Hort Innovation

Final Report

Capacity Building, Information, Technology and Extension for the Australian Mango Industry

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Delivery partner:

Australian Mango Industry Association Ltd

Project code:

MG13017

Project:

Capacity Building, Information, Technology and Extension for the Australian Mango Industry – MG13017

Disclaimer:

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Content

Content 3
Summary 4
Keywords 6
Introduction 7
Methodology 9
Outputs 11
Outcomes 18
Monitoring and evaluation 20
Recommendations 23
Refereed scientific publications 24
Intellectual property, commercialisation and confidentiality 25
Acknowledgements 26
Appendices 27

Summary

The project MG13017 Capacity Building, Information, Technology and Extension for the Australian mango industry commenced 20 June 2014 and finished 31 March 2018. The objective of the project MG13017 was to manage a range of activities and services aimed at improving the profitability and long-term sustainability of the Australian mango industry. Key industry stakeholders (the target audience) include growers (levy payers), retailers, wholesalers, industry organisations, researchers, industry media and federal and state government departments.

The project activities were guided by the mango industry strategic plan. This project initially had five key areas of focus; industry development, crop forecasting, communication, extension and biosecurity. As a consequence of a project mid-term review and an internal Hort Innovation review, the communication components of this project were separated and developed into an industry communication project, MG15006 Mango industry communication program 2016-2017, commencing 1st February 2016. Consequently, the projects focus key areas of activity were industry development, crop forecasting, extension and biosecurity.

The project utilised resources, skills and expertise both within and outside of the Australian Mango Industry to deliver relevant information on topics such as; research and development (R&D), marketing and promotion, market development and access, and biosecurity.

Key activities included:

- Collation of crop forecast prior to season commencement in each of the key regions.
- Collation of weekly crop flow during the mango season.
- Industry meetings with growers, wholesalers, retailers, cross-industry.
- Export application facilitation - including on-line crop monitor training, collection, review and collation of applications, audit co-ordination with Department of Agriculture and Water Resources (DAWR) and relevant parties.
- Biosecurity preparedness through participation at meetings and workshop Darwin, NT.
- Project co-ordination, liaison and written communications compilation.

Key outputs included:

- Written communications including a quarterly magazine style publication *Mango Matters*, a weekly in-season e-newsletter *My Mango* and a monthly out-of-season e-newsletter *The Slice*; AMIA Activities; website; other publications as required. (Please note: This component was removed from the project from January 2016 into MG15006)
- Grower meetings, held in key production regions on a minimum of twice yearly basis and as required to address tactical issues (such as biosecurity issues). In addition, one regional grower workshop (1/2 day to 1 day) is held in each major production region (three in total).
- Wholesaler meetings, three meetings held in Brisbane, Sydney and Melbourne which account for over 90% of sales. These are conducted at the commencement of each season to highlight R&D findings particularly in regard to supply chain handling practices; communicate marketing activities and encourage participation at a business level.
- Retailer meetings, two retailer meetings are held with the major supermarkets (Coles and Woolworths). These are conducted at the commencement of each season to highlight R&D findings particularly in regard to supply chain handling practices; communicate marketing activities and encourage participation at a business level.
- Grower field days, to be managed by the Industry Development Manager (IDM) and field personnel to demonstrate and extend R&D findings and practically demonstrate benefits and methods of implementation either on-farm or in the supply chain.
- Cross sectoral learning, the potential for international travel by the IDM to learn from other sectors of the industry for the benefit of Australian mango growers.

- In addition to the meetings and workshops, this project delivers a blended extension program with budgetary limitations and able to reach the majority of the Australian industry (by production and individual basis). This blended delivery includes:
    - 1 to 3 short videos on high priority production/supply chain issues per year (Removed January 2016 into MG15006)
    - 3 webinars, or similar communication methods per year (Removed January 2016 into MG15006)
    - An improved and more interactive website and electronic media delivery.
    - Other materials, production of best practice guides and manuals.

Key outcomes included:

- Ensuring the overall range of program activities coordinated and managed effectively.
- Working with growers in key regions to undertake field demonstration trials to expose growers to current national and international crop manipulation technology; crop nutrition and canopy management.
- Working with growers to assess current production practices and to deliver improvements in production practices.
- Working with growers and packing sheds to assess current picking and post-harvest handling practices and look for areas of improvement in regard to fruit quality.
- Ensuring effective extension of industry R&D through organising and facilitating workshops, field days, study tours and mango focused events.
- Improving domestic and export market access and market development critical in lifting industry profitability.
- Ensuring access to information, leading to the increased uptake of new knowledge and technologies across industry—with the objective of improving grower profitability.
- Ensuring the delivery of accurate and timely information, ensuring all Australian mango growers and others through the supply chain have equitable access, to the most up to date information on production, post-harvest and market practices and issues.

Keywords

Australia; biosecurity; communication; crop flow; crop forecasting; domestic; export; industry development; mango; mango growers; markets.

Introduction

During the program, there were several project leaders due to staff changes. Industry Development Manager Trevor Dunmall managed the project from June 2014-June 2017, CEO Robert Gray with the support of Supply and Communications Manager Jessica Mitchell, managed the project from June 2017-August 2017 and Industry Development Manager Samantha Frolov managed the project August 2017-May 2018. Industry Development Manager Samantha Frolov compiled this report.

The MG13017 Capacity Building, Information, Technology and Extension for the Australian mango industry commenced in June 2014 and was due to finish in December 2017, however the project was extended by Hort Innovation until March 2018.

An independent mid-term review of the project MG13017 was conducted during 2015 to assess and measure industry adoption and what impact the project was having on different industry sectors. The review also looked at the extension component of the project and assessed the value of this component of the project. The review had multiple recommendations; those concerned with the communication component were that extension activities were difficult to distinguish from those of communication in the project documentation. Therefore, it was decided through internal processes to separate the communication component from the industry development activities within MG13017.

Mangoes are grown in many countries in tropical and sub-tropical regions throughout the world. The majority of world production occurs in developing countries, through central and South America, southern Asia and Africa. Australia is one of the few developed countries to have a significantly developed mango industry.

The Australian industry is located predominantly in northern Australia with 95% of production coming from north of the Tropic of Capricorn. The major production regions are the Darwin and Katherine regions in the Northern Territory and Mareeba/Dimbulah and Bowen/Burdekin regions in Queensland. Smaller but significant production occurs in the Kununurra, Carnarvon and Gingin region of Western Australia; Rockhampton and Bundaberg regions in Queensland and northern New South Wales. Several growers are now producing mangoes in the Mildura region in northern Victoria.

The Australian Mango Industry comprises of approximately 800 growers, a wide cross section of wholesalers and many food retailers, including larger retailers, through to specialist green grocers and many family operated businesses. Production businesses range in size and produce varieties unique to Australia. While the industry was dominated by the Kensington Pride variety, believed to have originated from India, over the past 25 years the range of new Australian bred varieties, such as R2E2, Calypso and Honey Gold, have increased in production and now produce significant volumes through the season. Other international varieties, such as Keitt, Kent and Palmer are grown, mainly in Queensland. New varieties, either bred in Australia, or introduced from other breeding programs are being trialed to evaluate the commercial viability.

While many of the challenges that face the industry are common across many horticultural enterprises, mangoes face several unique challenges. These include distance to market, the need for more research in areas from production through to post harvest, the need for improved accurate and timely information through a very short harvest season, and the need for increased management tools for issues such as crop nutrition, canopy management and pest and disease management.

The Australian mango industry is spread across wide areas of production meaning the delivery of information, technology and research outcomes is challenging. In conjunction with this, the industry comprises of growers and other industry members with a diversity of cultural backgrounds. In major production regions, a network of existing information networks exists (e.g., through other growers in their own region as well as other regions, local resellers, consultants and Government Department staff). These networks are less reliable in other areas. The resourcing of extension staff within State and Territory Departments of Agriculture/Primary Industries has declined in recent years.

Traditionally, the mango harvest season commences in August/September and runs until February/March. Although there are mangoes harvested outside of this production period, 90% of production occurs during this period. The Australian Mango Industry is also characterised by seasonal fluctuation in supply and peaks in supply during the season when demand does not match supply. Delivering strategic communication to key industry stakeholder both in and out of season is important to ensure information is disseminated effectively.

Project MG13017 uses the Mango Strategic Investment Plan 2014 as the basis for its key activities. The strategic plan has three principal objectives, with the aim of increasing grower profitability by 20% during the life of the project.

The three objectives, with strategies are:

1. Increase average profit per tonne of fruit sold by 20% by 2018/19 by ensuring a consistent and sustainably - grown supply of quality Australian mangoes that meets customer and consumer needs and expectations
    1.1 Continuously improve the effectiveness and efficiency of mango production systems
    1.2 Improve packhouse and supply chain practices
    1.3 Implement appropriate information systems and risk management strategies to underpin supply
2. Increase average profit per tonne of fruit sold by 20% by 2018/19 by increasing demand for Australian mangoes.
    2.1 Investigate market development and product improvement opportunities
    2.2 Drive growth in targeted domestic and export market segments through product improvement and effective market development
    2.3 Increase consumer confidence in Australian mangoes through managing product issues effectively
3. Increase average profit per tonne of fruit sold by 20% by 2018/191 by ensuring the Australian mango industry has appropriate relationships and resources to effectively manage industry development and build industry capacity
    3.1 Facilitate industry development activities to deliver improved outcomes for industry and industry investors
    3.2 Develop appropriate leadership, structures and resources to provide sound industry stewardship
    3.3 Ensure the industry has appropriate resources / risk management strategies to function effectively

This project (which continued on from MG10016 Capacity Building project) activities are guided by the industry strategic plan. This project has five key areas of activity:

1. Industry Development
2. Crop Forecasting
3. Communication
4. Extension
5. Biosecurity

Many of the activities within the five activity areas are connected. The activities of this project also link closely with other industry projects, including:

MG14504 Mango quality standards
MG15002 Quality standards, refinement and testing
MG15003 Data collection to facilitate supply chain transparency (Stage 3)
MG15004 Exporting mangoes – United States of America
MG15006 Mango Industry Communication Program 2016-2017
MG16001 The 11th Australian Mango Conference

Methodology

The MG13017 Capacity Building, Information, Technology and Extension for the Australian mango industry project aimed to improve the delivery of information and services, and benefits to growers and other stakeholders in the mango industry. The program assisted in a coordinated whole of industry approach, with a focus on key areas aligned with the industry strategic plan. This strategic plan was prepared by the Australian Mango Industry Association (AMIA), the national peak body for Australia's mango industry. Its purpose was to provide a framework for industry growth and development. AMIA facilitated the development of the strategic plan and together with Horticulture Australia Ltd. (HAL), had responsibility for its implementation.

The strategic plan was prepared against a background of influences, principal among them:

- The challenge to maintain product quality right along the supply chain – thus minimising wastage at retail level and maximising consumer satisfaction.
- An industry with a strong regional structure and those regions with their own production and market drivers.
- Acknowledgement that the industry, while it has both Marketing and Research and Development levies, has very limited resources to undertake activities and so must focus on issues of greatest need and impact.

This project underpinned a wide range of activities which were designed to address the industry development needs of the Australian mango industry. The key areas of activity within the project included industry development, communication (later moved into its own project MG15006), crop forecasting, and biosecurity.

Mango extension utilised the resources, skills and expertise currently within the mango industry and seek out selected skills outside the industry to deliver relevant information on new and existing technologies that benefit the Australian mango industry, including growers, throughout the supply chain. Service providers include State and Territory Departments of Primary Industry, commercial consultants, other research agencies, agronomists and horticulturalists from resellers and others who can provide targeted information relevant to improving the profitability of all sectors of the mango industry.

Mango communications focused on continued improvement of communication with all sectors of the industry, including print and electronic communications. It included the electronic publications of *My Mango* and *The Slice* publication of *Mango Matters* and AMIA Activities, management of the Mango website and a contribution to grower field days / workshops and wholesaler workshops. In relation to the industry need above, communications will have a focus on: industry engagement; industry understanding of factors that impact productivity and quality; and ensuring the industry understands the how improved production and supply chain management practices can be applied to achieve improved outcomes.

(Please note; this component was removed from the project as of January 2016 into MG15006).

Crop Forecasting included the establishment of a national crop forecasting system and the development of a crop flow system, providing all sectors of industry with current and accurate information on the timing of harvest for each region as well as the volumes of product (trays) being shipped to markets on a weekly basis during the season. While the mango season stretches from September to March each year, seasonal climate and weather patterns can influence the timing of the harvest for each region and also the volume of harvest. Accurate crop forecasting is important as it provides industry participants with an objective assessment of when the harvest will commence in each region and allows them to plan for the season. This information is used by many sectors of the industry, from on farm service providers (e.g. carton manufacturers, labour hire companies) to the wholesale and retail sector. This is especially important for large retailers when planning their category management and marketing programs.

Providing estimates of volumes for each region allows sectors, such as transporters, wholesalers and retailers to be better prepared when they have knowledge of what volumes to anticipate. The system is now being used by the majority of larger production enterprises as well as medium to small production enterprises as a guide to harvest periods. 80% of the larger mango production enterprises (more than 20,000 trees) have contributed to and utilise the information provided by the crop forecasting system. An estimated 60% of other commercial enterprises

(1,500 to 20,000 trees) view the crop forecasting information (based on feedback at grower meetings).

The information from this system is being used by Australia's major retailers to better implement their category management programs and timing of targeted marketing campaigns. During the first season of this project 2014/15, retailers adjusted marketing campaigns based on information received from the industry crop forecasting system. Retailers have continued to rely on the weekly updates from AMIA to guide their seasonal marketing campaigns and communications to staff and consumers. For example, in season televised *Fresh market* updates.

Mango biosecurity focused on activities aimed at sustaining and improving the industry's preparedness to manage exotic pests and diseases. Having a professionally developed biosecurity plan provides the industry with tools and processes to follow in the event of a pest or disease incursion. In addition, an orchard biosecurity manual provides information to growers on biosecurity issues and raises awareness throughout industry on issues and how to be better prepared to manage pest or disease incursions. During the period of this project, the IDM coordinated industry response to biosecurity incursions, including participation in meetings with the Consultative Committee on Exotic Plant Pests (CCEPP) and Scientific Advisory Panels (SAP). This included SAP meetings related to Mango Malformation disease as well as several CCEPP meetings on Mango Malformation.

Export

This project has acted as a communication and liaison vehicle between industry and DAWR Market Access. The industry focus has been on both gaining access to new markets, improving current protocols and developing existing markets. Holding export workshops provides key industry participants (growers, exporters, researchers, Federal, State and Territory Government staff) an opportunity to openly discuss challenges and opportunities for the development of the export markets for fresh Australian mangoes. These annual workshops led to a greater understanding of the issues impacting on market access and the development of phytosanitary protocols.

Program Management

This project has provided the industry with the ability to communicate and liaise on the wide range of activities within the mango industry, Hort Innovation and other Federal, State and Territory Departments of Agriculture/Primary Industries. This not only includes mango levy funded activities, but activities and research projects funded through other sources, such as the Australian Centre for International Agricultural Research (ACIAR), Hort Innovation staff and others in the industry to assist develop and deliver activities that are beneficial to the industry.

Outputs

This project delivered key activities which included:

- **Pre-season workshops** over the life of the MG13017 project were attended by over 500 growers and stakeholders through the major mango production regions.
- Events such as regional post-harvest meetings in key production regions as well as wholesale markets.
- **Relevant and timely communication** with all sectors of industry, including *Mango Matters* (quarterly), *The Slice* (monthly – out of season) and *My Mango* (weekly- during the season).
- **Crop forecasts and crop flow information** published on a weekly basis throughout each of the mango seasons for the duration of the project between 2014/15 to 2017/18. This provided the industry with prior knowledge of the timing of harvest for each main production region as well as estimates of production volumes. This allowed greater planning in preparation for the season for all industry participants.
- **Export application facilitation** - including on-line **crop monitor training**, collection, review and collation of applications, audit co-ordination with Department of Agriculture and Water Resources (DAWR) and relevant parties.

This project also interacted with a range of other projects and activities, including:

- An awareness and alertness of biosecurity issues. The Australian mango industry, in partnership with State, Territory and Federal Governments, has managed incursions of Mango Malformation disease, and remained alert for potential incursion of pests such as Red Banded Mango Caterpillar and Mango Leaf Gall Midge.
- Improved access to crop protection products, such as Scholar, Actara, and chemicals that have been under review, such as dimethoate and fenthion. This project contributed to crop protection for Mango Seed Weevil control. In 2016, APVMA requested the withdrawal of the Minor Use Permit of the product Actara® (250g/kg thiamethoxam) due to concerns over the efficacy of the recommended use rate and concerns over potential off-site movement of the product. Sumitomo had been undertaking research in mangoes on the product Shield™ (200 g/L clothianidin) for control of mango seed weevil in mangoes for several years. Working with Sumitomo, AMIA developed an emergency/minor use permit which was submitted to APVMA. For industry it was important to have an effective control product for mango seed weevil, as seed weevil in endemic throughout Queensland, the Darwin region of the Northern Territory and New South Wales. It was also critical for growers exporting to countries with specific phytosanitary protocols pertaining to mango seed weevil they have access to a product appropriate for the control of seed weevil. APVMA reviewed the permit application and granted the permit in May 2017.

Preseason Industry Workshops

A series of pre-season workshops were held in each key production region during the period August to November of each of the mango seasons for the duration of the project between 2014/15 and 2017/18. The workshops presented information on a range of topics and provide the opportunity for questions and feedback. The audience at the meetings consisted of growers, wholesalers, exporters, government research and extension staff and rural supplier staff.

The content of each workshop, while tailored for the audience in each region, had similar core topics including:

- The season crop forecast
- The benefits of contributing to crop forecasts and crop flow dispatch data
- Processes to collect crop flow dispatch data
- Objective reporting
- Planned marketing and promotion
- Social media
- Industry export performance

The 2017/18 workshops were held in the following regions and the approximate attendance included:

Venue	Date	Attendance

Katherine	15 August	36 recorded (headcount 45)
Darwin	16 August	34 recorded (headcount 55)
Bowen	25 September	31 recorded (headcount 40)
Ayr	26 September	22 recorded (headcount 32)
Mareeba	28 September 2017	53 recorded (headcount 77)
Benaraby	16 November 2017	28 recorded (headcount 31)
Canningvale	24 January 2018	24 recorded

Picture: *Attendees at the 2017/18 Mareeba pre-season roadshow*

Further to the preseason grower workshops, other (post-harvest) meetings were conducted.
An example of such meetings includes the Grower bus tour which was held in association with a Mareeba grower meeting and was preceded by a bus tour of several research sites. The research tour was organised in conjunction with the local QDAF staff. The tour visited the following orchards/research sites:
Matt & Jess Fealy's orchard (Mareeba)
- Efficient farming project - irrigation and nutrients (Trevor Parker, Northern Gulf RMG)

Adrian and Alfina Zugno's orchard (Mutchilba)
- Building soil health and better nitrogen management (Geoff Dickinson, QDAF).
- Integrated pest management for fruit fly and spotting bugs (Pat O'Farrell, QDAF)

Raimond Bin's orchard (Mutchilba)
- Understanding tree architecture to maximise productivity (Paula Ibell, QDAF).

25 people participated in the bus tour. These included growers, wholesalers, QDAF staff and local produce merchant staff.

A conference field day featured a series of presentations on the following topics:

Magpie Geese – challenges and future research	- **Warren Hunt** – Northern Territory Department of Primary Industries and Fisheries - **Mike Lawes** – Charles Darwin University - **Keith Saalfeld** – Northern Territory Department of Primary Industries and Fisheries - **Han Siah**- Mango grower and Nuffield Scholar
Resin Canal Discolouration – cause, effect, management, future research	- **Andrew Macnish** – Queensland Department of Agriculture and Fisheries - **Cameron McConchie** – Northern Territory Department of Primary Industries and Fisheries
Mango quality - **Challenges with transporting mangoes** - **How to reduce under skin browning** - **Mangoes that fail to de-green** - **Measuring Dry Matter**	- **Peter Hofman** - Queensland Department of Agriculture and Fisheries - **Terry Campbell** - Queensland Department of Agriculture and Fisheries
Pollination in your orchard	- **Romina Rader** – University of New England
Mango small trees **New mango varieties**	- **Ian Bally** - Queensland Department of Agriculture and Fisheries - **Ian Bally** - Queensland Department of Agriculture and Fisheries - **Jodie Campbell** - Queensland Department of Agriculture and Fisheries - **Bob Williams** - Northern Territory Department of Primary Industries and Fisheries
Managing fruit fly in the orchard – orchard freedom, non-host status, lures	- **Austin McLennan** Northern Territory Department of Primary Industries and Fisheries - **Bob Williams** – Northern Territory Department of Primary Industries and Fisheries - **Peter Leach** - Queensland Department of Agriculture and Fisheries
Mango crop manipulation – adjusting your flowering to manage your harvest	- **Cameron McConchie** - Northern Territory Department of Primary Industries and Fisheries

During 2015, the IDM organised a workshop on pest incursion management. Stephen Dibley, Program Manager (Training and Biosecurity Preparedness) with Plant Health Australia provided mango industry leaders with pest incursion scenario training. The training took the meeting participants through a pest incursion scenario, the roles and responsibilities of each stakeholder or stakeholder group (e.g. Plant Health Australia, State and Territory Governments, industry bodies) and discussed potential actions and consequences. Meeting participants found the scenario training invaluable as it provided a greater depth of understanding of how pest and disease incursion are managed.

National mango industry quality standards

Australian Mangoes worked with growers and packing sheds to assess current picking and post-harvest handling practices and look for areas of improvement in regard to fruit quality. The previous IDM in conjunction with Noel Ainsworth (QDAF project leader MG15002) developed a new mango defect poster (currently available in hard copy and online at http://www.industry.mangoes.net.au/resource-collection/mango-defect-guide-2016) and the collection of new mango defect images align with the new standards. These images have been used in new quality standards posters after sourcing the correct images from existing QDAF image library and by photographing new images. To ensure that growers and key industry stakeholders were aware and have access to the new industry standards; including retailer updates on their alignment with the uniform industry quality specifications, these were distributed to growers via industry publications. Printed versions of the standards were presented at each of the pre-season grower workshops and during on farm visits in 2017. These uniform quality specifications have been accepted and adopted by major retailers through quality testing at centres. Key retailers spoke at regional workshops how dry

matter (NIR) maturity testing would be part of the standard quality process at distribution centres and ripening facilities in their decision making on quality acceptance. AMIA previously worked with retailers on updating their specifications to align with 2016 Mango Industry Quality Standards.

Ensuring the delivery of accurate and timely information, ensuring all Australian mango growers and others through the supply chain have equitable access, to the most up to date information on production, post-harvest and market practices and issues.

- Mango industry communication activities were delivered in an accurate and timely manner. For example, one survey respondent said that, "(the) email comes through, (it's) relevant happening right there and then, (and I) don't need to go looking for the information."
- *My Mango,* the weekly in-season e-newsletter, was produced on a weekly basis during the 2015/16 (end of season only applicable to this reporting period), 2016/17, and the 2017/18 mango season.

Due to the harvest season starting at different times each year, the number of editions is somewhat variable each season, however it is usually distributed between August and March on a Tuesday. It is distributed to approximately 1,000 industry stakeholders and is also hosted on the industry website. The e-newsletter reports on the crop forecast (part of MG13017), provides regional reports on how the harvest is progressing in each key production region, features objective (quality) reporting and weekly wholesale prices (part of MG15003). It also provides regular updates on industry marketing and PR, but these articles are usually shorter than the ones that appear in the magazine. Events, industry opportunities and relevant news are also shared via this platform.

- *The Slice,* the monthly out-of-season e-newsletter, was distributed once a month during the off season (depending on content) during 2016, 2017 and 2018 (April and May only applicable for this reporting period). It is released to the same database that subscribes to *My Mango. The Slice* focuses on keeping the industry engaged out of season and shares information on events, industry opportunities and relevant news; such as chemical updates.

  Copies of *The Slice* can be found at: https://www.industry.mangoes.net.au/the-slice/.

- The website (http://www.industry.mangoes.net.au) and database have been maintained and reviewed regularly, with new material loaded onto the website as and when required. Industry website analytics provided in measurement and evaluation section.

- Six webinars (web meetings) were organised on a variety of topics. The table below provides a summary of the webinars conducted. It should be noted that there were more participants registered for most webinars than dialed into the meetings. Where participants were not able to join, they were sent copies of slides afterwards. Two webinars were also recorded and uploaded to AMIA's YouTube channel to extend the reach of these meetings (YouTube views are noted below).

Date / time	Topic Presented	Presenter/s	Target Audience	Participants
Thursday 22 June 2017, 1pm-2pm	Preparing to export to markets with specific on farm phytosanitary requirements	Trevor Dunmall - AMIA	All key industry stakeholders	1* Due to lack of interest, this was conducted as a telephone call instead.
Wednesday 28 June 2017, 1pm-2pm	Freshcare: Quality Assurance –Update and Outlook	Clare Hamilton-Bate– Freshcare	All key industry stakeholders	8
Wednesday 14 February 2018, 3pm-3.40pm	GS1—DataBar	Melanie Wishart—GS1	All key industry stakeholders	7
Thursday 15 February 2018, 3pm-3.40pm	GS1—DataBar	Melanie Wishart—GS1	All key industry stakeholders	6 (Also recorded 22 views)

Wednesday 21 February 2018, 3pm-4pm	Update on HARPS	Belinda Millard / Tristan Kitchener—HARPS project team	All key industry stakeholders	11 (Also recorded 24 views)
Thursday 12 April 2018, 3pm-4pm	National Mango Breeding Program	Samantha Frolov—AMIA, Ian Bally —QDAF, Ben Reilly—Steritech	All key industry stakeholders	18

- Three Best Practice Guides were developed and are provided on the industry website (links provided below):
  - **Understanding crop nutrition - a guide for Australian mango growers** was developed with a focus on new mango growers and new orchard managers who need a guide to crop nutrient requirements and the most appropriate timing of fertiliser application.
  - Export market requirements – a guide for Australian mango growers and exporters was developed to provide growers, exporters and importers with information that will assist them with understanding export market requirements for the range of target countries. It is the first guide specifically developed for the mango industry. Ensuring access to information, leading to the increased uptake of new knowledge and technologies across industry—with the objective of improving grower profitability. Information about emerging technologies was a focus of several activities produced as part of the mango industry communication program. For example the article 'Monitoring the temperatures of your fruit—what system to use?' discusses the technology available to exporters.
  - **Using the Felix F-750 Produce Quality Meter – a guide for users** was developed to facilitate the adoption of the Felix F-750 Produce Quality Meter as a tool to non-destructively measure mango dry matter in the orchard, packing shed and market. The meter provides the user with the ability to quickly measure dry matter without destructive sampling. This system replaces the traditional method of cutting and weighing a sample of flesh, drying the sample and weighing again to calculate dry matter. Information was delivered through multiple mediums, aiming to lead to the increased uptake of new knowledge and technologies. For example NIR technology was widely promoted in publications and a best practice guide was developed to assist growers with using the technology themselves. NIR technology aims to give growers a tool to assess their dry matter (one of the indicators of fruit maturity). By using this tool (alongside others), growers can pick fruit at the right time, leading to an increase in fruit quality and ultimately profitability.
- Six videos were created as part of this project and can be accessed on the industry website and also AMIA's YouTube channel (links provided below):
  - Sprayer calibration and Sprayer application were created to allow growers who were unable to attend the orchard sprayer calibration workshops see the presenter (Dr David Manktelow) demonstrate the key aspects of calibration and application for orchard sprayers. This was a two part video due to the duration.
  - Four videos were produced from the 11th Australian Mango Conference, providing key industry stakeholders who couldn't attend an opportunity to watch some of the presentations. The first video discusses mango marketing and growing demand. The second video discusses understanding the application of new technology in the orchard and packing shed. The third video discusses mapping horticulture tree crops in Australia. The fourth video discusses managing magpie geese. Video links can be accessed below:
    - Mango Conference—Treena Welch, Robert Gray and Elisa King.
    - Mango Conference—Jesse Reader Bosch.
    - Mango Conference—Craig Shephard DSITI.
    - Mango Conference—Amelie Corriveau CDU.

Crop forecasts and crop flow information published on a weekly basis through the season.

Comparing the response from the 2015/16 season to the 2016/17 season:

The number of growers participating in the crop flow system has increased by 21%, from 71 growers in 2014/15 to 86 growers in 2017/18. Much of this increase is due to growers from the Gingin region of southern Western Australia. In other regions, the number of contributing growers has remained steady, with some small variations due to a range of factors including several growers contributing for the first time in 2015/16 and the sale of some orchards. Growers contributing to the system account for over 85% of Australian production.

Improving the crop-forecasting systems has been a priority of the project and the MG13017 Capacity Building project Stage 2 reinforced the importance of having an accurate, industry supported and well-resourced crop forecasting system. It should be highlighted however there has been significant improvements over the duration of the project. The time and cost to secure the remaining 5-10% of the data would not justify the output.

Appendix One highlights the crop forecast information for 2017/18 season.

Export application facilitation

During 2015, AMIA took a greater role in export development. In association with the Department of Agriculture and Water Resources (DAWR), the Queensland Department of Agriculture and Fisheries (QDAF) and the Northern Territory Department of Primary Industries and Fisheries (NT DPI&F) AMIA worked to facilitate increased grower and exporter involvement in targeted export markets, in particular markets with strict phytosanitary protocols.

- Improving domestic and export market access and market development critical in lifting industry profitability.

  Guide produced for Australian Mango growers and exporters

Crop Monitor training was delivered in key production regions throughout Australia for growers and crop monitors targeting China, Korea and the United States of America.

The venues these training sessions were held were:

Darwin

Tuesday 21st June. 1.00pm Berrimah Research farm, Vet laboratory (enter Berrimah farm and turn left on first road on left, travel passed John English Building. Vet Lab meeting room at end of this road).

Mareeba
Tuesday 19th July, 9.00am to 11.00 am
QDAF offices, Peters Street, Mareeba

Bowen
Wednesday 20th July, 9.00am to 11.00am
QDAF Research Station, Bowen.

Ayr
Wednesday 20th July, 2.00pm – 4.00pm
QDAF, Ayr Research Station, Old Claire Road, Ayr

Bundaberg
Friday 22nd July, 9.00am – 11.00am
QDAF, Kalkie Research Station, Ashfield Rd, Bundaberg

DAWR required that the crop monitor training was delivered by suitably qualified and experienced people.

Northern Territory: Delivery was undertaken by Mr Bob Williams, Director Plant Industry Development, Department of Primary Industry and Fisheries.

Queensland: Delivery of training was initially undertaken by Mr Geoff Dickinson, Senior Horticulturist, Department of Agriculture and Fisheries (early pre-season training)

Late pre-season training was undertaken by the Trevor Dunmall, Industry Development Manager.

Outputs during this project included:

- Co-ordination of quarantine inspectors from Japan, Korea and the United States of America
- Co-ordination of growers, exporters, treatment facility operators and suppliers exporting to the USA (in

conjunction with the Northern Territory Department of Primary Industries and Fisheries – NT DPI&F)

- In conjunction with the treatment facility operator, prepare a guide to export to the USA for growers, exporters, crop consultants and other stakeholders
- Linking growers and exporters to the DoAWR plant export division for orchard and packing house approval
- Facilitating crop monitor and grower training for approval to export to China, Korea and the USA.

Crop monitors training for 60 growers and crop monitors planning to be involved in export to key markets (markets with specific phytosanitary requirements – China, Korea and the United States of America).

Table 1 lists the venues the training was delivered and the number of growers/crop consultants attending each session.

Table 1. Crop monitor training attendance – China, Korea, USA

Date	Venue/region	No of crop monitors/growers
Monday 6th July	Darwin NT	10
Tuesday 7th July	Katherine NT	6
Wednesday 8th July	Mareeba Qld	20
Thursday 9th July	Bowen Qld	12
Wednesday 22nd July	Rockhampton Qld	3
Thursday 23rd July	Bundaberg Qld	6
Tuesday 4th August	Ayr Qld	3

As an integral component of each training session, each participant was required to complete a questionnaire on the training before they were recognised as successfully completing the training. The names of the participants who successfully completed the training were supplied to DoAWR as the training is a requirement of the orchard/packing shed audit which is undertaken prior to the orchard gaining DoAWR approval for export.

With the US market, industry worked collegiately with growers, exporters and the treatment facility operator to facilitate a coordinated approach to exporting to this market. This coordination included a weekly teleconference with participating growers, exporters and other stakeholders (e.g. packaging suppliers). These teleconferences were chaired by NTDPI&F Market Development Officer, Michael Daysh, who played a key role in the US market development activities. Michael also lead the project MG15004.

Outputs of the activity include:

- A guide for exporting to the United States
- Crop monitor training for the US
- Crop monitor training for China/Korea

The export guide is located within the Australian Mangoes website under the resource section. A link is emailed to new growers who wish to export each season. Other key links relating to export markets are also emailed to new exporters. These links are listed below.

An Industry Advice Notice is published each season updating growers of the following:

We advise the mango and lychee industries that applications are now open for growers to nominate orchards/blocks and packhouses for mango and lychee exports to the USA, and mango exports to China, Japan and Korea for the relevant season.

All previous Plant export industry advice notices are available on the Department of Agriculture and Water Resources websites.

For specific market requirements, refer to the relevant work plan and protocol in the documents section of the MICoR Plants website.

To remain registered, Crop monitors must review the course material and successfully complete the online training course for mangoes each year.

Outcomes

This project had a primary focus on supporting the adoption of research and development as well as communicating with all sectors of industry on all aspects of industry development. Key outcomes facilitated by the mango industry program aimed to ensure key industry stakeholders were well informed and armed with reliable industry data, so they could feel empowered to make more effective decisions and support the strategic vision for the industry. The project focused on ensuring industry understands and knows how to support the industry's programs; understands the factors that impact productivity and quality; understands the improved production and supply chain management practices and how they can be applied to achieve improved outcomes; and ensuring the industry understands and knows how to access information and obtain required knowledge The project managed a range of activities and services and aimed at improving the profitability and long-term sustainability of the Australian mango industry.

This project, and through linkages to other projects and activities, has been instrumental in delivering a range of outcomes for the industry.

Overall, the project held 27 preseason industry workshops (roadshows), 15 (other) workshops (including crop monitor training, post-harvest), 19 field days, 12 retailer/wholesaler meetings (3 states) and 9 webinars.

Pre-season workshops

The attendance at preseason roadshows for this project:

Roadshow Attendance by Region	2014/15	2015/16	2016/17	2017/18
Darwin		60	72	20
Katherine		12	46	45
Mareeba/Dimbulah		32	30	59
Ayr		21	19	27
Bowen		24	19	36
SEQ (Bundaberg/Benaraby)		20		28
Gingin (Perth)	n/a	n/a	n/a	28
Total Attendance	nil data	**169**	**186**	**243**

Crop forecasts and crop flow information

Crop forecast participants summary:

Crop Forecast Participants	2014/15	2015/16	2016/17	2017/18
Darwin	10	12	16	15
Katherine/Mataranka	10	8	5	4
Kununurra	-	-	-	7
Bowen/Burdekin	19	18	14	15
Mareeba/Dimbulah	20	23	15	16
SE/Central Qld	12	14	10	14

Gingin	-	11	7	7
Cross Regional (growers with farms across multiple regions)	-	-	-	3
Total participants	**71**	**86**	**67**	**81**

Refer to Graph 2014/15 to 2017/18 actual volumes including AMIA forecast 2017/18 in Appendix Two.

Crop Forecast versus actual levy data summary:

Regions Grower Forecast	**2014/15**	**2015/16**	**2016/17**	**2017/18**
Darwin	1,976,600	1,621,780	2,119,910	2,302,056
Katherine	1,849,700	1,287,653	1,281,439	2,576,929
Kununurra	204,500	123,000		428,158
Bowen/Burdekin	1,535,300	1,043,723	1,281,400	1,591,816
Mareeba/Dimbulah	2,679,400	1,688,503	1,023,937	2,220,286
Sth Qld NSW	283,650	277,980	547,902	824,781
Gingin		65,053	7,689	74,750
Forecast Total (7kg trays)	**8,529,150**	**6,107,692**	**6,262,277**	**10,018,776**
Actual Levy Data	**9,071,098**	**8,254,289**	**8,231,866**	**10,628,239**
Forecast versus Levy accuracy %	94%	74%	76%	94%

Monitoring and evaluation

Monitoring and evaluation was primarily conducted over the project lifetime via surveys, interviews and informal feedback received by key industry stakeholders. Overall results indicate that desired outcomes were achieved. There were a few recommendations from the evaluation collected which should be incorporated into the next mango industry building capacity program.

Overall results indicate that desired outcomes were achieved for the Capacity Building, Information, Technology and Extension for the Australian mango industry. There were a few recommendations from the evaluation collected which should be incorporated into the next mango industry capacity building project.

Pre-season workshops

There was a steady consistent increase in participation in regions for preseason roadshow attendance over the course of the project. From 2015/16 to 2017/18 we noted a 70% increase in participation at these events.

As part of the survey in 2018, 35 people participated in the online survey. The online survey was conducted during September, October and November 2017.

The results rate the preseason roadshows as 40% Very Good, 54% Good, 3% Average and 3% Poor with nil stating that they are Very Poor. Overall the feedback provided by participants was predominately positive and included;

“A great opportunity to meet Mango growers in the region.”

“Very interesting and informative.”

“Very well presented and attended.”

“Very informative with interesting information about the industry and the upcoming pick.”

“It was very educational for all parties and especially for my industry gaining a better understanding of benefits, challenges and opportunities that can help maximise opportunities and growth for the Mango industry.”

“Great information.”

“Undisguised promotion of higher levies without justification.”

“I know it’s difficult, but it would be a lot better if you could be on time or within 10 minutes.”

“Well organised, interesting topics, good mix of growers etc.”

“Enjoyable, informative.”

It should be noted the Australian Mangoes marketing manager and IDM visited regions in WA through season 2017/18. The feedback received after visiting these WA regions was to include them in next season preseason roadshows as well as in the forecasting data spreadsheet. It is our recommendation to include Kununurra, Carnarvon and Gingin region in the preseason roadshows for the next project.

Other workshops and meetings

Events such as regional post-harvest meetings in key production regions as well as ongoing wholesale markets meetings and weekly ‘work in progress’ with the major retailers and greengrocers has continued. Complimenting these meeting is the weekly communication of *My Mango*, which includes a copy of the weekly Crop Forecast and Flow data.

Relevant and timely communication with all sectors of industry, including *Mango Matters* (quarterly), *The Slice* (monthly–out of season) and *My Mango* (weekly-during the season).

Communication surveys were conducted in 2018 and results from these surveys can be viewed as part of the relevant project (part of MG15006).

The outcomes of these surveys which related to monitoring and evaluating the effectiveness of our communication channels including our publication My Mango, Mango Matter and The Slice and our website (http://www.industry.mangoes.net.au) as well feedback in relation to the webinars and videos can also be viewed in the relevant project report (MG15006).

The value in the communication flow including Australian Mangoes publications, namely the in season *My Mango* that includes the weekly Crop Forecast and Flow data update, assists retailers (as well as growers) with their seasonal promotional planning and is articulated in the retailer feedback below.

- *"My Mango is a terrific medium that engages the industry and includes useable information for retailers, cross referencing with feedback that we receive from key growers. This information helps us plan seasonal events including promotions, point of sale and more. All information and opportunities to engage the industry community across multiple platforms and includes all elements of the supply chain from grower through to consumer should be encouraged. The information provided is informative, timely and user friendly."*

- *"The 2017/18 Australian Mango season has proven to be a very successful one for Metcash and IGA. The planning out of our promotional package and sharing of information with our retailers was made simpler thanks to the information contained with the weekly My Mango email. From a category manager perspective, I was able to clearly articulate to our state teams what was taking place in the growing regions. The crop estimates forecast enabled us to plan our catalogues, with a surety that stock would be plentiful for those periods. Understanding and having clear visibility of what was happening within each growing region was again, an excellent communication tool to help us drive the right behaviors within our state buying teams and ultimately giving our retailers the confidence to support Australian Mangoes. The inclusion of dry matter and brix measurements was a key to better engagement with our suppliers to ensure we had the right fruit at the right time. With respect to the market pricing, it would be beneficial to get more information into this, as at times some of this pricing could be a little out of date or inaccurate. Having said all that, I look forward to next season and once again being able to draw on the exceptional content of information to help Metcash and IGA drive sales to a new high."*

- *"My Mango is useful for crop forecasting information to track forecast vs actual, so we can see the trend of what's coming to the markets. Objective reporting is useful to understand where maturity is across the market place and assists in looking at who's doing the right thing for maturity (for conversation with supplier not for ceasing their supply unless it continues). Also, good to look at the short descriptions about what's going on in each region (as in rain in Bowen stopped picking for a few days but will start again etc.) The Slice is good for knowing what's going on in regions and in the industry off season as a lot of things go on in growing regions that we wouldn't know otherwise, as we only visit during the season. Also, good for marketing updates on what's going on. Mango Matters provides information similar to the above. Good if you couldn't make events such as the biannual conference etc."*

- *"The AMIA market and information resources have provided guidance and support for both strategic and tactical activities to drive mango sales across the season. The weekly "My Mango" email assisted on a week to week basis with planning for the regional and varietal transitions across the season. The sharing of industry forecasts and consumer data assisted with total season set up planning and category review activities. In addition to this, having a central point for industry engagement was invaluable, both providing a forum for direct contact and feedback from growers at regional road shows, as well as connecting us with industry experts when we need technical advice. Thank you"*

Website

As part of monitoring and evaluation, the project team's recommendation is an upgrade to the industry website http://www.industry.mangoes.net.au that is to include a Best Practice Resource (BPR) which would be of tremendous value to growers and industry and should underpin the next program. The current / closest resource to a mango industry best practice manual or Best Practice Resource is the 'Mango Information Kit' (QDPI, 1999).

- In a communications survey conducted in 2018, 61% of survey respondents rated the website as very good or good. This is a good result but indicates that there are some barriers to key industry stakeholders using the website. Some comments from survey participants included:
  - *"Industry Resources section is poorly structured and random. Needs better categories and simple headings…"*
  - *"Been on there occasionally; difficulty navigating and finding things…"*
- This feedback indicates that the main barrier to using the website is that items are hard to find. An upgrade to the website would therefore be of benefit; especially one that includes a Best Practice Resource for growers.

Crop forecasts and crop flow information

The number of growers participating in the crop flow system has increased by 12.5%, from 71 growers in 2014/15 to 81 growers in 2017/18. Much of this increase is due to growers from the Gingin region of southern Western Australia. In other regions, the number of contributing growers has remained steady as larger corporate mango business expand their share of market, their contribution currently accounting for approximately 40% of Australian Mangoes grown. All growers contributing to the system account for over 85% of Australian production.

- Continuous improvement of our forecasting is the reality. Every year something more is being learnt and applied.
- The evolution from the first year to now (4th year) especially the increasing engagement of grower base and responses demonstrate their level of trust in this process and that there is some value in this process and something they want to be a part of.
- In 2017/18 season, the crop flow data has demonstrated that the forecast was reasonably accurate with volumes following the forecast trend though the season. Actual levy data for 2017/18 (March 2018) was 10.6 million trays versus AMIA's actual of 10 million (Approx. 6% variance between actual and actual dispatched captured over the season to March,2018).
- 2017/18 forecast line versus actual demonstrates that the forecast put out to the market is actually quite robust. This enables better planning. Marketing and warehouses can plan and puts some real trust into the numbers as it is a good indication of how things are going to flow. (Refer to graph in Appendix Two.)

Other

During MG13017 ongoing feedback by growers across regions included the need for industry development officers (IDOs) placed regionally as on the ground to support our growers nationally. Integrating two IDO's, one located in Darwin, NT and one located in northern Queensland, would allow growers the opportunity to utilise a 'local resource'.

In light of recent Australian produce biosecurity issues, industry needs to take the lead and assist mango growers to be fully prepared though awareness and education; for example, emergency biosecurity training. Supported by the IDO's in field, for the next project (MG17000) an assessment will be conducted of current on-farm biosecurity measures with growers.

Recommendations

The project has delivered a range of outputs and outcomes to the industry.

Some recommendations as a result of this project should be considered for future projects. These include:

- Ensure each component of the project is well resourced.
- Ensure that future projects of this type have the flexibility to adapt to changing industry priorities. For example, if the industry develops a new strategic plan, then, projects of this nature need to be able to be amended if the new plans' priorities are different from the previous plan.
- A business plan should be developed to develop alternative funding strategies for project and activities within the project to reduce the burden on levies.
- The need for industry development officers (IDOs) placed regionally to support growers nationally. Integrating two IDO's, one located in Darwin, NT and one located in northern Queensland, would allow growers the opportunity to utilise a 'local resource'.
- The review and update of the industry website which is also to include a Best Practice Resource for Australian Mangoes growers.
- In light of recent Australian produce biosecurity issues, industry needs to assist mango growers to be fully prepared through awareness and education; for example, emergency biosecurity training. Suggest for next project, undertake an assessment of current on-farm biosecurity measures with selected growers then undertake an annual assessment to measure change.

Refereed scientific publications

None to report.

Intellectual property, commercialisation and confidentiality

No project IP, commercialisation or confidentiality issues to report.

Acknowledgements

Appendices

Appendix One – Crop Flow/Forecast weekly summary *My Mango*

Appendix Two – 2014/15 to 2017/18 (including 2017/18 AMIA forecast) Crop Forecast graph

Appendix One

Table 1. Crop forecast and initial crop flow information - 2017

2015/2016 FORECAST — DISPATCH TO THE MARKETS — UPDATED 21 SEPTEMBER 2015

DARWIN

WEEK BEG	31 AUG	7 SEP	14 SEP	21 SEP	28 SEP	5 OCT	12 OCT	19 OCT	26 OCT	2 NOV	9 NOV	16 NOV	23 NOV	30 NOV	7 DEC	14 DEC	21 DEC	28 DEC	4 JAN	11 JAN	18 JAN	25 JAN
KP		5%	5%	10%	5%	5%	5%	5%	20%	20%	20%											
R2E2			10%	10%	10%			25%	30%	15%												
CALYPSO					5%	10%	15%			5%	25%	30%	10%									
VOLUME*	125t	147t	160	140	70	70	70	70	380	330	220	90	48									

KATHERINE/MATARANKA

WEEK BEG	31 AUG	7 SEP	14 SEP	21 SEP	28 SEP	5 OCT	12 OCT	19 OCT	26 OCT	2 NOV	9 NOV	16 NOV	23 NOV	30 NOV	7 DEC	14 DEC	21 DEC	28 DEC	4 JAN	11 JAN	18 JAN	25 JAN
KP						5%	15%	10%	5%	5%	15%	20%	25%									
R2E2								10%	20%		10%	25%	25%	10%								
CALYPSO							5%	10%	15%				25%	25%	20%							
HONEY GOLD										5%	25%	20%	15%	25%	10%							
VOLUME*				25	50	150	150	150	40	40	250	250	250	200	145							

BURDEKIN/BOWEN

WEEK BEG	31 AUG	7 SEP	14 SEP	21 SEP	28 SEP	5 OCT	12 OCT	19 OCT	26 OCT	2 NOV	9 NOV	16 NOV	23 NOV	30 NOV	7 DEC	14 DEC	21 DEC	28 DEC	4 JAN	11 JAN	18 JAN	25 JAN
KP													10%	20%	35%	20%	15%					
R2E2												5%	15%	15%	25%	20%	20%					
HONEY GOLD														20%	20%	20%	20%	20%				
VOLUME*																						

MAREEBA/DIMBULAH

WEEK BEG	31 AUG	7 SEP	14 SEP	21 SEP	28 SEP	5 OCT	12 OCT	19 OCT	26 OCT	2 NOV	9 NOV	16 NOV	23 NOV	30 NOV	7 DEC	14 DEC	21 DEC	28 DEC	4 JAN	11 JAN	18 JAN	25 JAN
KP															5%	10%	30%	20%	15%	10%	10%	
R2E2																10%	20%	20%	20%	20%	10%	
CALYPSO																10%	10%	20%	20%	20%	20%	
HONEY GOLD																			25%	25%	25%	25%
VOLUME*																						

*Actual weekly volume of trays despatched from the region across all varieties
*Forecast weekly volumes of trays despatched from the region across all varieties

Appendix Two

Graph depicting Crop Flow 2014/15 – 2017/18 including actual volumes and the AMIA forecast for 2017/18 (blue dot line)