outcomes for the banana industry and this is evidenced by a very large number of major achievements described in the body of this report. This project and the role of the ISM has added value to the industry by providing a mechanism to coordinate and integrate a number of strategy related activities that had previously been handled in a responsive, ad hoc manner – or not addressed at all. It has put the industry on the front foot and enabled it to proactively contribute to and lead critical discussions about topics relating to biosecurity and the environment that will shape the future of the banana industry and agriculture more broadly. The project has also ensured that banana growers are aware of the significant debates occurring within government and the community and the possible impacts these discussions may have on them and their industry.

The two "headline" outputs for this project have been the *Banana Industry Water Quality Strategy 2017 – 2020* and the *Banana Industry Biosecurity Framework*. Both documents set the strategic direction for the work being undertaken in their respective areas. The Water Quality Strategy clearly articulates the work that the industry needs to undertake over the next three years in order to make a significant contribution to improving water quality on the GBR. The Biosecurity Framework identifies current gaps in capacity and information and recommends priorities for future effort. It should be noted, however, that all of the work undertaken by the ISM for this project – report writing and editing, responding to enquiries, networking, delivering presentations, answering emails, meeting with growers and visiting

farms - is all relevant and related in some way to these overarching strategic documents.

A review of the project was conducted by an independent evaluator in its final year. The reviewer interviewed 19 people who were a mix of grower and non-grower stakeholders. The reviewer concluded that the ISM role (and therefore the BA13023 project) was a "highly value added capacity for the banana industry" that provided a "unique set of skills and capability in dealing with all stakeholders". The reviewer also concluded that the position of ISM should continue for another three-year period (ie after the conclusion of BA 13023).

The success of this project can be attributed to a number of factors including:

- The industry's vision and confidence to be proactive and prepared to address strategic environmental and biosecurity challenges;
- The ISM had a unique set of skills and capacities and could appreciate both the demands and pressures of government stakeholders and banana growers and work skillfully in bringing these two groups together to deliver better outcomes for all.
- Banana growers were receptive to challenge and prepared to listen and adopt new ideas;
- Access to a collaborative 'virtual' team of scientific, policy and industry professionals scattered across Australia who were willing to share information and advice as well as listen to concerns and work together to identify problems and design solutions.

Keywords

Banana

Industry development

Strategic

Water quality

Biosecurity

Environment

Great Barrier Reef

Water Quality Strategy

Biosecurity Framework

Biosecurity priorities

Industry Strategy Manager

Extension

Introduction

According to the *Banana Strategic Investment Plan 2017 – 2021*, bananas are one of the highest selling supermarket products with over five million eaten daily. All bananas consumed by Australians are grown in Australia – with 95% of them grown in north Queensland. The main growing areas are located in Tully, Innisfail, Mareeba and Lakeland. The industry produces an estimated 372,000 tonnes with a farm gate value of approximately $600 million.

The *Strategic Investment Plan for the Australian Banana industry (2014/15 – 2018/19)* identified a number of issues that were likely to have major impacts on the industry and its long-term performance. After consideration about the risks and challenges that lay ahead for the industry, it was decided by the then Industry Advisory Committee (IAC) that it would be highly beneficial to have a project to devise specific banana industry strategies in response to issues that are of critical impact.

The key issues that were identified as requiring attention included:

- pest and disease management protocols
- environmental stewardship
- workplace health and safety innovation
- banana variety development
- food safety

This project provided an important mechanism for the banana industry to engage with non-grower stakeholders at a critical time in its history. Government demand for grower and industry participation in policy development on strategic and complex issues such as the management of reef water quality has strengthened in recent years and it is likely that this expectation of engagement will only continue to grow. At a time when governments have been increasing or decreasing certain regulatory boundaries, growers have benefitted greatly from having the project in place. The ISM has been a productive conduit for information and advice and helped to deliver outcomes that work for the banana industry.

The project aimed to ensure that the banana industry is a sustainable sector that is supported by profitable production.

Methodology

Project definition
Between 2009 and 2016, the banana industry's priorities have been guided by three key strategy documents. These have assisted growers to understand the priority areas to invest their levies to deliver the maximum industry benefit. The documents are:

1. the Industry Development Needs Assessment for the Banana Industry (June 2009),
2. the Australian Banana Industry Strategic Plan (2009-2014);
3. the Australian Banana Industry Strategic Investment Plan (July 2014).

These documents noted that there were areas of strategic industry development that would critically underpin the future sustainability and integrity of the banana industry. The IAC realised the importance of being prepared for emerging issues and the need to address them in a coordinated and considered way. It decided that the industry needed a dedicated project to understand and develop banana industry-specific responses to these issues.

Project planning
An application was made to Horticulture Australia to provide levy funds for a Strategic Industry Development project that included the employment of an ISM. The project incorporated the following five priority areas:

1. pest and disease management strategy
2. environmental stewardship;
3. workplace health and safety innovation;
4. banana variety development; and
5. food safety.

Project launch
Horticulture Australia advertised the Banana Strategic Industry Development project (BA 13023) and a project was awarded to the Australian Banana Growers' Council (ABGC) with a commencement date of 1 May 2014. The ISM position was advertised and, after interviews and referee checks, Michelle McKinlay was appointed to the position for three years - the duration of the BA 13023 project. A positive and lasting legacy of the ABGC, the peak industry body hosting and delivering this project will be the industry's access to the accumulated corporate knowledge and extensive network of contacts that has made as a result of this successful project.

Project management
This project has been governed by a Project Reference Committee (PRC) made up of the following people:

- Doug Phillips (Banana grower, Innisfail)
- Paul Johnston (Banana grower, Tully)
- Bianca Cairns (originally Alison Anderson from Hort Innovation)
- Jim Pekin (CEO, ABGC)
- Michelle McKinlay (ISM, ABGC)

The PRC has met annually to discuss work priorities for the annual work plan. Additionally, frequent informal discussions and updates occurred between the ISM and the two grower representatives and the CEO of ABGC. The Committee also endorsed the Monitoring and Evaluation Report and the Program Logic that was developed for the project mid-way through its life.

The ISM also provided quarterly reports to the ABGC Board (the industry's leadership group) to advise them of issue developments and seek their input and advice on issues of relevance to the entire industry. The Board membership has changed during the life of BA 13023 which has extended the ISM's network of strategic thinking, industry active and committed banana growers across Australia.

Since the BA13032 project commenced, the 12 banana growers have had formal roles in the industry's leadership group and formed an important part of the ISM's network. These growers are:

- Stephen Lowe (Tully grower)
- Stephen Spear (Coffs Harbour grower - NSW)
- Thomas Day (Carnarvon grower – Western Australia)
- Jade Buchanan (Innisfail grower)
- Ben Franklin (Tully and Mareeba grower)
- Paul Inderbitzen (Lakeland grower)
- Leon Collins (Tully and Lakeland grower)
- Doug Phillips (Innisfail grower)
- Steve Lizzio (Innisfail grower)
- Peter Molenaar (Northern Rivers grower – NSW)
- Paul Johnston (Tully grower)
- Adrian Crema (Tully grower)

Some of the success of BA13023 can be attributed to the constructive and complementary relationship between the PRC and the ABGC Board. The PRC and the Board had distinct and different roles - the PRC set the annual strategic direction of the project and the Board Directors provided a way to ground-truth developments that arose along the way. Given the wide geographic distribution of Directors, they were able to provide the ISM with insight into the regional impacts of issues and decisions and collectively mesh that information into an overall national position. This provided an efficient way for the ISM to gain a truly national understanding of the industry.

Within the first year of the project, there were two major events that had significant impact on the planned outputs of the BA 13023 project – the detection of TR4 in north Queensland (March 2015) and an Australian Broadcasting Commission (ABC) story on the impact of banana farming on the Great Barrier Reef (August 2015). Both events generated an enormous amount of unplanned work – trying to educate growers on the impacts and implications each would have on them and the industry and establish networks with key stakeholders to support growers map a sustainable pathway forward. As a result of these immediate and significant issues and the consequent urgent workload, the project leader advised the PRC in August 2015 that the ISM would be unable to deliver outputs for the original five priorities. He proposed that the number of original priorities be reduced to two – focusing exclusively on biosecurity and the environment. The PRC discussed the proposal and agreed that it would be better to have two priorities handled well than to try and deal with five priories in an ad hoc and reactive way. This decision was made on 11 September 2015 and Horticulture Australia subsequently prepared a variation to reflect the reduced number of priority areas. At this time, Horticulture Australia also added in the requirements that a Monitoring and Evaluation Plan (including a Program Logic, Stakeholder Engagement Plan and a Risk Register) (Appendix 1) be completed for the project.

Project finalisation

The impact and effectiveness of the project was reviewed by an independent evaluation expert, John Bagshaw. His final report was delivered in February 2017 (Appendix 2). As part of the review, 19 stakeholders - both growers and non-growers - were interviewed. To frame the interviews, the project reviewer used the key evaluation questions contained in the Monitoring and Evaluation Report. He found that the project has been overwhelmingly successful with all stakeholders describing positive experiences in working collaboratively with the ISM. The Evaluation report made a number of recommendations that include:

- Continue the project for another three years and then review its relevance;
- Maintain the current dual focus of biosecurity and environment (also identified as priority areas in the new Banana Strategic Investment Plan 2017 – 2021);
- Increase communication about the ISM's role to growers – especially those growers who have little direct contact with the ISM;
- Keep the focus on strategic issues of importance to the banana industry.

In summary, this project has successfully initiated and delivered activities as well as leveraged expertise, funding and outcomes from many projects that have commenced and concluded during the life of BA 13023. The project has provided growers with a mechanism to influence and inform government management of critical issues and design of projects. Importantly, it also ensured that growers are better informed about impacts and consequences of changing government policy. This strategic engagement will deliver long-term benefits for growers and the industry and the environment.

Outputs

The Program Logic design for BA 13023 identified four major outputs and these are described below. Two of these outputs were significant documents that articulate future banana industry activity in the areas of biosecurity and the environment. The remaining two outputs are a collection of activities that have been clustered together to demonstrate the written and relationship components of this role. Also included in this section is a list of projects that have had an influence on the outputs and outcomes of BA 13023.

1. Banana Industry Biosecurity Framework

The *Banana Industry Biosecurity Framework* (Appendix 3) examines the current extent of biosecurity preparedness within the banana industry – from growers' awareness levels to research gaps and the industry's capacity to respond to exotic pests. The framework considers those pests and diseases that have been determined to be High Priority Pests (HPPs) in the Banana Industry Biosecurity Plan (2010) as well as other pests and diseases that impact on the banana industry such as yellow Sigatoka.

The framework uses the different elements of the biosecurity continuum to make an assessment about how well positioned the Australian banana industry is to respond to an exotic pest outbreak (both exotic to Australia or regional production areas). The continuum elements include:

- Prevention of pest and disease movement into and within Australia;
- Preparedness - including:
    - Grower and general industry awareness;
    - Research including diagnostic tests;
    - Contingency planning.
- Surveillance;
- Response Actions including pest classification under the Emergency Pest Plant Response Deed; and
- Ongoing Management of the pest or disease.

The framework is the result of an assessment of existing, published information and conversations with growers and industry experts as well as general observations. Importantly the framework has a list of recommendations to guide further biosecurity work. There is also a "traffic light" summary that shows at a glance the current level of preparedness in response to each pest identified.

2. Banana Industry Water Quality Strategy 2017 – 2020

The *Banana Industry Water Quality Strategy* (Appendix 4) is focused on working with growers to help them improve their adoption of improved nutrient and sediment management practices. The Strategy contains targets and actions that commit the industry to improve the water quality of the GBR. This approach to sustainable farming is increasingly important to many Australians who make purchasing decisions based on a number of factors, including environmental impact.

The Strategy sets out the extension and related priorities for the industry for the three years from 2017-2020 with a clear focus on reducing the amount of nutrients and soil leaving farms. Implementation of the Strategy has commenced and shall be pursued and evaluated through the next Banana Strategic Industry Development project (BA 16008).

As part of the Water Quality Strategy's design and implementation, the ISM has worked very closely with the Department of Environment and Heritage Protection and the ABGC extension officers to provide strategic oversight of:

- a targeted delivery strategy BMP extension effort;
- the development of a smart phone app to provide growers with an electronic record keeping system;
- the delivery of two workshops on ways to improve the quality of water leaving banana farms;
- a communication strategy.

BA 13023 has also linked with funding from the Australian Government's Reef Trust III program to deliver growers access to:

- a grants program to assist with the purchase of water quality improvement related farming equipment;
- results of innovation trials to help forge new standards of farming systems; and
- on-farm extension services.

3. Technical outputs

A large component of this project has been the delivery of technical advice to governments that are considering changes to policy or the creation of new policy or funding programs. Below is a list of outputs that have been delivered by the ISM during this project. The biosecurity related outputs have been listed separately to the environmental outputs.

a) Biosecurity

- Provision of technical advice to the Queensland, NSW and Australian Governments about how the proposed biosecurity legislation would impact on the banana industry, extent of effectiveness, likelihood of grower compliance etc.
- Joint development and promotion of the Banana Industry Biosecurity Guideline to increase awareness of acceptable leaf spot levels, biosecurity zones, etc
- Provision of advice to the Biosecurity Capability Review Committee who requested a written and oral submission on the banana industry's experience of the Queensland biosecurity system.
- Provided input into the Queensland Biosecurity Strategy to highlight the banana industry's experience with TR4 (including a TR4 case study)
- Advice to Biosecurity Queensland that informed numerous TR4 planning and policy documents including:
    - the Biosecurity Manual (used to implement quarantine orders on the first infected properties),
    - Plant Biosecurity Compliance Strategy;
    - Standards and Guidelines – distributed to all banana growers in north Queensland,
    - Fact Sheets on Decontamination Guide, fencing, surveillance and tracing processes, legislative requirements and Frequently Asked Questions;
    - media releases, magazine stories etc
- Provision of technical advice to the Australian Government in response to the Review of the Biosecurity Import Risk Assessment Handbook (including the Import Risk Assessment Guidelines).
- Developed the banana industry's response to the National Torres Strait Exotic Fruit Fly Response;
- Contributed technical information to the Plant Health Australia Review of the Emergency Plant Pest Response Deed;
- Contributed technical information to the Plant Health Australia Review of the Banana Industry

Biosecurity Plan and Farm Biosecurity Manual;
- Prepared the banana industry's contribution to the Emergency Plant Pest Response Deed Biosecurity Statement (updated annually).

b) Environmental

The following dot points highlight some of the more strategic outputs delivered in the environmental arena as a result of BA 13023.

- Chemical workshop that identified the priorities requiring action. This information informed action at the AgVet Collaborative Forum (2017) as well as integrated pest management component of the Improved Plant Protection for the Banana Industry project (BA 16001).
- Provided technical advice to:
    - the Queensland Government's Consultation Regulatory Impact Statement – Broadening and enhancing reef protection regulations;
    - the Reef Water Quality Research, Development and Innovation Strategy;
    - the Great Barrier Reef Water Science Taskforce review of water quality
    - an Economic Assessment of Banana best management practices;
    - the design and implementation strategy of the Wet Tropics Major Integrated Project;
    - the formation of the first water quality report card for the Wet Tropics.
- Successful application for Reef Trust III funding that provided $1.4m over three years to the banana industry for extension services relating to water quality;
- Wrote a successful project proposal that gained funding from the Department of Environment and Heritage Protection to deliver BMP extension and develop a record keeping app for banana growers.

4. Improved relationships with stakeholders

One of the elements of success for this project has been the stakeholder relationships that have been formed. The ISM has worked hard to create relationships based on trust, honesty and transparency. This has made understanding the history and current complexity of issues much easier and has facilitated rapid progress in sensitive discussions.

a) Biosecurity related relationships and networks

- The ISM was a member of:
    a. the technical working group contributing to the Review of the Banana Industry Biosecurity Plan (BA 15001)
    b. the Biosecurity Legislation Reference Group – a forum of industry and government representatives to resolve complex points of legislation under review;
    c. the TR4 Standards and Guidelines working group;
    d. Member of the crisis communication group to support the linkages between growers, industry, wholesalers and retailers during the early weeks of the TR4 detection in north Queensland;
- The ISM initiated many discussions with the Queensland Chief Plant Biosecurity Officer as well as other senior departmental officers to advance critical issues such as the biosecurity regulations, TR4 response, Torres Strait Fruit Fly, Owner Reimbursement Costs for the Banana Freckle Response;
- The ISM fulfilled the role of the Brisbane-based Industry Liaison Officer during the first 9 months of the TR4 Emergency Response;

- The ISM actively participated in:
    a. five Plant Industry Forums (including regional forums) convened by PHA;
    b. three Biosecurity Import Risk Analysis workshops to provide information about the banana industry and how the revised process would impact on it.
    c. the Banana Freckle debrief exercise with other CCEPP and NMG members (Chief Plant Health Officers from all states and the Australian Chief Plant Biosecurity Officer).
    d. the CSIRO workshop "advancing collaborative knowledge systems for plant biosecurity surveillance" – that was designed to work through a hypothetical outbreak of TR4 in NQ – a month before it was detected.

b) Environmental related relationships and networks

Through a range of forums and activities, there is now a strong and reliable network to support the water quality endeavours of the banana industry. Key stakeholders include NRM specialists, commercial agronomic companies and extension officers, scientists and academics and government officers. This network has been formed and maintained by the ISM as a result of membership to the following important forums:

- Agricultural Stakeholder Advisory Group that provides advice on the industry impacts of regulation and other associated policy decisions;
- Wet Tropics Major Integrated Project Panel that has responsibility for the design and implementation of the $15 million project;
- Wet Tropics Healthy Waterways Partnership that has responsibility for the development of a regional approach to water quality management.
- Partnership Committee that has responsibility for implementing the Reef Water Quality Protection Plan.
- Reef Alliance Management Committee which is made up of industry, NRM groups and the conservation sector to provide unified advice on key water quality issues.
- Project Reference Committees for two projects funded by the Department of Environment and Heritage Protection:
    a. The Tools and Extension for Adoption of Banana Best Management Practice
    b. A Nutrient Budgeting Tool for the Banana Industry.

Additionally, the ISM has organised farm tours for key environmental policy makers so that they can better understand the industry and inform their decision making.

c) Knowledge sharing with growers

Over the last three years, the ISM has:

- attended 15 Cassowary Coast Banana Grower Association meetings to discuss developing issues
- visited approximately 20 banana farms to better understand farming practices and discuss specific issues such as nutrient and sediment control;
- attended industry workshops such as the NSW Banana Field Day (2016) and the TR4 Workshop (2015), Water Quality workshop (2 September2016);
- prepared background information for newspaper articles including:
    a. "Banana Health in Focus", The Land, 23 February 2016
    b. "Timely Tips for banana farming in the big wet", Innisfail Advocate, 11 November 2015
    "Partnership Project aims to protect reef", Innisfail Advocate 15 August 2015

    c. "Banana app management tool has wide appeal", Cairns Post, 3 September 2016
       "Banana Group aims for better water use", Rural Insight insert in the Cairns Post, 18 October 2017
- written Australian Banana Magazine articles – for example:
    a. "Biosecurity changes on way", Australian Bananas magazine, Spring 2015
    b. "Bananas on target to help reef", Australian Bananas magazine, Spring 2015
    c. "Growers add app-eal", Australian Bananas magazine, Spring 2015
    d. New Queensland Biosecurity laws, Winter 2016
    e. Workshop Brainstorms Water Quality Ideas, April 2017
    f. Strategic Industry Development Project, September, 2017
    g. Wet Tropics – Collaboration the Key to Improving Water, September 2017
- presented at two of the Banana Industry Roadshows (2016)
- attended 2015 Banana Congress and participated in the Environmental Best Management Practice booth at 2017 Banana Congress
- observer at the Banana Industry Technical Advisory Group meetings
- attended the banana industry export forum to meet more growers
- addressed grower leaders on the project via 12 ABGC Board meetings.

Linkages to other industry- funded projects:

a. NSW Banana Industry Development Officer (BA 13025)
b. Banana Industry Extension and R&D Management (BA 11027)
c. Integrated Management of Yellow Sigatoka and other Diseases (BA 15003)
d. Review of the Banana Industry Biosecurity Plan (15001)
e. National Banana Development and Extension Project (BA 13004)
f. National Banana Development and Extension Project (BA 16007)
g. Coordination of banana industry R&D (Panama TR4) (BA 14012)
h. Fusarium wilt of TR4 – Biosecurity and sustainable solutions (BA14013)
i. The Australian Banana Communications Program (BA 15005)
j. Communication Project for the banana industry (BA13003)
k. National Banana Bunchy Top Program Phase III (BA 15006, 15007)
l. Improved Plant Protection for the Banana Industry (BA 16001)

Linkages to government-funded projects

Given the growing community debate about water quality on the GBR, the Queensland and Australian Governments are investing in projects to improve farming practices in GBR catchments. The ISM has played a pivotal role in designing and securing funding for a number of projects as well as leading the banana industry's contribution to others. They include:

1. The Tools and Extension for Adoption of Banana Best Management Practice (Queensland Government funding)
2. Growing a Great Barrier Reef - Reef Trust III (Australian Government funding)
3. Wet Tropics Major Integrated Project (Queensland Government funding)
4. TR4 Biosecurity Extension Project (ABGC project using Queensland and Australian Government funding)
5. Economic Assessment of the Banana BMP (Queensland Government funding)

Outcomes

This project has successfully delivered on the outcomes that were outlined in the original project plan and then refined in the Program Logic Framework. It should be noted that for many of the outcomes listed below, the benefits will continue to be realised after the project has concluded – this is the nature of strategic projects such as BA 13023. For the industry to capture and utilise the benefits from such a legacy, it will be important for the industry to maintain and grow the various networks and relationships created by this project.

Below are the key outcomes of the project. The evidence of these outcomes is discussed in the Results section of this report.

- Banana growers are better able to engage in and respond to strategic biosecurity and environmental issues as a coordinated industry.
- The banana industry has a Water Quality Strategy that publicly commits the industry to improving water quality in the Great Barrier Reef. This will help to protect its social licence to farm in proximity to the reef which is important for the long term viability of the industry. The Strategy also helps to prioritse the future direction of the environmental projects for the industry.
- Banana growers now have access to government funding to deliver extension effort, financial incentives and innovation trials to support growers to improve their farming standards, comply with future regulations, minimise risk of non-compliance and remain profitable.
- Banana growers have an improved understanding of the industry, government and community expectations of their farming practices and how their practices impact on the water quality of the reef and know where to go for assistance.
- The Queensland and Australian Governments (and other non-grower stakeholders) are able to make more informed policy decisions as they understand the industry and its current pressures and long term priorities.
- The banana industry is better linked into local networks enhancing access to future environmental or biosecurity opportunities for the industry and promoting the excellent work being done by many growers. Constructive relationships between the ABGC and key stakeholders (including government departments and regulators) have been developed.
- The banana industry has a Biosecurity Framework that clearly identifies the gaps in the industry's biosecurity capacity and suggests priorities to be potentially addressed in future projects.
- The banana industry has been well represented in technical biosecurity and environmental discussions and was able to favourably influence the outcomes of many discussions.
- There is now a strong strategic linkage between a number of projects being delivered for the benefit of the banana growers. These projects extend beyond levy funded projects and include work funded or delivered by the Queensland Government, Australian Government, universities, NRM groups, Plant Health Australia etc. These are listed in Outputs section of this report.

Evaluation and Discussion

The Monitoring and Evaluation Plan prepared for this project included a Program Logic Framework as well as a series of key evaluation questions. The evaluation questions were split into three broad categories – to determine the project's impact, effectiveness and efficiency. These categories guide the evaluation and discussion in this report.

PROJECT IMPACT

The project's impact is measured by the positive and negative effect it has on the matters that are relevant to it. Specifically, four questions were asked in the Monitoring and Evaluation Plan:

1. What contribution has this project made to growers being better informed about the biosecurity and environmental developments impacting on them?
2. To what extent has this project helped non-grower stakeholders understand the key issues impacting on banana growers?
3. To what extent has this project helped non-grower stakeholders to maximize the benefits derived from their interaction with banana growers (and the industry more broadly)?
4. Have there been any unintended impacts of the project?

1. Growers better informed about biosecurity and environmental developments

This project has provided an accessible conduit between growers and policy makers resulting in effective and practical decision-making. Without it, the banana industry would not have provided input in strategic areas and may not have had choice but to passively "inherit" decisions. This project has provided growers with biosecurity and water quality information that has been tailored specifically for the banana industry. As a result, they better understand the content of a number of controversial policy areas and most importantly they are better informed about the risks and impacts this may have on them. They can choose to participate in activities to mitigate risks and potentially improve their profitability. With information and engagement comes knowledge and choice and this is important for growers who aim to be a part of this industry in the long term.

Evidence of the positive impact of this project on the banana industry is found in the independent evaluation report of BA 13023. For example:

- A banana grower of significant influence in the industry said the ISM was "very good at explaining complex issues especially those related to regulations and government in clear understandable language" that "enables the banana grower leadership group to make better decisions about the way forward".

- A Biosecurity Queensland (BQ) staff member commented, "She (the ISM) checked back with industry right through the (regulatory) process to make sure things were on the right track, so bringing industry along with the process." Reducing government regulation was potentially an emotive issue with banana growers.

- One of the banana grower leadership group commented that the ISM, "consulted heavily with the group (about biosecurity regulations). Without her, the leadership group wouldn't have got across it very well at all".

2&3. Non-grower stakeholders understand the key issues impacting on banana growers and maximise the benefits derived from their interactions.

This project provided non-grower stakeholders with a structured and focused "entry point" into the banana industry. Prior to having an ISM, stakeholders either didn't consult with the industry or made approaches to individual growers for information. It was a very ad hoc approach which frequently meant that the industry was not engaged in critical discussions about issues with big impacts – or missing out on opportunities that were available to other industries who were more organized in this respect. The ISM role has meant that governments and other key decision makers have had a reliable contact point for a very large industry and they have confidence in the information that is provided to them. As a result, the ISM has been invited to be a member or partner on many influential groups and committees which means that the banana industry can directly influence policy development from the ground up (see Outputs section of this report). There is the added benefit that the banana industry now has an extension network that can be easily accessed when the banana industry initiates activity in a particular area and requires advice or receives funding.

Evidence of the impact of this project are found in its independent evaluation report:

- All 17 non-grower stakeholders interviewed for the independent evaluation said how much they appreciated the ISM's insights into the workings, characteristics, perspectives and issues of the banana industry.

- BQ interviewees said the ISM provided very good constructive feedback on a wide range of issues related to TR4. She would highlight the advantages of certain BQ plans but also make suggestions on how their biosecurity plans could be better for industry if done in a different way.

- BQ staff, the CEO of Terrain and staff from Plant Health Australia have expressed how the ISM "looks for win-win outcomes" in her dealings with them, and also "looks for synergies and opportunities for people to collaborate. Helps people make connections".

- Government interviewees appreciated that the ISM, with a government background, understood where the government "was coming from", but also strongly represented industry needs and issues. This made the negotiation process smooth and professional, rather than combative and emotive. The government interviewees felt the ISM's approach to negotiation resulted in better outcomes for the banana industry.

4. Unexpected impacts on the project

During the project, the primary banana growing region of Australia was impacted by Panama disease TR4 in north Queensland. As described in other sections of this report, the ISM needed to respond and support the industry through an extended difficult time of uncertainty and worry. As a consequence, other priorities identified in the project were dropped.

The TR4 detection generated an enormous amount of education material for growers in a very short period of time. This meant that the need for BA 13023 to produce *pest and disease management*

protocols (as identified in the original project proposal) became redundant. Instead, the ISM, in consultation with the PRC, decided to take a more strategic approach to identifying the gaps in the collective industry knowledge of a number of high priority pests and diseases. The culmination of this work then became the Banana Industry Biosecurity Framework and for the first time, a document now presents an analysis of the available information, scientific capability etc of high priority pests and diseases against each part of the biosecurity spectrum.

While the TR4 detection has had a major impact on this project, on a positive note, the industry now has access to a large library of material to guide good on-farm biosecurity behaviour and investment. Additionally the ISM now has a thorough understanding of biosecurity and TR4 which is an excellent resource for the industry and is one of a small number of people who has been involved with the industry's response since the initial detection.

PROJECT EFFECTIVENESS

Measuring the effectiveness of this project meant assessing the project's ability to produce a specific desired effect or result that can be measured. The Monitoring and Evaluation Plan included the following two key questions to measure the project's effectiveness:

1. To what extent were the planned outputs successfully delivered?
    a. Biosecurity Strategy
    b. Water quality environmental strategy
    c. Technical and industry advice to stakeholders
    d. Improving relations between the banana industry and other stakeholder groups.
2. In what ways could the effectiveness of this project be improved?

The amended project included general and very specific outputs. In relation to the specific deliverables:

1(a) The ***Banana Industry Biosecurity Framework*** has been completed, provided to relevant stakeholders and is available on the ABGC website. A priority listing of future activities that will further prepare the industry for future incursions has been recommended. As this is a strategic document, it is more relevant to non-grower stakeholders than growers. Growers will reap the benefits from the Framework once the priority activities are completed.

1(b) The ***Banana Industry Water Quality Strategy 2017 – 2020*** has been completed, provided to stakeholders and is available on the ABGC website. It is one of the high profile projects rotating on the ABGC Home Page". Implementation of the actions and strategies has commenced and work will be ongoing to improve the industry's performance and participation.

1(c) ***Providing technical and industry advice to stakeholders***

The primary output of the project has been the provision of technical industry advice to stakeholders. As a result, there has been an increase in knowledge about the industry's farming systems, size, value etc. Through this knowledge, there is now a greater understanding of how decisions impact on banana growers. For example, some influential non-grower stakeholders incorrectly thought that the existing water quality regulations for the cane industry could be easily applied to the banana industry because they were both plant crops. These opinions were clearly formed from a lack of knowledge about the industry. The ISM has provided the mechanism for the banana industry to be represented in these discussions and provide facts and evidence to improve decision making. Prior to the ISM project, the industry was not consistently and effectively represented and consequently was the 'recipient' of poorly

informed decisions.

Evidence of the effectiveness of this project is found in the independent evaluation report:

- "Staff from the Queensland Government, Plant Health Australia, Queensland Farmers Federation (QFF), Terrain, Growcom, members of the Queensland Regional NRM Groups Collective and James Cook University have all expressed how effectively the ISM presented the industry's characteristics and perspective on a range of issues. Her advice about strategy development was also appreciated by these stakeholders. The ISM linked stakeholders to industry technical specialists where needed. The ISM offered Queensland's experiences negotiating new biosecurity regulations for the banana industry to the New South Wales government".

- A BQ officer working with the ISM on the TR4 response issues commented that the ISM has a "very good depth of knowledge about the banana industry" and "she provided a reality check about some of BQ's proposed activities for on-farm biosecurity".

- The QFF coordinator of the Reef Trust III project commented that the ISM provided a "very valuable" contribution bringing a "different skill set to the table". During meetings the ISM presented the banana industry's perspective very well, while searching for the best outcome.

1(d) ***Improving relationships between the banana industry and other stakeholder groups***

In addition to providing technical advice, it is important that relationships between stakeholders are fostered and maintained. Constructive and reliable relationships are a fundamental element to achieving deliverables, especially where difficult and intense negotiations are required. Excellent interpersonal skills combined with technical industry knowledge has ensured that the ISM has been invited to participate in an increasing number of forums and committees during the life of the project. The ISM has become a respected source of advice and has informed decision making and policy setting so that the impact on the banana industry is understood.

Evidence of the effectiveness of this project are found in its independent evaluation report:

- All non-industry stakeholders commented that the ISM had developed very good working relationships with their organisations. In particular, she brought a professional, balanced, analytical approach to organisational relationships. The ISM was "very good at building rapport with people in various organisations" according to one stakeholder. Her background in government and understanding of government workings was a key advantage to both the government and the banana industry when, for example, negotiating difficult regulatory issues.

- The ISM effectively navigated (the biosecurity) process such that banana growers still had a biosecurity outcome they could live with and felt they hadn't been walked away from by BQ. This was seen by BQ staff as a stepping stone away from regulation without BQ pulling out of regulation completely. The ISM was thus largely responsible for several biosecurity regulations (to protect banana growers) being retained in some form rather than being removed entirely which was BQ's initial position.

- The ISM's involvement greatly influenced BQ's approach toward a policy that accounted for industry priorities and finding an agreed way forward for benefit of both government and

industry. One BQ staff member commented that the ISM had the "important role of setting the industry's strategic direction under the new biosecurity legislation". According to BQ staff involved in the exercise, the ISM strongly presented the banana industry's perspective in a pragmatic and measured way, and worked towards "how can we get the best for both industry and government." "She thinks broadly and strategically, always looking for synergies and opportunities for people to collaborate".

- A DEHP officer commented that having the ISM's input on this advisory group "has been great". Having a background in government processes has meant she understands "where DEHP is coming from" and "makes DEHP's job in dealing with the banana industry that much easier and effective". The DEHP officer also commented that "she keeps DEHP staff honest in some respects as well". He also noted that the ISM "understands the banana industry very well and presents their perspective and issues effectively".

- According to Growcom's Chief Advocate the ISM has been very collaborative and outcome focused in her dealings with them. She has contributed greatly to building the relationship between the banana industry and Growcom.

2. Improving the effectiveness of the project

The independent review made some recommendations about the ways to improve the effectiveness of the project. Refer to the "Recommendations" section of this report for details.

PROJECT EFFICIENCY

'Project Efficiency' measures the relationship between the outputs from a project against the resources invested into delivering this project. There were two questions included in the Monitoring and Evaluation Plan that looked at evaluating the efficiency of the project. They were:

1. To what extent has this project achieved agreed outputs according to the contract?
2. If there have been variations what were the reasons?

1. Achievement of agreed outputs

This project has delivered all of the agreed outputs except for holding a second chemical workshop (see below):

- The ISM was appointed, the PRC was formed and met to discuss priorities for each annual work plan.

- Annual work plans were submitted. All Milestone Reports demonstrating progress towards annual work plans were completed, submitted and accepted by Horticulture Australia/Hort Innovation.

- Two significant bodies of work – the Biosecurity Framework and the Water Quality Strategy – were prepared and have been distributed to grower and non-grower stakeholders.

- An independent review of the project was completed and recommendations have been taken on board to improve future project development and functioning.

- A Monitoring and Evaluation Plan (including a Program Logic Framework, Risk Register and

Stakeholder Engagement Plan) was prepared mid-project as requested by Horticulture Australia. These documents were essential tools in the evaluation of the BA 13023 project.

- A chemical use workshop involving growers and scientific experts was held (Appendix 5).

Additionally many other outputs were also delivered and these are listed in the 'Outputs' section of this report.

In the original design of the project, it was anticipated that chemicals would be a source of concern in the industry's environmental management. However, over the life of the project, water quality has emerged as the most significant environmental issue confronting the banana industry. Consequently, only one chemical workshop was convened by the ABGC in mid-2016 and the information gathered at this workshop was used to inform the Integrated Pest Management component of the Improved Plant Protection for the banana industry project (BA 16001) and was also used by the Horticulture Innovation representative at the AgVet Collaborative Chemical forum. It was not deemed practical to convene another workshop in the life of the BA 13023 project as the issues and solutions would not have progressed adequately to warrant a second workshop.

2. If there have been any variations, what were the reasons?

There was a major variation agreed to on 11 September 2015. This variation reduced the scope of the project and allowed for a focus on strategic biosecurity and environmental issues. This variation occurred with the full support of the Project Reference Committee.

Conclusion

Based on the evidence gathered for the evaluation, it can be concluded that the project made a significant impact for the banana industry and positioned the industry well in negotiations and discussions on complex issues. When asked if these issues can be adequately progressed without the ISM role, both the CEO and ex-Chairman of the banana industry organisation said there is no capacity for anyone else in the industry to work on these issues and do it effectively if the ISM was not there. The CEO further said, "often strategic thinking and planning is an add-on to other people's main role so is done poorly or not at all. The ISM is a specialist strategic planning role, not a generalist role".

Recommendations

It is recommended that:

- The industry continue to have an active project examining the strategic industry development issues associated with biosecurity and the environment. The ISM role is a highly valuable added capacity for the banana industry and valued by both the industry and non-grower stakeholders – especially government stakeholders.
- The industry continue to have a strategic focus on biosecurity and environmental issues through a follow-on project. There is a significant body of work to be undertaken to implement the Banana Industry Water Quality Strategy 2017 – 2020 and the Banana Industry Biosecurity Framework. Spreading the focus for the ISM role too widely would make it more difficult to get good outcomes in any one focus.
- There should be an element of flexibility in allowing the role to respond to new and emerging priorities. It was critical (and a key success factor) that this occurred during the first detection of TR4 in north Queensland.
- The benefits of having an ISM with a strategic focus should be regularly communicated to the wider banana industry who may have little or no direct contact with the ISM due to the 'backroom' nature of the role.
- That the ISM take a deliberate approach to increasing the size of the existing grower networks on specific issues to build capacity within the industry by giving growers direct exposure to strategic, 'whole-of-industry' issues.
- The ISM should have a more regular involvement (informal and formal) with the Project Reference Committee for guidance and feedback on strategic issues impacting the banana industry.
- The ISM provides increased focus on supporting the sub-tropical banana industry in NSW as growers navigate a new Biosecurity Act and water quality issues as they emerge.

Scientific Refereed Publications

Not applicable to this project

Intellectual Property/Commercialisation

No commercial IP generated

References

Not applicable to this project

Acknowledgements

The ABGC credits the extraordinary success of this project to the work, capabilities and approach used by the ISM.

The ABGC would also like to thank Dr Jay Anderson for the excellent guidance and assistance given in the development of the Banana Industry Biosecurity Framework. Her technical knowledge of the industry combined with an extensive R&D network meant that Dr Anderson was able to help deliver a quality product that will inform future years of biosecurity R&D for the banana industry.

Appendices

Appendix 1 Monitoring and Evaluation Plan for BA 13023

Appendix 2 Independent Review of BA 13023

Appendix 3 Banana Industry Biosecurity Framework

Appendix 4 Banana Industry Water Quality Strategy 2017 - 2020

Appendix 5 Outcomes from the chemical workshop organised by ABGC

Project Information

PROJECT INFORMATION

Project Details	
Project code:	BA13023
Project title:	Banana Strategic Industry Development
Project type	Industry Development
Service Provider:	Australian Banana Growers' Council
Industry	Banana 100%
Government Priority	Productivity and Adding Value
Project Leader:	Mr Jim Pekin
Project Period:	1 May 2015 – 20 July 2017
Project Manager	Michelle McKinlay

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 achievements of BA13023.
- Enable communication and reporting on progress, performance, and achievements and the resulting impacts.
- Enable lessons learned from M&E to be identified and fed back into the project for improvement
- This M&E plan will be prepared by the project manager and identifies:
    - Evaluation questions necessary for assessing achievements
    - Requirements for monitoring progress and performance
    - Project risks and how they will be managed
    - Stakeholder engagement plan

It should be noted that the M&E plan has been added mid-way through the BA13023 project.

1.1 STAGES

The M&E Plan for BA13023 (Banana Strategic Industry Development) 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 or 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 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: 1 May 2014 – 20 July 2017

Purpose:

The Banana Strategic Industry Development project (the project) employs the Industry Strategy Manager (ISM) who has responsibility for delivering the strategic industry development for the banana industry. In the first instance this project will enable the ISM to undertake research and preparation of two key strategies that will guide the future growth of the banana industry. The second, and most critical component, is the practical extension of the content of these strategies to growers. It is through exposure to and adoption of new ideas that banana growers will be profitable, resilient and well positioned to respond to changes and challenges.

Background and Rationale

The Australian Banana Industry Strategic Investment plan 2014/15 – 2018/19 identified five areas that were critical to the future sustainability and integrity of the banana industry. Originally this project was designed to address aspects of each of the five areas. These areas were:

- Adoption of better pest and disease management practices;
- Promoting banana farming practices to safeguard the environment ;
- Introducing innovation in workplace health and safety practices;
- Availability of improved banana varieties;

- Ensuring a high standard of food safety in the industry is maintained.

However with the detection of TR4 in the north Queensland main production region and an increased government and public focus on the water quality of the Great Barrier Reef, it was agreed by the PRC to vary the original project plan to allow a focus on just two essential areas – biosecurity and the environment.

The project will coordinate and integrate a number of activities that have historically been treated in a short term, adhoc manner. This more strategic approach will deliver greater benefits to banana growers and provide better value for money to the funding and policy agencies seeking to implement change. This project will ensure that growers are better informed about impacts and consequences of the changing policy context and will be involved in designing and implementing a more holistic, strategic response that includes practice change. A critical element of this project is that, through the Industry Strategy Manager, it gives banana growers a mechanism to influence government policy development and project design to ensure that investment is directed into programs that are practical, relevant and that will deliver long term benefits for growers, the industry, the environment and the community.

The primary outputs of the Industry Strategy Manager fall into two broad categories – Industry Strategy Development and Practice Change. The primary outputs are:

i. A Biosecurity Strategy for the banana industry (Industry Strategy Development);
ii. An Environmental Strategy for the banana industry (Industry Strategy Development);
iii. Providing advice to stakeholders about biosecurity and environmental issues impacting on the banana industry (Practice Change);
iv. Improving relationships between stakeholder groups that are important to the banana industry (Practice Change).

Activities:

The main activities undertaken to deliver project outcomes are:

- Researching and preparing biosecurity and environmental strategies to support the banana industry to ensure it remains sustainable and profitable;
- Representing the banana industry in meetings and other stakeholder engagement mechanisms about issues relating to biosecurity and the environment (specifically water quality on the Great Barrier Reef). Stakeholders include HIA, Plant Health Australia, Australian and State government departments etc (a more comprehensive list can be found in the attached Stakeholder Engagement Plan);
- Communicating to growers about significant developments (and the impacts) in the biosecurity and environmental area through field days, workshops, growers meetings as well as preparing articles for industry newsletters, E-bulletins, Australian banana magazine;
- Building knowledge about the banana industry to better understand the impact and consequences of changing government biosecurity and environmental policy and to maximise the opportunities to attract additional projects that will benefit banana growers.

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

Part 1 - Program Logic

PROGRAM LOGIC DIAGRAM

The project logic for BA13023 is based on the information provided in the project scope.

This program logic was developed by the Industry Strategy Manager Project Leader. 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 the delivery of outputs.

PART 2 Monitoring and Evaluation Plan

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 this project has made to:
    - Supporting practice change through extension, relationships and linkages (including membership of project committees, alliances and reference groups);
    - Providing advice to banana growers and other stakeholders about key biosecurity and environmental issues.
- Did the project deliver what was intended? To what extent has 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 and other stakeholders (eg departmental representatives)
- 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?

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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 made to growers being better informed about the biosecurity and environmental developments impacting on them?	Milestone and end of project reports There will be an independent review of this project in its final year. The results of the review will be included in the end of project report. The review will include a survey of growers and non- grower stakeholders.	Extent of grower access to information about biosecurity and environmental initiatives Number of growers participating in biosecurity and environmental extension activities.	Number of news stories in local media Information published in banana industry related publications. Surveying growers at activities such as field days, grower meetings, small group extension activities, extension roadshows etc. Increased grower awareness of key biosecurity and environmental issues relevant to the banana industry identified through the independent review. Feedback provided by non-grower stakeholders

				through the independent review.
	To what extent has this project helped non-grower stakeholders understand the key issues impacting on banana growers?	There will be an independent review of this project in its final year. The results of the review will be included in the end of project report. The review will include a survey of growers and non- grower stakeholders.	Invitations for the ISM (or a banana industry representative) to provide advice to inform policy development and participate in forums, membership on committees and advisory groups.	Records of ISM participation in major activities relevant to this project. ISM has provided information to inform the development of legislation, policy outcomes and funding decisions for the benefit of banana growers.
	To what extent has this project helped non-grower stakeholders to maximise the benefits derived from their interaction with banana growers (and the industry more broadly)?	There will be an independent review of this project in its final year. The results of the review will be included in the end of project report. The review will include a survey of growers and non grower stakeholders.	Invitations for the ISM (or a banana industry representative) to provide advice to inform policy development and participate in forums, membership on committees and advisory groups.	Records of ISM participation in major activities relevant to this project. ISM has provided information to inform the development of legislation, policy outcomes and funding decisions for the benefit of banana growers.
	Have there any unexpected impacts of the project?	Stakeholder feedback and observations throughout the project recorded in milestone reports, end of project reviews and the independent review.	The types of unexpected impacts will be recorded throughout the life of the project and summarised for the final report	Methods such as observation and stakeholder feedback will be used to capture unanticipated impacts of this project and the way in which they were addressed.
Effectiveness	To what extent were the planned outputs successfully delivered? 1. Developing a Biosecurity	Milestone and end of project reports Independent review	Stakeholder awareness of the Biosecurity and Water Quality Strategies.	Progress in the four outputs (and the component parts) will be discussed and evaluated by the project reference group and stakeholders. This will be reported in milestone and end of project reports.

	Strategy; 2. Developing a water quality Environmental Strategy; 3. Providing technical and industry advice to stakeholders; 4. Improving relationships between the banana industry and other stakeholder groups.	of the project (final year). The review will include a survey of growers and non grower stakeholders.		NOTE: Some of the results of the strategies may not be apparent in the life of BA 13023 as delivery targets stretch beyond the life of this project.
	In what ways could the effectiveness of this project be improved?	There will be an independent review of this project in its final year. The results of the review will be included in the end of project report. The review will include a survey of growers and non grower stakeholders. Evidence of improvement measures.	Milestone reports (every 6 months) and Project Reference Committee meetings. Implementation of lessons learned as a result of monitoring and evaluation	Expected outputs will be measured against actual outputs by the independent reviewer. Methods such as observation and stakeholder feedback will be used to measure the effectiveness of this project and the way in which improvements could be implemented. Lessons learned discussed at management meetings and recorded in final report as recommendations.
Efficiency	To what extent has this project achieved agreed outputs according to the contract? If there have been variations what were the reasons?	End of project review including progress reports. Milestone reports	Comparing actual activity progress and outputs to planned progress and outputs. Information gathered for project meetings and reported twice yearly in milestone reports and the final report.	Project accounts and audited records of expenditure. Project Reference Committee records/minutes. Evidence of amended/varied contract.

PART 3: PROJECT RISK

To help anticipate and determine management strategies for the risk associated with the project, update and attach the risk plan here. Based on the risks and the controls or contingencies identified, you may need to update other sections of this MERI plan. Risks identified should be those that the project team consider 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*
The Biosecurity and Environmental strategies fail to link relevant projects and opportunity for synergy is lost.	*Unlikely*	*Moderate*	LOW	*Develop and maintain wide-reaching networks to ensure the ISM's knowledge of existing and proposed projects is accurate and up-to-date.* *Broadly promote the existence of the strategies and the role of the ISM to encourage proponents of new projects to make contact to discuss linkage opportunities.*	There is a significant amount of biosecurity and environmental work being undertaken by multiple stakeholders across Australia. This means it can be difficult to keep track of (and respond to) all developments. This could lead to gaps in the biosecurity and environmental strategies and potentially date each strategy.
The Biosecurity and Environmental strategies do not deliver to the banana industry a strategic direction that will guide investment or evaluate future project relevance.	*Unlikely*	*Major*	MEDIUM	*Align the strategies with the Strategic Investment Plan for the banana industry.* *Ensure the strategies recognise current and future policy direction of key stakeholders such as Australian and State Governments.* *Project Reference Committee members will guide each strategy.* *Ensure strategies recognise the priorities identified by the Strategic Industry Advisory Panel.*	Government policy direction can change very quickly and this can impact on the banana industry's priorities and responsibilities. Awareness of anticipated changes and an ability to determine the banana industry's response will help to minimise this risk and keep the strategies relevant.
Industry Strategy Manager (ISM) does not develop effective relationships with stakeholders and sup-optimal strategies result.	*Unlikely*	*Moderate*	LOW	*Attendance and participation in industry events such as Congress, field days, workshops, conferences , grower meetings etc* *ISM visits to a growing region are structured to deliver maximum contact with banana growers, industry extension officers and other stakeholders.* *Scheduling of regular meetings and telephone calls with stakeholders.* *The ISM has excellent "people skills" and easily mixes and communicates with people from a*	The large workload of the ISM position may reduce the opportunity to spend an appropriate amount of time in the growing regions, talking directly to growers and building relationships. Given the industry-wide focus of strategy development (and the type of day-to-day work that underpins it) many strategic stakeholders are based in Brisbane or Canberra and the ISM spends the vast majority of time working with these stakeholders in these locations. This can result in less frequent interactions with growers than desired.

				wide range of backgrounds.	Regular face-to-face engagement with banana growers in Coffs Harbour and Carnarvon districts is difficult due to the expense and time it takes to travel to these regions.
The banana industry is being proactive in developing the Environmental Strategy. However governments may pressure/enact penalties on the banana industry if it fails to deliver on the voluntary targets set in the strategy.	*Possible*	Moderate	MEDIUM	*Regularly engage with government and other stakeholders to moderate their expectations and reinforce that the strategy targets are aspirational.* *Regularly review the targets set in the strategy to monitor industry's progress towards achieving targets, and assess any requirements to change targets, strategies etc.*	

	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**

PART 4 Stakeholder Engagement Plan

AIM

The aim of the stakeholder engagement plan is to identify the stakeholders who have had a key role to play in the success of the BA13023 project (Strategic Industry Development). This includes those stakeholders who are contributors to the strategies and those that are beneficiaries of the strategies' outputs (ie the Biosecurity and Environmental Strategies). Having a defined list of stakeholders will act as a "check list" to ensure that the Industry Strategy Manager – ISM - (employed as part of BA13023 project) connects with and informs other major bodies of work being developed by stakeholders such as the Australian and state Governments. The stakeholder list will also reduce the risk of having content gaps in each strategy to maximize the success of the project.

Engagement Objectives

- To develop strategies in the dynamic policy fields of biosecurity and the environment – particularly water quality on the Great Barrier Reef.
- To ground-truth proposed strategies with growers to ensure they can be implemented; and
- To support practice change through a clearly articulated and "joined up" approach to the industry's strategic direction, extension effort and relationships.

Who	**1. Stakeholders**	• Australian and State Government departments; • Banana growers; • Local Banana Growers' Associations; • Plant Health Australia; • peak industry bodies (eg Growcom; National Gardening Industry Association; Queensland Farmers Federation) • Wet Tropics Healthy Waterway Partnership group; • Reef Alliance; • Horticulture Innovation Australia; • banana supply chain businesses; • ABGC colleagues; • NRM bodies; • consultants
How	**2. Level of Engagement**	• Australian and State Government departments: **High interest / High Influence** • Banana growers: **medium interest /High Influence** • Banana Growers' Associations: **medium interest / High Influence** • Plant Health Australia: **High interest / High Influence** • Peak industry bodies: **low interest / low Influence** • Healthy Waterway Partnership groups: **High interest / low Influence** • Reef Alliance: **High interest / medium Influence** • NRM bodies: **High interest / High Influence** • Banana supply chain businesses: **Low Interest / low influence** • Consultants: **medium interest / Low Influence** • Horticulture Innovation Australia: **medium interest /medium influence** • ABGC colleagues: **High interest / High influence**
	3. Proposed method of engagement	**Australian and State Government departments** Face to face meetings, membership of project reference groups, steering committees, teleconferences; focus groups, public comment, forums, Australian Bananas magazine; ABGC website; newsletters; E bulletins.

		Banana growers Face to face meetings, Fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops, Australian Bananas magazine; ABGC website; newsletters; E bulletins
		Local Banana Growers' Associations Face to face meetings, seminars, Fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops Australian Bananas magazine; ABGC website; newsletters; E bulletins
		Plant Health Australia Face to face meetings, seminars, Fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops Australian Bananas magazine; ABGC website; newsletters; E bulletins;
		Consultants Face to face meetings, seminars, Fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops Australian Bananas magazine; ABGC website; newsletters; E bulletins
		Peak industry bodies Face to face meetings, seminars, Fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops Australian Bananas magazine; ABGC website; newsletters; E bulletins
		NRM bodies Face to face meetings, seminars, Fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops Australian Bananas magazine; ABGC website; newsletters; E bulletins
		Healthy Waterway Partnership groups Face to face meetings, seminars, Fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops Australian Bananas magazine; ABGC website; newsletters; E bulletins
		Banana supply chain businesses Meetings, web sites, bulletins, newsletters, surveys, public meetings. Australian Bananas magazine; ABGC website; newsletters; E bulletins
		Horticulture Innovation Australia Meetings, project reporting, workshops, project steering committees Australian Bananas magazine; ABGC website; newsletters; E bulletins
		ABGC colleagues Collaborations; meetings and reporting requirements.
		Reef Alliance Face to face meetings, seminars, Fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops Australian Bananas magazine; ABGC website; newsletters; E bulletins
	4. Timing	**Australian and State Government departments** There are numerous interactions with representatives from government departments. Some of these are regular such as weekly sit rep meetings with Biosecurity Queensland about TR4; some meetings are quarterly such as project committee meetings for the development and roll out of BMP-related extension material and many interactions are as required and the issues will be ongoing.
		PHA There are at least 3 meetings of PHA members annually as well as ongoing contact by email, teleconference meetings and phone calls.
		Banana growers Meet with banana growers at least 4 times per year Have input into fact sheets, web sites, newsletters, bulletins, circulars, surveys, public meetings, workshops – ongoing Participation in Extension Roadshows held every 2 years.

		Local Banana Growers' Associations Attend meetings of growers associations 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.
		Wet Tropics Healthy Waterways Partnership Meetings, networking events, meetings, forum and workshops – as required -on going Attendance at 2 meetings per year (face to face or teleconference)
		Reef Alliance Reef Alliance members to meet at least quarterly. Meetings, networking events, meetings, forum and workshops – as required -on going
		Horticultural peak bodies; NRM Groups; consultants; supply chain businesses Liaise with other stakeholders 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 – ongoing.
		HIA Liaise with HIA officers through meetings, networking events, meetings, forum and workshops – as required -on going. Project Reference Committees meetings held and milestone reports submitted as required.
	5. Resources	In late 2015, the scope of the project was reduced due to the significant volume of work stemming from the Biosecurity and Environment Strategies. As a consequence, the project plan was varied by HIA. The project is now appropriately resourced to meet the stakeholder engagement plan.
	6. Responsibilities	• Responsibility for the implementation of the Stakeholder Engagement Plan rests with the Industry Strategy Manager, ABGC. • Extension project teams (non HIA funded) will mainly be responsible for the roll out of extension strategies. • The ISM will work closely with the ABGC Communications manager for the dissemination of information to industry and other stakeholders. • The ISM will work collaboratively with other banana-focused projects and the ABGC management team in stakeholder engagement activities. • It will be the responsibility of the ISM, together with the Project Leader, Jim Pekin to submit milestone and final reports to HIA.
	7. Key messages to communicate	• Strategies are an important tool to focus and coordinate the effort and available funding that is currently directed at the industry from numerous funding sources. • Strategies will set a foundation for the industry's future. • Strategies will identify current gaps in knowledge or tools, and help determine who can fill and fund the gaps. • Strategies will help attract future investment for the industry.
Other considerations	**8. Managing Risk**	See attachment 2 for the risk management plan

ATTACHMENT : PROGRAM LOGIC: BA 13023 BANANA STRATEGIC INDUSTRY DEVELOPMENT

Broader Banana Industry goals	Banana industry is a sustainable sector supported by profitable production	A valued and quality product is consistently delivered to consumers. Increased production and **profitability** of Australia's banana industry	Bananas maintain their lead position in the produce category

End-of-program outcomes

- *A sustainable banana industry that is better able to respond to issues arising in biosecurity and the environment.*
- *Growers are informed about the biosecurity and environmental developments impacting on them and the industry and know where to go for assistance.*
- *Stakeholders understand the key issues impacting on banana growers and how to engage with growers to ensure adoption of best practice for a sustainable industry.*

Intermediate outcomes

- *Existing biosecurity and environmental projects are evaluated and where consistent with the Strategic Investment Plan, are incorporated into the Biosecurity Strategy and Environmental Strategy as each is developed.*
- *Banana growers implement practice change to increase profitability and minimise risk*
- *Constructive relationships between the ABGC and key stakeholders (including government departments and regulators) are developed.*

Outputs

- *Biosecurity Strategy*
- *Environmental Strategy*
- *Advice to stakeholders*
- *Improved relationships*

Activities

- *Preparing strategy documents*
- *Providing technical advice to stakeholders to inform reports and papers,*
- *Meeting and liaising with growers, government departments, regulatory authorities and industry stakeholders.*
- *Extension of strategy outcomes through publications, at field days, Banana Grower Association meetings, road shows, congress, workshops, growers meetings or any other forum.*

Foundational activities

- *Industry strategy development,*
- *Support practice change through extension, relationships and linkages including membership of project committees, alliances, reference groups,*
- *Provide technical advice to banana industry and other stakeholders (eg government officers) about key biosecurity and environmental issues.*

Project Review

Project BA13023 (Banana Industry Strategy Manager)

Prepared by:

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February 2017

Introduction and background

The Banana Industry Strategy Manager (ISM) project was developed to coordinate and integrate a number of activities that have historically been treated in a short term, ad-hoc manner. This more strategic approach aims to deliver greater benefits to banana growers and provide better value for money to the funding and policy agencies seeking to implement change. The project aims to ensure that growers are better informed about impacts and consequences of the changing policy context and be involved in designing and implementing a more holistic, strategic planning approach that includes practice change. A critical element of this project is that, through the ISM, it will give banana growers a mechanism to influence government policy development and project design to ensure that investment is directed into programs that are practical, relevant and that will deliver long term benefits for growers, the industry, the environment and the community.

The Australian Banana Industry Strategic Investment plan 2014/15 – 2018/19 identified five areas that were critical to the future sustainability and integrity of the banana industry. Originally this project was designed to address aspects of each of the five areas. These areas were:

- Adoption of better pest and disease management practices;
- Promoting banana farming practices to safeguard the environment ;
- Introducing innovation in workplace health and safety practices;
- Availability of improved banana varieties;
- Ensuring a high standard of food safety in the industry is maintained.

However with the Banana Freckle disease response in the Northern Territory underway, and an outbreak of Panama diseaseTR4 (TR4) in the north Queensland production region, along with an increased government and public focus on the water quality of the Great Barrier Reef, it was agreed by the Project Reference Committee to vary the original project plan to allow a focus on two essential areas – biosecurity and the environment.

This review involved semi-structured interviews with the ISM and 19 stakeholders: six banana industry people (including two growers from the leadership group) six government stakeholders and seven non-government stakeholders. All have had direct dealings with the ISM related to her various roles.

Summary of outcomes

The Key Evaluation Questions addressing project IMPACT from Part 2 of BA13023's project M&E plan are:

- What contribution has this project made to growers being better informed about the biosecurity and environmental developments impacting on them?
- To what extent has this project helped non-grower stakeholders understand the key issues impacting on banana growers?
- To what extent has this project helped non-grower stakeholders to maximise the benefits derived from their interaction with banana growers (and the industry more broadly)?

Growers better informed about biosecurity and environmental developments

The ISM regularly fed information back to the banana industry grower leadership group about her dealings with the Queensland Government on changes to proposed biosecurity and environmental regulation. She provided regular updates on import risk assessment negotiations with the State and federal governments.

The ISM was a participant in response planning meetings with BQ during the Banana Freckle and TR4 outbreaks. She fed information back to the grower leadership and contributed to regular Banana Freckle and TR4 updates to the broader industry through industry meetings and media (ebulletin, newsletter, emails, banana industry magazine).

The ISM provided regular updates on progress of the BetterBunch App and Reef Trust 3 projects (both managed by the ISM) and other reef protection and environmental issues to the grower leadership group and to the broader industry through industry meetings and media.

The ISM is seen by stakeholders as a key conduit between them and the banana industry. And the ex-Chairman of the grower leadership group said the ISM was "very good at explaining complex issues especially those related to regulations and government in clear understandable language" that "enables the banana grower leadership group to make better decisions about the way forward".

Non-grower stakeholders understand the key issues impacting on banana growers

All non-grower stakeholders interviewed said how much they appreciated the ISM's insights into the workings, characteristics, perspectives and issues of the banana industry.

The ISM has presented the industry perspective in a professional way during negotiations with government about regulatory matters and during discussions about the Banana Freckle and TR4 outbreaks.

The ISM is a member of the Agricultural Stakeholder Advisory Group formed to advise Queensland Government Ministers how to better engage with industry related to reef regulation. In this role the ISM presents banana industry perspectives and issues.

In meetings with Plant Health Australia the ISM has contributed the Banana Industry's biosecurity experiences with, and response planning for the Banana Freckle and TR4 outbreaks.

The ISM has represented banana industry interests during collaborative discussions with Terrain and the Reef Alliance organisations when developing the new Reef Trust 3 project.

Helped non-grower stakeholders maximise the benefits derived from interactions with banana growers

The ISM is the main point of contact between the banana industry and a wide range of stakeholders. BQ staff, the CEO of Terrain and Plant Health Australia staff have expressed how the ISM "looks for win-win outcomes" in her dealings with them, and also "looks for synergies and opportunities for people to collaborate. Helps people make connections".

Government interviewees appreciated that the ISM, with a government background, understood where the government "was coming from", but also strongly represented industry needs and issues. This made the negotiation process smooth and professional, rather than combative and emotive which is often problematic with some other industries. The government interviewees felt the ISM's approach to negotiation resulted in better outcomes for the banana industry.

The Key Evaluation Questions addressing project EFFECTIVENESS from Part 2 of BA13023's project M&E plan are:

To what extent were the planned outputs successfully delivered?

- Developing a biosecurity strategy
- Developing a water quality environmental strategy
- Providing technical and industry advice to stakeholders
- Improving relationships between the banana industry and other stakeholder groups

Developing a biosecurity strategy

A draft Biosecurity Strategy for the banana industry has been developed by the ISM in consultation with R&D specialists. The draft strategy will be presented to the grower leadership group during their February 2017 meeting for comment and feedback.

Developing a water quality environmental strategy

The Environmental Water Quality Strategy was presented to the grower leadership group during their November 2016 meeting, and after consultation was accepted by them.

Providing technical and industry advice to stakeholders

Staff from the Queensland and Federal Governments, Plant Health Australia, Queensland Farmers Federation, Terrain, Growcom, members of the Queensland Regional NRM Groups Collective and James Cook University have all expressed how effectively the ISM presented the industry's characteristics and perspective on a range of issues. Her advice about strategy development was also appreciated by these stakeholders. The ISM linked stakeholders to industry technical specialists where needed. The ISM offered Queensland's experiences negotiating new biosecurity regulations for the banana industry to the New South Wales (NSW) government.

Improving relationships between the banana industry and other stakeholder groups

All non-industry stakeholders commented that the ISM had developed very good working relationships with their organisations. In particular she brought a professional, balanced, analytical approach to organisational relationships. The ISM was "very good at building rapport with people in various organisations" according to one stakeholder. Her background in government and understanding of government workings was a key advantage to both the government and the banana industry when, for example, negotiating difficult regulatory issues.

Unexpected impacts on the project

During the project period the banana industry was impacted by two exotic disease outbreaks; Banana Freckle in the Northern Territory and Panama disease TR4 in Far North Queensland. These required 'all hands on deck' to deal with the responses. The ISM was heavily involved in dealing with strategic and ad-hoc issues with both outbreaks.

The ISM largely took on responsibility and work related to environmental issues. Many of these were strategic but a few required rapid ad-hoc response such as dealing with negative and inflammatory media reports about banana farm impacts on water quality. The ISM was involved in dealing with these responses.

Work deliverables

The current negotiated focus of the Industry Strategy Manager falls into two categories – biosecurity and environment.

Biosecurity

TR4 response

TR4 response planning with BQ – pre-TR4 outbreak

Before the TR4 outbreak, the ISM had worked with BQ officers to develop up a response strategy in the event of a TR4 outbreak. According to interviewed BQ staff the ISM provided the industry's perspective and practical issues to resolve, and also had a good understanding of government workings (having come from a government background). BQ staff commented that having an industry contact person who understands government workings makes the communication process much more efficient and constructive.

TR4 Response planning with BQ – post-TR4 outbreak

The ISM represented the banana industry in regular planning meetings with BQ after the TR4 outbreak in March 2015 until the appointment of the new R&D Manager in October 2015. From July 2015 (departure of previous R&D Manager) to October 2015 The ISM was the main representative at these meetings. The ISM shared this role with the new R&D Manager following her appointment with a view to winding back the ISM's involvement. A BQ officer working with the ISM on TR4 response issues commented that the ISM has a "very good depth of knowledge about the banana industry" and "she provided a reality check about some of BQ's proposed activities for on-farm biosecurity".

The ISM also worked up plans with all stakeholders to meet and discuss TR4 issues between the banana and cane industries.

Policy development for quarantining non-contiguous properties.

The ISM was involved in meetings with BQ to develop a strategy for quarantining non-contiguous properties in the event of a T4 outbreak on these properties. Non-contiguous properties are properties with banana blocks separated by public roads or other land that involve movement of machinery and equipment between the blocks. It is a particularly difficult scenario for managing on-farm biosecurity.

The ISM contributed the banana grower's perspective and practical considerations to aid BQ developing a workable strategy.

Review BQ Standards and Guidelines

The ISM provided feedback on BQ's TR4 Standards and Guidelines document prepared for the banana industry.

Strategic development

Queensland biosecurity regulation review

From around mid-2015 to when the new Biosecurity Act was in place in July 2016, The ISM collaborated with, and took the lead on negotiations with, BQ staff to review the level of regulation in the banana industry under the proposed new Queensland biosecurity regulation.

The banana industry was historically heavily regulated. A lot of the issues with the new regulation were difficult for the industry because banana growers had relied on government regulation to ensure the whole industry was kept free of exotic pests and diseases.

The ISM effectively navigated this process such that banana growers still had a biosecurity outcome they could live with and felt they hadn't been walked away from by BQ.

The review involved determining what banana pests and diseases should continue to be regulated and what could be moved out of regulation, or 'softened' in the new regulation. For example some less critical issues were moved into a 'guideline'. The concept of developing 'guidelines' evolved during negotiations between BQ and the ISM and was strongly encouraged by the ISM. This was seen by BQ staff as a stepping stone away from regulation without BQ pulling out of regulation completely.

The ISM was thus largely responsible for several biosecurity regulations (to protect banana growers) being retained in some form rather than being removed entirely which was BQ's initial position.

Two examples of the outcomes of this negotiation were:

- A re-consideration of banana quarantine areas. BQ staff and the ISM took a risk-based approach, resulting in the number of quarantine areas being scaled back without increasing the risk of disease spread.
- Yellow Sigatoka – the industry was able to retain much of the original regulation in the Banana Biosecurity Guideline related to Yellow Sigatoka after much negotiation by the ISM (BQ wanted to remove all the regulation). This gave the Yellow Sigatoka officer employed by the industry regulatory backup to enforce preventative grower practices if needed.

The ISM's involvement greatly influenced BQ's approach toward a policy that accounted for industry priorities and finding an agreed way forward for benefit of both government and

industry. One BQ staff member commented that the ISM had the “important role of setting the industry’s strategic direction under the new biosecurity legislation”.

According to BQ staff involved in the exercise, the ISM strongly presented the banana industry’s perspective in a pragmatic and measured way, and worked towards “how can we get the best for both industry and government.”

Reducing government regulation was potentially an emotive issue with banana growers. The ISM would go back to industry people to ‘brief up’ on issues. A BQ staff member commented, “She checked back with industry right through the process to make sure things were on the right track, so bringing industry along with the process.”

Adding to the complexity of the negotiations, industry priorities were shifting at the same time due to the TR4 outbreak. According to BQ staff the ISM was able to effectively navigate through this uncertainty.

The ISM also sought technical input from industry specialists during the process as needed. BQ staff appreciated her professionalism in researching issues well and bringing “evidence rather than emotion to the table”.

One of the banana grower leadership group commented that the ISM, “consulted heavily with the group. Without her the leadership group wouldn’t have got across it very well at all”.

The outcome was a government policy position that was agreed by the industry and by the Minister. It was a framework that everyone in government and the industry was comfortable with and could understand the rationale for. The framework developed between BQ staff and the ISM became a future point of reference for both government and industry. It was seen by BQ staff as “a good strategic framework for any issues that arose.”

NSW government biosecurity regulation review

The NSW government has started a similar process to the Queensland government to review their biosecurity regulations. The ISM is a participant in consultation and has sent a couple of submissions to them on different topics. The ISM has offered the Queensland banana industry experiences and learnings to the NSW government process.

Biosecurity Queensland’s 5-year strategic plan

The ISM has provided input to BQ about development of their 5-year strategic plan.

Plant Health Australia (PHA) Emergency Plant Pest Response Deed

PHA is the custodian of the Emergency Plant Pest Response Deed (EPPRD). The EPPRD is in place to facilitate partnerships with all national stakeholder members (over 36 peak industry members and all state governments), so they all have a say in how pests important to them

are managed. The Deed parties meet twice a year. The Banana industry became a EPPRD member in 2005.

The ISM was asked to be part of the development team for input and debrief of Banana Freckle. The ISM has been an active participant in meetings and relevant regional forums and was "a more active participant than most" according to a PHA officer. "She puts forward lots of information and opinion which the PHA values". The ISM has contributed the Banana Industry's experiences with, and response planning for, the Banana Freckle and TR4 outbreaks.

The ISM is also an active participant on the Banana Freckle consultative committee for emergency preparedness, along with the Chief Executive Officer of the banana industry peak body.

Import risk assessments

The ISM has been involved in two import risk assessments:

- the Australian Department of Agriculture and Water Resources (DAWR) examination of the Import Risk Analysis (IRA) process (in 2014), and
- development of the Biosecurity Import Risk Analysis (BIRA) regulation under the *Biosecurity Act 2015* (in 2015/16).

Queensland Department of Agriculture and Fisheries (DAF) coordinated a series of meetings, workshops and discussions to seek stakeholder views and input. The DAF coordinator noted that the ISM was "a very keen and active participant, representing the views of the banana industry. Her thoughtful and considered approach to identifying (and suggesting solutions to) issues was appreciated by all participants from the federal and state governments and other plant industry representative bodies".

During development of the new BIRA regulation, the ISM strongly advocated for the development of an 'Issues Paper' for all BIRA, to ensure the import risk analysis process was more standardised and transparent for stakeholders. As a result, the DAWR made it mandatory that an issues paper be prepared for all BIRA. According to the DAF coordinator "this was an excellent outcome for all stakeholders in the BIRA process".

Torres Strait fruit fly response plan

The ISM represents the banana industry on the National Management Group for Exotic Fruit Flies in the Torres Strait. It is a relatively minor role for the ISM but important to be involved as the group comprises all Australian governments and affected plant industry parties. The banana industry shares costs in the response process.

The ISM was involved in early discussions and negotiations about more strategic matters of cost-sharing and relative levels of involvement of government and industry.

Environment

The CEO of the banana industry said, “If environmental issues are not managed strategically by the banana industry, the industry could lose the community’s ‘licence’ to grow bananas given the proximity of the North Queensland industry to the Great Barrier Reef”.

If the ISM role had not been in place, the TR4 outbreak would have dominated everyone’s time and environmental initiatives would have suffered. The ISM was able to progress initiatives such as the Reef Trust 3 project and negotiations with government on proposed new reef regulations through the chaotic times of the TR4 response.

Water quality environment strategy for the banana industry

This strategy paper was presented to the banana grower leadership group during their November 2016 meeting. It links closely with the Better Banana App project and the Reef Trust 3 project currently managed by the ISM on behalf of the banana industry.

Staff of the Queensland Department of Environment and Heritage Protection (DEHP) felt the development of the water quality environment strategy for the banana industry was very timely given early negotiations around implementing the Water Science Taskforce Report recommendations.

The BetterBunch App project

The deed of contribution between ABGC and DEHP for the project had been co-signed before the ISM’s appointment, but no action had been taken. The ISM took it on, linked DEHP staff with banana industry staff to form a team, and it progressed from there.

The project started in 2015. It is managed by the ISM with one extension officer conducting the project. It involves developing a recording tool (the BetterBunch App) that links closely with the banana industry’s Best Management Practice (BMP) guideline. This guideline lists good environmental practice (among other practices), with a focus on water quality. Growers are encouraged to assess their practices against the guideline and improve practices where gaps are identified. As part of getting access to the App, growers must have done and/or updated their BMP.

The ISM is a ‘guardian’ of the App. For example, she oversees confidentiality of information generated by the App and how that information is managed.

To date 19 banana growing businesses representing 31 farms and 2751 hectares have been trained in the use of BetterBunch.

Eleven growers have completed the Banana BMP for the first time to gain access to BetterBunch.

Reef Trust 3 project

The ISM was instrumental in bringing about a change in funding and operational arrangements from previous iterations of reef protection projects. Previously funding was managed by the local NRM Board (Terrain) and devolved to other peak industry bodies for managing the banana industry program. The ISM role was not in place during these previous projects.

The ISM was part of a 14-member consortium coordinated by Queensland Farmers Federation (QFF) that developed up the Reef Trust 3 proposal. The QFF coordinator commented that the ISM provided a "very valuable" contribution bringing a "different skill set to the table". During meetings the ISM presented the banana industry's perspective very well, while searching for the best outcome. She "was open to other industry perspectives and learnt from them".

She gained the confidence of the Reef Alliance that the banana industry (through the ISM) had the capacity and capability of managing funding and on-ground activities of the banana industry component of Reef Trust 3. The ISM took a lead in organising funding for the banana industry.

As a result the banana industry received $1.4 million from the Federal Government to manage the banana industry Reef Trust 3 project. Three extension staff were appointed to conduct on-ground project activities. It is still early days but this project (managed and conducted by the banana industry for the banana industry) is more likely to result in better outcomes for both industry and the Great Barrier Reef.

The CEO of Terrain commented that "The ISM's involvement was critical to the banana industry taking over ownership of Reef Trust 3." And "the planning for Reef Trust 3 was happening around the same time as the TR4 outbreak. The ISM was able to keep banana industry's involvement in this process through the TR4 crisis. It could have easily been derailed as all staff were dealing with TR4".

Staff employed to roll out this project have expressed strong support for the ISM. They appreciate that she deals with all the stakeholders at a government and regional management level, leaving them free to focus on on-ground activities. The project has high 'transaction' costs in reporting to multiple stakeholders. The ISM is responsible for overall project management, and project staff have commented that the ISM is rigorous in ensuring they meet project milestones and other deadlines.

New Major Integrated Project (MIP)

Terrain has involved the ISM in initial discussions about a new environmental project funded by the Queensland government. The CEO of Terrain explained that the ISM's involvement was critical in the early planning stages, citing her enthusiasm, understanding of the banana

industry and government processes, her strategic approach to problem-solving and looking for collaboration opportunities. She will be the conduit between the project leaders and the banana industry.

The Terrain CEO also mentioned the ISM was up-front and pragmatic about her limited capacity to be involved in the new project given her existing responsibilities and workload. This would need to be weighed against the benefits such involvement would provide to the banana industry.

The ISM is currently exploring options for forward progress.

Implementation of the Water Science Taskforce Report recommendations

The Queensland Government through DEHP are in the process of implementing 10 recommendations. Many of these will have direct impacts on the Banana industry in North Queensland. For example Recommendation 5 is to "Implement staged regulations to reduce water pollution throughout the Reef regions", raising the spectre of increased regulation of banana growers.

The banana industry was asked to be part of an Agricultural Stakeholder Advisory Group to provide strategic advice to the Minister about implementation of these recommendations. The ISM is the banana industry's representative on this advisory group.

A DEHP officer commented that having the ISM's input on this advisory group "has been great". Having a background in government processes has meant she understands "where DEHP is coming from" and "makes DEHP's job in dealing with the banana industry that much easier and effective". The DEHP officer also commented that "she keeps DEHP staff honest in some respects as well". He also noted that the ISM "understands the banana industry very well and presents their perspective and issues effectively". He said the ISM has set up meetings bringing banana industry and DEHP people together to discuss issues (outside the formal Advisory Group meetings).

The Advisory Group meets monthly and will continue through 2017.

Building organisational relationships

Relationships with government organisations

The ISM is seen as the 'go to' person by key BQ staff. She is their contact point with industry on a wide variety of issues. BQ must meet a government requirement to involve industry in decision making – not just a token involvement. The ISM, as a single point of contact with the banana industry, makes this job "so much more efficient for BQ" according to BQ staff.

BQ interviewees said the ISM provided very good constructive feedback on a wide range of issues related toTR4. She would highlight the advantages of certain BQ plans but also make

suggestions on how their biosecurity plans could be better for industry if done in a different way.

BQ interviewees all valued the ISM's contributions and opinions saying the role has been critical for giving the industry a strategic voice with government on current biosecurity initiatives. Some BQ staff further commented that the ISM is very professional and very easy to work with. "She thinks broadly and strategically, always looking for synergies and opportunities for people to collaborate".

A key DEHP staffer working with the banana industry said she had developed a great relationship mainly due to the ISM's professional approach and ease of communication. She said the ISM "has always sought further information from DEHP to make sure she has DEHP facts about reef regulations clear in her head before presenting to the industry". The ISM has "shown a keenness to work with DEHP on these water quality issues which is really good to see".

Relationships with non-government stakeholders

The Terrain CEO said "the ISM has built a strong rapport with Terrain and the other 13 members of the consortium formed to develop the Reef Trust 3 project". The ISM's smooth working relationship with Terrain made their "complex task of coordinating a large group of organisations that much easier" when developing the Reef Trust 3 project.

According to Growcom's Chief Advocate the ISM has been very collaborative and outcome focussed in her dealings with them. She has contributed greatly to building the relationship between the banana industry and Growcom which historically has not always been the best.

The ISM engaged positively with the Queensland Regional NRM Groups Collective Paddock to Reef program (according to the Paddock to Reef GBR Coordinator). This positive support was important for them getting the cooperation of banana growers and technical people in the industry. The ISM took a neutral (rather than a defensive) stance and facilitated goodwill between industry participants and Paddock to Reef program staff which was appreciated by them.

Future priorities for the ISM

Initially the project proposed the ISM focus on five issues which was later pared down to biosecurity and environment by the Project Reference Group.

Concerning the other three issues, food safety and OH&S are already well under control by most growers. On-farm food safety programs have been a requirement of retailers for many years and OH&S programs at varying levels are widely used by growers. Growcom is very active in the issue of employee relations for horticultural industries so there is little need for the banana industry to address this.

Banana variety development continues to be an important issue, but for a different reason to the initial reason this topic was included in the original proposal for the ISM role. Pre-TR4 outbreak, the focus was on developing different varieties to give a wider range of consumer options in bananas, and so expand the market. This was a marketing focus in which the ISM could possibly have had a facilitation role with retailers and banana marketers. Post-TR4 the priority is now on disease resistant varieties and falls squarely within the R&D Manager's role.

Strategic market development to mitigate a saturated domestic market is an issue that may need to be addressed in the future. Marketing issues are better addressed by HIA but the ISM could have a linking role between HIA and the banana industry.

However biosecurity and environmental issues are felt by most interviewees to be the highest priority for the next three years.

When asked if these issues can be adequately progressed without the ISM role, both the CEO and ex-Chairman of the banana industry organisation said there is no capacity for anyone else in the industry to work on these issues and do it effectively if the ISM not there. The CEO further said, "often strategic thinking and planning is an add-on to other people's main role so is done poorly or not at all. The ISM is a specialist strategic planning role, not a generalist role".

General comments about the ISM role from interviewees

From the ex-Chairman of the grower leadership group

"The ISM role is partly an intangible thing, but critically important to the industry. There may not be an immediate key deliverable out of doing the strategic stuff, but if the industry is not part of it then it could lead to future problems".

"The industry leadership group is careful to keep the ISM on biosecurity and environment issues and not get caught up with organisational administration."

From BQ staff:

The ISM is an "open constructive point of contact with industry".

If the ISM role wasn't there "the government would have had to make unilateral decisions that would be less acceptable to industry and a poorer outcome for government".

From Plant Health Australia staff:

The ISM is "a critical role". "During crises (for example, Banana Freckle and TR4 outbreaks) the banana industry CEO is fully caught up in dealings day-to-day. Having the ISM means she can take up the slack to continue dealing with other strategic issues. It's important to have that extra capacity on the ground".

From Terrain CEO

The ISM "should be able to bring all opportunities together into a cogent, understandable funding package for the growers. (Not a confusing disconnected mess of government funding)".

The ISM "gives me confidence that someone in the industry has a handle on key issues and is across them. On-the-ground growers don't have the time to do this."

The ISM "should be assessing industry priorities in collaboration with industry management, and package up programs for the industry so they work well on the ground."

"One of the ISM's strengths is to look at broader opportunities for the industry and be a catalyst for the industry taking advantage of them. The role needs to be free to pursue them and maximise these opportunities."

From Senior Extension Officer with DAF

"The banana industry needs a person to be on top of environmental issues and help the industry be pro-active to defend its right to continue farming in the region".

Personal characteristics mentioned by interviewees

The ISM is "well suited to the role as she understands how government thinks and is able to structure an argument to include those things that 'hold weight' and exclude those things that don't.

The ISM "knows how to prepare government submissions for the best outcome. She understands government-speak and how best to interact with government for a good industry outcome".

"Excellent in her performance".

"Gets out and interacts with growers regularly". The ISM is "respected by most growers and is easy to get along with".

"A good communicator. She targets her communication to the audience very well.

"An effective negotiator and collaborator with stakeholders".

"Dealing with some industries is often emotive resulting in poorer outcomes. The ISM dealt with facts and strategies to go forwards, not emotive".

"Positive, recognises and acknowledges people's input".

"Can see how to bring together diverse opportunities and activities. She melds activities and funding toward efficient use of resources.

"An influencer with the people and groups she works with. Totally about people. Has the ability to bring people along with her from all groups. Treats people with respect and values others".

"Applies analytical thinking to develop future approaches".

"Not afraid to gently pose a different point of view to probe and encourage full exploration of an issue".

"Says what she thinks, tactfully. Not scared to put issues on the table".

Recommendations

- Continue the position of Banana Industry Strategy Manager for the period July 2017 to July 2020 and review at the end of this time. The ISM role is a highly valuable added capacity for the banana industry (valued by both the industry and non-grower stakeholders – especially government stakeholders). The role provides a unique set of skills and capability in dealing with government and non-government stakeholders. The role has also brought funds into the industry to enable environmental activities. The new environmental Major Integrated Project will require ongoing planning input from the banana industry to ensure optimum benefit to the banana industry. The ISM is ideally suited to provide this.

- Maintain the current focus on biosecurity and environment. Biosecurity issues pose the greatest current risk to the industry in both likelihood and consequences. The banana industry's involvement in activities associated with water quality on the GBR will only continue. This may mean that in the future more resources will need to be directed into representing and informing banana growers about this issue. Spreading the focus for the ISM too widely would make it more difficult to get good outcomes in any one focus.

- The ISM role is largely a 'backroom' role. Much of the activity of the ISM is out of sight of most growers because she deals mainly with non-industry stakeholders and the grower leadership group. There may be benefit informing the wider banana industry (who have little or no direct contact with the ISM) of the ISM's role, why the industry has a strategy manager and outcomes and benefits of the role to the industry. In this context, there may also be benefit in the ISM taking a more structured approach to increasing the size of the existing formal grower networks on specific issues. This would also provide more opportunities for the ISM to observe and question growers about their current practices.

- The Project Reference Group and the Project Leader of the ISM project should be particularly vigilant that the ISM's activities remain focussed largely on strategic,

forward looking issues of significance to the banana industry. Current examples of these strategic issues are the proposed introduction of new environmental regulations related to the GBR by the Queensland government and strategic planning with the new environmental MIP project.

Acknowledgements

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- Mr D Phillips, banana grower and ex-Chairman, ABGC
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- Ms S Simpson, Extension Officer, ABGC
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Biosecurity Framework for the Australian banana industry

March 2017

This Biosecurity Framework has been produced by the Australian Banana Growers' Council as a part of the Banana Strategic Industry Development Project that is funded by HIA Ltd using the banana industry R&D levy and matched funds from the Australian Government.

Background

Bananas are a highly genetically homogenous crop which are propagated from vegetative material and around 94% of the industry is grown in close proximity in North Queensland. Therefore, exotic and endemic pests and diseases as well as those under active containment pose a threat to banana production.

Purpose of framework

The aim of this framework is to examine the current extent of biosecurity preparedness within the banana industry – from growers' awareness levels to research gaps and the ability to contain (and continue to farm with) exotic pests given Australian production systems. The framework considers those pests and diseases that have been determined to be High Priority Pests (HPPs) in the Banana Industry Biosecurity Plan (2010) as well as other pests and diseases that impact on the banana industry.

In preparing this report and to give structure to the information currently available, this report uses the different elements of the biosecurity continuum to make an assessment about how well positioned the Australian banana industry is if it had to respond to an exotic pest (both exotic to Australia or currently found outside of a current production area). The elements include:

- Prevention of pest and disease movement into and within Australia;
- Preparedness - including:
    - Grower and general industry awareness;
    - Research including diagnostic tests;
    - Contingency planning.
- Surveillance;
- Response Actions including pest classification under the Emergency Pest Plant Response Deed; and
- Ongoing Management of the pest or disease.

This framework is the result of an assessment of existing, published information. Importantly the framework has a list of recommendations to guide possible further work in the banana biosecurity area. There is also a "traffic light" summary the reflects the current level of preparedness in response to each pest identified. The colour system used does not rate the importance/impact of the actual pest on the banana industry.

The assessment of the available information and subsequent preparation of the Banana Industry Biosecurity Framework would not have been possible without the research contribution of Dr Jay Anderson, Plant Pathologist, Research and Development for Primary Industries Pty Ltd.

Table of contents

List of acronyms

ABGC – Australian Banana Growers Council

BBTV – Banana bunchy top virus

BPPP – Banana Plant Protection Program, HIA funded project 2011 – 2016.

BQ – Biosecurity Queensland

BWAP – Banana wilt associated phytoplasma

CCEPP – Consultative Committee on Emergency Plant Pests

DAF – Department of Agriculture and Fisheries (Queensland)

EFSA – European Food Safety Authority

EPPRD – Emergency Plant Pest Response Deed

HFS – Horticulture and Forestry Science (a group within DAF)

HIA – Horticulture Innovation Australia

HPP – high priority pest

NAQS – Northern Australia Quarantine Strategy

NDP – National Diagnostic Protocol. Links to NDPs: http://plantbiosecuritydiagnostics.net.au/resource-hub/priority-pest-diagnostic-resources/

PaDIL – Pest and Disease Image Library – online resource from the Australian Government's Department of Agriculture, in collaboration with Museum Victoria, Plant Health Australia, the Department of Agriculture and Food Western Australia and the Plant Biosecurity Cooperative Research Centre. http://www.padil.gov.au/

PEQ – post-entry quarantine

PHA – Plant Health Australia

QAAFI – Queensland Alliance for Agriculture and Food Innovation

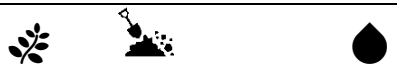
QBAN – Quality Banana Approved Nursery

SEQ – South East Queensland

SPHDS – Subcommittee on Plant Health Diagnostic Standards

Biosecurity Framework Summary Table

	Organism	Pathways[a]	Awareness	Research	Prevention of movement	Surveillance	Diagnostics	Contingency plans	Management	EPPRD
Exotic										
Abaca bunchy top virus										NC
Banana bract mosaic disease										√
Banana bunchy top virus (exotic strains)										√
Blood Disease										√
Moko										√
Bugtok										√
Bacterial wilt – *X. c.* pv. *musacearum*										NC

	Organism	Pathways[a]	Awareness	Research	Prevention of movement	Surveillance	Diagnostics	Contingency plans	Management	EPPRD
Freckle disease										√
Eumusae leaf spot										√
Black Sigatoka										√
Banana skipper butterfly										√
Spider mite										√
Banana Wilt Associated Phytoplasma										?
Exotic nematodes										?

	Organism	Pathways[a]	Awareness	Research	Prevention of movement	Surveillance	Diagnostics	Contingency plans	Management	EPPRD
Restricted range										
Panama disease Tropical race 4										X
Panama Race 1										X
BBTV (Australian strain)										X
Endemic										
Yellow Sigatoka and leaf spot diseases										X
Coffee bean weevil										X

Organism: - virus, - bacteria, - fungus, - butterfly, - mite, - phytoplasma, - nematode, - weevil. [a] Adapted from R. Sapuppo, J. Anderson "Risky Business" Roadshow presentation 2014 – planting material, – fruit, - soil, – moved by insects or insects able to move themselves, - tools, footwear and equipment, – water, – wind.

Colour indicates level of preparedness (rather than impact of pest) : Red - very little preparation, needs attention, Orange – moderate preparation, needs attention but not most urgent, Green - relatively well prepared, Light orange – unknown, needs further investigation

NC = not classified. √ = covered by the EPPRD. X = not covered by EPPRD. ?=not clear if covered by EPPRD.

List of priorities and gaps

The following recommendations are listed in order of priority.

- Continue to encourage growers to regularly look for anything unusual on their plants and get someone qualified to look at a symptom ASAP. There is potential to contain/eradicate pests and diseases if found early enough.

- Maintain existing systems and research capacity that are preventing the movement and establishment of exotic pests and diseases into Australia for example:

    - NAQS surveillance,
    - post entry quarantine facilities and conditions,
    - germplasm banks and
    - diagnostic, networking and high calibre technical knowledge capacity.

- Address potential for Banana Bunchy Top Virus (BBTV) spread from South East Queensland and Northern NSW to other growing regions by ensuring support for the BBTV containment program. There needs to be more information about this virus targeted at north Queensland growers. Clarification is required about the current EPPRD classification (pg 10).

- Maintain education program on Panama disease Tropical Race 4 and development, importation and testing of varieties with resistance to the disease. Update of PHA factsheet on the disease (pg16).

- Continue to develop management strategies for Panama disease (pg 16).

- Investigate a program for supply of black Sigatoka resistant varieties to replace susceptible varieties on Cape York in conjunction with a structured sentinel program to support for black Sigatoka detection. Support regular surveillance in the Cape (pg 22).

- Develop extension materials with information and high quality images on symptoms for growers to look for. Provide training for pest scouts on what to do if they find a suspect plant.

- Develop National Diagnostic Protocol (NDP) and Contingency plans for bacterial wilt diseases to enable a swift response if there was an incursion.

- Develop a north Queensland strategy to deal with feral bananas that could harbour potential incursions e.g. banana bunchy top virus

- Update of the industry biosecurity plan (IBP) and facts sheets.

- Categorise *Mycosphaerella eumusae* (cause of Eumusae leaf spot) under the EPPRD (pg 24)

- Understand more about the distribution of Eumusae leaf spot as well as other research on the disease. (pg 24)

- Address the lack of information on banana wilt associated phytoplasma (pg 19)

- Develop a diagnostic protocol and contingency plan for Banana Skipper Butterfly (pg 38)

- Review all draft NDPs and assess the resources required to finalise them.

- Develop management strategies for coffee bean weevil (pg 41)

- Any future surveillance projects, regardless of the pest or disease ,must include that inspectors also note and act on ANY unusual symptoms.

It is recommended that all of the priorities listed above are reviewed annually.

Specific Pest and Disease Information

Banana Bunchy Top Disease

Caused by *Banana Bunchy Top Virus*

Banana bunchy top virus (BBTV) is the most devastating banana virus disease world-wide. The virus is present in Southeast Asia and the South Pacific and is present in parts of India and Africa (refer to attached maps).

The disease causes a stunting and a choking of the banana plants and badly affected plants do not produce bunches. The disease is spread in infected planting material and by aphids (*Pentalonia nigronervosa*). There is no known resistance to the virus.

The virus has alternate hosts (*Canna*, *Heliconia*, *Strelitzia*) that are commonly found in backyards across Queensland.

The disease is under active containment in northern NSW and SEQ. There are however, concerns about the introduction of exotic strains into Australia as well as the introduction of the current strain(s) into north Queensland (NQ), NT and WA. The high density of plantings in north Queensland and the ubiquitous nature of the vector could make eradication difficult in north Queensland.

If the current virus was found outside of the existing regions, then it would be covered under the EPPRD.

Awareness and research

Grower awareness of the virus is high in northern NSW, moderate in SEQ and generally low amongst growers in NQ, NT and WA. Awareness in the gardening communities in SEQ and NNSW is currently relatively high due to work of BBTV project Phase I and II. There is a concern that without ongoing education, general public awareness will decrease. It is critical to maintain awareness of this pest to reduce the likelihood of the general public spreading the pest into the main Australian production area via the movement of contaminated planting material.

Due to the ongoing containment program in SEQ and northern NSW there are many resources on recognising and dealing with the disease. Material includes photos, popular articles, scientific literature and videos. There needs to be work done to determine whether these resources are up to date.

Research is currently being undertaken to understand latency of the virus in corms of banana plants as the disease has appeared in locations a long distance from other infected plants but in close proximity to where infected plants were removed over 12 months prior.

GAPS:

- NQ and WA growers lack knowledge about the disease and its symptoms.
- There needs to be continued effort to educate the general public about the risks of moving planting material outside of the B BTV zones (particularly in NSW and SEQ).

Prevention of movement

Into Australia

Prevention of movement into the country on planting material is covered under importation conditions. Banana is considered a high risk crop and therefore tissue culture plantlets are imported into post entry quarantine (PEQ) glasshouse under strict protocols.

Clean, well packed fruit is not a potential vector of the disease.

Within Australia

There are restrictions on the movement of planting material between States and also for some areas between biosecurity zones.

Encouragement of growers to use QBAN tissue culture plants to start new plantations.

GAPS:

- Biggest threat is the potential build-up of the disease in SEQ (and NSW if resources are lessened there) and then disease then spreading to other growing regions, potentially very easy for a member of the public to take infected suckers to NQ.
- Prior to Panama TR4 in NQ, lack of care by growers in sourcing planting material from neighbours in NQ, with the TR4 incursion growers now take much more care in sourcing plants.

Surveillance

Early infections have subtle symptoms and so can be difficult to identify.

Regular surveillance and eradication of BBTV infected plants is being undertake as part of the HIA funded projects “National banana bunchy top virus program – Phase 3 – QLD (BA15006) and National banana bunchy top virus program – Phase 3 – NSW (BA15007).

Due to the longevity of funded BBTV projects, there are trained inspectors who can identify early symptoms and have an awareness to look for symptoms of other diseases.

ABGC’s yellow Sigatoka inspector has had training on recognising the disease, however he has not had regular exposure to seeing infected material and so may have difficulty in identifying early infections.

GAPS:

- Growers need to be encouraged to closely monitor their plants and to know what actions to take if they notice something unusual.
- There is currently no succession planning for inspectors.

Diagnostics

Testing for BBTV is routinely performed by DAF/QAAFI however there is no National Diagnostic Protocol (NDP) (draft or ratified).

Expertise:

- Diagnostics: Dr John Thomas with Dr Kathy Crew.
- Visual identification: Barry Sullivan, Joshua Chapman David Peasley, Samantha Stringer (no longer working on BBTV but have extensive field experience).

GAPS:

- Fast assays, ratified NDP

Contingency/Covered under EPPRD

Incursion into NQ, NT and WA could be covered under EPPRD as the disease is under active control in northern NSW and SEQ. Work may be required on the classification of this disease.

A well-established plan for containment exists for this disease (Thomas, 2009). Research is currently being undertaken to understand the potential for the virus to remain latent in the eyes of corms and appear a number of years after the last detection of BBTV in a plantation. This has implications for declaring an area free of BBTV.

Management

Current management practice is to contain the disease and eradicate it from commercial plantations. Management relies on regular inspections and destroying infected plants. There is good information available on destruction methods of infected plants (standard operating procedures were updated in 2016) with more research being done to examine the efficacy of insecticides and herbicides at different times of year.

No resistant varieties.

GAPS:

- Major scientific gaps in knowledge about the disease have been or are being addressed.
- Increasing public awareness of how to report this disease is very important.

Resources

http://www.planthealthaustralia.com.au/wp-content/uploads/2013/03/Banana-bunchy-top-disease-FS.pdf

http://abgc.org.au/projects-resources/industry-projects/banana-bunchy-top-virus/

http://www.promusa.org/Bunchy+top

Thomas JE (2009) Strategies for the control of banana bunchy top virus – a review

Cook DC, Liu S, Edwards J, Villalta ON, Aurambout J-P, et al. (2012) Predicting the Benefits of Banana Bunchy Top Virus Exclusion from Commercial Plantations in Australia. PLoS ONE 7(8): e42391. doi:10.1371/journal.pone.0042391

Stringer S, Sullivan B and Peasley D. SOP for destruction of BBTV infected plants. ABGC.

Abaca Bunchy Top Disease

Caused by *Abaca bunchy top virus*

Abaca bunchy top virus (ABTV) affects abacas plants and has some similarities to b*anana bunchy top virus* as they are both Babuviruses. Abacá, (Musa textilis) is a species of banana native to the Philippines and is grown as a commercial crop in the Philippines, Ecuador, and Costa Rica. It has a great economic importance as it is harvested for its fibre that is pulped and

used in a variety of specialized paper products including tea bags, filter paper and banknotes. The fruit is inedible and is rarely seen as harvesting occurs before the plant produces fruit.

ABTV symptoms in abaca plants are similar to those caused by BBTV in banana plants.

For some time it was thought ABTV was caused by b*anana bunchy top virus* but abaca bunchy top virus was described for the first time in 2008 (Sharman et al, 2008).

Strains of the virus in Malaysia have been recorded from banana while banana plants in the Philippines have grown alongside infected abacá plants and remained free of the virus.

Awareness and research

Active research is being undertaken in the Philippines to understand more about the disease as well as other viruses of banana (Cruz et al, 2016).

GAPS:

- There is very little awareness of the disease in all banana growing states of Australia however awareness by growers of the related *Banana Bunchy Top Virus* is high in SEQ and northern NSW.
- There are large gaps in understanding the different strains of the virus, where it is present and potential resistance in abacá.
- There is no PHA factsheet for the virus.

Prevention of movement

Like BBTV, ABTV is spread by banana aphids (*Pentalonia nigronervosa*) and in infected planting material.

Into Australia

Prevention of movement into the country is covered under PEQ glasshouse. Similar potential for entry as for exotic strains *of BBTV.*

Within Australia

There are restrictions on the movement of planting material between states. Encouragement of growers to use QBAN tissue culture plants to start new plantations will decrease the possibility of moving infected planting material. ABTV is not currently listed in the *Biosecurity Act 2014* as being either prohibited or restricted matter.

GAPS:

- Grower awareness of this virus is not high however since Panama TR4 being detected in NQ, there is an increased awareness of the importance of using clean planting material.

Surveillance

There is no specific surveillance activities targeting this disease.

Diagnostics

There are specific PCR primers for ABTV. They have been tested against the small number of known isolates in existence (currently six).

Expertise: Dr John Thomas (QAAFI), Dr Murray Sharman (DAF) did the studies on ABTV in mid 2000s, Dr Kathy Crew (DAF).

GAPS:

No NDP for ABTV.

Contingency/Covered under EPPRD

An incursion into Australia would be covered under EPPRD but the disease has not been categorised.

GAPS:

There is no contingency plan but there is a well-established plan for containment and eradication of BBTV (Thomas, 2009) that could be used. There would be overlap in contingency plans between BBTV, ABTV and BBrMV, but they differ in:

- Mode of transmission (non-persistent vs persistent) and vector species (Pentalonia only vs a wide range of species)
- Host range differences – BBrMV has some known hosts (Alpinia, Elletaria) outside Musa. Alternative hosts for ABTV and BBTV are likely, but still a work in progress.

Management

Potentially similar as for BBTV. No resistant varieties.

GAPS:

- Very little is known for ABTV but in the absence of specific knowledge, the industry response would be similar to BBTV.

Resources

Sharman M, Thomas, J, Skabo S and Holton T (2008) Abaca´ bunchy top virus, a new member of the genus *Babuvirus* (family *Nanoviridae*). Archives of Virology 153: 135-147.

Cruz FCS, Belen GB and Alviar AN (2016) Serological and molecular detection of mixed bunchy top and mosaic virus infections in abaca (*Musa textilis* Nee) Philippine Agricultural Scientist 99(1): 88-98

Banana Bract Mosaic Disease

Caused by *Banana bract mosaic virus (Potyvirus)*

Banana Bract Mosaic Virus causes Banana Bract Mosaic Disease (also called Kokkan). It was first found in the Philippines in 1979. The disease can cause significant losses (up to 40%) and can infect banana and abacá. The most striking symptom are purple mosaic symptoms on male flower bracts and can cause distortion of bunches and underdeveloped fingers.

The disease is exotic to Australia. It is present in the Philippines, India and Sri Lanka.

Although belonging to a different group of viruses to BBTV, BBrMV is also spread by the banana aphid (*Pentalonia nigronervosa)*. Three other aphids widespread within Australia also vector the disease; corn aphid (*Rhopaloshiphum maidis*), cotton or melon aphid (*Aphis gossypii*) and cowpea aphid (*Aphis craccivora*). Unlike for BBTV, BBrMV is non-persistently transmitted meaning that aphids are no longer infective after moulting and the aphid is only able to spread the virus for a short period of time.

Awareness and research

There is a PHA Factsheet for the disease.

GAPS:

- There is very little specific awareness of the disease in Australia however the impact of virus diseases in general is high in SEQ and northern NSW (because of BBTV) but significantly less in NQ, WA and NT.

Prevention of movement

Into Australia

Prevention of movement into the country is covered under PEQ glasshouse. Similar potential for entry as for exotic strains of BBTV.

Within Australia

There are restrictions on the movement of planting material between states and between biosecurity zones within some states.

GAPS:

Grower awareness of this virus is not high however since Panama TR4 being detected in NQ, there is an increased awareness of the importance of using clean planting material. Encouragement of growers to use QBAN tissue culture plants to start new plantations.

Surveillance

The NAQS and BQ surveys are conducted regularly around Cape York and urban NQ. Staff looks for any unusual symptoms and teams are aware of the range of exotic pests and diseases.

The staff employed in the HIA funded projects for BBTV and yellow Sigatoka inspections take note of unusual symptoms and seek help if need be.

There is a large range of pest scouting services used by growers and inspection of plantations by growers. Some growers inspect plants very closely and others do many operations by calendar and may miss seeing the development of issues in the field.

GAPS:

Growers need to be encouraged to closely monitor plants but also know what actions to take if they notice something unusual.

Diagnostics

Expertise:

- Dr John Thomas (QAAFI),
- Dr Kathy Crew (DAF),
- Dr Andrew Geering (QAAFI).

GAPS:

- There is a draft NDP which has not yet been ratified.

Contingency/Covered under EPPRD

Incursion into Australia would be covered under EPPRD and the disease has been categorised as Category 3.

GAPS:

There is no contingency plan but there is a well-established plan for containment and eradication of BBTV. There would be overlap in contingency plans between BBTV, ABTV and BBrMV, but they differ in:

- Mode of transmission (non-persistent vs persistent) and vector species (Pentalonia only vs a wide range of species)
- The (unknown) potential for seed transmission of BBrMV only – only relevant to wild seeded bananas).
- Host range differences – BBrMV has some known hosts (Alpinia, Elletaria) outside Musa. Alternative hosts for ABTV and BBTV are likely, but still a work in progress.

Management

Management practices would be similar as for BBTV. There virus is aphid vectored but the virus only survives in the aphids for a short period of time.

GAPS:

- No resistant varieties

Resources

http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Banana-bract-mosaic-virus-FS.pdf

http://www.padil.gov.au/pests-and-diseases/pest/main/136660

Panama disease/ Fusarium wilt

Caused by the fungus *Fusarium oxysporum* f.sp. *cubense*

The disease is characterised by a yellowing of the older leaves and an eventual collapse to form a 'skirt'. When cut open there are brown streaks through the water conducting vessels of the pseudostem. Yields are severely impacted and eventually affected plants die. The symptoms are similar to those caused by Moko.

The disease is soil-borne and can remain infective in the soil for up to 40 years. In addition to transmission via soil the disease can be spread in infected bits and suckers, on farming equipment and via fungal spores in flood and irrigation water. It can take some time between the infection of the roots of a plant and symptoms to develop, meaning that the disease can be spread without people realising it is present.

There are a number of races of *F. o.* f.sp. *cubense* each with a different host range.

Race 1 affects Lady Finger, Sugar and Ducasse, but not Cavendish.

Race 2 affects 'Bluggoe' and other cooking bananas

Race 3 is not a pathogen of banana and affect *Heliconia*

Race 4 has the widest host range and is the most destructive. It affects all varieties that Race 1 and 2 affect as well as 'Cavendish' and others which are resistant to Race 1 and 2.

Race 4 is divided into Subtropical Race 4 which affects Cavendish in subtropical conditions and when the plant is subject to stress and Tropical Race 4 which does not require predisposing factors for infection to occur.

Race 1 is present in nearly all banana growing countries in the world. Tropical Race 4 has been present in South East Asia for some years, where it has had a significant impact, but more recently has been found in Mozambique, Jordan, Lebanon and Pakistan (http://panamadisease.org/en/map).

Tropical Race 4 was first found in Australia near Darwin in 1997 where it significantly impacted on local banana production. In March 2015 the disease was found for the first time in Queensland on a commercial farm near Tully.

Awareness and research

Since the incursion of Tropical Race 4 awareness of Panama disease has increased significantly both in growers and the general community particularly in NQ.

A large amount of extension and communications materials have been developed since the detection in NQ. Workshops to help growers develop and implement on-farm biosecurity plans were delivered.

NSW Biosecurity has produced a Panama Tropical Race 4 alert and also undertook well promoted surveillance in April 2015 in northern NSW.

There is a PHA factsheet that requires updating.

Panama research has been ongoing for many years in Australia (the world's first record of Panama disease was Race 1 – found at Eagle Farm, Brisbane in 1876). Research efforts increased in the late 1990s early 2000s due to the incursion of Tropical Race 4 in the NT. Research was also part of the CRC for Tropical Plant Pathology and the follow-up CRC for Tropical Plant Protection. In recent years ongoing efforts have been made as part of the Banana Plant Protection Program (2011 – 2016). With the detection in NQ there has been an increase of funding from the Federal Government for research into the disease.

GAPS:

- Adherence to good biosecurity practices will need to be promoted as the initial activity surrounding the detection in Tully reduces.
- There is a gap in the epidemiology knowledge of the disease. Many studies were started prior to 1960 when Race 1 was affecting 'Gros Michel' production but were stopped when the Race 1 resistant 'Cavendish' was found. In order to prolong the life of any tolerant/resistant varieties found basic questions on epidemiology (study of the disease in plant populations) need to be addressed.

Prevention

Into Australia

Planting material being bought into the country must go through PEQ as part of the import conditions.

F. o. f. sp. *cubense* is not moved in banana fruit.

Within Australia

There are state and territory restrictions on movement of planting material, soil and farm implements, there are also restrictions on movement between biosecurity zones.

In NQ growers have been assisted with the development of on-farm biosecurity plans to prevent movement onto their farms. The workshops focused on making sure potentially infected material is not moved from one farm to another.

Prior to the Tropical Race 4 incursion in NQ, Banana Bunchy Top teams undertook measures to ensure they did not spread Race 1 or Subtropical Race 4 in SEQ and northern NSW. The Yellow Sigatoka Liaison Officer undertakes measures to lessen the potential spread of soil borne diseases as part of his routine inspection work.

Surveillance

BQ has an extensive surveillance program in place in the NQ production region that has targeted commercial plantings. BQ teams also respond to public enquiries about residential plants or feral bananas.

Panama disease is a high priority for NAQS surveillance.

The Yellow Sigatoka Officer and BBTV inspectors have been trained to look for TR4 symptoms.

NSW DPI undertook surveillance for banana freckle and Tropical Race 4 in April 2015.

GAPS:

- There will be a change to the BQ surveillance strategy which will mean they employ a more targeted, risk based approach to inspections. This may create gaps.

Diagnostics

There is a diagnostic method using 'Vegetative Compatibility Groups' (VCG) of growing various races of *F. oxysproum* f.sp. *cubense* with 'tester' isolates. This test takes a number of weeks but produces reliable results for all known races of Panama disease.

There is a reliable molecular diagnostic protocol available.

Expertise:

- Wayne O'Neill (DAF - VCG testing, culturing of the fungus, routine use of molecular diagnostics)
- Dr Juliane Henderson (QAAFI – development of molecular tests).
- Dr Julie Pattemore. (DAF)
- Lynton Vawdry (DAF).

GAPS:

- A SHPDS ratified diagnostic assay

Contingency/Covered under EPPRD

Tropical Race 4 was categorised as a Category 2 pest, but as the pathogen itself cannot be demonstrated to be practically eradicated it was not deemed to be covered under the EPPRD.

There was no contingency plan for the Tropical Race 4 at the time of detection. Planning for containment of the Tully incursion soon after the incursion was led by BQ with input from other parts of DAF, ABGC, QAAFI and banana growers.

GAPS:

- Contingency plan if there is an incursion of Tropical Race 4 in an area outside NQ or NT.

Management

Race 1

- Many 'Lady Finger' (and other Race 1 susceptible varieties) growers have had strict quarantine procedures in place on their properties to prevent the introduction of the disease.
- Management of Race 1 on infected properties has been left up to individual growers.
- Growers would try to prevent the movement of the fungus by undertaking operations to reduce spread of the disease to unaffected areas on the farm.
- In affected plantations in SEQ and northern NSW, plants are grown on steep slopes and operations are undertaken manually so there has slow spread of the disease. When the spread of Race 1 makes in uneconomical to farm, growers switch to 'Cavendish' or change crops all together.

Tropical Race 4

The current focus is containment of the disease and assisting growers in developing their on-farm biosecurity plans including prevention of movement of soil and planting material off their own farms.

GAPS:

- Agronomically suitable and consumer acceptable Tropical Race 4 varieties.
- There is potential to learn from 'Lady Finger' growers who have been living with Race 1 for many years, although it should be noted that Tropical Race 4 is thought to be more aggressive on susceptible cultivars.

Resources

PHA fact sheet: http://www.planthealthaustralia.com.au/wp-content/uploads/2013/03/Panama-disease-FS.pdf

Biosecurity Queensland Tropical Race 4 Grower Kit: https://publications.qld.gov.au/dataset/panama-disease-tropical-race-4-grower-kit

ABGC Panama disease information: http://abgc.org.au/panama-tr4/

NSW Department of Primary Industries alert: http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/516764/Exotic-Pest-Alert-Panama-disease-Tropical-Race-4.pdf

Wilt disease of bananas

Symptoms of wilted banana plants with vascular tissues with discontinuous streaks of brown were first being noted in cooking bananas growing near dead or dying coconut trees in Papua New Guinea. The coconut trees were infected with a phytoplasma that is associated

with 'Bogia Coconut Syndrome' (Davis, 2009). A phytoplasma was later found in the bananas using a PCR assay and subsequent targeted surveys undertaken in PNG in 2009 and 2010 (Davis et al, 2012) consistently found a particular phytoplasma associated with wilted bananas. Further studies (Davis et al, 2015) have found a group of closely related phytoplasmas from bananas which have similarities with phytoplasmas from wilted coconut plants.

It should be noted that Koch's Postulates (whereby a potential causal organism is conclusively proven to be the cause of a disease) has not been undertaken for this disease yet but phytoplasmas are consistently associated with the symptoms.

Phytoplasmas are like a small bacteria except they have a single membrane instead of cell wall and are unable to survive outside of a suitable host, either a plant or an insect vector. Thus they are unable to be grown up in pure culture which makes demonstrating Koch's postulates more difficult. Due to not being able to survive outside a host, phytoplasmas can only be spread via vegetative planting material or insect vectors such as leafhoppers and not via tools such as cane knives.

Phytoplasmas affecting banana have been recorded in PNG and the Solomon Islands, they are not known to occur in Australia.

The impact of the disease has not been described. The disease is thought to be spread via infected planting material and by vectors. Suggested vectors are leafhoppers.

Awareness and research

It is unlikely many growers or consultants would be aware of the disease as it has only just been recently described, and is not recorded in Australia.

NAQS staff were among the first to identify the disease in surveys and link it with a potential phytoplasma.

GAPS:

It is not known nor an estimate made on what kind of impact this disease could have in Australia.

Very little research has been conducted thus far; Koch's postulates has not been undertaken, it is not known what vectors the disease nor an extensive survey been undertaken to establish geographic spread.

The phytoplasmas from coconut wilt affected plants and wilt affected plants are very similar and more work needs to be done to examine the link between the two and potential vectors.

Prevention

Into Australia

The disease is currently exotic to Australia and prevention of movement into the country with planting material is covered under import conditions requiring holding of plants in PEQ glasshouse with testing.

GAPS:

- Knowledge on the presence of the disease in the Pacific and on vectors of the disease and their potential movement.

Surveillance

NAQS undertake regular surveillance in northern Australia and also in neighbouring countries when invited. BWAP is not specifically listed in the NAQS target list however coconut wilt is listed. NAQS staff do look for any unusual symptoms on bananas as part of their regular surveillance.

GAPS:

NAQS are well aware of this disease but there is a gap in grower and consultant knowledge about the disease and symptoms in Australian production areas.

Diagnostics

There is a 'general' assay for phytoplasmas which is undertaken on plants in PEQ glasshouse testing.

The development of a specific assay was commenced as part of the Banana Plant Protection Program and will be continued in the new HIA project (BA16005).

Expertise:

- Dr Richard Davis (NAQS – visual symptoms)
- Dr Juliane Henderson (molecular assay).
- Professor Geoff Gurr (insect vectors)

GAPS:

- A SHPDS ratified diagnostic assay
- Once potential vectors are identified, some experts would need training in identification of the vectors.

Contingency/Covered under EPPRD

The disease is not currently listed in the Banana Industry Biosecurity Plan (BIBP) as the disease was not known at the time of writing of the plan. The BIBP is currently being reviewed. Although the disease is not known to occur in Australia, surveillance is undertaken for unusual symptoms on bananas and it has not been found in Australia.

There is no contingency plan for the disease.

GAPS:

- The disease has not been categorised.
- The disease is not listed in BIBP
- There is no contingency plan and it will be difficult to develop one without more basic research on the disease being undertaken.

Management

As very little is known about this disease at present it is hard to devise management plans.

It is not known if there are varieties which are resistant to the disease or to the potential vectors.

GAPS:

- So little is known about the disease that a management strategy would need to be based on strategies used for similar diseases such as BBTV.

Resources

Davis, 2009 http://www.musarama.org/en/image/phytoplasma-associated-wilt-symptoms-157.html

Davis RI, Kokoa P, Jones LM, Mackie J, Constable FE, Rodoni BC, Gunua TG, Rossel JB (2012) A new wilt disease of banana plants associated with phytoplasma in Papua New Guinea (PNG). Australasian Plant Disease Notes 7: 91-97.

Davis RI, Henderson J, Jones LM, McTaggart AM, O'Dwyer C, Tsatsia F, Fanai C and Rossel JB (2014) First record of a wilt disease of banana plants associated with phytoplasmas in Solomon Islands. Australasian Plant Disease Notes 10: 14

Black Sigatoka

Caused by *Mycosphaerella fijiensis*

Black Sigatoka (also called black leaf streak, BLS) is one of the most devastating banana diseases in the world. It is present in the Pacific, Asia, Africa, Latin America and the Caribbean. The disease is present on Norfolk Island and in the Torres Strait. There have been incursions onto the Australian mainland multiple times, each time with the pathogen being eradicated with the most recent incursion being into NQ growing region in 2001.

The casual organism may also be called *Pseudocercospora fijiensis* or *Paracercospora fijiensis* but most of the literature refers to *Mycosphaerella fijiensis*. While the fungus is related to the one which causes yellow Sigatoka (*Mycosphaerella musicola*) which is already present in Australia, the lifecycle of the *M. fijiensis* is much shorter than *M. musicola* (meaning the fungus can cause greater damage in a shorter period) and *M. fijiensis* is able to infect a wider range of hosts.

The disease appears as small brown/ reds flecks on the undersides of leaves expanding to black lesions and finally grey necrotic sunken patches. In severe infections leaves die and yields are reduced and uneven ripening of bunches occurs. Yield losses of up to 50% can occur. Control is through regular de-leafing and an intensive fungicide program (over 36 sprays a year). The fungus develops fungicide resistance very quickly under these conditions.

Awareness and research

Awareness of black Sigatoka is high in the industry due to the successful effort to eradicate the disease from North Queensland after the 2001 incursion of the disease.

There are many images available of the disease however symptoms are not diagnostic.

There is a lot of international research is being done on the disease and Australian researchers have links into these programs.

Prevention

Into Australia and within Australia

The disease is currently exotic to mainland Australia and prevention of movement into the country with planting material is covered under import conditions requiring holding of plants in PEQ glasshouse.

The disease is present in the Torres Strait (providing a potential pathway to mainland Australia) and NAQS and BQ regularly survey the area. In previous years black Sigatoka resistant varieties were provided to the communities on Cape York Peninsula and surrounds to prevent the planting of susceptible varieties which could provide a pathway for the disease from the Torres Strait.

Fruit is a potential pathway. The Philippines have requested to export fresh fruit to Australia. Conditions imposed by the Australian Government mean that fruit must be from an area of low pest prevalence. As yet no Filipino (or other nations) company has attempted to demonstrate they would meet the import conditions of Australia.

There is a potential for spores to blow into northern mainland Australia from PNG or the Torres Strait, hence the need for ongoing surveillance.

GAPS:

- Evidence based quarantine measures to prevent the potential movement of the disease into Australia must be continued.

Surveillance

The disease is present in the Torres Strait and NAQS and BQ regularly survey the area. BQ also conduct regular urban surveillance in NQ for banana diseases including black Sigatoka.

In 2014 BQ did a review of their surveillance program.

Samples are provided by the Yellow Sigatoka Liaison Officer to the DAF plant pathologists at Mareeba who test isolates collected from leaf spots in the production areas.

GAPS:

- There will need to be continued support for surveillance in NQ and the NT.

Diagnostics

Expertise:

- Kathy Grice (DAF),
- Dr Juliane Henderson (QAAFI) and
- Lynton Vawdry (DAF).

Both Kathy Grice and Juliane Henderson have seen the disease in the field overseas and worked with the molecular diagnostic. Dr Richard Davis has field experience with the disease.

There is a draft NDP.

GAPS:

- A SHPDS ratified diagnostic assay

Contingency/Covered under EPPRD

There is an eradication plan from the successful 2001 incursion which could be used as a basis for any further incursions. In addition there are many similarities between *M. fijiensis* and *Phyllosticta cavendishii* which is currently subject to an eradication program in the NT.

As black Sigatoka is under active containment in Australia (Norfolk Island and Torres Strait) it is covered under the EPPRD if an incursion was to occur on the mainland,

It is a Category 2 pest.

GAPS:

- No obvious gaps.

Management

There are management strategies for yellow Sigatoka and these could be used for black Sigatoka but with much shorter intervals for spraying and more severe de-leafing programs

GAPS:

- Breeding of commercially acceptable resistant cultivars. If the disease was to establish in Australia there may not currently be consumer acceptance of resistant/tolerant cultivars.
- Access to effective fungicides which *M. fijiensis* does not have the potential to develop resistance.

Resources

http://pbt.padil.gov.au/index.php?q=node/6&pbtID=166

http://www.apsnet.org/publications/apsnetfeatures/Pages/blacksigatoka.aspx

http://www.apsnet.org/edcenter/intropp/lessons/fungi/ascomycetes/Pages/BlackSigatoka.aspx

http://www.agriculture.gov.au/biosecurity/australia/nags/nags-target-lists/black-sigatoka

Eumusae leaf spot

Caused by *Mycosphaerella eumusae*

Eumusae leaf spot was first described in 2000 and hence there is still relatively little information on it.

The fungus is able to infect leaves and fruit (Thangavelu et al. 2007).

The fungus is closely related to the fungi which cause black and yellow Sigatoka and is thought to behave in a similar manner. *M. eumusae* is able to cause disease on the dessert bananas that are resistant to black and yellow Sigatoka.

The fungus is present in southern India, Sri Lanka, Thailand, Malaysia, Vietnam, Mauritius, and Nigeria. It is expected to be found in other areas when surveys are completed in locations where previous surveys could not attribute similar leaf symptoms to *M. fijiensis* or *M. musicola*. The fungus is exotic to Australia.

Awareness and research

There is very little grower awareness of this disease.

There is a PHA fact sheet for the disease as well as a PaDIL page (see resources below).

Prevention

Into Australia

The disease is currently exotic to Australia and prevention of movement into the country with planting material is covered under import conditions requiring holding of plants in PEQ glasshouse with testing.

Fruit is a potential pathway but fresh fruit imports from affected countries into Australia are not occurring.

There is a potential for spores to blow into northern mainland Australia from PNG or Indonesia if the disease were to establish in these countries. The need for ongoing surveillance by NAQS is critical.

GAPS**:**

- Evidence based quarantine measures to prevent the potential movement of the disease will be critical.

Surveillance

NAQS and BQ regularly survey northern Australia.

As part of the Banana Plant Protection Program, DAF tested isolates collected from leaf spots in the production areas. The Yellow Sigatoka Liaison Officer is able to supply samples.

GAPS:

- Continued support for surveillance in NQ and the NT will be critical.

Diagnostics

Expertise:

- Kathy Grice (DAF),
- Dr Juliane Henderson (QAAFI).

There is a draft NDP.

GAPS:

- A SHPDS ratified diagnostic assay

Contingency/Covered under EPPRD

The disease would be covered under the EPPRD however it has not been categorised.

There is no specific contingency or eradication plan, however much could be used from the black Sigatoka and Banana Freckle plans.

GAPS:

- Very little is known about this disease so all planning would be done based on assumptions from knowledge for black and yellow Sigatoka.

Management

GAPS:

- Very little is known about this disease (e.g. potential sources of resistance, how fast the fungus may develop resistance to fungicides). Potential management practices would be based on knowledge for black and yellow Sigatoka.

Resources

http://www.planthealthaustralia.com.au/wp-content/uploads/2013/03/Eumusae-leaf-spot-FS.pdf

Thangavelu R, Carlier J, Henderson J & McTaggart AR (2007) Eumusae leaf spot (Mycosphaerella eumusae)Updated on 10/16/2007 Available online: PaDIL - http://www.padil.gov.au/pests-and-diseases/pest/main/136640/7749

Carlier J, Zapater M-F, Lapeyre F, Jones DR & Mourichon X. (2000) Septoria leaf spot of banana: A newly discovered disease caused by *Mycosphaerella eumusae* (anamorph *Septoria eumusae*). *Phytopathology* **90**: 884-890.

Crous PW & Mourichon X (2002) *Mycosphaerella eumusae* and its anamorph *Pseudocercopsora eumusae* spp. nov.: casual agent of eumusae leaf spot disease of banana. *Sydowia* **54**:35-43.

Banana Freckle

Caused by *Phyllosticta cavendishii*

Infections by *Phyllosticta cavendishii* cause raised 'freckles' on the leaves and fruit of banana plants. The disease can reduce the photosynthetic area of the leaves reducing yields and caused mixed ripening. Unsightly blemishes cause downgrading of fruit.

There are different strains of the fungus and they have been divided into 'Cavendish-infecting (Cavendish competent) and non-Cavendish infecting. Until 2013 banana freckle was present in Australia but only on non-Cavendish plants. Part of the difficulties with the fungus is being able to distinguish the two (or potentially more) different strains. This led to the removal of all banana plants (Cavendish and others) in the NT eradication zones of the 2013 eradication program.

Awareness and research

High level of awareness amongst growers and community, especially in NT due to the incursion into the NT in July 2013.

There is a PHA fact sheet for the disease as well as a PaDIL page (see resources below).

Dr Mee-Hua Wong completed her PhD on the disease and published a number of papers (see below).

Prevention

Into Australia

The 2013 incursion into the NT is currently being eradicated.

Prevention of movement into the country with planting material is covered under import conditions requiring holding of plants in PEQ glasshouse with testing.

Fruit is a potential pathway but fresh fruit imports into Australia are not occuring.

Within Australia

Restrictions on the movement of planting material between states and between biosecurity zones within some states

GAPS:

- Continued support for evidence based quarantine measures to prevent the potential movement of the disease will be critical.
- It is not known how the inoculum that caused the 2013 incursion arrived into Australia. Understanding this would help to prevent future incursions.

Surveillance

NAQS and BQ regularly survey northern Australia.

GAPS:

- The 2013 incursion was not picked up as part of a survey but rather from an NT DPI staff member seeing the disease on a farm near Darwin.

Diagnostics

Expertise:

- Dr Lucy Ran-Nguyen (NT DPI),
- Dr Jose Liberato (NT DPI),
- Kathy Grice (DAF),
- Dr Juliane Henderson (QAAFI).

There is no NDP but there are molecular tests which have been used extensively throughout the NT incursion/eradication campaign.

GAPS:

- A SHPDS ratified diagnostic assay

Contingency/Covered under EPPRD

The disease is covered under the EPPRD and is a category 3 pest. The current eradication program is being undertaken under the Deed.

Prior to the incursion there was no contingency plan for the disease. There is now a plan that is specific to the NT which could be modified for other locations.

One of the advantages of eradicating the disease from the NT, is the distance between hosts This is a very different situation to NQ. If there was an incursion in NQ, a response plan would need to be more like the 2001 black Sigatoka plan.

GAPS:

- Contingency plan more suitable to NQ production area.

Management

Management techniques similar to those used for black Sigatoka would be required as well as additional measures to protect the fruit from blemishes.

GAPS:

- Varieties resistant to banana freckle along with other leaf spot diseases.

Resources

https://nt.gov.au/industry/agriculture/food-crops-plants-and-quarantine/banana-freckle-eradication-program

http://abgc.org.au/biosecurity/banana-freckle-response/

http://www.planthealthaustralia.com.au/wp-content/uploads/2015/03/Banana-freckle-FS.pdf

http://www.padil.gov.au/pests-and-diseases/pest/main/136600

Wong, MH, Henderson, J and Drenth, A (2013) Identification and differentiation of Phyllosticta species causing freckle disease of banana using high resolution melting (HRM) analysis. Plant Pathology **62:** 1285 - 1293

Wong, MH,Crous, PW, Henderson, J, Groenewald, JZ and Drenth, A (2012) Phyllosticta species associated with freckle disease of banana. Fungal Diversity **56:** 173-187.

Yellow Sigatoka

Caused by *Mycosphaerella musicola*

Yellow Sigatoka is endemic in all banana growing areas of Australia except for the growing area around Carnarvon in WA. When left unchecked the disease affects the photosynthetic ability of leaves and yields are decreased and mixed ripening can occur. Disease pressure is much higher in tropical NQ than in SEQ and NSW.

Until 2015 yellow Sigatoka control was mandatory for growers in Queensland who were not allowed to have any more than 5% leaf spot on one leaf (Plant Protection Regulation 2002). This limit was set to help control the build up of inoculum in plantations because it can spread very easily to neighbouring farms. The regulations changed in 2016 and this leaf spot provision is no longer contained in the regulations. Instead, there is the Banana Industry Biosecurity Guideline that describes to growers how they are to manage this disease to meet their General Biosecurity Obligation (GBO). To help growers meet their obligations ABGC has employed a HIA-funded 'Yellow Sigatoka Liaison Officer' since 2010. This officer visits every commercial banana farm in North Queensland twice a year.

Yellow Sigatoka is controlled with regular de-leafing to remove inoculum sources and a range of fungicide sprays rotated to avoid the development of resistance to the sprays by *M. musicola*. There are varieties which are resistant to yellow Sigatoka but they do not have consumer acceptance nor the agronomic characters currently desired.

Awareness and research

Growers in NQ are very aware of the disease due to the work of the Yellow Sigatoka Liaison Officer.

The Banana Industry Biosecurity Guideline also describes to growers what they need to do to manage leaf spot.

Current research in Australia has mostly been on efficacy of different fungicides as well as screening new varieties for yellow Sigatoka resistance.

Prevention

Within Australia

The Carnarvon growing region is the only area without yellow Sigatoka. Movement controls into Carnarvon targeting other pathogens also prevent the movement of yellow Sigatoka.

GAPS:

- If any new areas are developed for banana growing then there is the opportunity to put in place protocols to prevent the introduction of yellow Sigatoka to the area.

Surveillance

As part of the Banana Plant Protection Program, DAF tests isolates collected from leaf spots in the production areas by the Yellow Sigatoka Liaison Officer.

The yellow Sigatoka isolates are also checked to examine if the isolates are developing resistance to the systemic fungicides.

Diagnostics

- Expertise: Kathy Grice (DAF),
- Dr Juliane Henderson (QAAFI).
- Louis Lardi (ABGC) – visual inspection.

Diagnostics are usually not required unless regulatory action is being taken by BQ.

There are protocols for *M. musicola* that distinguish it from *M. fijiensis.*

Contingency/Covered under EPPRD

Not applicable.

Management

Regular de-leafing and fungicide applications applied as part of an anti-resistance strategy.

GAPS:

The General Biosecurity Obligation contained in the new Biosecurity Act and Regulation are yet to be tested. This may impact on ongoing management of the disease.

The continued role of the Yellow Sigatoka Liaison Office is critical to the management of the disease.

Resources

National Banana Extension and Development Program Factsheet: “Top ways to manage banana fungicide resistance fact sheet”.

Banana Industry Biosecurity Guideline (Department of Agriculture and Fisheries, 2016).

Moko

Caused by *Ralstonia solanacearum* biovar 1 and race2

Moko affects a range of banana varieties and plantains. Similar to Panama disease, on infected plants the oldest leaves turn yellow and die first, the rest of the leaves are then affected and eventually the pseudostem collapses. Fruit can also be affected with the flesh of infected fruit turning brown and then grey.

The bacteria causing Moko can be spread in infected soil, via water, cane knives and farm machinery. Moko can also be spread by root to root contact. Insects play a large role in moving the disease; Trigona bees, wasp and other flying insects vector the disease and can move long distances (reports of over 90km for some strains of Moko).

The disease is present in Central and South America, the Caribbean and the Philippines.

Moko, Bugtok and blood disease are often grouped together. It is accepted that blood disease is caused by a distinct bacterium, the causal organisms of all three diseases grouped into the ‘*Ralstonia solanacearum* complex’.

GAPS:

Further taxonomic work has clarified the naming of the pathogens but further work is still required, especially as the two bacteria which cause Moko and Bugtok are distinct from one another but are hard to distinguish using current lab tests. Correct identification could delay an EPPRD response should there ever be an incursion.

Awareness and research

There is some awareness of this disease by growers because of its relevance to the Import Risk Analysis that was conducted for the importation of fresh bananas from the Philippines. However, while growers are aware of the disease is it unlikely they would be able to describe the symptoms nor know what to look for in their plantations.

There is a PHA fact sheet for the disease as well as a PaDIL page (see resources below).

Prevention

Into Australia

The disease is currently exotic to Australia and prevention of movement into the country with planting material is covered under import conditions requiring holding of plants in PEQ glasshouse with testing.

Fruit is a pathway but fresh fruit imports in Australia are not occurring.

GAPS:

- There will need to be continued support for evidence based quarantine measures to prevent the potential movement of the disease e.g. on-going for import of fruit conditions.

Surveillance

NAQS and BQ regularly survey northern Australia.

GAPS:

- There will need to be continued support for surveillance in NQ and the NT into the future.

Diagnostics

A major emphasis will be placed on researching Moko, Bugtok and Blood Disease for the development of accurate diagnostics in the HIA funded project BA16005. There is an assay for Moko.

Expertise:

- Dr Nandita Pathania (DAF),
- Dr Anthony Young (formerly DAF, now USQ),
- Dr Mark Fagan (formerly CRC for Tropical Plant Protection),

There is a draft NDP. It is unclear if the draft clearly distinguishes between Moko, Bugtok and Blood Disease.

The current standard protocol is more than 10 years old so confirmation is required as to whether it still works against the existing isolates.

As there is potential for a hold up in diagnostics due to the diversity of *Ralstonia* species, a finalised NDP (incorporating the latest taxonomic information is a priority.

GAPS:

- A SHPDS ratified diagnostic assay.

Contingency/Covered under EPPRD

The disease is covered under the EPPRD and is a Category 2 pest.

GAPS:

- There is no contingency plan for moko disease or any of the other bacterial diseases. If detected in Australia, a swift response would be required as insects could spread the disease quickly and over a great distance.

Management

There are no resistant varieties and *Heliconia* is also a host.

Filipino companies have a system of destroying infected plants that involves burning the plant and the site of the infection with rice hulls to heat treat the soil below. Provided that infected plant material, sap and soil from below the infected plant is not spread around or disturbed, the bacteria will break down in the soil relatively quickly (6-12 months).

As the bacterium can spread in sap, farming tools (cane knives, hook knives etc.) need to be regularly and thoroughly disinfected.

A complication to the Australian production system compared to overseas is our high reliance on mechanised operations, If the bacterium did get into a plantation in NQ (where there is a high use of machinery) the bacterium could spread very quickly via wet soils, cane knives and other farming tools.

GAPS:

- Management systems for highly mechanised Australian production systems.
- Management systems for dealing with vectors.

Resources

http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Moko-FS.pdf

http://www.padil.gov.au/pests-and-diseases/pest/main/136650

Fegan, M and Prior P (2006) Diverse members of the *Ralstonia solanacearum* species complex causebacterial wilts of banana. Australasian Plant Pathology **35:** 93-101

Bugtok

Caused by *Ralstonia solanacearum* biovar 1 and race2

The disease occurs in the Philippines, it affects ABB cooking bananas but does not have an impact on export 'Cavendish'. Unlike Moko and blood disease, Bugtok infections affect fruit and bracts but symptoms are rarely seen in the pseudostem. Infection is thought to be via thrips transmitting the disease to the flowers. The pulp of affected fruit turn grey to yellow and only a few fingers or all of the fingers in a bunch may be affected. Bracts may turn black and have bacteria oozing from them. The disease is not thought to be transmitted in planting material.

One of the difficulties with the bacteria which causes Bugtok is that it is extremely difficult to distinguish it from the bacteria which causes Moko.

Awareness and research

There is probably less awareness of this disease than Moko (although there may be some knowledge because of its relevance to the import risk analysis for importing fresh bananas from the Philippines). It is unlikely that growers would know what the symptoms are.

There is a PHA fact sheet as well as a PaDIL page for Moko and Bugtok.

Prevention

Into Australia

The Bugtok bacterium is thought to not be carried in planting material but any planting material being brought into the country is covered under import conditions requiring holding of plants in PEQ glasshouse with testing.

Fruit is a pathway but fresh fruit imports into Australia are not occurring.

GAPS:

- There will need to be continued support for evidence based quarantine measures to prevent the potential movement of the disease.

Surveillance

NAQS and BQ regularly survey northern Australia.

GAPS:

- There will need to be continued support for surveillance in NQ and the NT.

Diagnostics

A major emphasis will be placed on researching Moko, Bugtok and Blood Disease for the development of accurate diagnostics in the HIA funded project BA16005. There is an assay for Moko.

Expertise:

- Dr Nandita Pathania (DAF),
- Dr Anthony Young (formerly DAF, now USQ),
- Dr Mark Fagan (formerly CRC for Tropical Plant Protection).

There is a draft NDP for *Ralstonia solanacearum* race2 but it is unclear if the draft clearly distinguishes between Moko, Bugtok and Blood Disease.

The current standard protocol is more than 10 years old so confirmation is required as to whether it still works against the existing isolates.

There is potential for a hold up in diagnostics due to the diversity of *Ralstonia* species. Therefore a finalised NDP (incorporating the latest taxonomic information Safni et al 2014) is a priority.

GAPS:

- A SHPDS ratified diagnostic assay

Contingency/Covered under EPPRD

Moko and Bugtok are covered under the EPPRD and is a Category 2 pest.

GAPS:

- There is no contingency plan for Bugtok disease or any of the other bacterial diseases. This is a priority.

Management

GAPS:

- Management systems for highly mechanised Australian production systems.
- Management systems for dealing with vectors.

Resources

http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Moko-FS.pdf

http://www.padil.gov.au/pests-and-diseases/pest/main/136650

Safni I, Cleenwerck I, De Vos P, Fegan M, Sly L, Kappler U. (2014) Polyphasic taxonomic revision of the *Ralstonia solanacearum* species complex: proposal to emend the descriptions of *Ralstonia solanacearum* and *Ralstonia syzygii* and reclassify current *R. syzygii* strains as *Ralstonia syzygii* subsp. *syzygii* subsp. nov., *R. solanacearum* phylotype IV strains as *Ralstonia syzygii* subsp. *indonesiensis* subsp. nov., banana blood disease bacterium strains as *Ralstonia syzygii* subsp. *celebesensis* subsp. nov. and *R. solanacearum* phylotype I and III strains as *Ralstonia pseudosolanacearum* sp. nov. International Journal of Systematic and Evolutionary Microbiology. **64**:3087–103.

Fegan, M and Prior P (2006) Diverse members of the *Ralstonia solanacearum* species complex causebacterial wilts of banana. Australasian Plant Pathology **35:** 93-101

Blood disease

Caused by: *Ralstonia syzygii* subsp. *celebesensis*

Symptoms are similar to Panama disease and Moko. Leaves turn yellow, wilt and form a 'skirt'. When cut open affected plant will have reddish-down discolouration of the vascular tissue. Freshly cut stem surfaces may exude bacteria white to red-brown in colour. Fruit may turn black. Transmission of the disease is thought to be in a similar manner to that of Moko i.e. via insects transmitting the disease to flowers, via infected fruit, soil and on farming implements. Spread has been rapid in Java (to a distance of over 25km per annum in some areas) which supports the insect dispersal hypothesis (Eden-Green, 1994).

The disease is present in Indonesia including West Papua, but until recently it had not been found elsewhere in the world until a recent incursion in Malaysia (limited distribution).

Awareness and research

There is likely to be some awareness of this disease by growers because of its relevance to the import risk analysis for fresh bananas from the Philippines.

There is a PHA fact sheet for the disease as well as a PaDIL page.

The taxonomy of this disease has only just recently updated (Safni et al 2014) and is yet to be widely adopted. More research needs to be done to better understand the bacterium as many assumptions about blood disease are based on Moko.

Prevention

Into Australia

The disease is currently exotic to Australia and prevention of movement into the country with planting material is covered under import conditions requiring holding of plants in PEQ glasshouse with testing.

Fruit is a potential pathway but fresh fruit imports into Australia are not occuring.

GAPS:

- There will need to be continued support for evidence based quarantine measures to prevent the potential movement of the disease.

Surveillance

NAQS and BQ regularly survey northern Australia.

GAPS:

There will need to be continued support for surveillance in NQ and the NT.

Diagnostics

A major emphasis will be placed on researching Moko, Bugtok and Blood Disease for the development of accurate diagnostics in the HIA funded project BA16005. There is an assay for Moko.

Expertise:

- Dr Nandita Pathania (DAF),
- Dr Anthony Young (formerly DAF, now USQ),
- Dr Mark Fagan (formerly CRC for Tropical Plant Protection),

There is a draft NDP. This may need to be reviewed based on the latest taxonomic information (Safni et al, 2014). It is unclear if the draft clearly distinguishes between Moko, Bugtok and Blood Disease.

GAPS:

- Lacking a SHPDS ratified diagnostic assay.
- Lacking widespread recognition of the current taxonomic assignment.

Contingency/Covered under EPPRD

The disease is covered under the EPPRD and is a Category 2 pest.

GAPS:

- There is no contingency plan for blood disease or any of the other bacterial diseases.

Management

Management is expected to be similar as for Moko disease.

A lack of understanding about transmission of the disease and confirmation of which vectors are involved could hamper control measures targeting transmission.

GAPS:

- Management systems for highly mechanised Australian production systems.

Resources

http://www.padil.gov.au/pests-and-diseases/pest/main/136649

http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Blood-disease-FS.pdf

Eden-Green, SJ (1994) Banana Blood Disease. Musa Disease Fact Sheet No.3: http://www.bioversityinternational.org/uploads/tx_news/Banana_blood_disease_127.pdf

Safni I, Cleenwerck I, De Vos P, Fegan M, Sly L, Kappler U. (2014) Polyphasic taxonomic revision of the *Ralstonia solanacearum* species complex: proposal to emend the descriptions of *Ralstonia solanacearum* and *Ralstonia syzygii* and reclassify current *R. syzygii* strains as *Ralstonia syzygii* subsp. *syzygii* subsp. nov., *R. solanacearum* phylotype IV strains as *Ralstonia syzygii* subsp. *indonesiensis* subsp. nov., banana blood disease bacterium strains as *Ralstonia syzygii* subsp. *celebesensis* subsp. nov. and *R. solanacearum* phylotype

I and III strains as *Ralstonia pseudosolanacearum* sp. nov. International Journal of Systematic and Evolutionary Microbiology. **64**:3087–103.

Xanthomonas bacterial wilt

Caused by *Xanthomonas vasicola* pathovar *musacearum*

Xanthomonas bacterial wilt (XBW) has been present on Ensete plants in Ethiopia since 1968 but in the last 15 years it has spread and is now present in Ethiopia, Kenya, Uganda, Democratic Republic of Congo, Burundi, Rwanda and Tanzania on dessert and cooking bananas.

The symptoms of the disease are very similar to Panama and Moko and whole plants can be killed within a month of first symptoms appearing. One characteristic symptom is the oozing of yellow bacterial exudate out of cut pseudostems of badly affected plants.

Awareness and research

Very little awareness of this disease in Australia.

Research is being undertaken in Africa where management plans have been developed.

GAPS:

- Awareness of the disease is low in Australia.

Prevention

Into Australia

The disease is currently exotic to Australia and prevention of movement into the country with planting material is covered under import conditions requiring holding of plants in PEQ glasshouse with testing.

Fruit is a potential pathway but fresh fruit imports into Australia are not occurring.

GAPS:

- There will need to be continued support for evidence based quarantine measures to prevent the potential movement of the disease e.g. on-going for import of fruit conditions.

Surveillance

None specifically conducted for XBW.

GAPS:

- There will need to be continued support for surveillance in NQ and the NT.

Diagnostics

Expertise:

- Dr Juliane Henderson (QAAFI),
- Dr Nandita Pathania (DAF)

There is no diagnostic test available.

GAPS:

- No assay exists.

Contingency/Covered under EPPRD

Not yet categorised but would come under the Deed.

GAPS:

- There is no contingency plan.

Management

Management systems have been developed in Africa and are reportedly working well when supported with extension programs. These management systems may not work in a highly mechanised production system like in Australia.

The bacterium is spread via planting material, insect vectors, in soil and water, on farming implements and via animal vectors such as rats, birds, bats and livestock.

GAPS:

- Management systems for highly mechanised Australian production systems.

Resources

http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Banana-Xanthomonas-wilt-FS.pdf

EFSA assessment of risk of introduction http://www.efsa.europa.eu/en/efsajournal/pub/669

http://www.promusa.org/Xanthomonas+campestris+pv.+musacearum#footnote7

http://www.promusa.org/Xanthomonas+wilt

Exotic nematodes

Under the current import conditions, there is an extremely low chance of nematodes entering Australia on banana plants provided they are imported through the correct channels. However, there is a chance that they could enter Australia on other products such as the burrowing nematode *Radopholus similis* on fresh ginger from Fiji.

In January 2013 conditions to import fresh ginger from Fiji to Australia were published. This included treatment of consignments with methyl bromide. In mid-2014 live root knot nematodes were found in a consignment of ginger in Sydney indicating that the methyl bromide did not kill the root knot nematodes (which are closer to the surface of the ginger rhizome than the burrowing nematodes).

There was a Australian Government review of the conditions which came to the conclusion that no live quarantine pests were found (root knot nematode was not considered a quarantine pest) and that experiments were needed to understand the relatedness and host preference of burrowing nematodes from Fiji. This information would then be compared to Australian isolates.

Awareness and research

There is likely to be very little grower awareness of the exotic nematodes. Very little research has been done.

Research has commenced to look at the different populations of *Radopholus similus* in Australia and Fiji. This work will compare if they are genetically different and if there are differences in pathogenicity. The results should be available in 2017.

GAPS:

- There is a gap in the level of knowledge about the pathogenic differences between Australian and Fijian isolates of burrowing nematode.

Prevention

Into Australia

Movement into the country with banana planting material is covered under import conditions requiring holding of plants in PEQ glasshouse with testing.

GAPS:

- Potential to come into Australia on fresh ginger imports from Fiji if methyl bromide treatments do not work.

Surveillance

GAPS:

- No formal surveillance.

Diagnostics

Expertise: Jenny Cobon (DAF)

GAPS:

- An understanding of the diversity of lesion nematodes in Australia and Fiji.

Contingency/Covered under EPPRD

GAPS:

- Not enough information to know if it is required.

Management

GAPS:

- There is not enough information to know if different management practices would be required in addition to the current practices for endemic burrowing nematode.

Resources

http://www.agriculture.gov.au/biosecurity/risk-analysis/plant/import-conditions-fresh-ginger-from-fiji

Banana Skipper Butterfly

Erionata thrax

Banana skipper butterfly is native to South East Asia. It is now present in South East Asia, Papua New Guinea, Mauritius, Guam and Hawaii.

The symptoms of infestation are large cut sections on banana leaves rolled into tight cocoon shapes. Damage to bananas is from reduced photosynthetic area due to feeding and rolling. Banana skipper butterfly affects all cultivated bananas.

Awareness and research

There is probably not a high level of awareness of this pest despite characteristic symptoms of infestation. There is a PHA fact sheet.

Previous research was done by CSIRO into control of the pest using biological control agents. There would be benefit in revisiting this research to look for any knowledge gaps or material/information that could be shared with growers.

Prevention

Into Australia

Eggs could be potentially moved on planting material but movement into the country with banana planting material is covered under import conditions requiring holding of plants in PEQ glasshouse.

There is a risk associated with the illegal movement of planting material between PNG, Torres Strait Islands to mainland Australia (eg via Cape York).

Within Australia

The butterfly can move short distances by flying. Longer distance dispersal is via eggs on planting material.

Surveillance

NAQ target banana skipper butterfly in their surveillance.

GAPS:

Pest scouts could potentially undertake surveillance but it is likely that growers do not have a lot of knowledge about this pest.

Diagnostics

Expertise:

- Donna Chambers (DAF),
- Bruno Pinese (DAF – may no longer work in the field).

GAPS:

- A diagnostic protocol. There is a closely related butterfly which may cause confusion if there is an incursion.

Contingency/Covered under EPPRD

Banana skipper butterfly is covered under the Deed and is a category 4 pest.

GAPS:

- There is no contingency plan.
- While there is confidence that the parasites that CSIRO released into PNG keep these pests in check, it is not known what the impacts of the insecticides used to control other banana insect pests would have on the banana skipper butterfly.

Management

GAPS:

Knowledge on the effect of the Australian insecticide program on parasites of the banana skipper butterfly.

Resources

http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Banana-skipper-butterfly-FS.pdf

http://www.ento.csiro.au/biocontrol/skipper.html

http://www.cabi.org/isc/datasheet/21833

Banana spider mite

Tetranychus piercei

T. piercei causes damage on a range of crops resulting in a high economic impact. The mite has been recorded in Asia, Indonesia, Malaysia and Papua New Guinea. Mites feed on the leaves thereby reducing the photosynthetic area. This leads to reduced yields and potentially mixed ripening. Spider mites also produce a fine web.

Tetranychus gloveri (cotton red mite) was present in the NT and in 2014 the mite was found in banana plantations in NQ. By the time it was detected it had established and was deemed too difficult to eradicate by CCEPP due to the wide range of weed host plants.

Awareness and research

There would be low awareness of banana spider mite amongst growers and early infestations could look like other mite damage.

Prevention

Into Australia

T. piercei is exotic to Australia.

Mites can only travel short distances unaided. Any long distance dispersal will be via planting material.

Banana planting material introduced to Australia must go through PEQ.

Within Australia

Banana spider mites could be moved on planting material. Movement controls for pathogens should limit the spread of banana spider mites if an incursion into Australia occurred.

Surveillance

GAPS: Difficulty for growers to distinguish banana spider mite from other mites.

Diagnostics

Expertise: Owen Seeman (Queensland Museum).

There is a draft NDP.

GAPS: A ratified diagnostic protocol.

Contingency/Covered under EPPRD
T. piercei is covered under the Deed and is a category 4 pest.

GAPS: There is no contingency plan.

Management

Banana spider mites feed on a wide range of host plants meaning if they were to establish in Australia, control measures would need to also target alternate hosts.

For the mite populations currently in Australia, issues arise on bananas growing in dry, dusty conditions or where a chemical application has knocked out predators which normally keep mite populations in check. It is not known if there are predators present in Australia which would suppress *T. piercei* if it were to establish here

GAPS:

- Effects of natural predators
- Alternative control measures.

Resources

http://pbt.padil.gov.au/index.php?q=node/6&pbtID=116

http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Banana-spider-mite-FS.pdf

Coffee bean weevil

Araecerus fasciculatus

The coffee bean weevil is a pest of stored products. It is present on the east coast of Australia but absent from WA. It does not damage bananas but rather survives in the dried flower parts tthat remain attached to the fruit.

The main problem for growers is the rejection of consignments into WA when coffee bean weevil is found.

Awareness and research

Awareness of the pest is high amongst NQ banana growers who export to WA.

Prevention

Into Australia

Consignments of dried goods coming into Australia are subject to inspections for pests.

Within Australia

Consignments of fruit are inspected on arrival into WA fruit are removed from 6 cartons and placed on a white inspection tray where flower ends are flicked off fruit and insects collected and examined. If a grower gets a detection the fruit must be treated at the growers cost (fumigation may cause damage to fruit particularly if there is condensation on the fruit), re-exported at the growers cost or disposed of by deep burial at the cost to the grower. The next consignment that the grower sends will then be subject to a higher rate of inspection.

Surveillance

Nil formal.

Diagnostics

Expertise: Dr Rolf Oberprieler (CSIRO) has provided literature in the past and may be able to assist with identification.

GAPS:

- A diagnostic protocol.

Contingency/Covered under EPPRD

If there was an incursion into WA eradication could potentially be covered under EPPRD. Further clarification on this point is required.

GAPS:

- Contingency plan for incursion into WA.

Management

It is thought that coffee bean weevils invade the flower parts when the fruit is in the field. The current control measure is to use water or manually remove flower parts off the bunches of fruit just before they enter the packing shed. This adds a considerable cost to packing. Some growers are more thorough than others at removing the flower parts.

GAPS:

- In field control measures for coffee bean weevil.

Resources

http://www.padil.gov.au/pests-and-diseases/pest/main/135950/7030

Conclusion

This desk top analysis highlights that the banana industry has a strong foundation in biosecurity preparedness. Research, to varying extents, has been done on most of the High Priority Pests. However, there are gaps that need to be filled and this can be done over time according to priority. Given the economic importance of the banana industry and the public's love for Australian bananas, it is important that the industry continues to build on its existing knowledge, reduce the research gaps and prepare the industry against future potential incursions. It is also vitally important that the scientific capacity that currently supports the industry is maintained.

The detection of Panama tropical race 4 in north Queensland has shown growers across Australia that they must not be complacent when it comes to on-farm biosecurity. It is hoped that this developing biosecurity culture amongst growers continues. It can then be supplemented and strengthened with new knowledge as it emerges.

The list of recommendations, informed by the analysis in this report will guide future research projects as the industry implements a more strategic and proactive approach to filling the gaps in its biosecurity knowledge and practices.

Appendix 1

General surveillance and prevention of movement of pests and diseases

Domestic Quarantine

Domestic Quarantine (DQ) have a website with information for travellers (http://www.quarantinedomestic.gov.au/) divided by State/Territory. Information on movement of bananas is listed. It is suspected that very few travellers check the website prior to moving. DQ also produce brochures to provide to travellers and also work with organisations (like the Defence Force) to provide information on interstate quarantine issues when staff are relocated.

Northern Australia Quarantine Strategy (NAQS)

NAQS undertake activities to minimise the risk of pest and disease incursions into the north of Australia, they are a group within the Department of Agriculture and Water Resources. They assess the risks, undertake regular surveillance activities, liaise with local communities, manage the biosecurity risk in the Torres Strait and contribute to Australian and international initiatives.

NAQS surveillance areas:

Appendix 2

Terms use in the Queensland Biosecurity Act

From: https://www.daf.qld.gov.au/biosecurity/about-biosecurity/biosecurity-act-2014/information-and-resources-about-the-act/overview-and-foundation-principles/terms-used-under-the-biosecurity-act

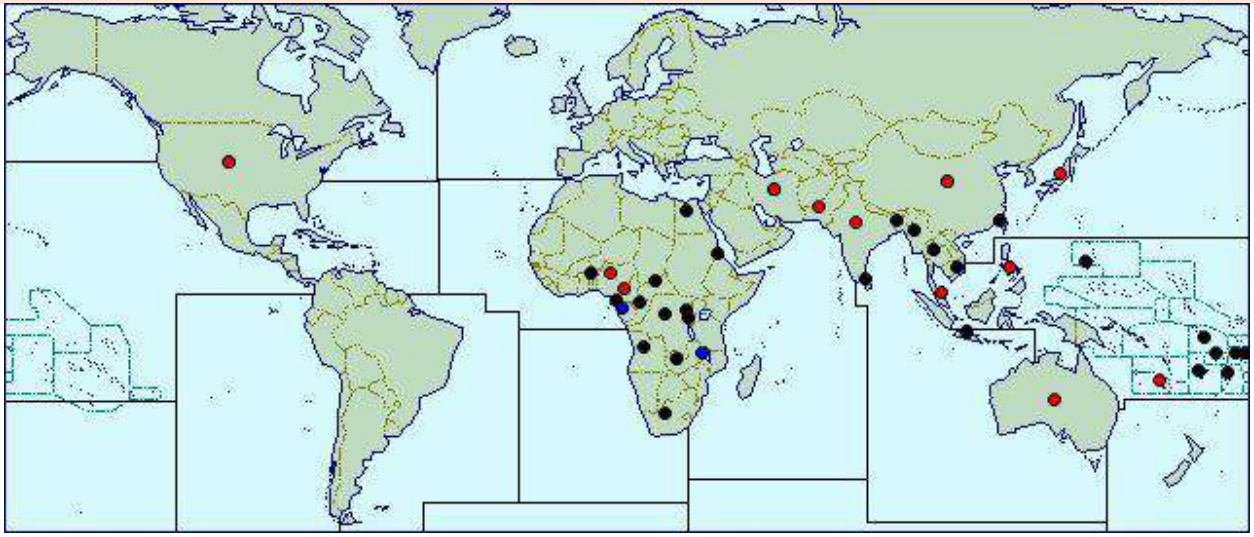
Prohibited matter: Prohibited Matter is biosecurity matter not currently present or known to be present in Queensland. It is prohibited because it may have a significant adverse effect on a biosecurity consideration if it did enter Queensland.

Restricted matter: Restricted Matter is biosecurity matter found in Queensland that may have adverse effects on a biosecurity consideration if conditions or restrictions under the Act were not imposed.

Appendix 3 – maps of locations of pests

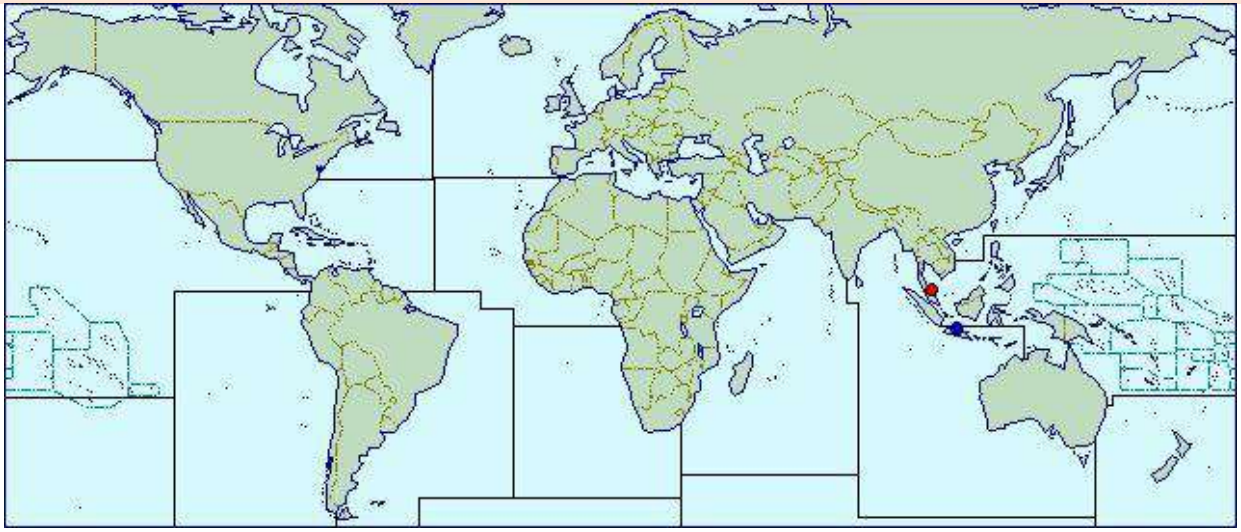
Sourced from: http://www.cabi.org/isc/ . More detailed maps for each country are available.

Banana Bunchy Top Virus

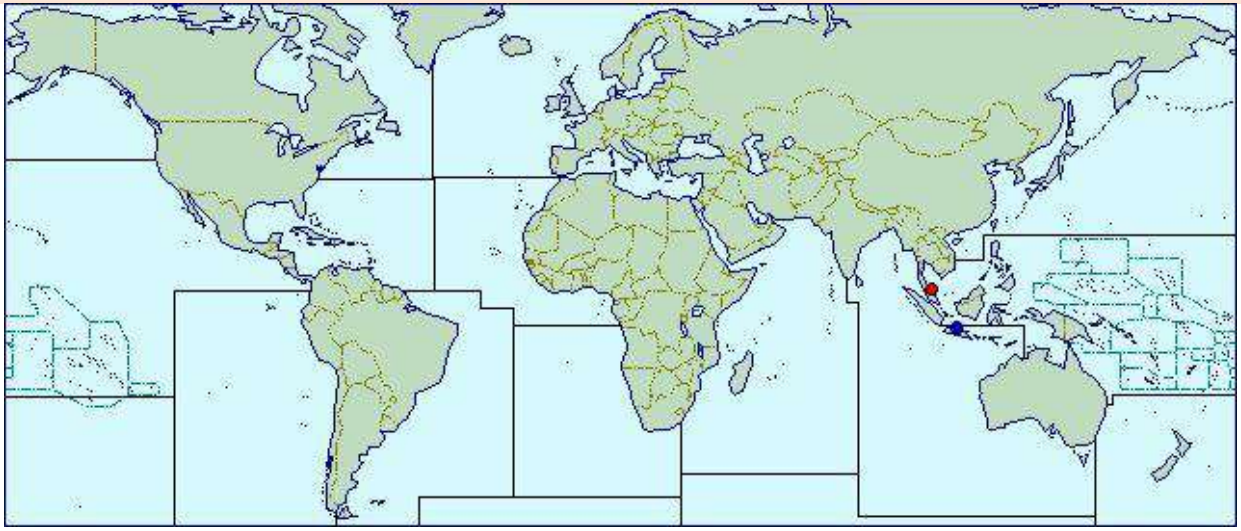


	Present, no further details		Evidence of pathogen
	Widespread		Last reported
	Localised		Presence unconfirmed
	Confined and subject to quarantine		See regional map for distribution within the country
	Occasional or few reports		

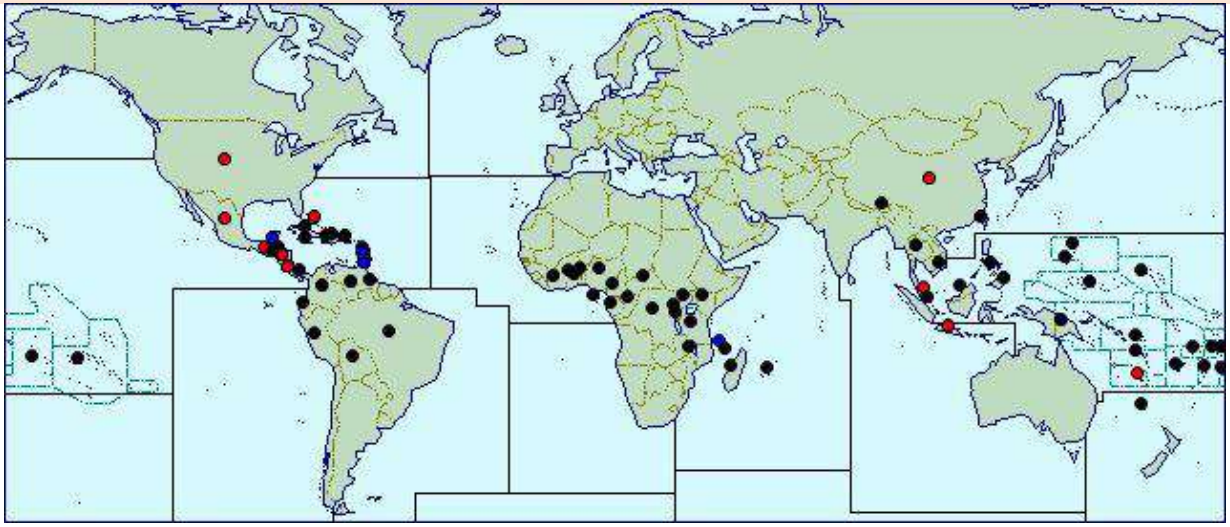
Banana blood disease



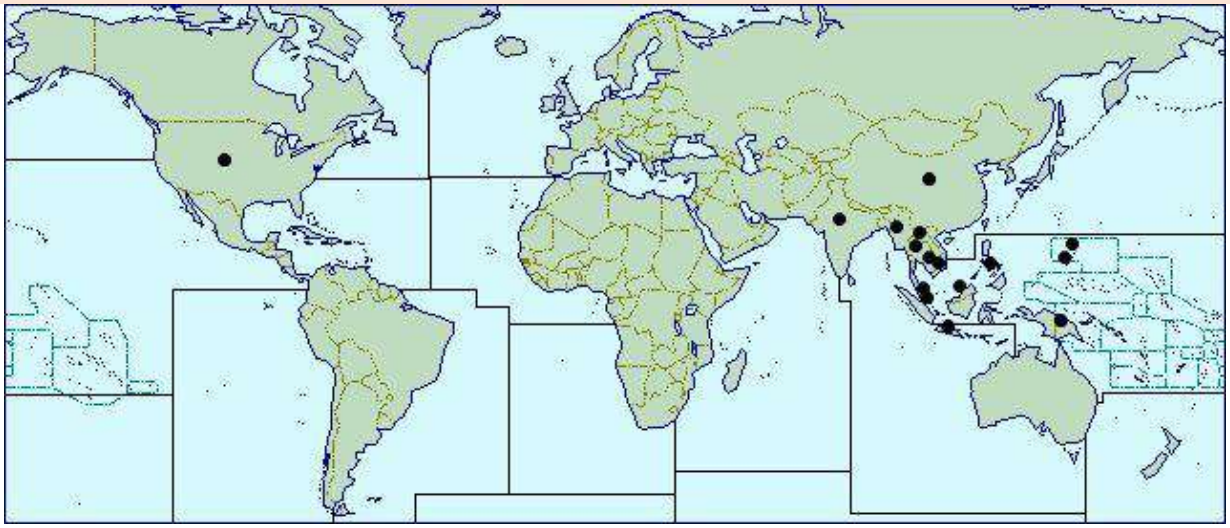
Bacterial wilt



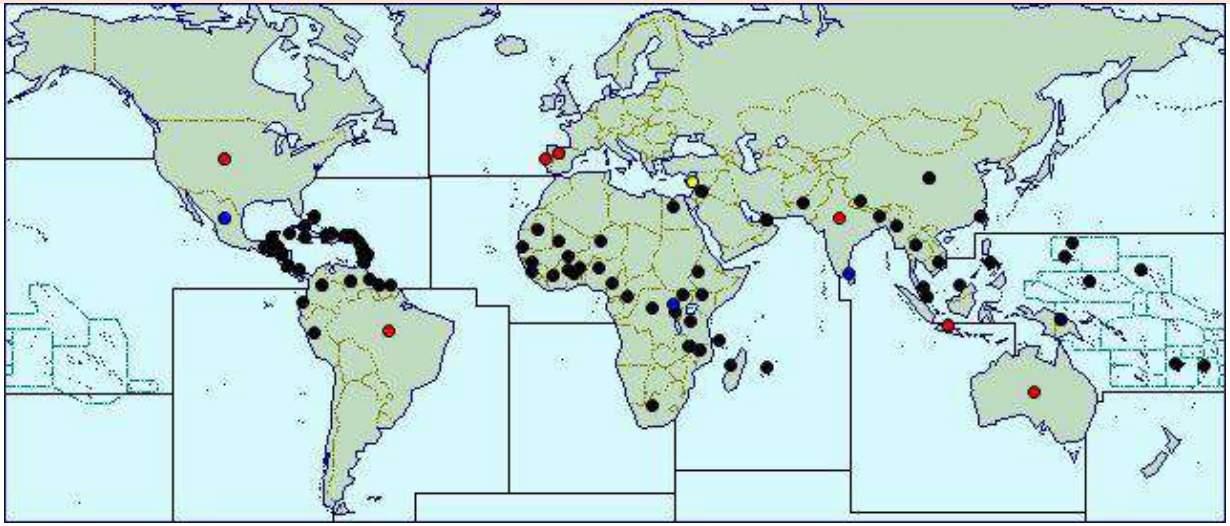
Black Sigatoka



Banana skipper butterfly



Panama disease



NORTH QUEENSLAND BANANA INDUSTRY

WATER QUALITY STRATEGY

2017 – 2020

AUSTRALIAN Banana GROWERS' COUNCIL INC.

FOREWORD

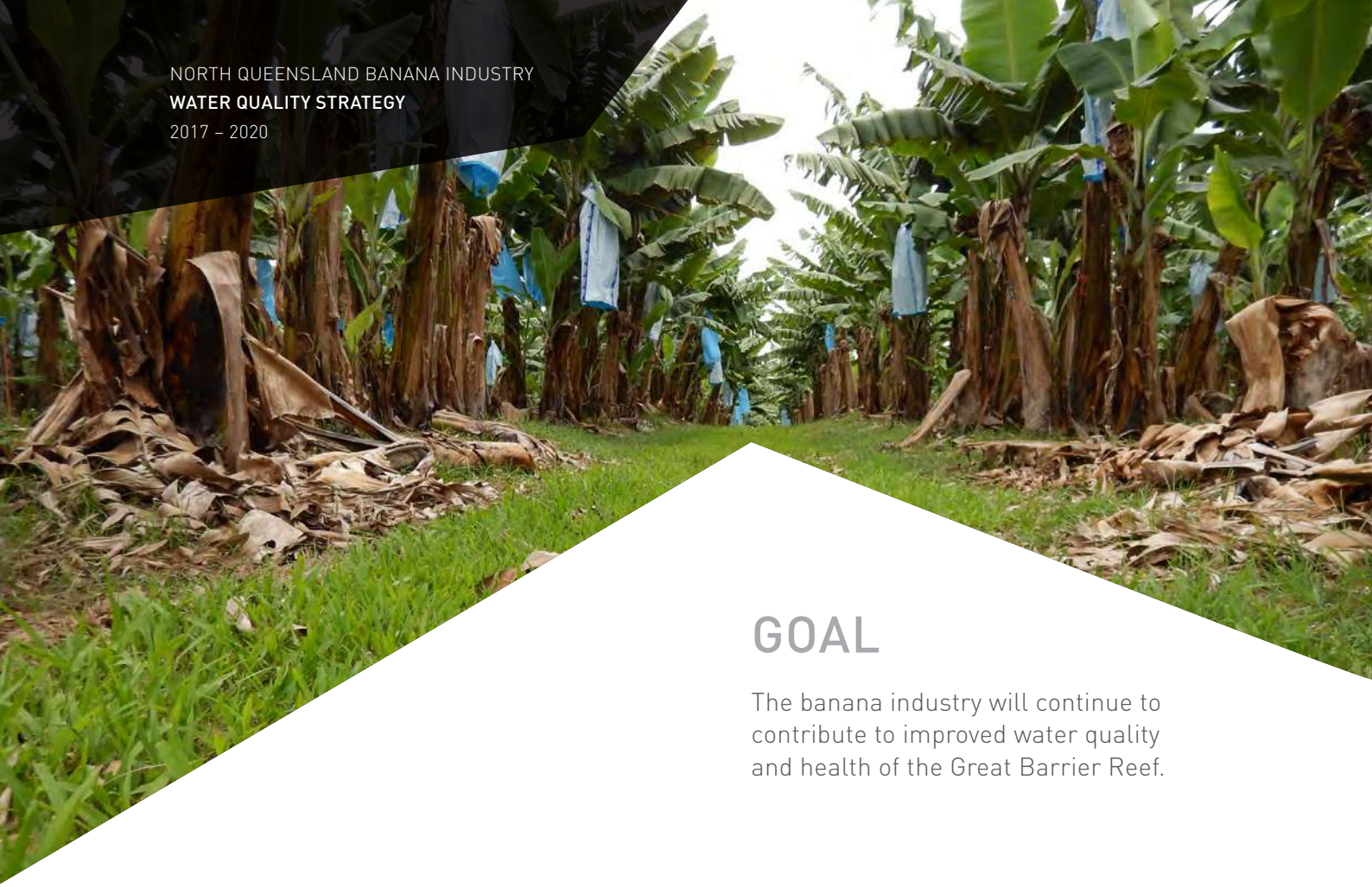
The banana industry has a great reputation for adopting environmental best management practices. The majority of growers respect the natural environment and the Great Barrier Reef and understand the impact their farming can have on the quality of water in local catchments. There are increasing numbers of growers implementing best management practices on their farms with the industry having reduced the rate of nitrogen application by 40% over the last 10 years. While this is an outstanding achievement, there is room for improvement.

This Water Quality Strategy has been written with a focus on extension and working with growers to help them improve their adoption of nutrient and sediment management practices. It is the goal of the Australian Banana Growers' Council (ABGC) to help more growers farm at best practice without compromising their productivity and profitability. Consequently, this Strategy contains targets and actions that demonstrate that the ABGC is committed to helping growers improve the water quality of the Great Barrier Reef. This approach to sustainable farming is increasingly important to many Australians.

The Strategy lays out the priorities for the ABGC for the next three years with a clear focus on reducing the amount of nutrients and soil leaving farms. The ABGC will work closely with funding and delivery partners to develop new extension tools that will support growers adopt practice change so that these changes can be quantified, measured and achieved.

The ABGC encourages growers to get on board and adopt best management practices so that the industry can proudly showcase its responsible approach to farming.

Chair - Australian Banana Growers' Council



GOAL

The banana industry will continue to contribute to improved water quality and health of the Great Barrier Reef.

OBJECTIVE

The banana industry will contribute to a 10% decrease in dissolved inorganic nitrogen and a 5% decrease in sediment run off to improve the water quality of the Great Barrier Reef (GBR) Lagoon by 2020.

STRATEGY

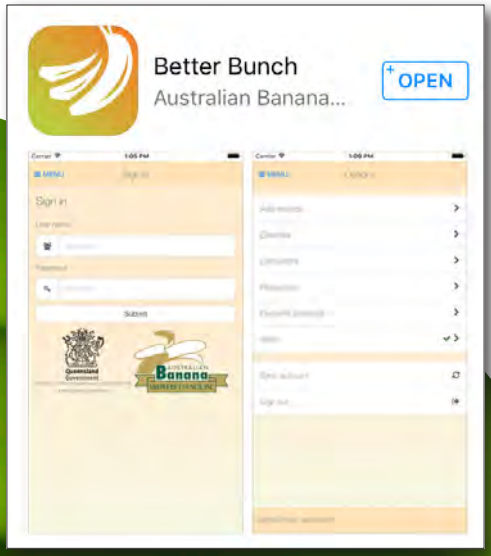
North Queensland banana growers will be supported to improve their production standards and adopt recognised best management practices. Specifically, this strategy will focus on assisting growers to:

- apply the optimum amount of nutrients to their banana crops; and
- retain soil on their farms.

ACTIONS

1. Extension Delivery

- Design and deliver a coordinated, multifaceted approach to extension, that will focus on working closely with growers, officers from the Australian and Queensland government departments, natural resource agencies, universities and industry service providers to:
  - identify the optimum rates of nutrient application on a farm and/or block basis;
  - identify and assist growers to implement the most cost effective land management practices;
  - support trialling and validating innovation to establish improved sustainable practices;
  - create opportunities for peer to peer learning from industry champions and innovators;
  - use new technology to improve farming profitability and environmental outcomes;
  - provide access to experts in water quality management; and
  - explain to banana growers, using clear language, the findings and implications of new research about the condition of water quality on the Great Barrier Reef.



Targets

Over the next four years, the banana industry will participate in modelling and monitoring work to identify the production areas and practices that are at the highest risk of contributing to poor water quality and implement changes to management practices to mitigate the risks. Specifically,

- **By June 2019**, at least 43 banana growers (or approximately 4,200 hectares) will have changed their farming practices and adopted 'B' level practices for nutrient and sediment management.
- **By 2020:**
  - At least 70% of all north Queensland banana production land will be farmed using the Banana BMP Guidelines for nutrient and sediment management.
  - All north Queensland growers who have completed the BMP or who are assessed to be farming at industry best practice standards will have access to industry developed extension tools (such as the Better Bunch App) to improve their productivity and profitability.
  - The ABGC will facilitate an effective informal network of industry champions who influence farm management practices across the industry by actively promoting the economic and environmental benefits of adopting BMP and innovative practices.
- **Commencing 2018**, there will be a biennial workshop to keep growers, industry service providers and consultants up-to-date on new developments relating to best management practice, water quality improvements, nutrient management, new products etc

ACTIONS

2. Extension material

- Banana growers' adoption of BMP will be supported through the design of extension material and tools. Examples include:
  - Nutrient budgeting tools and plans;
  - Electronic extension and decision making tools such as smart device applications, the BMP Guidelines and videos;
  - Case studies to demonstrate best practice and innovation;
  - BMP Guidelines that reflect evolving best practice;
  - Farm and topographical maps to improve farm layout; and
  - Fact Sheets and other technical information products.

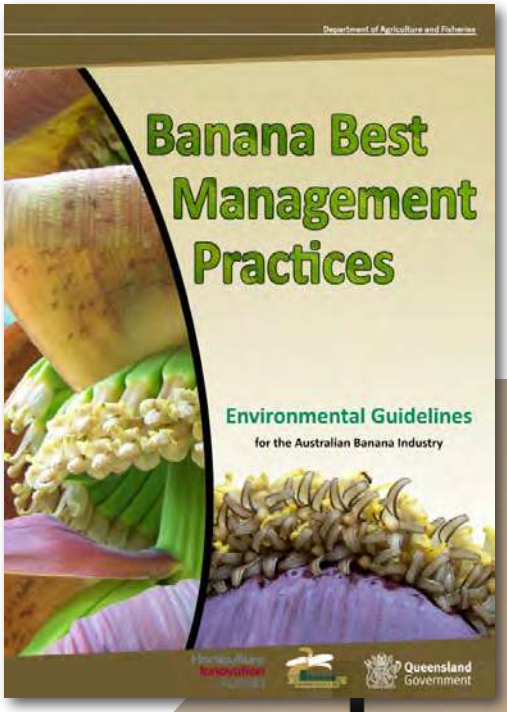
Targets

- **Commencing in 2017**, extension material targeting nutrient and sediment retention (such as the tools listed above) will be developed to inform banana growers of the benefits of adopting best management practices;
- **Commencing in 2017**, there will be a biennial review of extension material and techniques used in other industries – to identify possible new extension opportunities for the banana industry;
- **Commencing in 2018**, there will be a biennial review of banana-industry BMP extension material to ensure it promotes current best practice;
- Production of two videos per year to promote innovation and best management practice.

COMMUNICATION

It is important to keep banana growers and other stakeholders informed about the steps the industry has taken, and is continuing to take, to reduce the loss of nutrients and sediments from farms. Consequently, regular communication and engagement with growers will raise their awareness of the water quality issues impacting on the banana industry as well as the Great Barrier Reef. This will include regularly profiling the efforts and initiative of growers who are delivering on-farm best practice and innovation. The ABGC will use a number of avenues to keep growers informed including:

- Workshops;
- Water quality events and seminars
- Australian Banana Magazine;
- E bulletins;
- ABGC website;
- Banana Congress;
- Social media – including Facebook;
- Media releases;
- Local grower group meetings.




WWW. ABGC.ORG.AU

Banana Industry Chemical Workshop - August 12 2016- 9:30am – 4pm
EcosSciences 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 Pedranda (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 Guignardia musae* (anamorph: *Phyllosticta musarum*)	
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*	
Sigatoka – black	*Mycospharella figiensis*	
Sigatoka yellow leaf spot	*Mycospharella musicola*	Affects upper leaves of canopy
Moderate		
Anthracnose- post harvest	***Colletotrichum musae***	This is on the body of the fruit and is less of a problem than crown rot.
Bacterial corm rot	*Erwinia spp.*	*Associated with beetle borer in NSW*
Bacterial rot, soft rot	*Erwinia spp.*	
Base (Butt) rot	*Chalara paradoxa*	
Leaf speckle	***Mycospharella musae***	Variety dependant - controlled incidentally- affects lower leaves
Mokillo - Bacterial finger	***Enterobacter cowanii* and *Pantoea agglomerans***	Ad hoc appearance.

tip rot		Affects Ducasse and Lady Fingers especially in NSW – ruins the whole bunch with a bad taste. Pinched fingers have a negative affect on fruit marketing. May affect Cavendish as well. Not much R&D has been done on this and more is needed.
Low		
Anthracnose- in crop	*Microdochium* black end (*Colletotrichum musae*)	
Black tip	*Deightoniella torulosa*	
Fruit spot – *Deightoniella*	*Verticillium spp.*	
Leaf spot - cordana	*Deightoniella torulosa*	Rare in NQ. Linked to crop hygiene
Ripe fruit spot (post harvest)	*Gloeosporium spp.*	
Squirter (post harvest)	*Nigrospora musae, Nigrospora sphaerica*	
Erwinia	*Erwinia spp.*	Erwinia- a minor intermittent problem –QLD: it enters the plant through the top. NSW: enters the plant through the base because of wounds caused by beetle borer.

Disease Control Options:

Anthracnose, AND Crown rot, and other post harvest diseases

- **Prohloraz 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 Perchloras currently being used.
  Action: Make an Enquiry to APVMA to see if there is any issue with using Perchloras 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.
- **Adepidin (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.

Peter Trevorrow and Kathy Grice (DAF Mareeba) are looking at sanitisers for control of crown rot which may be easier than using other chemicals. There are two different diseases for crown rot (cool weather and hot weather) therefore we need to have two suites of chemicals for effective control.

Fruit Speckle

- **Metiram (Gp M3)** is registered in all states but not for use in bananas- It could be an effective fungicide but is the same Gp as Mancozeb which is already available in the banana industry but 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 not from above or they will be ineffective. Generally this disease is incidentally controlled with yellow Sigatoka treatments.

- **Propiconazole(Gp3**) Tilt offers incidental control when being used to control yellow Sigatoka.

Note Pyraclostrobin (a systemic) now has to be mixed with other contact fungicides to be effective.

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 Permits in place for future exotic pests and disease incursion. 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 incursion.

Yellow Sigatoka.

- **Luna** (Fluopyram, Gp 7) has been registered for bananas since the SARP was prepared. It is being used and working well.
- ***Bacillus subtilus*** Bayer is registering as biofungicide for yellow Sigatoka control – this would be safe for 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
Banana Scab moth	*Nacoleia octasema*	
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*	
Moth Banana scab	**Nacoleia octasema**	**A big problem in NQ – affects the appearance of the fruit.**
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 temps 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 –** Needs 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 run off of soil and nutrients.
This needs R&D but it may not be a chemical solution. It currently isn't 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, curcubits, 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 Chloropyrifos (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)** 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.
- **Oxymal (Gp 1A) 'Vydate'** Dupont - is registered in all states and available for control of nematodes (burrowing and spiral) and weevil borers in bananas (but there is no supply).
- **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 orr 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)

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Appendix 1
Possible alternative chemicals for 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)