Optimising Mango Export and Sea freight Supply Chains

Terrence Campbell
Department of Employment, Economic Development & Innovation

Project Number: MG06016

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This report is published by Horticulture Australia Ltd to pass on information concerning horticultural research and development undertaken for the mango industry.

The research contained in this report was funded by Horticulture Australia Ltd with the financial support of Department of Employment, Economic Development & Innovation and the mango industry.

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ISBN 0 7341 2768 5

Published and distributed by:
Horticulture Australia Ltd
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Sydney NSW 2000
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Horticulture Australia

Department of **Employment, Economic Development and Innovation**

MG06016 (30th November 2011) Optimising Mango Export & Sea freight Supply Chains

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Department of Employment, Economic Development & Innovation

Toward Tomorrow's Queensland

Queensland Government

HAL Project number: MG06016

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Purpose of the report: This report details extension and research undertaken by the Department of Employment, Economic Development and Innovation into improving the profitability of the mango industry by building effective mango supply chains to key export markets using air and sea freight.

Funding Sources:
Department of Employment, Economic Development and Innovation (Qld)
Global Markets Initiative
Horticulture Australia Ltd.
The Australian Mango Industry Association
Voluntary contributions from Manbulloo Ltd, Pinata Marketing Australia, Delica Global, OneHarvest, Global Rewards and Market Gardeners

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Media summary

A Horticulture Australia funded project, “Optimising mango export and sea freight supply chains” was initiated in 2006 to improve export supply chains and facilitate market growth in Singapore and Hong Kong. This project has been expanded to include new markets particularly those which require disinfestation treatments such as China, New Zealand and Korea and to develop sea freight using controlled atmosphere sea freight.

The project vision was to deliver benefits to collaborators and the wider mango industry that increased the volume and value of exports and enhances the sustainability of the Australian mango industry. The project goals were:

1. Increase the volume and value of mango exports from Australia.
2. Improve the capacity of mango businesses to achieve sustainable competitive advantage for their mango export chains.
3. Project partners and funders gain benefits that provide an acceptable return for their financial and in-kind investment in the project

The project used a participatory improvement model to build the capacity of mango businesses to capture and grow export opportunities. The project team worked with the commercial collaborators and their chain partners in a “learning together in partnership” approach, which provided case studies for achieving sustainable competitive advantage of Australian mango export chains.

Mango exports peaked during the 2009/10 season with a total 3,974 tonnes exported, which was a 25% increase on the previous season. The value of exports also peaked with a 5% increase to $15.05 million. During the 2010/11 season, both the volume and value of exports decreased due to the extreme wet weather in all Queensland production districts.

The highest volume markets for the collaborators were New Zealand, Middle East, Russia, and Japan. Overall, the collaborators exported 17.5% of the total volume of mangoes exported from Australia during the 2010/11 season. In some markets, Japan, China, Korea, UK and Europe, the collaborators were the only Australian exporters. A notable achievement was the first export of Australian mangoes to South Korea during the 2010/11 season.

Highlights of the project included;

Training in best practice handling for Australian mangoes was delivered for businesses at all steps in the chain from harvesting to retailing. A total of 22 importers, 3 retailers, and 4 freight forwarding companies were trained in 10 export markets.

The first sea freight shipments were exported to Japan and mainland China in controlled atmosphere sea containers during the 2009/10 season. When compared to air freight, sea freight provided savings of $5.00 per carton. It also enabled better temperature control during transport and more consistent fruit quality on arrival in destination markets

A new handling and transport system was developed, tested and implemented for irradiating mangoes and sea freighting to New Zealand. The new system reduced double handling at the irradiation plant, provided fruit fly security after irradiation treatment, and enabled better temperature control during transport to Auckland. Savings of $4.00 per carton were achieved with this handling system when compared to the existing air freight handling system.

Introduction

One of the objectives identified by the Australian Mango Industry Association (AMIA) in their 2004-2009 strategic plan was “to support the development of new export markets and maintain and further develop existing markets”. The long term trend indicated that production was growing at 8% per year, with production likely to double within nine years. The amount of mangoes exported had remained static at 7% of total production. With future increases in supply over the next decade, export markets needed to be developed to maintain profitability for producers and their supply chain partners.

Key constraints to industry development related to export identified in the AMIA strategic plan were: variability in fruit quality, cost and availability of air freight and difficulties with sea freight. Two actions recommended to achieve export development were: commission a “Better Mangoes” cool chain project, and coordinate an integrated export marketing trial in selected markets targeting wholesale and retail sectors to build functional systems that provide sustainable markets.

A 3 year HAL project, “Optimising mango export and sea freight supply chains” was initiated during the 2006/07 season to improve export supply chains and facilitate market growth in Singapore and Hong Kong. The key findings from the first year were: fruit quality is variable, temperature management throughout the export chain is poor, facilities for ripening and storing mangoes are lacking in the markets, and retail handling and promotion is inadequate due to poor knowledge and merchandising of Australian mangoes.

The project scope was expanded providing technical and logistics support to export of the first shipment of Australian mangoes direct to mainland China was achieved in December 2007. Direct trade was established through a quarantine agreement between China and Australia negotiated by the Australian Government. Five businesses participated in the initial shipments to China, including production and export companies, as well as the two VHT facility operators. The project objectives ranged from developing supply chain handling systems for direct export, to identifying ways to improve practices and reduce costs and understanding the market dynamics in China.

The success of this breakthrough export in 2007/08 established the direct route to China but follow up shipments were needed to continue the development of this new market.

The “Exporting mangoes to China” project proved to be an effective model for working with supply chain businesses to develop export markets. The collaborators requested on-going assistance to not only develop the China market but also to expand exports to other global markets. The expansion of the project scope was supported by AMIA as it was consistent with their export development plan.

This project became the technical and logistics support for a Global mango export development project which provided a management structure for all mango export initiatives of the various groups within DEEDI. It mobilized the knowledge and skills present in the Horticulture and Forestry Science and Trade and Investment Groups into an effective project team with support from the NT Department of Resources (DOA) and the WA Department of Agriculture and Food (DOA&F).

The priorities for project activities were determined through consultation with the collaborators, AMIA and other funders. The activities conducted in each market depended on the level of market maturity and development. Financial and in-kind contributions were obtained from collaborators, AMIA, HAL, ACIAR and other service providers.

Project vision, goals and objectives

The project vision was to deliver benefits to collaborators and the wider mango industry that increased the volume and value of exports and enhances the sustainability of the Australian mango industry. The goals and objectives are listed in Table 1.

Table 1. Goals and objectives

Goals	Objectives
1. Increase the volume and value of mango exports from Australia.	1.1. To increase mango exports from 7% to 10% of total mango production by June 2011. 1.2. To increase the volume and value of mangoes exported by collaborators by 25% from 2008 to 2011. 1.3. To improve ease and cost of gaining access to markets with quarantine protocols by 2011. 1.4. To improve the export culture of the Australian mango industry by June 2011.
2. Improve the capacity of mango businesses to achieve sustainable competitive advantage for their mango export chains.	2.1. To improve the capacity (knowledge and skills) of project collaborators to increase the sustainable competitive advantage of their mango export chains by 2011. 2.2. To develop effective and efficient handling systems for export chains that deliver mangoes of the right quality to customers.
3. Project partners and funders gain benefits that provide an acceptable return for their financial and in-kind investment in the project.	3.1. To provide benefits to project partners and funders that satisfies their investment (financial and in-kind) in project activities.

Methodology

Strategy

The project used a participatory approach to generating and transferring information that built the capacity (knowledge and skills) of mango businesses to capture and grow export opportunities. The project team worked with the commercial collaborators and their chain partners as case studies for achieving sustainable competitive advantage of Australian mango export chains. Members of the case study chains were engaged in a "learning together in partnership" approach.

The knowledge generated by the case studies was communicated to the wider mango industry to increase the interest and capacity of mango businesses to develop export markets and to foster an increase in the volume and value of mango exports.

Critical to the success of the strategy was to engage collaborators (chain captains) that have the motivation and capacity to influence their chain partners and to drive chain improvement for the mutual benefit of members.

Key criteria for selecting collaborators were:

- motivated to develop export markets/ chains,
- can secure supply of mangoes for export,
- has the capacity to influence chain partners,
- managers and staff are available to be involved in planning, completing and reviewing project activities (in-kind contributions),
- committed to support the funding of the project with voluntary contributions,
- willing to share lessons learnt with the wider mango industry,
- willing to develop agreed objectives with the project team, funders and other partners, and
- interested in using value chain thinking to analyse existing export chains to identify and implement improvements or establish new export chains.

Improvement models

Participatory improvement model

A participatory improvement model developed by Ledger et al (2006) was used to build the capacity of commercial collaborators to achieve sustainable competitive advantage for their mango export chains. The elements of the model are:

1. Identify the key business in the chain that wants to champion improvement (chain captain).
2. Work with the chain captain and their partners to benchmark performance and identify where improvement is needed.
3. Conduct research where gaps in knowledge exist.
4. Complete improvement projects (develop, test, implement, and evaluate improved practices).
5. Prepare information and training products and communicate information to all members of the chain to improve their knowledge.

6. Communicate the generic knowledge gained to the wider industry using a variety of communication methods.

Three conditions are critical for success of the model – motivation, knowledge and capacity to improve. Businesses must want to improve (motivation), know how to improve (knowledge), and have the means to improve (capacity). It requires the chain captain to be motivated to continually improve the export chain to meet the changing environment, be able to influence other chain members to improve, and have the aspiration to ensure that benefits flow to those making the improvements.

During the exporting mangoes to China phase, the activities were focussed in five areas: market and consumer research, facilitating compliance with the quarantine protocols, improving product quality and handling systems from the tree to the retail shelf, economic analysis of the costs and returns, and communicating the information generated.

To identify the steps where produce quality is lost and where improvements in the handling system are needed, the following method was used.

- Map the product flow through the export chain from production to retail sale.
- Conduct a hazard analysis to identify processes impacting on quality, causes for quality loss, actions taken to prevent quality loss, and suggestions for improvement.
- Monitor quality and handling conditions through the supply chain.
- Conduct laboratory simulations to determine the effect of supply chain conditions on produce quality.

Value chain analysis

During the National Mango Industry Conference in May 2009, the project team was introduced to Professor Andrew Fearne, Director of the Centre for Value Chain Research, Kent Business School. Professor Fearne and colleagues from the Kent Business School, University of Tasmania, and University of Queensland, developed a methodology for analysing and improving a value chain titled “Sustainable Value Chain Analysis” (Bonney et al 2010).

The Sustainable Value Chain Analysis (SVCA):

- defines value creation in terms of the product attributes which affect consumer behaviour (willingness to pay and frequency of purchase),
- identifies which activities add this value, from inputs for agricultural production to consumption/disposal of the final product,
- evaluates the preparedness of the chain to create, realise and distribute value effectively,
- compares the environmental impact of different activities along the chain, and
- assesses the scope for the chain to act collaboratively to create competitive advantage through both product and process innovation and improved environmental management.

The SVCA looks at both effectiveness (doing the right things) and efficiency (doing things right). For a value chain to be competitive, it must do both. The SCVA assesses whether the chain is:

a. ***Effective*** at maximising the opportunities for adding value in the eyes of the consumer, and

b. ***Efficient*** in adding value, producing, processing and distributing at the least cost and environmental impact.

This requires that the value chain:

- understands what consumers value in the product, and focus on adding this value throughout the chain,
- develops strategic collaboration and operational co-operation throughout the value chain,
- strives for continuous innovation to improve both effectiveness and efficiency; and
- achieves competitive advantage in ways that are environmentally as well as commercially sustainable.

The methodology focuses on five key themes:

1. What product attributes do ***consumers value*** in the product?
2. Where in the chain's ***material flow*** is this value created? Value adding activities should be targeted for investment; whereas necessary but non-value-adding activities should focus on efficiency and only attract investment for cost reduction. Any unnecessary activities should be eliminated.
3. What are the main ***environmental impacts*** of the chain, and through which activities do these impacts arise? What commercial advantage can be gained from reducing these impacts?
4. How is ***information*** generated, shared and used, from final consumption/disposal up to primary production and input genetics and back again? Are decisions about what, when and how to produce pulled by the consumer or distorted by fractured flows?
5. Do the ***relationships*** in the chain enhance strategic alignment? How much trust and commitment exists? Do the relationships foster an equitable distribution of value, reflecting where it was created and the risks taken by different chain partners?

The process involves mapping the material and information flows and relationships within and between the businesses, from agricultural inputs to consumption and disposal of the product. The data is gathered by:

- a survey of chain participants at all levels, managerial and operational, and
- interviews, focusing on the priorities identified through the survey, and consumer research, involving focus groups and surveys.

This combination provides a strategic assessment of where opportunities exist to achieve truly sustainable competitive advantage, and the extent to which the chain is ready to collaborate in exploiting those opportunities.

During the later years of the project, four of the themes (consumer insights, material flow, information, relationships) were used to analyse and identify areas for improvements in targeted export chains. The number of themes used varied with each targeted chain. All four themes were used for a case study of the mango export chain to the UK.

Extension models

Effective extension engages the customers in the process of discovery, learning and testing of new ideas and technology and communicates the information generated to the customers through multiple delivery methods. The project used all of the following models developed by Coutts and Roberts (2003) in their study of best practice extension in over 50 projects across industries and regions in Australia.

The group facilitation/ empowerment model. This model focuses on participants increasing their own capacity in planning and decision-making and in seeking their own education/ training needs. They may do their own research and generate information to improve their knowledge and skills. The group may often use a facilitator to help define their goals and learning needs and to realise these.

The technology development model. This model is about individuals working together to develop specific technologies, management practices or decision support systems. It often involves local trials and demonstrations. The information generated is then communicated to the wider industry.

The programmed learning model. The model is about delivering specifically designed training activities to targeted groups to increase their understanding or skills in defines areas. The training activities can be delivered in a variety of modes and learning approaches.

The information access model. This model is about providing a range of information that individuals or groups can access from a distance and at a time that suits them. It can be based on a website, information centre or other centralised locations.

The personalised consultant model. This model involves the interaction between a mentor or consultant working with an individual or group to improve their managerial, technological, social or environmental situation.

Target markets

Markets were categorised according to following level of market "maturity" and the activities were tailored to the market development required.

Level 1 – New market

- need to determine mango export potential
- focus on facilitating market access and market and consumer research

Level 2 – Market with limited exports that has potential to be developed

- focus on facilitating collaboration between mango businesses and chain partners, market access, advice and training on best practice handling systems, monitoring chain performance, market and consumer research, and economic analysis

Level 3 – Market nearing commercial maturity

- focus on analysing chain performance (VCA), facilitating collaboration between mango businesses and chain partners, advice and training on best practice handling systems, consumer research, promotion and retail merchandising, and economic analysis

Level 4 – Market has reached commercial maturity

- focus on analysing chain performance (VCA), facilitating collaboration between mango businesses and supply chain partners, and promotion and retail merchandising

The priority markets identified by AMIA in their 2005 business plan for export development were Singapore, Hong Kong and New Zealand in the short term, UK and EU in the medium term, and more ambitious markets such as China in the longer term.

The level of market development for the target markets for each year of the project are listed in Table 2.

Table 2. Level of market development for global mango markets

Market	Level of market development		
	2008/09	2009/10	2010/11
Singapore	3	3	3
Hong Kong	3	3	3
China	2	2	2
United Kingdom	2	2	2
Europe	2	2	2
Japan	2	2	2
New Zealand	2	2	2
Middle East	2	2	2
Korea	1	1	1
Russia	1	1	1

Activities

The types of activities depended on the level of market development for the markets targeted by the collaborators.

1. Conduct research into market dynamics and opportunities for Australian mangoes

Services were provided to assist commercial collaborators to capitalise on trade opportunities and undertake exports to target markets. The types of activities undertaken included:

- Market research to ascertain demand for mangoes in the target countries and identify the characteristics of the local distribution channels. Market scans and briefs were prepared for target markets.
- Market visits to targeted countries to assess trade opportunities. Potential customers (importers, wholesalers, retailers, food service) were interviewed to assess their interest in Australian mango products.
- Business matching opportunities between potential overseas customers and project collaborators.

2. Value chain analysis

Value chain analysis was used to identify areas for improvement/ innovation for existing export chains or to establish new export chains. The fundamental principle is that to achieve sustainable competitive advantage, export chains must deliver value to the end customer (consumers) and profitability for chain members.

This requires insights into the product attributes that consumers value. The extent of the value chain analysis depended on the motivation and capacity of the collaborators to engage chain partners. To be successful, partners must have a mutual opportunity and agreed objectives and be willing to share the lessons learnt.

Components that were investigated included:

- Consumer insights
- Effectiveness – What are the material flow processes in the chain and do they add value or are essential or generate waste?
- Efficiency – How efficient are the systems, processes and practices in the chain?
- Information flow – What is the strength of the information flows in the chain?
- Relationships – How strong are the relationships between members of the chain?

3. Facilitate collaboration and relationships between collaborators and chain partners

Mango businesses involved in production and export were invited to participate in the project. A range of communication methods was used to facilitate collaboration between the mango businesses and their chain partners (producers, exporters, importers, retailers etc) and input suppliers (logistics operators, packaging manufacturers etc) – face to face meetings, teleconferences, webinars and emails.

4. Facilitate compliance with phytosanitary and sanitary protocols for market access

The export markets vary in requirements for compliance with phytosanitary and sanitary protocols. Some markets such as Singapore and Hong Kong have no phytosanitary requirements, some markets such as China, Japan, Korea and New Zealand have specific phytosanitary requirements, while other markets such as USA are at early stages of Biosecurity Australia (BA) negotiating an acceptable phytosanitary protocol.

For markets with an existing phytosanitary protocol, information was provided to the mango businesses and chain partners to ensure they were aware of the requirements for compliance. All forms of communication were used to work with BA and AQIS to clarify mango export protocols and work plans and coordinate processes such as registrations of growers and facilities. Assistance was provided to BA/ AQIS/ AMIA to review and amend existing protocols/ work plans and prepare submissions for access to new markets.

Information and assistance was provided to the mango businesses to help them comply with sanitary requirements such as chemical MRLs and customer requirements for good agriculture practices/ food safety programs.

5. Provide advice and training on best practice systems from managing product quality

Information guides providing recommendations for managing quality were provided to all businesses in the supply chain. Training sessions were delivered in Australia and in export markets on ripening, storing and transporting of Australian mangoes. The guides and training materials were produced in both English and country languages such as Chinese and Japanese.

The project team worked with the collaborators and packaging manufacturers to develop packaging that met the requirements of customers, handling systems and quarantine protocols. Different packaging was required to suit the different varieties and specific markets and market segments. Where appropriate, the packaging was generic in design, suitable for use by all collaborators with some flexibility to allow specific brand information to be included in the graphics.

6. Monitor handling practices and conditions and fruit quality from harvest to retail shelf

Shipments were monitored for fruit quality and handling conditions from harvest to retail display. Temperature loggers were placed into packages in different positions in the load to determine temperature profiles through the export chain. Information was collected on handling practices and holding periods at each step in the chain.

Fruit was sampled at different points along the supply chain and assessed for external and internal quality and where possible held until eating ripe and re-assessed. Team members tracked shipments to export markets to assess fruit quality through to retail. Training on assessing and reporting on fruit quality was provided to chain businesses. Where available, independent Produce Surveyors based in export markets were trained to do outturn inspections and prepare reports.

The monitoring results were analysed to determine if handling practices and conditions were reducing fruit quality and saleable life and to identify areas for improvement. The results were reviewed with the project collaborators and plans developed for testing and implementing improvements.

7. Facilitate promotion and retail merchandising of Australian mangoes.

Based on market research findings and recommendations, assistance was provided to mango businesses to help coordinate promotion and retail merchandising programs. Collaborators were supported to access funds for promotion from AMIA and promotional services from HAL and other providers.

8. Communication of information generated

The information generated by project activities was communicated to target groups as follows:

- Project collaborators – individual reports, personal visits, planning and review meetings, regular updates on progress and achievements by email, milestone and final project reports – information about individual business performance remained confidential.
- Wider mango industry – key findings reported in Mango Matters newsletter and public press, and at industry conferences and forums.
- Partners (AMIA, HAL, BA, AQIS, NT DOA, WA DOA&F) – planning and review meetings, regular updates on progress and achievements by email, presentations to Boards/ senior management, milestone and final project reports.
- Project team – individual reports, planning and review meetings, regular updates on progress and achievements by email, milestone and final project reports
- GMI steering committee and DEEDI senior managers – milestone and final project reports, briefings on progress and achievements
- Qld Minister for Primary Industries and Fisheries – briefings on progress and achievements

9. Project evaluation

Bennett's Hierarchy was used to evaluate the project activities and outcomes. Evaluation activities included:

- monitor and record inputs, activities, and participation levels throughout the project,
- observe and record changes in practices throughout the project, and

- interview collaborators to assess reactions to project activities, changes in knowledge, attitudes, skills and aspirations, practice change and benefits gained from project.

As part of the evaluation of the GMI program, the global mango export development project was selected as a case study. A cost benefit analysis (Strahan 2011) was completed and collaborators and partners were interviewed to assess reactions, changes in knowledge, skills and practices and benefits gained (Coutts 2011)

10. Project management

Meetings were held in person and by teleconference with commercial collaborators, partners and team members to plan and review activities. Administration processes were followed to manage finances and other resource allocations.

Activities

These activities detail activities supported by MG06016 which are closely linked with the activities of the Global Markets Initiative supported project "Global mangoes Marker Development"

United Kingdom

Collaborators	Chain partners			Input suppliers
	Exporters	Importers	Retailers	
Manbulloo (08-11), Pinata Marketing Australia (10-11)	Finest Fruit Exports (09-11)	Malet/Univeg (08-10), Minor Weir & Willis (10-11)	Marks & Spencer (08-10), Sainsbury (10-11), ASDA (10-11)	CT Freight (08-11), Amcor Fibre Packaging (08-11), QPak (10-11)

Activities	2008/09	2009/10	2010/11
1. Conduct research into market dynamics and opportunities for Australian mangoes	Information collected on market dynamics during monitoring of shipment to UK importer	Three month placement of T&I officer in Trade Qld office in London gained extensive insights into mango market dynamics	Former Director of GMI contracted for VCA of UK mango export chain. Represented project team in UK during mango season.
2. Value chain analysis	Product flow mapped from farm to retail shelf.	Product flow mapped from farm to dispatch from importer warehouse (Univeg).	Consumer research – Tesco loyalty card data analysis, 2 focus groups, online survey (400 shoppers), in-store interviews in 3 supermarkets (225 shoppers), home tasting survey (109 respondents). Material flow mapped from input suppliers to farm to consumers. Interviews with chain members to assess

			information flow and relationships. Chain improvement project proposal developed for collaborator
3. Facilitate collaboration and relationships between collaborators and chain partners	Trade Qld office in London facilitated collaboration between importers and supermarkets. Monitoring and training enhanced relationship between collaborator and importer.	London based T&I officer facilitated collaboration between collaborators, importers, processors and retailers. Monitoring enhanced relationship between collaborator and importer.	VCA enhanced relationship between collaborators, importer and retailers. Information on VCA presented to collaborators, importer (MWW) and 2 supermarket retailers (Tesco, Sainsbury)

Activities	2008/09	2009/10	2010/11
4. Facilitate compliance with phytosanitary and sanitary protocols for market access	No phytosanitary requirements	No phytosanitary requirements	No phytosanitary requirements
5. Provide advice and training on best practice systems from managing product quality	Information products distributed. Training on product handling for UK importer (Malet/Univeg)	Information products distributed. Monitoring report provided to importer.	Information products distributed. Presentation to importer (MWW) on monitoring of handling system.
6. Monitor handling practices and conditions and fruit quality from harvest to retail shelf	Air freight shipment of KP mangoes monitored from Katherine, NT to importer warehouse. Fruit sold in over 100 Marks & Spencer supermarkets. KP sold for a premium price above Keitt from Israel and Tommy Atkins from Brazil.	Two air freight shipments were monitored from Katherine farm to UK importer warehouse (Univeg)	Air freight shipments of KP and Honey Gold mangoes monitored from Katherine farms to dispatch from importer warehouse. Innovative new foam insert tested and assessed for impact on transport rub.
7. Facilitate promotion and retail merchandising of Australian mangoes.	No activities	No activities	Information brochures and product tastings provided during in-store interviews in 3 supermarkets and home tasting survey.

4.2 China

Collaborators	Chain partners			Input suppliers
	Exporters	Importers	Retailers	
Manbulloo (08-11), Oneharvest (08-09), Pinata Marketing Australia (09-11),	Carter & Spencer (08-09), Finest Fruit Exports (09-11)	Dole China (08-09), Duwin (08-11), Origin Direct (09-11), Chunlin (09-11), Dalice (09-10)	Parkson (09-11), Pacific (10-11)	CT Freight (08-11), Amcor Fibre Packaging (08-11), Theart Farming (09-10), Maersk (09-10), QPak (10-11)

Activities	2008/09	2009/10	2010/11
1. Conduct research into market dynamics and opportunities for Australian mangoes	Information collected on market dynamics during monitoring of shipment to Shanghai importer	Visit by T&I officer to Shanghai and Beijing in Nov 09 to research market dynamics and identify opportunities for market growth.	Information collected on market dynamics during consumer research in Beijing
2. Value chain analysis	Product flow mapped from farm to importer.	Product flow mapped from farm to retailer.	Consumer research in Beijing – in-store interviews in 3 supermarkets (620 shoppers), product tasting in 2 supermarkets (201 people). Insights gained into Information flow and relationship during consumer research.
3. Facilitate collaboration and relationships between collaborators and chain partners	Two producers and an exporter collaborated for 2 air freight shipments. Trade Qld office in Shanghai facilitated collaboration with importers and quarantine authority. Monitoring and training enhanced relationship between collaborators (Manbulloo, Oneharvest, Carter & Spencer) and importer.	Collaboration facilitated by T&I market visit and Trade Qld office in Shanghai. Monitoring and training enhanced relationship between collaborators, importers, and retailer.	Consumer research in market enhanced relationships between collaborators, importers and retailers.

Activities	2008/09	2009/10	2010/11
4. Facilitate compliance with phytosanitary and sanitary protocols for market access	Guide prepared on roles and responsibilities. Assistance provided by NT DOR for fruit cutting for mango seed weevil inspection. Training provided to Crop monitor and VHT staff on Work Plan requirements	Protocol and Work Plan amended to include systems approach for seed weevil freedom. Assistance provided by NT DOR for fruit cut inspection for orchard freedom for seed weevil. Training provided for growers, crop monitors, packhouse inspectors (consultants and farm staff), and VHT staff on requirements of Work Plan. Innovative system using net bags and pallet nets implemented to reduce costs of compliance.	Assistance provided by NT DOR for fruit cut inspection for orchard freedom for seed weevil. Training provided for growers, crop monitors, packhouse inspectors (consultants and farm staff), and VHT staff on requirements of Work Plan.
5. Provide advice and training on best practice systems from managing product quality	Information products distributed. Training on product handling for Shanghai importer (Dole China)	Information products distributed. Training on handling Australian mangoes provided for 3 importers and 1 retailer	Information products distributed.
6. Monitor handling practices and conditions and fruit quality from harvest to retail shelf	First 2 air freight shipments monitored – KP and Calypso™ to Shanghai importer, R2E2 to Beijing importer. Fruit picked in Katherine, VHT at Berry Springs, NT	Four air freight and 2 controlled atmosphere sea freight shipments were monitored from Katherine farm to Beijing retailers. The effects of VHT on Honey Gold, storage of R2E2 after VHT, and packing method on transport rub were assessed.	Innovative new foam insert tested and assessed for impact on transport rub.
7. Facilitate promotion and retail merchandising of Australian mangoes.	Official launch of Australian mangoes in Chinese market	No activities	Leaflets and posters prepared for in-store survey and product tasting.

4.3 Japan

Collaborators	Chain partners			Input suppliers
	Exporters	Importers	Retailers	
Manbulloo (08-11), Delica Global (09-11)	Delica Global (09-11)	Nikko Foods (08-09) Watari (09-11), IPM (09-11), Showa Boeki (09-11), Minami Kyushi (09-11), F&T (10-11), Bell Fresh (09-10)		CT Freight (08-11), NAX (10-11), Vision (10-11), Amcor Fibre Packaging (08-11), Theart Farming (09-10), Maersk (09-10), QPak (10-11)

Activities	2008/09	2009/10	2010/11
1. Conduct research into market dynamics and opportunities for Australian mangoes	Information collected on market dynamics during monitoring of shipment to Tokyo importer	Visit by T&I officer to Tokyo and Kobe in Nov 09 to research market dynamics and identify opportunities for market growth.	Assistance provided with consumer research by Trade Qld office in Tokyo
2. Value chain analysis	Product flow mapped from farm to importer.	Product flow mapped from farm to retailer. Improved information flow system tested for communicating information about product quality.	Consumer research – 2 focus groups in Qld (Brisbane, Gold Coast), 2 focus groups in Tokyo, online survey (620 respondents)
3. Facilitate collaboration and relationships between collaborators and chain partners	Trade Qld office in Tokyo facilitated collaboration with importers and quarantine authority. Monitoring and training enhanced relationship between collaborator and importer.	Trade Qld office in Tokyo facilitated collaboration between collaborators, importers and quarantine authority. Monitoring and training enhanced relationship between collaborators and importers.	Consumer research in market enhanced relationships between collaborators, importers and retailers.
4. Facilitate compliance with phytosanitary and sanitary protocols for market access	Training provided to VHT staff on Work Plan requirements	Innovative system using net bags and pallet nets implemented to reduce costs of compliance. Training provided to VHT staff on Work Plan requirements	Training provided to VHT staff on Work Plan requirements

Activities	2008/09	2009/10	2010/11
5. Provide advice and training on best practice systems from managing product quality	Information products distributed. Training on handling of Australian mangoes provided for Tokyo importer (Nikko)	Information products distributed. Training on handling of Australian mangoes provided for 5 importers (Tokyo, Kobe, Fukuoka)	Information products distributed.
6. Monitor handling practices and conditions and fruit quality from harvest to retail shelf	Two air freight KP shipments monitored to Tokyo importer. Fruit picked in Burdekin district, VHT at Berry Springs, NT	Nine air freight and one CA sea freight shipment monitored from VHT plant to dispatch from importer warehouses.	Innovative new foam insert tested and assessed for impact on transport rub.
7. Facilitate promotion and retail merchandising of Australian mangoes.	No activities	No activities	Leaflet prepare for in-store survey (promotion cancelled as exports stopped from Qld due to wet weather)

4.4 Korea

Collaborators	Chain partners			Input suppliers
	Exporters	Importers	Retailers	
Manbulloo (10-11), Pinata Marketing Australia (10-11), Delica Global (10-11)	Delica Global (10-11)	Global Trading (10-11), Jinwon Trading (10-11)	Shinsagae (10-11)	NAX (10-11), Vision (10-11), Amcor Fibre Packaging (08-11), QPak (10-11)

Activities	2008/09	2009/10	2010/11
1. Conduct research into market dynamics and opportunities for Australian mangoes	Visit by T&I officer to Seoul in Oct08 to assess market opportunities for mangoes. Discussions with collaborators on market opportunities	No activities	Information collected on market dynamics by Trade Qld office in Seoul and during monitoring of shipment to Seoul importers
2. Value chain analysis	No activities	No activities	Product flow mapped from farm to retailer
3. Facilitate collaboration and relationships between collaborators and chain partners	No activities	No activities	Trade Qld office and T&I officer in Brisbane facilitated collaboration between collaborators, importers and retailers. Monitoring shipments and training of importers enhanced relationships.
4. Facilitate compliance with phytosanitary and sanitary protocols for market access	No activities	No activities	Innovative system using net bags implemented to reduce costs of compliance. Training provided to crop monitors, growers and VHT staff on Work Plan requirements
5. Provide advice and training on best practice systems from managing product quality	Information products distributed.	No activities	Information products distributed. Training on handling of Australian mangoes provided for 2 importers.
6. Monitor handling practices and conditions and fruit quality from harvest to retail shelf	No activities	No activities	Air freight shipments of KP, R2E2 and Honey Gold mangoes monitored from VHT plant to retail shelf.
7. Facilitate promotion and retail merchandising of Australian mangoes.	No activities	No activities	Australian mango leaflet translated into Korean language but not used.

4.5 New Zealand

Collaborators	Chain partners			Input suppliers
	Exporters	Importers	Retailers	
Manbulloo (08-11), Pinata Marketing Australia (09-11), MG Marketing (09-10)	MG Marketing (08-10), Harrowsmith (08-09), Finest Fruit Exports (09-11)	Fresh Direct (09-11), MG Marketing (08-11)	Progressive Enterprises (09-11), Food Stuffs (09-10)	CT Freight (08-11), Steritech (08-11), Amcor Fibre Packaging (08-11), QPak (10-11)

Activities	2008/09	2009/10	2010/11
1. Conduct research into market dynamics and opportunities for Australian mangoes	No activities	Information collected on market dynamics during monitoring of shipment to retailer distribution centre	Information collected on market dynamics during monitoring of shipment to supermarkets
2. Value chain analysis	Product flow mapped from farm to importer.	Product flow mapped from farm to retailer distribution centre.	Product flow mapped from farm to supermarket in Christchurch.
3. Facilitate collaboration and relationships between collaborators and chain partners	No activities	Monitoring and training enhanced relationship between collaborators and importers.	Monitoring and training enhanced relationship between collaborators, importer and retailer.
4. Facilitate compliance with phytosanitary and sanitary protocols for market access	No activities	No activities	Innovative system using pallet net implemented to reduce costs of compliance.
5. Provide advice and training on best practice systems from managing product quality	Information products distributed.	Information products distributed. Training on handling of Australian mangoes provided for 2 importers and 1 supermarket retailer.	Information products distributed. Training on handling of Australian mangoes provided for Steritech staff, importer and retailer.
6. Monitor handling practices and conditions and fruit quality from harvest to retail shelf	Sea freight shipment of R2E2 by Brisbane based exporter (MG Marketing) monitored from Brisbane to Auckland. Fruit was picked at Bowen and irradiated at Steritech, Narangba.	Two sea freight shipments monitored from irradiation plant to retailer distribution centre.	Two sea freight shipments monitored from irradiation plant to retailer distribution centre and supermarket in Christchurch. Innovative new foam insert tested and assessed for impact on transport rub.

Activities	2008/09	2009/10	2010/11
7. Facilitate promotion and retail merchandising of Australian mangoes.	No activities	Assistance provided to retailer (Progressive Enterprises) to prepare leaflet for store managers on handling and merchandising of Australian mangoes. Assisted collaborator with display stand at national conference of Progressive Enterprise store managers.	Assistance provided to retailer (Progressive Enterprises) to update leaflet for store managers on handling and merchandising of Australian mangoes.

4.6 Singapore

Collaborators	Chain partners			Input suppliers
	Exporters	Importers	Retailers	
Manbulloo (08-11), Pinata Marketing Australia (10-11), OneHarvest (08-09)	OneHarvest (08-09) Finest Fruit Exports (09-11)	Benelux (08-09), Hupco (10-11)	Cold Storage (08-09)	CT Freight (08-11), Hellman/ Coolport (10-11), Amcor Fibre Packaging (08-11), QPak (10-11)

Activities	2008/09	2009/10	2010/11
1. Conduct research into market dynamics and opportunities for Australian mangoes	Information was collected on market dynamics and logistics during monitoring of shipment to retailer.	No activities	Information was collected on market dynamics and logistics during market visit to train importer staff
2. Value chain analysis	Product flow mapped from farm to retail shelf.	No activities	No activities
3. Facilitate collaboration and relationships between collaborators and chain partners	Monitoring and training enhanced relationship between collaborator (OneHarvest) and importer.	No activities	Training enhanced relationship between collaborators and importer.
4. Facilitate compliance with phytosanitary and sanitary protocols for market access	No phytosanitary requirements	No phytosanitary requirements	No phytosanitary requirements
5. Provide advice and training on best practice systems from managing product quality	Information products distributed. Training provided to importer and retailer on handling Australian mangoes.	Information products distributed.	Information products distributed. Training provided to importer and Coolport (Freight Forwarder) staff on handling Australian mangoes.
6. Monitor handling practices and conditions and fruit quality from harvest to retail shelf	Sea freight shipment of Calypso™ (881 cartons) monitored from Katherine farm (Oolloo Farm) to Singapore supermarket shelf. Fruit were packed and stowed into 20 foot container at Darwin packhouse. Time from stowing of container to unloading at importer	No activities	Innovative new foam insert tested and assessed for impact on transport rub.

	warehouse in Singapore was 10 days.		

Activities	2008/09	2009/10	2010/11
7. Facilitate promotion and retail merchandising of Australian mangoes.	Assistance provided with preparation of material for retail promotion associated with sea freight shipment.	No activities	No activities

4.7 Europe, Middle East, Russia, Hong Kong

Collaborators	Chain partners			Input suppliers
	Exporter	Importer	Retailer	
Manbulloo (08-11), Pinata Marketing Australia (10-11)	Finest Fruit Exports (09-11), Fresh Produce Group (09-11), Delica Global (08-09), Walker Longbottom (09-11), Fresh Alliance Australia (09-11), Australian Fresh Exports (09-11)	Golden Fruit (Lebanon 10-11), Special Fruit (Belgium 10-11), Alimpex (Russia 10-11), Roveg (Holland 08-09)		CT Freight (08-11), Amcor Fibre Packaging (08-11), QPak (10-11), Eurigold (10-11)

Activities	2008/09	2009/10	2010/11
1. Conduct research into market dynamics and opportunities for Australian mangoes	Information on market dynamics collected during visits to Middle East for ACIAR Pakistan project	Information on market dynamics collected during visits to Middle East for ACIAR Pakistan project	Information on market dynamics collected during visits to Middle East for ACIAR Pakistan project
2. Value chain analysis	Product flow mapped from farm to Rotterdam importer.	Product flow mapped fro farm to Dubai importer.	No activities
3. Facilitate collaboration and relationships between collaborators and chain partners	Monitoring and training enhanced relationship between collaborator (Manbulloo) and Rotterdam importer.	No activities	No activities
4. Facilitate compliance with phytosanitary and sanitary protocols for market access	No phytosanitary requirement for Europe, Russia, Hong Kong. Seed weevil freedom for Middle East shipments.	No phytosanitary requirement for Europe, Russia, Hong Kong. Seed weevil freedom for Middle East shipments.	No phytosanitary requirement for Europe, Russia, Hong Kong. Seed weevil freedom for Middle East shipments.
5. Provide advice and training on best practice systems from managing product quality	Information products distributed. Training provided to Rotterdam importer on handling Australian mangoes.	Information products distributed.	Information products distributed. Information provided to importers and retailers during Fruit Logistica trade show in Berlin in Feb 10.
6. Monitor handling practices and conditions and fruit quality from harvest to retail shelf	Air freight shipment of R2E2 mangoes monitored from Katherine packhouse to Rotterdam importer.	No activities	Air freight shipment monitored from Katherine to Dubai importer. Innovative new foam insert tested and

			assessed for impact on transport rub.
7. Facilitate promotion.	No activities	No activities	No activities

4.8 Communication

The types of communication methods used for target audiences are highlighted in Table 3 and lists of communication events, presentations and documents are contained in the following appendices.

- Appendix 1. Information products and training resources
- Appendix 2. Market and consumer research reports
- Appendix 3. Mango monitoring reports
- Appendix 4. Press releases and articles
- Appendix 5. Presentations (meeting, workshop, seminar, conference)

An annual mango export forum was held to provide feedback on key findings and plan activities with collaborators, chain partners, and project partners.

Table 3. Communication methods for target audiences

Method	Target audience								
	Collaborators	Chain partners	AMIA/ HAL	Mango industry	Project team	Project partners (eg BA)	GMI steering commit.	DEEDI senior manager	Minister
Planning/ review meetings	✓	✓	✓		✓	✓			
Project updates/ briefings	✓	✓	✓		✓	✓	✓	✓	✓
Milestone/ final project report	✓		✓		✓	✓	✓		
Market research reports	✓	✓	✓	✓	✓	✓			
Consumer research reports	✓	✓	✓	✓	✓	✓			
Monitoring reports – verbal/written	✓	✓			✓	✓			
Mango Matters newsletter	✓	✓	✓	✓	✓	✓	✓		
Press releases/ articles	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mango conference presentation	✓	✓	✓	✓	✓	✓			
Personal visits, emails, telephone	✓	✓	✓		✓	✓	✓		
Information/ training products	✓	✓	✓	✓	✓	✓	✓		

Consumers were targeted with a promotional leaflet on Australian mangoes during the in-store surveys in the UK and China. The leaflet was also to be used for the Japan in-store

survey but this activity was cancelled due to exports ceasing as a result of the wet weather in Queensland.

Results

Goal 1. Increase the volume and value of mango exports from Australia

Objective	Desired outcomes
1.1. To increase mango exports from 7% to 10% of total mango production by June 2011.	• Volume of Australian mangoes exported increases from 7 to 10% of total production by June 2011

Achievements

Tables 4 and 5 present the volume and value of mangoes exported from Australia to global markets. Mango exports peaked during the 2009/10 season with a total 3,974 tonnes exported, which was a 25% increase on the previous season. The value of exports also peaked with a 5% increase to $15.05 million.

Both the volume and value of exports decreased during the 2010/11 season due to the extreme wet weather in all Queensland production districts. The producers suffered large losses in returns due to the orchards being flooded or too wet to harvest or from poor fruit quality caused by the constant rain. Very few mangoes were exported from Queensland districts.

The first export of mangoes to South Korea was achieved during the 2010/11 season.

Table 4. Volume (kg) of mangoes exported from Australia to global markets

Country	2007/08	2008/09		2009/10		2010/11	
	Volume kg	Volume kg	% change	Volume kg	% change	Volume kg	% change
Hong Kong	1,352,646	1,216,982	-10%	1,619,703	33%	1,008,281	-38%
China	9,028	2,440	-73%	25,818	958%	16,930	-34%
Singapore	541,065	576,650	7%	443,618	-23%	234,700	-47%
South Korea	0	0		0		7,830	
Japan	224,574	189,008	-16%	149,792	-21%	29,855	-80%
Other Asia	207,867	169,063	-19%	184,393	9%	106,231	-42%
New Zealand	295,020	185,330	-37%	568,875	207%	345,479	-39%
Middle East	547,486	702,059	28%	782,098	11%	452,572	-42%
UK	4,468	1,400	-69%	5,103	265%	2,800	-45%
Europe	141,260	110444	-22%	103,362	-6%	23,833	-80%
Russia	0	11,348		28,817	154%	53,015	84%
Canada	23,306	26,016	12%	61,644	137%	36,572	-41%
Pacific Islands	298	80	-70%	569	611%	34	-94%

Total	**3,347,018**	**3,190,817**	**-5%**	**3,973,813**	**25%**	**2,324,730**	**-41%**

Source: Australian Bureau of Statistics, HAL analysis

Table 5. Value (kg) of mangoes exported from Australia to global markets

Year	Value ($million)	% change
2007/08	11.00	
2008/09	14.39	31%
2009/10	15.05	5%
2010/11	9.05	-40%

Source: Australian Bureau of Statistics, HAL analysis

Table 6 lists the relative proportion of mangoes exported from Australian compared to total production. The volume of exports increased by 0.5% to 7.4% of total production in 2008/09 and this percentage was maintained in 2009/10. A further increase in the proportion of exports to total production was expected during the 2010/11 season but was not achieved due to the extreme wet weather.

Table 6. Proportion of mangoes exported compared to total Australian production

Year	Total production (tonnes)	Total exports (tonnes)	Exports/production (%)
2007/08	48,785	3,347	6.9%
2008/09	43,062	3,191	7.4%
2009/10	53,574	3,974	7.4%
2010/11	40,937	2,325	5.7%

Source: Australian Bureau of Statistics, HAL analysis

Objective	Desired outcomes
1.2. To increase the volume and value of mangoes exported by collaborators by 25% from 2008 to 2011.	• Volume and value of mangoes exported by collaborators increases by 25% from 2008 to 2011

Achievements

Table 7 presents the volume and value of mangoes exported by the project collaborators during the past 4 seasons. The volume increased by 1,778% in the first 2 years of the project and the value by 400%. The volume decreased by 8% in 2010/11 due to the extreme wet weather but the value actually increased by 8%. This contrasted with total mango industry exports where the volume decreased by 41% and the value by 40%.

The volume of mangoes exported by the collaborators to global markets during the 2010/11 season and their share of total exports is presented in Table 8. The top four export markets were New Zealand, Middle East, Russia, and Japan. Overall, the collaborators exported 17.5% of the total volume of mangoes exported from Australia. In some markets, Japan, China, Korea, UK and Europe, the collaborators were the only Australian exporters. This

demonstrates their commitment to exports in the worst season for over 50 years and is an outstanding achievement.

Table 7. Volume and value of mangoes exported by project collaborators, 2008-11

Year	Export volume (tonnes)	% change	Export value ($million)	% change
2007/08	23.2		no direct exports	
2008/09	104.5	189%	0.50	
2009/10	435.8	317%	2.00	400%
2010/11	401.2	-8%	2.15	8%

Table 8. Volume of mangoes exported by project collaborators to global markets, 2010/11

Market	Volume of mangoes exported by collaborators		Market share of total mango industry exports
	Number of cartons	%	
New Zealand	16,534	30%	33%
Middle East	13,333	24%	21%
Russia	6,371	12%	59%
Japan	4,764	9%	100%
Singapore	4,319	8%	14%
Europe	3,155	6%	100%
China	2,274	4%	100%
Hong Kong	2,131	4%	2%
Korea	1,118	2%	100%
UK	396	1%	100%
Total	**54,395**	**100%**	**17.5%**

Table 9 presents the volume of the different varieties exported by the collaborators during the past 3 seasons. From 2008/09 to 2009/10, the volume of Kensington Pride exported increased by 157% and R2E2 by 483%. The first Honey Gold mangoes were exported in 2009/10 and increased to 44.4 tonnes in 2010/11.

Table 9. Volume of mango varieties exported by project collaborators, 2008-11

Variety	Volume exported (tonnes)		
	2008/09	2009/10	2010/11
Kensington Pride	54.1	139.3	116.4
R2E2	50.4	293.6	240.4
Honey Gold	0	2.9	44.4
Total	**104.5**	**435.8**	**401.2**

Objective	Desired outcomes
1.3. To improve the ease and cost of gaining access to markets with quarantine protocols by 2011.	• The number of locations and treatment capacity for VHT increases by 50% by June 2011 • China Mango Export Plan is amended for 2009/10 season to include a systems approach for certifying freedom from mango seed weevil • Approval is granted by MAFF Japan for mangoes destined for Japan and China to be treated at the same time in a VHT facility • A practical and achievable Korea Mango Export Work Plan is implemented by June 2011

Achievements

VHT capacity increased by 173%. Two extra VHT plants were built in Queensland during 2009/10. One of these plants was built at the Manbulloo Ltd packhouse at Giru and the other was built by a Chinese exporter/importer at Beerwah.

China Mango Export Plan amended to include systems approach for mango seed weevil. Following 2 seasons of direct trade of mangoes to China, Biosecurity Australia was successful in negotiating changes to the quarantine protocol to include a systems approach for freedom from mango seed weevil. The systems approach provided an alternative to establishing orchard freedom status, which required cutting and inspection of up to 5,000 fruit.

The components of the systems approach are:

- Orchard hygiene – The registered orchard/block must be clearly defined and signs placed at entry points to the orchard/block forbidding the entry of mango fruit or seeds from non-registered orchards. Farm staff must be instructed on the orchard quarantine system.
- Monitoring and surveillance – Monitoring for mango seed weevil infestation by an approved crop monitor must commence from early fruit set and then continue weekly until the completion of harvesting for export. Records of crop monitoring must be kept.
- Chemical control – If mango seed weevil egg laying is detected, the grower may apply an insecticide prior to the next crop monitoring inspection. Records of chemical application must be kept.
- Packhouse inspection – Each batch of fruit picked for export must be inspected for freedom from seed weevil. A minimum of 50 fruit or fruit in 2% of the packages/field crates to be vapour heat treated, whichever is largest amount, must be inspected for each batch. A record of each inspection must be kept.

A training program was developed and delivered and information products prepared for both options for certifying seed weevil freedom. The systems approach improved the ease and reduced the cost of compliance with the Work Plan. Growers achieved savings of up to $2000 due to the reduction in the number of fruit required to be cut and inspected.

Both orchard freedom and systems approach were approved by AQIS as options for certifying freedom from mango seed weevil for the Korea Mango Export Work Plan.

Net bags and pallet nets reduced cost of compliance for fruit fly security after treatment. Security of packed fruit from re-infestation by fruit fly is required following VHT for export to Japan, China and Korea and following irradiation for export to New Zealand. Biosecurity Australia was successful in negotiating amendments to the Work Plans to include net bags for air freight and pallet nets for sea freight as an alternative to gauzing of carton vents. The net bags and pallet nets were developed, tested and introduced during the 2009/10 season and provided savings of $2.30 per carton.

Approval granted for treating fruit for Japan, China and Korea at same time. Biosecurity Australia was successful is negotiating approval from the quarantine authorities in Japan, China and Korea for fruit destined for two or more countries to be treated together in the VHT chamber. This arrangement improved the time and ease of stacking the chamber and the efficiency of treatments.

First mangoes exported to Korea. A new Mango Export Work Plan was negotiated with the Korean quarantine authority by Biosecurity Australia and AQIS for the 2010/11 season. The quarantine requirements were similar to China except a Korean inspector had to be present at the VHT plant for every treatment and export dispatch. The first mangoes for Korean were treated at the Manbulloo VHT plant and exported through Delica Global to two importers in Seoul. A total of 1,118 cartons were exported at a value of $64,000.

Objective	Desired outcomes
1.4. To improve the export culture of the Australian mango industry by June 2011.	• Export development is a priority for AMIA. • Increase in number of businesses participating in project activities.

Achievements

Export development is a priority for AMIA. AMIA's goal as described in their Mango Industry Strategic Management Plan 2010-2015 is "to build the Australian mango industry into a sustainable and profitable industry". They have 3 strategic priorities: 1. Industry profitability, 2. Orchard yield and fruit quality, and 3. Information and knowledge. Export development is an objective for increasing industry profitability – "Increase export volumes at a rate of 2% higher per season than the long term rate of increasing production, so the volume of Australian mangoes exported will increase from 3000 tonne to 4000 tonne by 2015" (Objective 1.3).

Number of businesses participating in project activities increased from 15 to 37. The number of businesses participating in project activities increased from 3 commercial collaborators and 12 chain partners and service providers in 2008/09 to 3 collaborators and 34 chain partners and service providers in 2010/11.

Goal 2. Improve the capacity of mango businesses to achieve sustainable competitive advantage for their export chains

Objective	Desired outcomes
2.1. To improve the capacity (knowledge and skills) of project collaborators to increase the sustainable competitive advantage of their mango export chains by 2011.	• Market research improves knowledge of collaborators about the characteristics and requirements of target markets. • Analysis of a case study mango export chain identifies opportunities for improvement/ innovation by June 2011. • Collaborators involved in the case study chain implement improvements that increase the performance of the chain by June 2011. • Knowledge about how to improve the sustainable competitive advantage of export chains is publically available by June 2011.

Achievements

Market research improves knowledge. The collaborators have gained considerable knowledge about target markets, particularly China, Japan and the UK, through research into the market dynamics and consumer attitudes and purchasing habitats and the value chain analysis case study of the UK mango export chain. The research has shown that opportunities for export growth exist and consumers value highly the attributes of Australian mango varieties.

Market and consumer research reports were prepared and presentations delivered at debriefing meetings with collaborators, 3 mango export forums and 2 national mango industry conferences. The collaborators have used this market research to plan their marketing strategies for priority markets. A list of market and consumer reports is contained in Appendix 2.

Value chain analysis increases capacity to improve chain competitiveness. The value chain analysis (VCA) case study of the UK export chain has not only identified improvements for this chain but has also built the capacity of the collaborators to analyse and improve other export chains. The collaborators are now using the VCA methodology to assess the performance of customers and to plan improvement projects for their priority chains. DEEDI has also increased its capacity to help improve value chains through sharing of the lessons learnt from the VCA case study with a wide range of DEEDI staff at a GMI seminar in April 2011.

Objective	Desired outcomes
2.2. To develop effective and efficient handling systems for export chains that deliver mangoes of the right quality to customers.	• Participants in mango export chains gain knowledge in best practice for handling Australian mangoes by June 2011. • Effective and efficient handling systems are implemented for air and sea freight chains by June 2011. • There is no loss of customer demand due to fruit quality problems in 2010/11 season.

Achievements

Knowledge gained in best practice handling at all steps in the chain. Training in best practice handling for Australian mangoes was delivered for businesses at all steps in the chain from harvesting to retailing.

Training in handling and ripening Australian mangoes was delivered in the following export markets:

- UK – 2 importers
- China – 2 importers in Shanghai, 3 importers in Beijing, 1 retailer in Beijing
- Japan – 6 importers
- Korea – 2 importers
- Singapore – 2 importers, 1 retailer
- New Zealand – 2 importers, 2 retailers
- Europe, Middle East, Russia, Hong Kong – 3 importers, 1 retailer
- All chains – 4 freight forwarders

Benefits will flow to the wider mango industry through publishing of the training resources and information guides for public use.

An accredited training program was delivered for harvesting and packing shed staff at the 3 Manbulloo farms during the 2010/11 season in collaboration with the Australian Agricultural College Corporation (AACC). The aim of the training was to optimise mango quality by ensuring all workers had the necessary knowledge and skills to do their jobs and best practice was used for harvesting and packing shed processes. Successful participants received a statement of attainment for one unit of competence from a Certificate I in Rural Operations training program, “RTE1005A Support horticultural production”.

The benefits of the training program were reduced levels of harvest injury, less error during grading and packing, increased confidence that the product was consistently meeting customer specifications, and less stress for farm workers. Efficiency gains of 10% were estimated. The training program was trialed as a pilot for the wider mango industry and the training resources and information guides will be published for public use.

Innovations increase effectiveness and efficiency of export chains.

The first sea freight shipments were exported to Japan and mainland China in controlled atmosphere sea containers during the 2009/10 season. When compared to air freight, sea freight provided savings of $5.00 per carton. It also enabled better temperature control during transport and more consistent fruit quality on arrival in destination markets.

A new handling and transport system was developed, tested and implemented for irradiating mangoes and sea freighting to New Zealand. Cartons were stacked onto a sea freight pallet in the packing shed and a net was placed over the pallet. The pallets were secured with corner stays and straps and transported to the Steritech irradiation plant at Narangba. After irradiation treatment and AQIS inspection, the pallets were loaded directly into a sea freight container.

The new system reduced double handling at the irradiation plant, provided fruit fly security after irradiation treatment, and enabled better temperature control during transport to Auckland. Savings of $4.00 per carton were achieved with this handling system when compared to the existing air freight handling system.

Moulded foam inserts were developed, tested and used for packing mangoes to reduce transport rub. The inserts were developed in collaboration with the manufacturer, QPak. Vibration of fruit in the standard plastic inserts during road transport caused rub marks on the contact points between fruit and the moulded cups. Monitoring of loads showed that the soft foam inserts reduced the incidence of rub marks. All global customers provided positive feedback about the foam inserts.

New carton lids were developed, tested and used for air and sea freight of Mod 8 cartons. The same inner tray was used for both transport systems, with a stronger lid used for air freight. The same inner tray was also used for domestic marketing which provided savings in packaging costs.

A two way chain information system was developed, tested and implemented to communicate information about product quality in the Japanese export chains during the 2010/11 season. Packed product was inspected at the time of dispatch from the VHT plant for ripeness (skin colour and firmness) and fruit quality and a customer advice report was sent to the importer by email. On arrival at the importer's warehouse, fruit quality and ripeness was re-assessed and a customer feedback report sent by email to Delica Global, the Finest Fruit Exports manager and the VHT plant manager.

This new communication system has provided advanced notice to the importer of the fruit quality and ripeness in the shipment and valuable information to Manbulloo, Finest Fruit Exports, and Delica Global about the performance of the transport systems. The system will be used next season for all export chains and a web based system developed for reporting and accessing the information.

Goal 3. Project partners and funders gain benefits that provide an acceptable return for their financial and in-kind investment in the project

Objective	Desired outcomes
3.1. To provide benefits to project partners and funders by June 2011 that satisfies their investment (financial and in-kind) in project activities.	• Project partners and funders are satisfied with the benefits they gain for their investment in the project

There was a good to high level of satisfaction by project partners and funders with their investment.

As part of the evaluation of the Global Markets Initiative (Coutts J&R, June 2011) of which this project was an integral part representatives from 8 businesses and organisations involved in the mango export project were interviewed. The level of satisfaction of the respondents with the project achieving their objectives was determined and on a scale of 1 to 10, six of the businesses/ organisations rated their level of satisfaction as 7 or higher.

The benefits reported were:
Increased export demand, sales and market share (17.5% in 2010/11 season)
Improved product knowledge and understanding of fruit quality and ripening and handling practices
Improved packaging and treatment processes (e.g. vapour heat treatment)
Improved collaboration and management of the value chains, including improved transport logistics
Improved relationships between industry and government bodies at state and national level

Adoption and impact

In May 2011, Coutts J&R were commissioned to evaluate the Global Markets Initiative of which this project was integral part.

Responses of collaborators and stakeholders

The purpose of the evaluation was to learn from the experiences to date and to measure impact.

Representatives from the following businesses and organisations involved in the MG06016 project were interviewed:

- 1 commercial collaborator (business funding project)
- 3 chain partners
- 2 industry organisations
- 2 research/ government agency

Involvement in mango export project

The main reasons given by collaborators, partners and funders for being involved in the project were to increase export sales and improve awareness of Australia produce overseas and ultimately increase market share.

Project activities in which the respondents could recall being involved were as follows:

- Market research (3)
- Identify members in the chain and processes (5)
- Monitoring product quality and improving technology (5)
- Providing advice and training (5)
- Development of quarantine protocols and market access (2)
- Consumer research (3)
- Improving information systems (5)
- Improving relationships (6)
- Other (4)

Satisfaction with involvement in project

There was a good to high level of satisfaction by project partners and funders with their involvement in the project. On a scale of 1 to 10, six of the businesses/ organisations rated their level of satisfaction as 7 or higher and one gave a rating of 6 and the other 5.

As well as the objective to improve market awareness and new markets, commercial collaborators noted the value of existing relationships with DEEDI staff as contributing factors to becoming involved in the project. Involvement was also identified as being part of one respondent's five year strategic plan…"*there are a number of mango sizes and quality specifications which make sales in Australian markets unprofitable. So we were looking for high return markets for all of our products - we needed to find alternative markets."*

One of the respondents from an industry organisation highlighted the need to ensure that "*levies are spent in line with their Strategic Plan"* and "*export is a strategic direction necessary for the future of the industry".*

Impact on capacity and practice

The impacts reported were:

- Increased export demand, sales and market share – 17.5% in 2010/11 season.
- Improved product knowledge and understanding of fruit quality and ripening and handling practices – *"the training, consumer and market research, and better understanding of product*

handling enabled us to tailor our products for the different markets and made us look at being more cost effective".

- Improved packaging – e.g. net bags and pallet socks to provide fruit fly security after heat treatment and irradiation.
- Improved treatment processes – e.g. vapour heat treatment
- Improved collaboration and management of the value chains, including improved transport logistics
- Improved relationships between industry and government bodies at state and national level. When asked about benefits extending beyond the individual businesses, 6 businesses/organisations reported a high level of satisfaction with the project delivering broader industry benefits (rating of 7-10).

The respondents highlighted that the project enabled them to achieve "*something that couldn't have logistically been accomplished by the industry itself*". Examples included opening up markets in the UK, Japan and Korea and reducing transport costs with sea freight, all of "which *will become available to other fresh produce exporters"*.
The project was seen as having made in-roads to sea freight, which will be "*released into the public arena".* Exporting protocols set up will be used by other export businesses. An example was the innovation of the "*pallet sock for fruit fly security after disinfestation treatment, which is available for use by others exporting into New Zealand*".
One importer made the comment that "*no other exporter or export country had ever presented such a comprehensive package"***.** It was also noted by one of the commercial collaborators that **"**w*e are including other growers into our export market and the more we move out of the Australian market, the more we work towards stabilising the Australian market - we are taking the pressure off the Australian market".*

Discussion and Recommendations

Supply chains for fresh produce (fruit and vegetables) are rapidly changing throughout the world. A successful supply chain must deliver the right product, value and satisfaction to the end customer, and profitability for its participants. The growing competition for consumer expenditure requires a whole of supply chain approach to delivering value and satisfaction. Critical to getting the product right is identifying those points where quality can be lost and implementing practices that produce and maintain quality through the supply chain.

This project has given the supply chain improvement team the opportunity to use recently developed approaches to analysis the performance of export systems, sea and airfreight following fruit from the pack shed to the importers distribution centres and to use this experience not just to improve the collaborators export performance but to develop information products that are most useful to the industry.

The Department of Employment. Economic Development and Innovation, the mango industry, Horticulture Australia and individual business have taken an important role in addressing quality problem important to right through to consumers in export countries.

Beyond the improvement of export performance detailed above there has been three major advances during this study.

The involvement of the collaborators as supply chain captains and case studies has given the mango industry new champions for improving the export performance of Australian mangoes to quarantine and non quarantine markets. The collaborators have freely shared their time and expertise as detailed in Appendix 5 and have been featured in press releases and articles as listed in Appendix 4. These presentations have been organised as industry functions or by the project team at regular events throughout the project and have been

important for sharing the learnings and to encourage more participants in the improvement process.

The development of the information package and resources has been improved through the involvement of the collaborators in identifying information needs and delivery. This has resulted in the preparation and publication of nearly sixty publications as listed in Appendix 1. They are a major resource for the collaborators and other participants in export supply chains and will be useful to the industry for many years.

The models and methodologies used for supply chain improvement have been tested and modified by the project team. The dominant model initially was the supply chain improvement model (Ledger et al, 2006) has been replaced with the Value Chain Improvement model (Bonney et al 2010.) and has shown great potential for analysing chains and developing improvement projects. An important part of the model is the development of multi-disciplinary teams.

The team that have worked on this project have been multi-disciplinary with expertise in research and extension principles as well as marketing, plant physiology and postharvest handling and the approach used while resource intensive has developed products vital for managing the vital steps of handling in the mango export value chain.

It is recommended.

- That the collaborators continue to be featured as case studies for the other participants in export supply chains demonstrating the improvements possible in developing efficient supply chains. This should be undertaken by the project team continuing to work with the collaborators and by the industry featuring project updates in the industry newsletter and at the industry conferences.

- That the information products developed in this project be up dated as required, promoted and made available to all participants in export supply chains. This should be facilitated by the Horticulture Australia project MG10013 Delivering Information and Technology to the Industry Part 2.

- That the Value Chain Analysis and Improvement approach be continued to be developed by the project team and in supply chain projects where improvements in supply market performance are required in complex systems where a multi disciplinary team is needed to improve performance.

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Appendix 1. Information products & training resources

Promotion

- Australian mango exports to the world booklet
- Australian mangoes direct to China – booklet (English, Chinese)
- Australian mangoes direct to Japan – booklet (English, Japanese)
- Australian mangoes – flavour guaranteed – brochure (English, Chinese, Japanese)
- Australian mangoes – the taste of Australia – Retail produce manager's guide (English, Chinese, Japanese)
- Australian mangoes – poster (English, Chinese)
- How to eat Australian mangoes – postcard (English, Chinese)
- Australian production districts – leaflet
- Manbulloo mangoes: Australia to Japan – presentation
- Manbulloo mangoes: Australia to China – presentation

Product description

- Mango skin colour guides – KP, R2E2, Honey Gold varieties – poster and leaflet (English, Chinse, Japanese)
- Mango blush guides – KP, R2E2, Honey Gold varieties – leaflet

Defect identification

- Common mango defects – poster (English, Chinese, Japanese)
- Types of skin damage – leaflet
- Mango problem solver – booklet

Packing

- KP packing patterns_Mod8 carton – leaflet
- KP packing patterns_Japan gift pack_with fruit socks – leaflet
- KP packing patterns_Japan gift pack_no fruit socks – leaflet
- KP _packing patterns_Japan retail pack_with fruit socks – leaflet
- KP packing patterns_Japan retail pack_no fruit socks – leaflet
- R2E2 packing patterns_Mod8 carton – leaflet
- R2E2 packing patterns_China air freight carton – leaflet
- Mango packing options for Japan – report
- Packing net bags – leaflet

Palletising

- Pallet stacking_mango domestic market – leaflet
- Pallet stacking_mango export market – leaflet
- Pallet netting for sea freight mangoes – leaflet
- Stacking Mod 8 tray on Euro pallet – leaflet

Handling systems

- Handling of KP at export destinations – booklet (English, Japanese)
- Handling of R2E2 at export destinations – booklet (English, Chinese)
- Exporting mangoes to China: managing fruit quality – leaflet

Cooling and storage

- Mango handling guide – poster (English, Chinese, Japanese)
- Designing a forced air cooling – leaflet
- Operating a forced air cooler – leaflet

Transport

- Stacking air pallets and containers – leaflet
- Stowing LD-3 airline container – leaflet
- Stowing 20 foot sea container – leaflet
- Transporting mangoes – leaflet

Ripening

- Mango ripening guide – leaflet (English, Chinese, Japanese)
- Important points for ripening and storage of mangoes – leaflet (English, Japanese)
- Managing ripening of mangoes – brochure (English, Japanese)
- Mango ripening manual – booklet
- When are mangoes ripe – KP and R2E2 varieties – leaflet

Quarantine

- China and Korea mango export_roles and responsibilities – leaflet
- Identifying quarantine pests and disease_China and Korea mango export – leaflet
- Managing mango seed weevil – leaflet
- Orchard freedom_China and Korea mango export – leaflet
- Pest monitoring training course – presentation
- Systems approach_China and Korea mango export – leaflet
- Fruit fly identification – poster

Training

- Handling and ripening in mango supply chains – presentation
- What happens when a mango ripens? – presentation
- How is mango quality lost? – presentation
- Managing mango ripening and storage? – presentation
- Manbulloo mangoes to the world – presentation
- Manbulloo training and assessment – presentation
- Optimising mango quality – presentation
- Manbulloo training program – trainer's notes – booklet
- Grading mangoes – trainee workbook
- Monitoring fruit quality and handling conditions

Manbulloo documents

- Hazard analysis report – mango fruit quality – growing to cooling
- Hazard analysis report – mango fruit quality – export chains
- Product specifications – KP and R2E2
- Job descriptions – harvesting and packing shed (22)
- Work instructions – packed product inspection, packing shed receival assessment, reject bin analysis, cooling and storage at Katherine packing shed, Horseshoe Lagoon packing shed, VHT plant
- Record forms – cooling log, mango receival assessment, packed product inspection, mango reject and juice analysis
- Report templates – daily quality summary, daily receival summary, VHT packout, customer advice, customer feedback

Appendix 2. Market and consumer research reports

China

- Gomez, E. 2007. The Chinese mango market: desktop market research. DEEDI Qld.
- Gomez, E and Campbell. J. 2008. The Chinese mango market: Consumer and supply chain market research. DEEDI Qld.
- McCarrol, A. 2010. China mango market research. DEEDI Qld
- Gomez, E and Roberts, R. 2011. Buying mangoes at the supermarket: an insight into Chinese consumers. DEEDI Qld

Japan

- Takashima, D. 2010. Japan mango market research. DEEDI Qld
- Bose, N and Gething, K. 2011. An insight into Japanese consumers: mango consumer research. DEEDI Qld.

Korea

- McCarrol, A. 2008. Korean market for Australian mangoes: market research. DEEDI Qld

United Kingdom

- Golding, B. 2010. United Kingdom mango market research. DEEDI Qld
- Fearne, A., Ada, R., Ledger, S. 2010. Attitudes of UK supermarket shoppers towards mangoes. DEEDI Qld. and Kent Business School
- Ada, R., Madhuranath, V., Fearne, A., Ledger, S. 2010. Attitudes of Sainsbury supermarket shoppers towards mangoes. DEEDI Qld. and Kent Business School
- Ada, R., Fearne, A., Ledger, S. 2010. Attitudes of ASDA supermarket shoppers to mangoes and reactions to Kensington Pride variety. DEEDI Qld. and Kent Business School
- Ada, R., Fearne, A., Ledger, S. 2010. UK consumer reactions to Honey Gold mangoes. DEEDI Qld. and Kent Business School
- Ada, R., Ledger, S., Dent, B. And Fearne, A. 2011. Value chain analysis case study: mangoes to the UK. DEEDI Qld. and Kent Business School

Appendix 3. Mango monitoring reports

China

2008/09

- Mango monitoring report_R2E2 and Calypso_load 1
- Mango monitoring report_R2E2_load 2

2009/10

- Mango monitoring report_R2E2 to Chunlin_load 1
- Mango monitoring report_R2E2 and KP to Dalice_load 2
- Mango monitoring report_R2E2 to Duwin_load 3
- Mango monitoring report_R2E2 to Duwin_load 4
- Mango monitoring report_R2E2 to Duwin_load 5
- Mango monitoring report_R2E2_ sea freight 1
- Mango monitoring report_R2E2_ sea freight 2
- Mango monitoring report_Honey Gold
- Mango monitoring report_R2E2 storage after VHT

2010/11

- Mango monitoring report_Honey Gold_NT to VHT plant

Japan

2008/09

- Mango monitoring report_KP to Nikko Foods_load 1
- Mango monitoring report_KP to Nikko Foods_load 2

2009/10

- Mango monitoring report_KP to Bell Fresh_load 1, 8, 14
- Mango monitoring reports_KP to Watari_loads 1, 9, 10
- Mango monitoring reports_KP to Showa Boeki_loads 3, 7, 12
- Mango monitoring reports_KP to IPM_loads 4, 6, 11
- Mango monitoring reports_KP to Minami Kyushi_loads 5, 13
- Mango monitoring reports_KP to Watari_sea freight_load 15
- Outturn reports_Japan_ 1, 2, 3, 4, 5, 6, 7, 8, 9
- Skin defects_Japan 09/10
- Air freight_deliver ripe
- Air freight_deliver unripe
- Sea freight_deliver unripe

Korea

2010/11

- Mango monitoring report_R2E2 to Global Fruit Trading
- Mango monitoring report_R2E2 to Jinwon Trading Company

Singapore

2008/09

- Mango monitoring report_Calypso to Benelux_sea freight

New Zealand

2008/09

- Mango monitoring report_R2E2 to Fresh Direct_sea freight

2009/10

- Mango monitoring report_R2E2 to MG Marketing_sea freight
- Mango monitoring report_R2E2 to Fresh Direct_air freight

2010/11

- Mango monitoring report_KP and R2E2 to Progressive Enterprises_sea freight_Oct 10
- Mango monitoring report_R2E2 to Progressive Enterprises_sea freight_Nov 10
- Mango monitoring report_Honey Gold to Progressive Enterprises_sea freight_Nov 10
- Steritech monitoring report_Oct 10

United Kingdom

2008/09

- Mango monitoring report_KP to Marks & Spencer

2009/10

- Mango monitoring report_KP to Univeg_loads 1, 2, 3

2010/11

- Mango monitoring report_KP to Minor Weir and Willis
- Mango monitoring report_Honey Gold to Minor Weir and Willis

Europe

2008/09

- Mango monitoring report_R2E2 to Europe_11 Feb 09

All markets

- Mango export project update 1_26 Oct 09
- Mango export project update 2_1 Dec 09
- Mango export project update 3_14 Jan 10
- Transport rub damage – Katherine to VHT plant_Oct 09
- Transport rub damage – Katherine to VHT plant_Oct 10
- Weather damage to KP mangoes_Nov11

Appendix 4. Press releases and articles

Ministerial press releases

Sweet demand for mangoes in premium international market (24 Nov 08)

- Qld's mango goes global. Qld Country Life
- Demand for our mangoes. News Mail (Bundaberg), Fraser Coast Chronicle, Gympie Times
- First mangoes to Japan. Bowen Independent
- First Qld mangoes exported to Japan. Weekly Times web page
- First Qld mangoes exported to Japan. Fresh Plaza Global Fresh Produce News web page
- Growing mango export market in Japan. ABC radio news: Tropical North (Mackay), North Qld (Townsville), Western Qld (Longreach), Far North (Cairns)

Australian mangoes taking tropics to UK and Europe (14 Jan 09)

- Prepared but not distributed

Quarantine protocol changes a boost for Australian mango exports to China (24 June 09)

- More mangoes bound for China. Cairns Post
- Mango export boost. Weekly Times
- New deal boosts mango industry. Fresh Plaza Global Fresh Produce News web page

New Queensland facility boosts Australian mango exports (11 Jan 10)

- Giru facility boosts our mango exports. The Advocate (Ayr)
- Asia mango treat. Townsville Bulletin
- Mango exports. Gympie Times
- Qld to boost mango exports. Stanthorpe Border Post
- Qld quest to grow world's best mangoes. ABC radio news: Home web page, Far North (Cairns), Tropical North (Mackay), North Qld (Townsville), Capricornia (Rockhampton), Wide Bay (Bundaberg), 612 Brisbane, Western Qld (Longreach)
- Qld to grow world's best mangoes. 98.9 FM radio news (Brisbane)
- New vapour heat treatment facility to boost mango exports. 4TTT radio news (Townsville)
- Vapour heat treatment plant to cut down quarantine problems. 4TO FM radio news (Townsville)
- State-of-the-art vapour heat treatment facility at Giru, Australia. Fresh Plaza Global Fresh Produce News web page
- Nth Qld mango industry has export breakthrough. WIN TV news: Cairns, Mackay, Townsville

Sweet as: New Zealand consumers love Queensland's mangoes (29 Jan 10)

- Qld mangoes popular in New Zealand supermarkets. Zinc FM radio news (Townsville)

Mango passion spreads globally as exports rise (5 July 10)

- Mango passion spreads globally. The Burdekin Grower
- They're sweet our mangoes. Sunday Mail

- Mango exports have risen by 25%. ABC radio news: Far North (Cairns), Tropical North (Mackay), North Qld (Townsville), Wide bay (Bundaberg), Southern Qld (Toowoomba)
- Mango exports have risen by 25%. 4TO FM radio news (Townsville), SEA FM radio news (Mackay)
- Mango passion spreads globally as exports rise. Fresh Plaza Global Fresh Produce News

First mangoes exported to Korea. (12 Nov 10)

- How sweet it is as mangoes head to Korea. Courier Mail
- International demand for Australian mangoes remains high. ABC radio news: Far North (Cairns), Tropical North (Mackay), North Qld (Townsville), Capricornia (Rockhampton), Wide Bay (Bundaberg)
- Australia opens mango exports to South Korea. Fresh Plaza Global Fresh Produce News

Grow the pie, not the slice (3 May 11)

- UK consumers love our mangoes. Cairns Post, The Mareeba Express
- Aussie mangoes not meeting UK potential. Fresh Plaza Global Fresh Produce News
- UK not getting mango message. Brisbane Business News (June 2011, p15)

Other press releases

- Mango road ships first VHT treated Australian mangoes by sea to Shanghai. Fresh Plaza Global Fresh Produce News web page. (29 Jan 10)
- Manbulloo Mango expecting a good season. Fresh Plaza Global Fresh Produce News web page. (18 Oct 10)

Mango Matters newsletter

- Ledger, S., Barker, L. Managing ripening of mangoes. Summer 09/10 issue
- Campbell, T., Ledger, S., Campbell, J., Barker, L. Sea freight success for Australian mangoes. Autumn 2010 issue
- Gomez, E and Roberts, R. Insights into Chinese mango consumers. Winter 2011 issue

HAL reports

- Project milestone reports. Optimising mango export and sea freight supply chains. 31 May 09, 16 Oct 09, 1 April 10, 1 Oct 10, 1 April 11
- Mango industry annual reports. 2008/09 to 2010/11. Project update. Global mango export development

Other reports

- Combining nationally recognised training and research to deliver results for Manbulloo. 2011 Environmental scan of the agrifood industry (page 29). Agrifood Skills Australia

Internal communication

- GMI web page. Project update. Global mango export development
- GMI annual reports. 2008/09 to 2010/11. Project snapshot. Global mango export development
- DPI&F OurNet web page. Australian mangoes on supermarket shelves in UK and Europe. 11 Nov 08
- DPI&F OurNet web page. Stakeholders unite to boost mango exports. 26 March 09
- DEEDI OurNet web page. UK lessons on Qld mangoes. 21 April 11

- Message from the Associate DG. Value chain centre collaborates with GMI to develop exports. 15 April 11
- Message from the Associate DG. GMI sheds light on supply chain profitability. 5 May 11
- GMI brief to Estimates Committee hearing. DEEDI growing primary industries export market. 20 July 10
- GMI brief to Estimates Committee hearing. First exports of Australia mangoes to Korea. 24 May 11

Appendix 5. Presentations

Mango export forums

18 March 2009

- Holmes, R. Handling mangoes through export supply chains: harvest systems
- Campbell, T. Handling mangoes through export supply chains: air freight
- Campbell, J. and Barker, L. Handling mangoes through export supply chains: improving knowledge and handling practices
- Ledger, S. Handling mangoes through export supply chains: integrating disinfestation treatments
- Johnson, P. (WA DOA&F). Sea freight supply chains: critical control points
- Goulding, B. and Gomez, E. Delivering trade services to the mango industry
- Gianibelli, C (Biosecurity Australia). Update on Biosecurity Australia's technical market access program for Australian mangoes
- Prowse, W. (HAL). Export trends – markets and volumes
- Prowse, W. (HAL). Capturing the interest of customers to buy Australian mangoes

2 March 2010

- Barker, L. Improving effectiveness and efficiency in mango export chains: sea freight of R2E2 to China
- Holmes, R. Improving effectiveness and efficiency in mango export chains: reducing cost of compliance for Mango Export Work Plans
- Campbell, T. Improving effectiveness and efficiency in mango export chains: sea freight of KP to Japan
- Campbell, J. Improving effectiveness and efficiency in mango export chains: irradiation and sea freight to New Zealand
- Collins, R. (UQ). Value chain analysis: information, relationships, performance

18 April 2011

- Gomez, E. and Roberts, R. Buying mangoes at the supermarket – an insight into Chinese consumers
- Bose, N. and Gething, K. mango consumer research: an insight into Japanese consumers
- Ada, R., Ledger, S., Fearne, A., Dent, B. Attitudes of UK supermarket shoppers towards mangoes
- Ledger, S. and Ada, R. Effectiveness and efficiency of UK mango export chain
- Ledger, S. Mango export chain information flow
- Campbell, J. Improvements to mango export supply chains to New Zealand
- Jones, V. and Barker, L. Investigating the effect of gamma irradiation dose on skin quality and ripening of mangoes

Conferences

- Campbell, T., Holmes, R., Barker, L. Successful sea freight for Australian mangoes. 9th International Mango Symposium, China, 8-12 April 10
- Ada, R., Ledger, S., Fearne, A., Dent, B. Mango export value chain analysis: Australian producer to UK consumer. 8th Australian mango conference, Darwin, 18-21 May 11
- Gomez, E. and Bose, N. Consumer insights: China, Japan, UK. 8th Australian mango conference, Darwin, 18-21 May 11
- Holmes, R. Information products and communication. 8th Australian mango conference, Darwin, 18-21 May 11
- Campbell, J. Improvements to mango export supply chains to New Zealand. 8th Australian mango conference, Darwin, 18-21 May 11
- Jones, V., Campbell, J., Barker, L. Impact of irradiation as a disinfestation treatment on mango quality. 8th Australian mango conference, Darwin, 18-21 May 11

Seminars and workshops

- Ledger, S. Improving mango export chains: key findings. GMI exporters forum, Brisbane, 11 Sep 09
- Ledger, S. Developing effective and efficient mango export chains. Fruit Logistica seminar, Berlin, Germany, 8 Feb 11
- Fearne, A. Using consumer insight to build sustainable value chains for mangoes. Fruit Logistica seminar, Berlin, Germany, 8 Feb 11
- Dent. B. Value chain analysis and management. GMI seminar, Brisbane, 6 April 11
- Dent, B. Kensington Pride-UK consumer value chain: key findings. GMI seminar, Brisbane, 6 April 11
- Ada, R., Ledger, S., Fearne, A., Dent, B. Attitudes of UK supermarket shoppers towards mangoes. GMI seminar, Brisbane, 6 April 11
- Ledger, S. Australian producer to UK consumer: mango value chain analysis. GMI seminar, Brisbane, 6 April 11
- Ledger, S. and Ada, R. Effectiveness and efficiency of UK mango export chain. GMI seminar, Brisbane, 6 April 11

Meetings

- Ledger, S. Manbulloo mangoes to the world. Manbulloo manager's meeting, Brisbane, 9 Feb 09
- Holmes, R. and Ledger, S. Mango season review - 2010/11. Manbulloo manager's meeting, Brisbane, 13 April 11
- Ledger, S. Calypso™ mangoes to Asia. OneHarvest planning meeting, Brisbane, 24 Feb 09
- Ledger, S. Improving mango export chains to Japan. Manbulloo/Delica Global planning meetings, Brisbane, 10 June 09, 9 June 10
- Ledger, S. Improving mango export chains: key findings. CT Freight planning meeting, Brisbane, 26 Aug 09
- Ledger, S. Project update. AMIA Board meeting, Brisbane, 16 Feb 10.
- Ada, R., Ledger, S., Fearne, A., Dent, B. Attitudes of UK supermarket shoppers towards mangoes. VCA review meeting with Minor Weir & Willis, Birmingham, UK, 7 Jan 11
- Ledger, S. and Ada R. Mango export chain improvement – Australia to UK. VCA review meeting with Minor Weir & Willis, Birmingham, UK, 7 Jan 11
- Dent, B. Kensington Pride-UK consumer value chain: key findings. VCA review meeting with Minor Weir & Willis, Birmingham, UK, 7 Jan 11