Horticulture Innovation Australia

Final Report

Monitoring mango fruit quality through the supply chain to the US

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Summary

The project objective was to monitor two consignments (shipments) of Australian mangoes to the United States of America (US), to detect any supply chain impacts on quality and, by working closely with growers, treatment facility, freight forwarders, exporters and importers, to quickly address any issues and enable improvements to be made.

The target audience for the project is mango growers, exporters and freight forwarders.

The project monitored three shipments from treatment through import to retail, another three from import through to retail and captured information on all 15 shipments planned for 2015/16. Project activities included visual observations at treatment, import and retail, and talking with growers, exporters, treatment provider, freight forwarders, importers and retail produce managers.

Outputs included reporting back to exporters during the season directly and individually, weekly through the AMIA US Working Group and through a program debrief, the preparation of a Guide for growers on the US market and three media items.

Thirteen commercial shipments of Australian mangoes, totaling approximately 75 tonnes, were made to the US in the 2015/16 season comprising Calypso, Keitt, Honey Gold, R2E2 and Kensington Pride (KP) varieties. The shipments were principally in January and February, with 83% of the fruit from Mareeba and the balance from the Burdekin in Queensland.

One shipment (5.5% of exported boxes) was overheated and unsaleable. Another shipment (5.5% of exported boxes) was overripe and largely unsaleable. The other 11 shipments (89%) landed successfully. Two of the 11 shipments were short shipped due to the interception of more than one pest of US concern in a lot within the shipment at the export inspection in Brisbane. Two further shipments were cancelled prior to packing because the grower/packer did not have the necessary US program approval.

There were no compliance issues reported on arrival in the US.

The mangoes were sold in supermarkets in Texas, Arizona, the north east and the north west. An estimated 75% of the Australian mangoes in the US in 2015/16 were sold through one retailer in Texas. No variety preferences were identified. A preference for 11 and 13 count (in the 5 kg box) was expressed by an importer and a retailer. Retail sales were supported by importer and retailer produced point of sale material, tasting and the *Australian Mangoes* branded package.

While there were quality issues with overheated, overripe, old, out of grade and lenticel spotted fruit, these were the exception; ≈99% of the Australian mangoes at retail had very attractive appearance with high flavour and very popular with US retailers and consumers.

Average price (across varieties and counts) was reportedly around AUD$47 /r box C&F Los Angeles, or AUD$35.30 /r box Brisbane after export costs other than exporter margin.

Recommendations include improved cool chain management, improved ripening management, investigation of Keitt lenticel spotting, improved compliance in Brisbane, more grower awareness of

MSW, compliance in the adoption of the new net pallet packaging option, fruit at PMA in 2016, widening the US distribution, lengthening the supply season, consideration of branding and promotion in the US, review the Working Group's role, developing a season long program for Australian mangoes in the US, clarification and communication of pending US air cargo security requirements and improved communication between stakeholders in US mango program.

Keywords

Mango, export, United States, irradiation, airfreight

Introduction

The US is the world's largest mango import market at around 350,000 tonnes per annum and growing in volume and value[1]. After 15 years of negotiation the Australian mango industry gained access to the mainland US in January 2015, starting with a four year pilot program developed between the Australian Department of Agriculture and Water Resources (DoAWR) and the United States Department of Agriculture (USDA). The requirements of the program are detailed in the Operational Work Plan (OWP)[2] .

The OWP requires:

- Property (US blocks) and packaging shed approval by DoAWR,
- Monitoring for pests of concern to the US from flowering by crop monitors who have undertaken a training program that meets DoAWR standards,
- Management of fungi of concern to the US,
- Pest secure packaging and pathway from the packing shed,
- Packaging labels with specific information,
- Pre-export inspection with specific tolerances for pests of concern to the US,
- Pre-export irradiation treatment,
- Export documentation and secure pathway to the US entry port and,
- USDA audits of the Australian processes and procedures.

The opportunity for Australian mangoes in the US market, where they land for typically three to four times the cost of mangoes from other sources, is considered by the Australian mango industry to be as better flavoured, attractive fruit from Australia. The better flavour and colour requires ripe fruit which brings cool chain management challenges.

Two initial commercial shipments of Australian mangoes (Calypso and Keitt varieties) were successfully made to the US in the 2014/15 season, a total of five tonnes. These were observed in the US and reported on in a Horticulture Innovation Australia (HIA) funded and Australian Mango Industry Association (AMIA) supported project[i].

The objective of the 2015/16 program was to build on the initial season, involve more growers with more varieties, correct problems identified in 2014/15 and expand the volume.

[1] US National Mango Board http://www.mango.org/en/Home

[2] http://micor.agriculture.gov.au/Plants/Pages/Documents.aspx

The 2015/16 program was the second year of access for Australian mangoes to the US market. Preparations were informed by the lessons of 2014/15 including the need for improved communications, a process to fund the USDA audit, revising the packaging, improving ripening and cool chain management and engaging more growers in the opportunity.

Organizational arrangements

There are a range of entities, summarised at **Table 1**, involved in the US mango program.

Table 1 - US mango program - entities and roles

Entity	Role
US retailer	Stimulate demand, sell Australian mangoes to US consumer
US importer	Obtain USDA import permit, importer of record for US regulators, facilitate import clearance, stimulate retailer demand
Freight forwarder	Load shipment, provide shipment data to DoAWR, negotiate airfreight rate (19% of the landed cost and single largest cost after fruit)
Exporter	Organise logistics, link grower and importer, manage cool chain, manage commercial aspects
Treatment provider	Deliver export treatment, lodge treatment data into USDA system, take pre-export MRL sample
Crop monitor	Monitor and record pests in crop in accordance with OWP
Packer	Apply for US approval, pass audit, comply with OWP, grade fruit to customer requirement, comply with US air cargo security (pending)
Grower	Apply for US approval, pass audit, comply with OWP, comply with MRL
AMIA	Represent growers to DoAWR, act as OWP Cooperator
NT DPIF and DAF	Supported crop monitor training, supported DoAWR activity, supported AMIA activity, provide advice to grower
Working Group	Reference group, open to all interested exporters and growers, to guide the development of the US market opportunity. Facilitated by AMIA
DoAWR	Negotiate and sign OWP with US, approve crop monitor training, approve and audit growers and packing sheds, undertake export phytosanitary inspection, monitor and approve export process

Industry preparation and communication

The nominated start date (dispatch of first exports) for the US program is important as the OWP requires that USDA be advised of approved growers and packers at least 30 days prior to the start. DoAWR takes advice from AMIA on the suitable start date. The OWP requires that properties (blocks) and packaging sheds for the US are registered with and approved by DoAWR. The blocks must be monitored from the start flowering for pests of US concern by trained and DoAWR approved pest monitors who record their observations in an auditable DoAWR approved format. AMIA, with support from the Northern Territory Department of Primary Industry and Fisheries (NT DPIF) and the Queensland Department of Agriculture and Fisheries (DAF), undertook crop monitor training

from July 2015. DoAWR called for applications from growers and packers to register for the US mango program[3] in July 2015.

There were several challenges with the grower and packer US application and approval process during the 2015/16 program. There was a 'mix up' over block descriptions with some growers, it was difficult for AMIA to know which growers were approved / not approved for the US and even some exporters were not aware of whether their intended growers were approved or not.

AMIA assessed that a 'Working Group' of stakeholders, meeting regularly and sharing information on the US program, would be an important tool. The first meeting, by weekly teleconference, was held in July 2015. As the program developed, the Working Group also developed. Participating exporters[4] used the Working Group to discuss US maximum residue limits (MRLs), packaging, their volume intentions and other matters of interest, committed and contributed to a process to fund the USDA audit and committed to AMIA's marketing guidelines for the US. The marketing guidelines for the US included nominating two US importers, Melissa's World Variety Produce and Giumarra, that exporters would work with. AMIA then sought and obtained Australian Competition and Consumer Commission (ACCC) certification that participating exporters could discuss and coordinate US program matters including volume and indicative pricing.

Pathway

The pathway from harvest to the US consumer for Australian mangoes is relatively complex involving two border inspections, a phtyosanitary treatment, multiple transport modes, the need to ripen the mango and the need to maintain temperature control (refer to **Table 2**).

[3] http://www.agriculture.gov.au/export/controlled-goods/plants-plant-products/ian/2015/2015-32

[4] Exporters who had signed AMIA's US marketing guidelines and contributed to the USDA audit fund.

Table 2 - Model Australia - US mango pathway

Activity	Time	Temp
Harvest	1 day	Ambient
Packing	1 day	Ambient
Cooling / ripening	Varies	Varies
Transport to Brisbane (can be 2-3 days)	2-3 days	16°C
Ripening / cooling	Varies	Varies
Export Inspection	+1 hour[5]	14°C
Export phytosanitary treatment (irradiation)	1 hour	14°C
Cooling to desired shipment temperature	Varies	14°C
Loading the airline pallet	1 hour	12°C
Delivery to Cargo Terminal Operator (CTO) at airport	1 hour	Ambient
Transfer to aircraft	1 hour	Ambient
Export from Brisbane / arrive at Los Angeles	13 hours	Varies
Transfer from aircraft to CTO	1 hour	Ambient
Deliver from CTO	1 hour	Ambient
Unload airline pallet / cool / queue	1-8 hours	Varies
Import inspection	1 hour	Varies
Deliver to importer warehouse / cool /quality control (QC)	1 hour	1 – 13°C
Store pending dispatch to retailer	+1 day, varies	13°C
Deliver to retailer distribution centre	3-5 days	1 – 6°C
Deliver to retail store	o/night	1- 6°C
Retail display	2- 5 days	20°C

The competitive opportunity for Australian mango growers and exporters is to have the more effective pathway that delivers the best quality[6] mango to the US retailer and consumer in the most efficient manner.

[5] OWP requires that DoAWR inspector remain on site to supervise the completion of the treatment

[6] Quality defined as appearance + shelf life + flavour + brix + eating

Methodology

The project was undertaken by working with exporters, treatment provider, freight forwarder, importers and retailers and observing shipments and fruit through the supply chain from export inspection, export loading, import arrival to retail display.

The objective was to observe as much fruit as possible in as many situations as possible, record the observations, talk to the commercial party responsible and build up as comprehensive picture as possible of the quality of Australia mangoes and any issues; over time, location, variety and step in the US supply chain in the 2015/16 season.

The fruit observed was all commercial fruit in the commercial pathway. Observations were subject to commercial timing and constraints. It was quite hard to get the timing right, particularly at import. Observations were supplemented and supported with interviews with and feedback from exporters, treatment operator, freight forwarder, importers, retailers and US consumers.

Observations were reported back to exporters daily as detailed in the Outputs section. Export observations were undertaken in Brisbane and import observations were undertaken in Los Angeles where both US importers were located. Retail observations were subject to where the fruit was distributed. Some observations were undertaken, without success, in the Los Angeles area. Most retail observations were undertaken in the Dallas Fort Worth area where there was a cluster of five stores, all under the same banner and stocking Australian mangoes but each slightly different due to their customers and store management.

Results

Shipments in 2015/16

Thirteen commercial shipments of Australian mangoes were made to the US in the 2015/16 season, principally in January and February 2016, a total of approximately 75 tonnes. One shipment was overheated, unsaleable and dumped. Another was overripe, largely unsaleable and mostly dumped. The other 11 shipments sold successfully in US supermarkets in Texas, Arizona, north east and north west. Two of these 11 shipments were short shipped due to the interception of more than one mango seed weevil (*Sternochetus mangiferae*, MSW) in the lot at the export inspection resulting in those lots not being permitted to be exported. MSW along with ten species of fruit fly, are specified in the OWP as quarantine pests of the US.

Table 3 - Summary of 2015/16 shipments by shipment

No	Month	Variety	Qty (boxes or trays, approx)	Comment / issues
1	Dec	KP & R2E2	240	KP rejected in BNE a/c MSW, relabelled, box issue
2	Dec	KP & R2E2	680	KP rejected in BNE a/c MSW, box issue
3	Dec	R2E2	800	No problem
4	Dec	Honey Gold	800	'Cooked' on arrival, dumped
5	Jan	KP & R2E2	800	Over ripe on arrival, KP all dumped even after repacking, R2E2 sold but less than Class 1 appearance
6	Jan	Honey Gold	800	No problems
7	Jan	Calypso	3,000	Relabelled Brisbane
8	Jan	Honey Gold	720	First pallet / net / Mod 12 tray shipment, no problems
9	Jan	Calypso	3,200	No problems
10	Jan	Calypso	1,500	No problems
11	Feb	Honey Gold	--	Cancelled, grower not approved for US
12	Feb	Keitt	832	No problems
13	Feb	Honey Gold	--	Cancelled, grower not approved for US
14	Feb	Keitt	832	No problems
15	Feb	Keitt	832	No problems
Total			15,036	

Data source – exporters, importers

Table 4 - Summary of 2015/16 shipments by arrival condition

Arrival condition	Qty (cartons and trays, approx)	% of total
Arrived in good condition, distributed to retail	13,436	89%
Arrived overheated, not distributed	800	5%
Arrived overripe, most not distributed	800	5%
Total	15,036	100%

Table 5 - Summary of 2015/16 shipments by production area

Supply area	Qty (cartons and trays, approx)	% of total
Burdekin	2,520	17%
Mareeba/Dimbulah	12,516	83%
Total	15,036	100%

Shipment sizes varied, stabilising as multiples of 832 boxes, the capacity of the airline pallet, as the season progressed. The lot size (unit of DoAWR inspection) also increased during the season, reducing unit inspection costs, and exporters learnt to maximise the size of their Request for Permit (RFP, unit of DoAWR export clearance process). Earlier in the season one exporter, on advice from their forwarder, split a single lot across two RFPs, which doubled their export inspection and documentation costs.

Compliance

Australian mangoes for the US must comply with the OPW, US Environmental Protection Agency (EPA) MRL requirements, US FDA foreign Food Facility registration (anti terrorism) requirements, Australian export requirements and evolving aviation cargo security requirements for US bound cargo[7] .

In Australia

Several growers who applied for approval for the US program were not approved for reasons such as MSW infestation, unable to comply with the pest monitoring or not having a copy of the OWP on hand at audit. There were non compliances at export inspection for labels, cartons and MSW.

More positively, there were reportedly several shipments (all?), other than those with MSW, where DoAWR found no live insects of quarantine concern. This meant the exporter had the option[8] to reduce the irradiation treatment dose from 400 Gy to 300 Gy, a 25% reduction in the dose with the

[7] https://infrastructure.gov.au/security/air-cargo/us-bound-air-cargo-security-arrangements.aspx

[8] The OWP specifies a minimum dose of 300 Gy for the US pests of concern (fruit flies + MSW). 400 Gy is an internationally / USDA accepted generic dose for Lepidopteran eggs or larvae (or most other insects of potential quarantine concern).

potential benefit of reduced treatment damage. It appeared that exporters are not clear on this option and tended not to exercise it.

On arrival in the US

DoAWR advised the US program debrief held in February 2016 that they had not received any advice of non compliance from USDA during the season.

In parallel with the US Customs and Border Protection (CBP) inspection and clearance process, there is also apparently a US FDA import clearance process. What this is and how it intersects with the US CBP was unclear at the time of writing. Several Australian mango shipments during the program were cleared by US CBP but subject to 'FDA hold'. This fruit was cleared from Los Angeles airport to the importer's warehouse but could not be opened, handled or dispatched pending release. In all cases the FDA release came through either while the fruit was on the road from the airport to the importer's warehouse, on arrival at the warehouse or overnight.

Figure 1- Fruit on FDA hold (shipment#5) in importer's warehouse

Pesticide residues

Some pesticides registered in Australia are either not registered in the US or have different MRLs.

There was discussion within the Working Group at the start of the program on US MRLs, pesticide residue testing and the limit of quantification (LOQ) available to commercial testing laboratories in Australia compared with technology available to US regulators. AMIA engaged Kevin Bodnaruk (HIA pesticide consultation with expertise in this area) in August 2015 to compile a comparison table that would assist mango growers interested in the US market to assess the requirements. This was made available to all registered growers. In addition, the Working Group resolved to (i) require growers to

provide, prior to US export packing, a copy of a C6[9] analysis of fruit from a US approved block that had been packed over their US approved packing line[10] and (ii) to fund a pre-export test. For 2015/16 the pre-export test was one C6 sample from each property exporting to the US. The sample was taken from fruit cut by DoAWR at the export inspection and submitted to a National Association of Testing Authorities (NATA) accredited laboratory. The analysis was forwarded to the grower. These tests provided a double check on the grower supplied tests and gave industry a body of independent data on residues.

It is anticipated that a summary the 2015/16 pre-export inspection MRL test data (without grower identifiers) will be made available to the Working Group prior to the 2016/17 program.

Fruit

Varieties

Calypso and Keitt varieties were exported to the US in 2014/15 and Calypso, Keitt, Honey Gold, R2E2 and Kensington Pride varieties were exported to the US in 2015/16. No Kensington Pride were retailed in the US in 2015/16 as the one shipment cleared for export arrived overripe and not suitable for retail sale.

Retailers generally displayed the mangoes by variety under an Australian Mangoes banner or point of sale (POS) material. While retailers made a range of comments on the merits of various varieties e.g. "the 'original' Australian mango was best", it is too early to be confident on any US variety preferences as the sample has been small. The target retailers and consumers are sophisticated, well informed, critical and seeking attractive food experiences. Over time it is expected they will form views on the merits of the various varieties.

Stage of maturity

The Working Group agreed that only fruit complying with agreed industry maturity standards would be exported to the US. This was to ensure that only mature, well flavoured fruit would be marketed to US consumers.

Stage of ripeness

The stage of ripeness of mangoes for the US is important for several reason;

1. Research[ii] , supported by 10 years of trade experience to New Zealand, suggests that mangoes ripened to (at least) stage 1 or 2 exhibit less irradiation treatment damage than mangoes that are treated unripe,

2. The market opportunity in the US is for a more coloured and more flavoured mango than

[9] C6 – term used by analytic labs in Australia to describe comprehensive pesticide residue analysis

[10] This could be a copy of a test undertaken for Freshcare or equivalent, at no additional cost to the grower

competiting fruit. Riper, more coloured fruit is visually more attractive at retail than substantially green fruit and,

3. There is a tension between the Australian opportunity of delivering a ripe, more flavoured mango and the US importer and retailer aim to receive a less ripe mango with longer shelf life.

One shipment (#5) arrived overripe and was largely unsaleable. This was preventable. With hindsight the Kensington Pride fruit were held too long in Australia for ripening. If it had have been exported several days prior to the actual export date, it may have been saleable.

Counts

A range of counts were reportedly shipped in 2015/16. A US importer reflected that they had little involvement in what counts were shipped, that some counts were too large for the target consumer and 11 and 13 counts (in the 5 kgs US box) were preferred. One produce manager reflected that, as they sold the fruit by unit, the larger fruit / smaller count were expensive for retailers. Figure 2 is a packing list / count range from one export shipment, with 91% of the shipment outside the customer's preferred count range! AMIA had recommended 11 and 13 count to packers for the 2014/15 season.

Figure 2 - Packing list / count range from one shipment

	Count/Size					
ıss	6	7	8	9	12	Grand Total
ɛmium					70	70
ɛmium	36			144		180
ɛmium	52		128			180
ɛmium	10	122				132
ɛmium	180					180
ɛmium	15					15
	293	122	128	144	70	757

Appearance

The Working Group resolved that only Class 1 (or better) fruit would be exported to the US.

Cool chain management

One shipment (#4) arrived overheated and was unsaleable. This was probably preventable. Most exporters, over 12 shipments, achieved an acceptable level of cool chain management.

Table 2 summarised a typical pathway. As well as more than 12 transport steps, there are approximately 20 different temperature (ambient and controlled) steps as the Australian mangoes move from one mode to another along the path to the US consumer. **Table 6** details the major cool chain steps.

Table 6 - Major cool chain steps

Location / mode	Typical cool chain temperature
Australian road transport (typical)	16°C
Steritech	14°C
Freight forwarder (typical)	12°C (forced draft an option)
Airfreight	≈24°C at Cargo Terminal Operator (CTO) and on tarmac in Brisbane (late morning, summer), no nominated temp in aircraft, ≈12°C on tarmac and at CTO in Los Angeles (early morning, winter,)
US importer	55°F (13°C)
US road transport	33°F-43°F (1 - 6°c)
US retail storage[11]	55°F (13°C)

It is very difficult to get a complete 'through-chain' record of the fruit (pulp, surface or air near the fruit) temperature from packing to retail. As well as the normal problem of finding and recovering temperature loggers (potentially solvable with remote monitoring), the standard temperature logger will not survive the irradiation treatment and the OWP requires that the package must only contain mangoes and remain sealed, other than the inspection, from packing until the US entry port inspection. As the sealed carton cannot be opened it is difficult to get pulp temperatures. Air temperatures, from data loggers, and infrared (IR) temperatures are relied on but they may not fully represent the temperature of the fruit across a shipment and can be misleading.

There is also the matter of air flow (temperature distribution) within the box and within the load across the multiple modes. This needs to be carefully considered by the exporter; is there enough samples and experience to accurately extrapolate a shipment temperature from one or two temperature sample points?

A positive in the cool chain management is that regular re-handlings of the product reduce the risk of CO^2 and ethylene build up. On the other hand, some freight forwarders were apparently 'pre loading' the airline pallet the evening before shipment. This may have reduced their labour costs but increased the fruit's time out of temperature control and air-change by 12 hours (or 50%).

[11] Retail stores apparently have cool rooms at two temperatures, 55°F and 42°F. One store manager reported accidentally storing some Australian mangoes at 42°F. They had to be dumped.

During the 2015/16 program, temperature data loggers were put on the outside of the boxes at the packing shed and at the forwarder immediately prior to export. One exporter may have 'through-chain' temperature data and graphs, but these were not available at the time of writing. The graphs of the recovered temperature loggers are below at Figures 3 - 8. These graphs, which cover the period from the airline unit load device (ULD) being packed at the freight forwarder in Brisbane to the shipment arriving at the importer's warehouse in Los Angeles, approximately 24 hours, are remarkably variable.

The one conclusion that can possibly be drawn is *if the mangoes have been thoroughly cooled to the desired temperature prior to loading, they will stay cool and close to that temperature for the trip to Los Angeles.*

Figure 3 - Temperature data, shipment #5

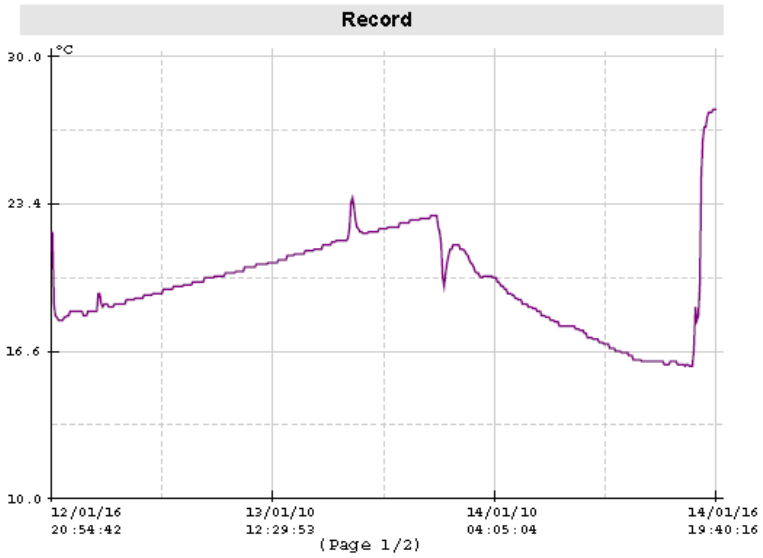


Figure 4 - Temperature data, shipment #6

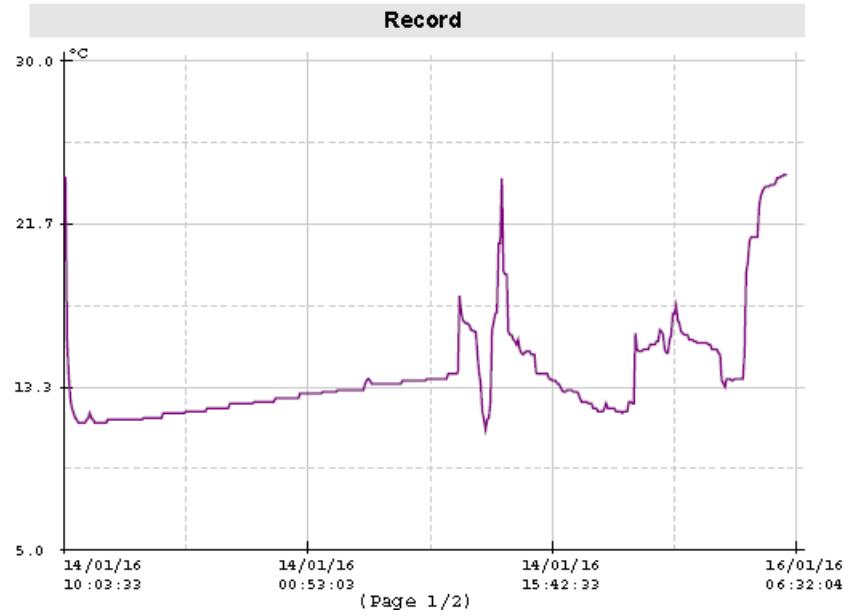


Figure 5 - Temperature data, shipment #12 (presumably on the outside of the load)

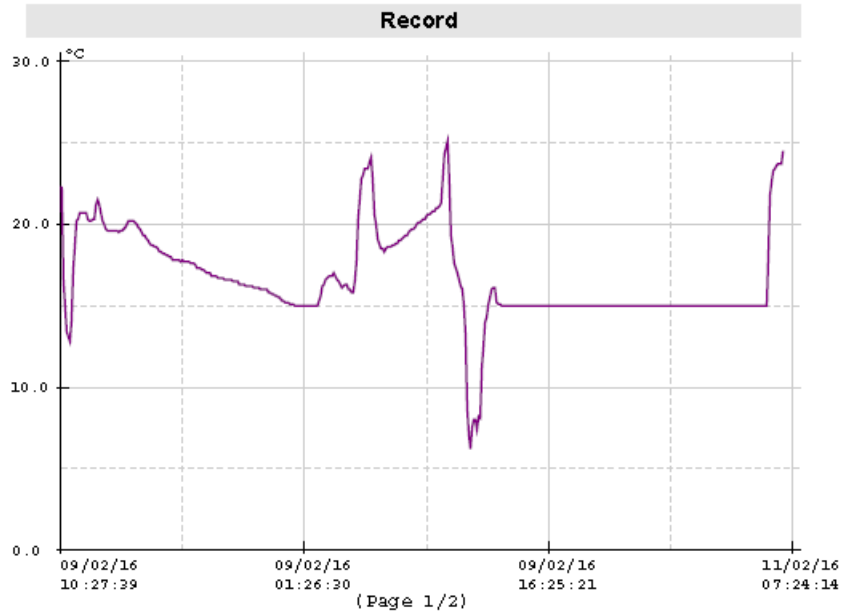


Figure 6 - Temperature data, shipment #12 (presumably on the inside of the load)

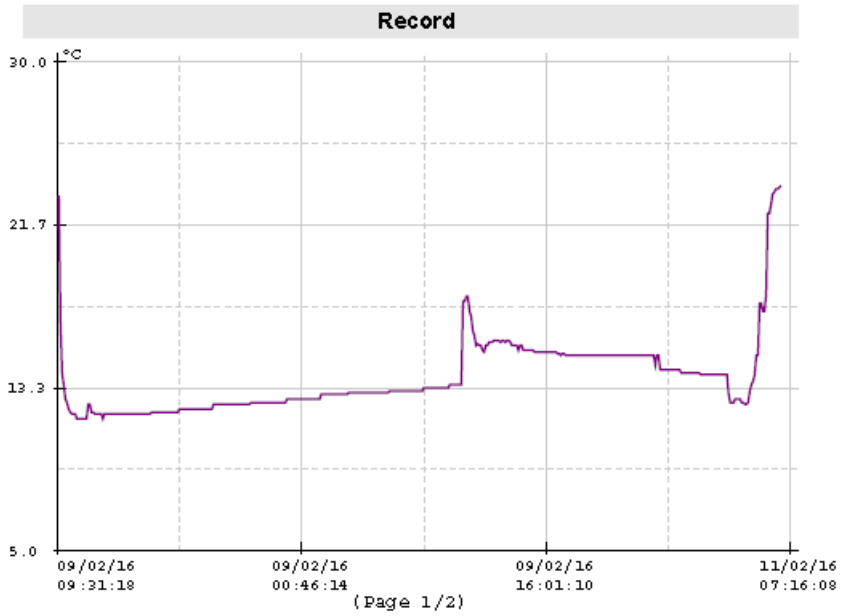


Figure 7 - Temperature data, shipment #14

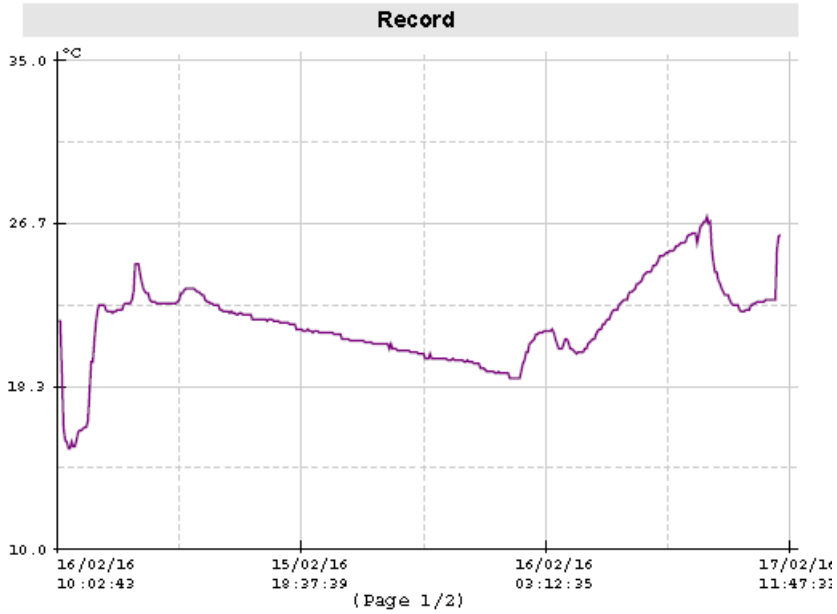
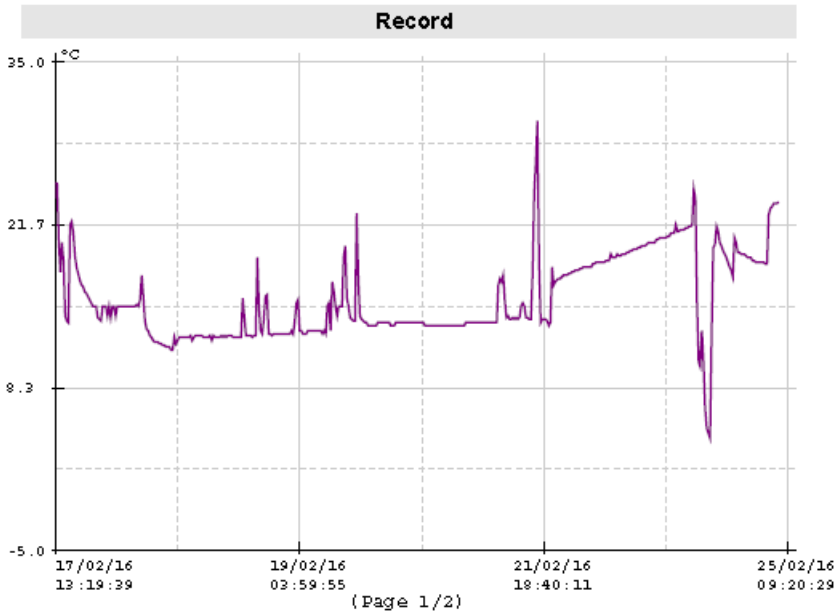


Figure 8 - Temperature data, shipment #15



The dates on Figure 8 are not correct. This shipment arrived in the US on 23 February. A pulp temperature of 67oF (19°C) was recorded by the importer.

While more information and data would be useful, there may be differences in the temperature response and cool chain management requirements between varieties. Observations at import and

retail indicate Calypso appear more tolerant of warm temperatures for longer than other varieties. Calypso (shipment #7) felt warm to touch (no thermometer was available) when seen being stacked at retail, immediately after arriving at the store after a five day trip from the importer and the retailer's distribution centre. This fruit continued to look very good several days later. This observation is consistent with the 2014-15 experience.

Keitt (shipment #12) were exhibiting lenticel spotting at retail, eight days after arrival, though the cause is unclear and may not be temperature related.

If imports through Dallas - Fort Worth and New York airports are approved for 2016/17, internal US distribution time will be reduced by 4-5 days which means fruit will arrive at the stores sooner, and less ripe. Fruit may need to be riper prior to export for these ports. The exporter will need to work very closely with the importer to ensure fruit arrives at the store in the optimum condition and in accordance with retailer specifications.

Packaging

The OWP requires Australian mangoes for the US to be packed in pest secure, USDA approved, packaging. There is a process though DoAWR for approval. At the start of the 2015/16 season there was one approved mango package (Figure 9). This box was very similar to the 2014/15 program box with the addition of 'all flaps meet' to solve the problem of retail produce staff cutting the middle fruit with their box cutter when stocking the shelves[12] and additional ventilation holes to improve air flow; issues identified in 2014/15. There were delays in manufacturing at the start of the season due to problems joining the required pest secure mesh to the box.

Figure 9 - Approved 5 kg US mango box

This box is relatively expensive (≈$6 / each v's $1.50 for an equivalent Mod12 5 kg tray) and inconvenient for packers compared to the trays used for most Australian domestic and other export markets. It is also a labour intensive process at treatment to restack the CHEP pallet into the

[12] Estimated (Daysh, M., Australian Mangoes to the US market, 2015, unpublished) that 3% of fruit was damaged in this way in 2014/15

approved, and minimum dose uniformity ratio (DUR), configuration and at export and import to stack and unstack the airline pallet (Figure 10).

Figure 10 - Typical loading of the 5 kg US box on the airline PMC at Brisbane

The Working Group requested additional packaging options and a netted pallet with Mod12[13] tray option was developed by NT DPIF working with AMIA. A standard 1200mm x 1000 mm pallet format was selected as that is the most efficient unit on the standard PMC airline pallet and close to US 40" x 48" grocery pallet. The pallet also needed to comply with International Standards for Phytosanitary Measures (ISPM) 15 concerning wood packaging materials. The Mod12 (net 5 kgs) standard domestic tray was selected as that is the most efficient mango package on the 1200mm x 1000 mm pallet.

The netted pallet with Mod12 concept, along with samples, was submitted to DoAWR for consideration by USDA. A key consideration was that the net material had to comply with the OWP[14] . There were limited suppliers of compliant net (one in Australia at the time of writing) and it is difficult for a packer to confirm that a particular net is compliant as that requires a microscope with a scale. Operationally, it is intended to rely on the net supplier to provide a compliant net, along with other package elements, as a convenient 'kit' to the packer. With the support of several members of the Working Group and the encouragement of DoAWR a mocked up (all the packaging elements but no fruit) netted pallet was assembled in Brisbane in December 2015 for inspection by a USDA auditor, who was already in Brisbane for the 2015/16 US program.

[13] Term used to describe an Australian domestic mango tray that loads 12 per layer on the Australian domestic 1165mm x 1165mm CHEP pallet.

[14] The OWP specifies a pore size of ≤0.6 x 0.6mm or ≤0.8mm on the hypotenuse.

Figure 11 - Mocked up net pallet mod12 tray at Brisbane for USDA inspection

The USDA approved the netted pallet application in January 2016 and an initial netted pallet shipment (#8) was made shortly thereafter.

Figure 12 - Initial shipment of netted pallet (shipment #8) - being loaded at freight forwarder, Brisbane

Courtesy - Mainfreight

Figure 13 - Initial shipment of netted pallet (shipment#8) - after unloading at importer, Los Angeles

Only one netted pallet shipment was made as the season was 50% complete by the time of approval in January, packers had stocks of the 5 kg boxes on hand and there was insufficient time left in the season to manufacturer and deliver pallet elements such as the pallet, pallet pads, corner board/net protector or pallet lids.

Pricing and costs

Advice from exporters suggests an average, across varieties and counts, C&F price of A$47.00 / 5 kg box through the season. Deducting estimated export costs[15] of A$11.70 / box result in a delivered Brisbane value, prior to exporter margin, of A$35.30 / 5 kg box, or about $7.06 / kg / Brisbane.

One importer reported fluctuations and variability in the pricing they were offered, including between counts, when they would prefer firm pricing at least 4 weeks prior to a shipment. Conversely at least one exporter undertook a multi shipment program over their harvest with a single, firm, price across all counts.

Observations at store level in the US indicated stable retail pricing, across varieties and count of US$4.98 / fruit. Anecdotal advice from the store produce managers was that, while the customers noticed and commented on the high price of Australian mangoes compared to mangoes from other sources, this did not stop purchases. This suggests;

- US demand for Australian mangoes is relatively price inelastic,
- Supply (having the fruit on the shelves) is a more important variable than price,
- Appearance (colour, blush, lack of marks) is a more important variable than price and,
- Flavour and eating experience are a more important variable than price.

Some export costs, such as packaging, increase in a straight linear manner with volume, while other costs such as the export inspection cost reduce with volume: e.g. assuming an export inspection of 3 hours and cost of $648, that is $0.78 per box for a one pallet shipment of 832 boxes, but $0.26 / box, a saving of $0.52 / box, for a three pallet shipment of 2,496 boxes. Others costs such as airfreight are 'semi variable' and optimised by shipping the maximum capacity of the most efficient airfreight unit. In the US mango case, that is the 4,990 kg capacity PMC airline pallet.

Another significant cost is losses. A single airline pallet of 832 boxes of mangoes for the US has a value of approximately A$39,000 landed in Los Angeles. A modest investment in cool chain management time could ensure that fruit arrives at the recommended temperature and fully saleable rather than lost.

Supply regions

Approximately 83% of the mangoes exported (Table 5) came from Mareeba /Dimbulah with the balance from the Burdekin in Queensland.

[15] Airfreight, documentation, handling, transport, DoAWR inspection, irradiation treatment

US distribution and marketing

Australian mangoes land in the US for typically three to four times the cost of mangoes from other suppliers in the same season. To be successful, Australian mangoes will need to differentiate themselves on variables other than price such as flavour, appearance and provenance, and then work with US importers and retailers who are motivated by those variables. AMIA, in consultation with the Working Group, nominated two US importers to market Australian mangoes.

Arrival and importer

All mangoes in the 2015/16 US program were exported from Brisbane and flew direct and non - stop to Los Angeles[16] . On arrival the mangoes are taken to the CTO of the respective airline. That can take about 1-2 hours. The fruit is then queued for US CBP inspection. That queue can be within the CTO, where the fruit is typically at ambient temperate for around four hours, or at the importer's warehouse, where the fruit is under temperature control and the queue can be 6 – 8 hours. Typically, the fruit is cleared on the day of arrival. Where possible, fruit was observed at the importer's warehouse with the importer immediately after the US CBP clearance.

Figure 14-Figure 22 are images of fruit at arrival. While the US importers see Australian mangoes as an interesting product with potential in market segments where consumers are looking for new, interesting and flavourful products, they raised a number of matters during the 2015/16 program;

- The need for programs and lead times so they can sell the 'Australian mango story' to their retailer customers,
- The need for growers and exporters to follow through on plans that have been agreed to with consistent volume and product,
- A desire for firm pricing at least four weeks before shipment,
- The need for more information on what's happening with the crop and 'no surprises',
- The need to increase the pace of activity and innovation to ensure Australia keeps pace with competitors including a presence at PMA[17],
- The need to increase the volume of the business to make it commercially viable and,
- Avoid Australia style date format (day/month) on the box labels as that is potentially confusing to US retailers.

[16] Industry has asked DoAWR if that can be varied in 2016/17 with non direct routing to increase capacity and direct entry to other US ports such as Dallas-Fort Worth and New York.

[17] Produce Marketing Association's Fresh Summit, the largest annual fresh produce trade show in the US (and the world) and a key marketing and promotion opportunity to the trade.

Figure 14 - R2E2 at importer's warehouse, shipment #2

Courtesy – Manbulloo

Figure 15 - Shipment #4 at importer's warehouse

Courtesy – Melissa's and Pinata

Figure 16 - Shipment #5 at importer's warehouse

Figure 17 - Repacking crew at importer

Working on the evening of arrival, sorting through shipment #5 to recover saleable fruit.

Figure 18 - Shipment #6 at importer's warehouse

Figure 19 - Shipment #7 at importer's warehouse

Figure 20 - Shipment #8 at importer's warehouse

The first netted pallet shipment (#8) arrived compliant thought the customs agent reported 'heat build up' at the airport CBP inspection. Apparently the temperature loggers were not recovered and the importer's QC report was not available at the time of writing.

As the first netted pallet shipment, this shipment spent an extra day in Brisbane held in a cool room at 14°C while the dose mapping was verified. It is not known if the fruit was force draft cooled after treatment and prior to loading and export.

Figure 21 - Shipment #12 at importer's warehouse

Figure 22 - shipment #14 at importer's warehouse

Retail

The target market is US consumers looking for interesting, new and flavourful products (mangoes). There are pockets of these consumers throughout the US, and there are retailers throughout the US in regional chains to meet these consumer's needs. One highly regarded US food retailer is Central Market (http://www.centralmarket.com/Home) in Texas. Central Market were identified by US importers as the initial retailer in 2014/15 and this continued in 2015/16. Anecdotally, Central Market and their parent, HEB, handled 75% of the 2015/16 Australian mangoes program. Other mangoes went to Wegmans (www.wegmans.com) in the North East, and to retailers in Arizona and the Pacific North West. It will be important for Australian mangoes to broaden their retail base in 2016/17.

Central Market are devoted to high-end food and wine with stores having only a small 'ordinary' grocery section. All Central Market stores have a catering service, a cooking school, a large wine section, a large flower section, bakery including tortilla section, a wide range of 'chef prepared' ready to eat meals, a café and free wifi. The fresh produce section, as an example, will typically have 20 different varieties of apples, there are 700 cheeses in the store and the deli section will have 50 different olive varieties in the self-service deli alone. **Figure 23** is from Central Market, Plano (north of Dallas); note the 'Foodie Crossing', the giant green capsicum as 'street art' and catering service delivery van. To paraphrase one importer; "Central Market, and their suppliers, are selling a lifestyle rather than just food".

Figure 23 - Catering service and entrance street art, Central Market store, Plano, Texas

Within these stores, Australian mangoes had between 75 – 95% of the mango shelf space in competition with mangoes from Brazil and Peru. Presumably this was a deliberate, corporate,

decision. Australian mangoes are an attractive product for the retailer: they are 'exotic' but safe and reaffirm Central Market's ability to source exciting fresh produce from around the world; they add excitement to the tropical category and Australia has a very positive image with US consumers. The retail pricing of Australian mangoes at Central Market increased from US$3.99 each in 2014/15 to US$4.98 each, a 25% increase. Produce managers commented that "customers always mentioned the price", but that did not seem to impact their purchase decisions or store sales.

Food irradiation remains a topic of discussion in the US[18] and not all retailers will stock irradiated food. Gelson's (https://www.gelsons.com/) in Southern California are currently talking with both importers but not stocking irradiated food.

Retail Displays and an attractive produce department are a critical element in the US retail food merchandising effort. In addition to point of sale (POS), shelf space is important; the more shelf space a product has, the greater the sales. The retailer space and energy devoted to displays of Australian mangoes continued upward from the high benchmark set in 2014/15.

Figure 24 - Australian mango retail display - Central Market, Lovers Lane, Dallas

Figure 24 and **Figure** 26 are examples; a large display, close to the produce section entrance with

[18] http://www.chapman.edu/scst/conferences-and-events/phytosanitary-irradiation-workshop.aspx

a mix of Calypso, Honey Gold and R2E2 incorporating both store generated and importer POS and the Australian Mangoes branded box. This all catches the customer's eye and draws there attention.

There was considerable variation observed between the Central Market stores in the size and format of their Australian mango displays; it appears that individual store produce managers have considerable autonomy.

Figure 25 - Retail display - detail of Calypso

Figure 26 - Retail display - three varieties and POS material

Figure 27 - Retail display - Three varieties of Australian mangoes + sampling

Figure 28 - Retail display - Australian Keitt

Figure 29 - Keitt display - *Australian Mangoes* branded boxes and Manbulloo POS (from previous R2E2s)

Figure 30 - Keitt display - *Australian Mangoes* branded boxes and POS

Figure 31 - Two further Keitt dispalys where the *Australian Mangoes* branded boxes are the only POS

Sampling is an important tool for US retailers (and food manufacturers and suppliers) to reach out to customers. On a busy day (typically Saturday and Sunday) Central Market might have 10 – 15 sample stations within a store. Sampling of Australian mangoes was undertaken, supported by the importer, in 2014/15 and stores continued it again in 2015/16. Recognising that the fruit on display might not be fully ripe and 'best eating', one produce manager inquired about boxes of 'best eating' fruit for sampling and tasting. On at least one occasion, the variety being sampled wasn't the variety most visible in the retail display.

Figure 32 - Retail sampling - Central Market, Southlake store

Merchandising is another important element in the US retail promotion mix. US consumers expect to be engaged and stimulated with information and visual cues along with sampling.

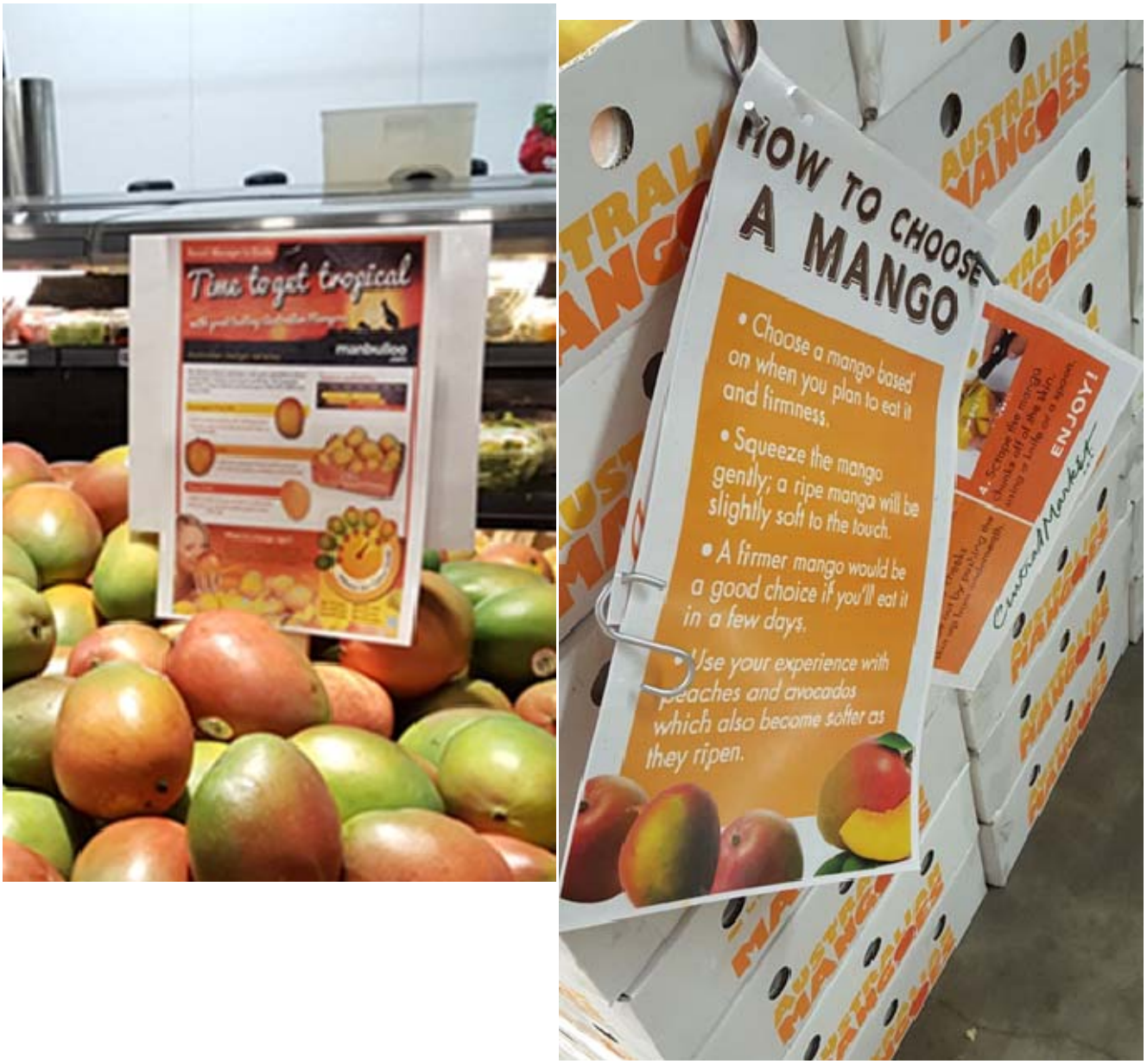
Figure 33 - Retail display, mixed varieties and range of POS

Figure 33 is a display with three visually different varieties, four pieces of POS, a price card, three different fruit stickers, sampling and the Australian Mangoes branded box!

Figure 34 - Example of POS

Figure 35 - Another example of POS, using boxes from an entirely different product

Figure 36 - Further examples of POS



At Figure 36 the left hand POS is a Manbulloo (KP and R2E2 varieties) sign from two months prior, on Keitt mangoes. Figure 37 is an example of importer prepared art work that was made available to retailers. Figure 38 are examples of the fruit stickers used in 2015/16. Fruit stickers carry required information such as the Price Look Up (PLU) number and advice that the fruit (food) has been irradiated along with variety and brand information.

Merchandising, POS and sampling is also supported by the importer's sales force who may, depending on the situation, work with either the retailer's buyers or directly with the store's produce manager with displays or sampling.

Figure 37 - Importer prepared artwork

Figure 38 - Examples of fruit stickers and branding

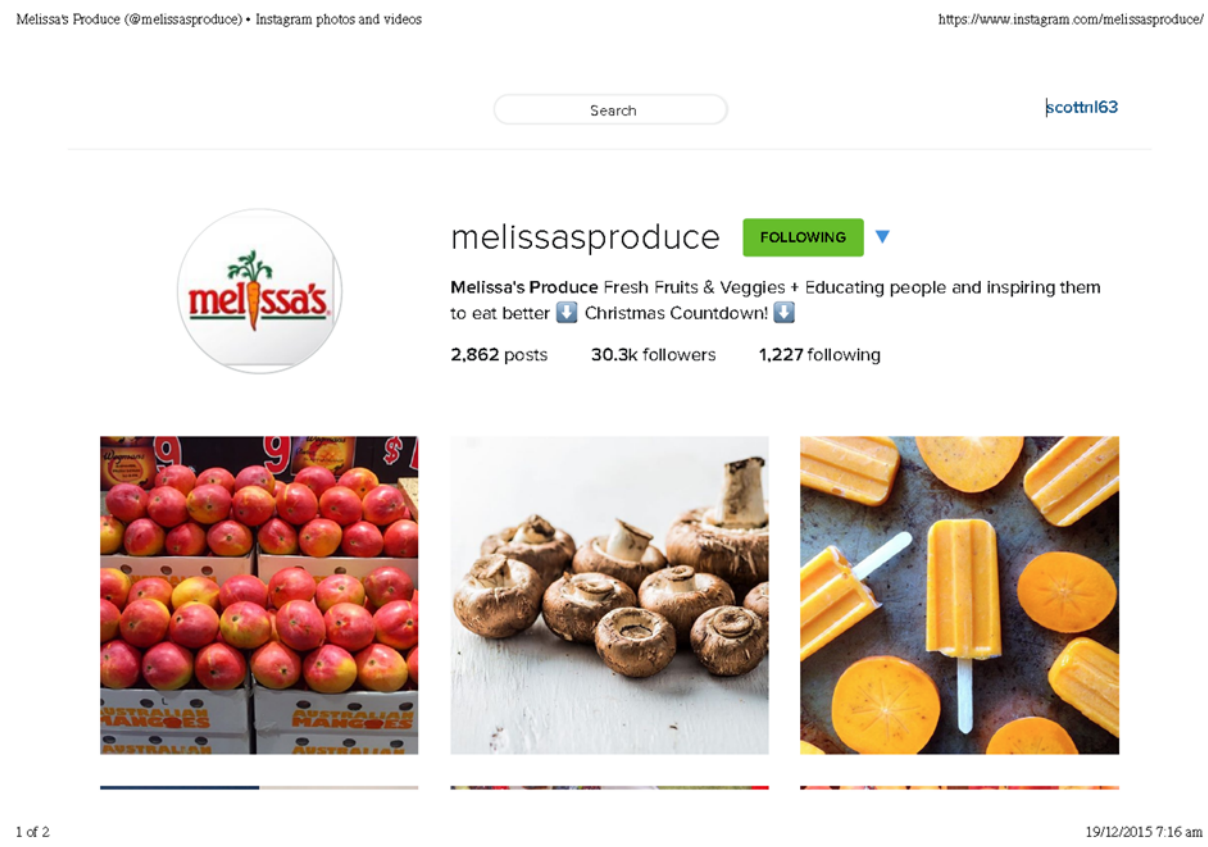
The importer advised that "the packinghouses are free to choose their own design and we will specify additional technical details the PLU's must have"[19] .There may be an opportunity for the use of the Australian Mangoes brand more prominently on the fruit stickers.

Social media also has a role. Figure 39 is an example of US importer social media activity featuring

[19] PC, email with importer, March 2016

Australian mangoes.

Figure 39 - Social media activity by Melissia's



Courtesy – Manbulloo / Melissa's

Fruit quality issues

Five different quality issues were observed on arrival or at retail; overheated, overripe, old fruit, lenticel damage and possibly poor grading and sap burn. On a more positive note, the problems of knife damage seen in 2014/15 (estimated 3% of fruit) were solved with the revised box, the problems with damaged labels seen in 2014/15 were solved by packers not using self adhesive tape to secure the pallets and there were only limited reports of damaged boxes in 2015/16. This may have been due to improved handling and attention in Australia and the uniform loading of the airline pallets.

Overheated: One shipment arrived overheated [20], soft and 'cooked' on arrival and was unsaleable. This was avoidable and the exporter has reviewed processes. This fruit was observed as warm at the export inspection but this was not flagged to the exporter. With hindsight, it is possible that overnight forced draft cooling prior to export may have reduced the fruit temperature sufficiently to save the shipment.

Figure 40 - Shipment #4 - overheated fruit at importer's warehouse

[20] Importer advice and words, QC report or temperature data was not available at the time of writing

Overripe: One shipment (mixed KP and R2E2) was soft and overripe on arrival. This was also avoidable. The KP were soft at inspection. With hindsight, the exporter could have elected not to export. Also, with hindsight, a GO / NO GO decision for fruit that was soft at the export inspection (where 30 pieces are cut in half) would have further informed the exporter and potentially saved the cost of the wasted airfreight to Los Angeles. The importer engaged the USDA for a third party inspection, sorted the shipment and attempted to sell to local retailer/s in the Los Angeles. The KPs were rejected by retailer/s as overripe. On a positive note, staff who ate samples of the overripe KP (which was great consumer eating) reported "flavour out of this world", "lives up to the hype" and "perfect at home but not for a four day ride to the store".

Figure 41 - Shipment #5, example of overripe fruit at importer's warehouse

Old fruit:

Figure 42 through Figure 45 are images of Calypso seen at US retail between 13 – 15 February. Assuming this fruit was from shipment #10 (no box labels were available to confirm) which landed in the US around 25 January, the fruit had been in the US for approximately 20 days and was probably approximately 26 days from harvest. The retail process would have concentrated the poorer fruit; consumers sorting through the display for the nicer fruit means an increasing percentage of poorer quality fruit remains in the display. For some reason the retailer was reluctant to clear the display and send sound but unattractive fruit to their fresh cut or food service sections.

The problem seems to have been an initial over ordering resulting in high stock levels and then old stock. The solution in 2016/17 could be more retailers in more regions involved in the US program and smaller, regular (weekly?) deliveries across the program, with the retailer selling out and looking for fresh Australian mangoes each week.

Figure 42 - Example of old fruit at retail

Figure 43 - Example of old fruit at retail

Figure 44 - Old fruit on display at retail

Figure 45 - Example of old 'green ripe' fruit at retail

Lenticel spotting and **discolouration**[iii] was observed on the Keitt from shipment #12 at retail. Most fruit had some percentage of lenticel spotting, mainly of a minor level. It was not observed on arrival or on shipment #14 on arrival. This was very similar to the lenticel spotting observed on arrival on the Keitt in the 2014/15 season.

Figure 46- Example of lenticel spotting at retail

Figure 47 - Example of significant lenticel spotting at retail

Poor grading and possibly **sap burn** was observed at retail on one lot of R2E2.

It is important to note that poor quality[iii] 'out of specification' fruit was a small proportion (≈1%) of the Australian mangoes marketed in the US in 2015/16. Reliable data on losses at retail is not currently available but an informed estimate is provided at *Table 7*.

Table 7- Estimated retail losses - 2015/16 program

	Estimated number of boxes delivered to retailers	Estimated number of boxes lost at retail	% of losses at retail
Calypso	7,700	100	1.3%
Keitt	2,496	30	1.2%
Honey Gold	1,520	5	0.3%
R2E2	1,720	5	0.3%
Total	13,436	140	1.0%

Outputs

The Working Group held weekly meetings by teleconference from July 2015 until February 2016. The Working Group was open to all exporters, growers and stakeholders interested in the US market, all attendees had the opportunity to raise matters relevant to the US program, meetings were minuted and the minutes were circulated.

Growers, exporters, DoAWR and other stakeholders contacted AMIA and the writer out of session during the season with questions and queries as they arose.

In addition to Working Group meetings, the writer provided information on arrival and retail conditions directly back to exporters during the US field visits, responded to exporter queries and responded to DoAWR requests.

A debrief for participating exporters was held on Brisbane on February 8, 2016. This was prior to the last shipments leaving for the US, however, it was assessed that most of the lessons and learning for the season were then available, and it was timely and convenient for key stakeholders. All participating exporters, major growers, key service providers, AMIA, DoAWR and HIA attended and DoAWR gave a presentation. A copy of the writer's presentation is attached at Appendix -- .

A guide for growers and exporters interested in the US market in 2016-17, summarizing the OWP, the packaging, market and MRL requirements was prepared (please refer to Appendix --).

Two media interviews with Australia rural media were undertaken while in the US:

- ABC Country Hour http://www.abc.net.au/news/2016-01-22/aussie-mangoes-selling-well-in-texas-united-states/7105130 ; and
- The Rural Weekly http://www.ruralweekly.com.au/news/export-success/2908283/

An item on the 2015/16 US program was prepared for the autumn 2016 edition of *Mango Matters*, the industry magazine http://www.industry.mangoes.net.au/mango-matters/

Outcomes

Challenges and learnings on the Australian side in the 2015/16 season include;

- Labelling not complying with the OWP. Two shipments (15% of total) had to be relabelled prior to export,
- Boxes not complying with the OWP. Reportedly two shipments (15% of total) had to be remediated prior to export,
- Interception of MSW at inspection. Lots within two shipments (15% of total) were rejected for export on account of finding more than 1 MSW. A single MSW was found in at least another two shipments,
- Inadequate cool chain management lead to one overheated shipment (8% of total) on arrival in the US which was dumped,
- One shipment (8% of total) arrived overripe in the US which was, after sorting and attempted sale, largely dumped,
- Two exporter / grower programs come to a sudden and unplanned end when the exporter found that the intended grower was not approved for the US. The result of a breakdown in communication between grower and exporter,
- At least one shipment was delayed in the US because the packer had not registered, as required, with the US Food and Drug Administration's (FDA) foreign Food Facility registration process and,
- One importer reported not receiving shipment details and documentation in a timely manner.

Challenges at the US side and learnings for Australia in the 2015/16 season include;

- A late start to the program (first shipment was not until mid December) leading to less time to develop retailer interest,
- Lack of clear and consistent supply and variety information leading to retailer confusion and reduced confidence in the 'Australian mango story',
- Pricing uncertainty ("Australian mango story moving too fast") and lack of advanced pricing leading to reduced retailer confidence,
- Shipments not arriving in the US in accordance with plans, leading to a lack of supply and not fulfilling retailer orders,
- Old fruit, over 20 days in the US, on display at retail leading to reduced sales and demand,

- Lack of information from Australian growers and shippers on events and activities impacting on supply,
- Apparent lack of energy and commitment from the Australian side according to US importers and,
- Overheated or overripe shipments leading to a shortfall in volume to retailers and disposal costs and inconvenience.

While there was an increase in the number of growers who shipped to the US from two in 2014/15 to six in 2015/16, the volume (refer to **Table 8**) is quite concentrated. Only one grower shipped in both seasons.

Table 8 - Summary of grower volume

	Estimated number of boxes exported	% of exports
Grower A	7,700	51.2%
Grower B	2,496	16.6%
Grower D	1,720	11.4%
Grower C	1,520	10.1%
Grower E	800	5.3%
Grower F	800	5.3%
Total	15,036	100.0%

Table 9 summarises the dates of packing, transport and retail display and the ripening process used for the shipments observed. There is a range of transport and holding times in Australia and a range of ripening processes. Recommended ripening varies with maturity and may vary between varieties.

Table 9 - Examples of 2015/16 shipment timelines and ripening

Shipment #	Pack date	Arrive Brisbane	Treatment	Depart/arrive	Arrive retail	Ripening (as advised)
#5	4/1/16	8/1/16	12/1/16	13/1/16	20/1/16	Ripened for 2 days in Brisbane, then held back a day which may have been too long by several days
#7	8/1/16	11/1/16	12/1/16	14 and 15/1/16	20/1/16	Held 1 day at shed, not ripened, shipment export spread over 2 days because of size / lack of aircraft capacity
#6	9/1/16	11/1/16	13/1/16	14/1/16	20/1/16	12 hours gas in Brisbane (Wamuran)
#8	14/1/16	17/1/16	19/1/16	21/1/16	Not sighted	12 hours gas in Brisbane (Wamuran), more mature fruit than previous shipment from this grower
#12	4/2/16	7/2/16	8/2/16	9/2/16	17/2/16	200ppm @22 hours @ 16C in Mareeba then vented prior to transport to Brisbane
#14	8/2/16	Not sighted	15/2/16	16/2/16	Not sighted	No information

Source - exporters

Evaluation and Discussion

There was a significant increase in volume between 2014/15 and 2015/16, with more growers and more varieties, though the actual volume exported of approximately 75 tonnes was modest and needs to be increased in years to come.

There was a modest increase in the number of US retailers involved. US importers attributed this to the lack of lead time to develop other retailers, the short season and the interruptions in supply once the season commenced. More retailers across more regions in the US need to be involved in years to come to broaden the demand base.

There was a significant reduction in package damage in the supply chain and cut fruit at retail. This was probably due to standardized loading of the airline pallet and revised 'all flaps meet' US box.

There may be a need for more communication between exporters and their US customers on counts and count preferences.

An initial netted pallet shipment was made successfully. While this will be more convenient and slightly lower cost for packers and exporters (lower package cost, higher transport costs), careful cool chain management will still be required and forced draft cooling continues to be recommended.

There was an increase in overheated and overripe shipments compared to 2014/15. These were preventable.

There was a continuation of the lenticel spotting in Keitt that was seen in 2014/15, though the importer has not reported any problems. The problem was not seen in other varieties exported to the US in 2015/16. The problem is possibly associated with the export treatment (lenticel spotting was not seen on Keitt from the same property distributed in Australia) combined with another factor such as variety, production, weather prior to harvest, stage of ripeness at treatment, etc.

US retail prices were, at around US$4.98, 25% higher than in 2014/15. While some consumers reportedly commented on the high price relative to competitive fruit from South America, this price did not appear to have a negative impact on sales. Export pricing, according to advice from exporters, was around A$47 / 5 kg box C&F Los Angeles. This is equivalent to A$35.30 / box delivery Brisbane prior to exporter margin.

The 2015/16 US program suggests that high quality Australian mangoes can be landed in the US and delivered to US retailers and consumers and, with appropriate cool chain management, there is the opportunity to expand the volume.

Recommendations

Recommendations are;

- Improved cool chain management, with all fruit leaving Australia fully cooled and no fruit arriving in the US overheated,
- Improved ripening management resulting in no fruit arriving either overripe or unripe,
- Consideration of the reasons for the Keitt lenticel damage and the implementation of any recommendations,
- Improved compliance with no label or package problems in Brisbane,
- Improved grower awareness of the MSW and not registering or not packing from 'at risk' blocks resulting in less interception of MSW at inspection and less rejected shipments,
- No issues with the adoption of the new netted pallet with Mod12 tray through adequately informing packers of the requirements,
- Fruit at PMA in October to launch the 2016/17 program with US retailers,
- Widening the distribution of Australia mangoes beyond the current major retail customer,
- Lengthening the supply season of Australian mangoes in the US market by starting the program earlier,
- Consideration of the branding and promotion of Australian mangoes in the US, including the use of the *Australian Mangoes* brand on Mod12 trays and on the fruit sticker,
- Review and reaffirm the Working Group's role,
- Developing, with exporters and importers, a season long program for Australian Mangoes in the US market including timing, varieties, counts, supply 'slots' and promotional activities,
- Clarification and communication of the pending new US air cargo security requirements and,
- Improved communication between grower, exporter and importer, including programs, count preferences and firm pricing prior to shipment.

Scientific Refereed Publications

None to report

Intellectual Property/Commercialisation

No commercial IP generated

References

i Daysh, M., (2015) Australian Mangoes to the US market; a report on the initial shipments, unpublished report

ii Ainsworth, N., (2015) Predicting the impact of irradiation on mango quality, Department of Agriculture and Fisheries, Brisbane

iii Holmes,R., Hofman,P., Barker,L., (2009), Mango Quality Assessment Manual, DEEDI

Acknowledgements

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Appendices

Travel itinerary

Debrief presentation, Brisbane, 8 February 2016

Guide for growers considering the 2016/17 US mango program

Travel itinerary

Trip #1

Date	Day	Activity
10-Jan	Sun	Darwin to Brisbane
11-Jan	Mon	Visit Steritech, telecon with AMIA and DoAWR
12-Jan	Tue	Observe inspection and treatment for shipment #5 and #7, shipment #6 arrived
13-Jan	Wed	Fly to Los Angeles
14-Jan	Thu	Observe shipments #5 & #6 at importer's warehouse
15-Jan	Fri	Observe shipment #7 at importer's warehouse
16-Jan	Sat	Store visits, look for shipment #5 without success
17-Jan	Sun	Store visits, look for shipment #5 without success
18-Jan	Mon	Store visits, look for shipment #5 without success
19-Jan	Tue	Store visits, look for shipment #5 without success
20-Jan	Wed	Fly to Dallas, store visits, observe fruit from shipments #5, #6 & #7, talk to retailer, return to Los Angeles
21-Jan	Thu	Observe shipment #8 at importer's warehouse
22-Jan	Fri	Store visits
23-Jan	Sat	Fly to Dallas, store visits, observe fruit from shipments #5, #6 & #7, talk to retailers, return to Los Angeles & Darwin

Trip #2

Date	Day	Activity
7-Feb	Sun	Darwin to Brisbane
8-Feb	Mon	Observe inspection and treatment for shipment #12 2015/16 debrief with exporters, growers, industry body, DoAWR and key service providers
9-Feb	Tue	Observe load out of shipment #12 Fly to Los Angeles
10-Feb	Wed	Observe shipment #12 at importer's warehouse
11-Feb	Thu	Meet with importer
12-Feb	Fri	Travel to Dallas
13-Feb	Sat	Store visits, observe fruit from shipment #10, talk with retailer
14-Feb	Sun	Store visits, observe fruit from shipment #10, talk with retailer
15-Feb	Mon	Store visits, observe fruit from shipment #10
16-Feb	Tue	Store visits, observe fruit from shipment #10 Travel to Los Angeles, observe shipment #14 at importer, return to Dallas
17-Feb	Wed	Store visits, observe fruit from shipment #12 in some stores, just arriving
18-Feb	Thu	Store visits, observe fruit and displays from shipment #12 in all stores, talk to retailers, return to Darwin

Australian Mangoes to the US – debrief on season #2

Michael Daysh
NT DPI&F
February 2016

Horticulture Innovation Australia

Northern Territory Government

AUSTRALIAN MANGOES

Agenda

- Summary of the season
- DoAWR presentation
- Exporter feedback and comment
- Improvements for 2016/17
- Mod 12 tray / net / pallet for 2016/17
- US marketing guidelines for 2016/17
- Questions / wrap up

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AUSTRALIAN MANGOES

Summary of the 2015/16 season

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Summary of the season

No		Variety	Qty (approx.)	Comment / issues
1	Dec	KP & R2E2	240	KP rejected in BNE a/c MSW
2	Dec	KP & R2E2	682	KP rejected in BNE a/c MSW
3	Dec	KP & R2E2	800	KP?
4	Dec	Honey Gold	800	'Cooked' on arrival, dumped
5	Jan	KP & R2E2	800	Over ripe on arrival, KP all dumped even after repacking, R2E2 sold but not great
6	Jan	Honey Gold	800	No problems
7	Jan	Calypso	3000	No problems
8	Jan	Honey Gold	720	First pallet / net / Mod 12 tray shipment, no problems
9	Jan	Calypso	3200	No problems
10	Jan	Calypso	1500	No problems
11	Feb	Honey Gold	--	Cancelled, grower not approved for US
12	Feb	Keitt	1600	Planned
13	Feb	Honey Gold	--	Cancelled, grower not approved for US
14	Feb	Keitt	1600	Planned
15	Feb	Keitt	1600	Planned

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Summary of the season

- 17,000 cartons

- 45% Calypso
- 28% Keitt
- balance Honey Gold, R2E2 and Kensington Pride

- 55% to Melissa's / 45% to Guimarra

- 75% (est) to Central Market / HEB in Texas

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Positives

- Volume – 5t to 80t
- Growers – 2 to 7
- Exporters – 2 to 5
- US retail distribution expanded
- Carton presentation tidied up & airline pallet load standardised
- No compliance issues reported
- US ‘working group’ consultation

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Queries

- 29 growers sought US registration
- MRLs / US FDA
- Pace of innovation / sense of urgency
- Pricing
- Arrival days
- Varieties (at US consumer level)

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Room for improvement

- Grower involvement and commitment
- MSW
- Ripeness / temperature control
- Tray labels
- Size of shipments
- Need for seasonal program
- Timely documentation
- One count per pallet / no mixed pallets

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Room for improvement #2

- Attention to harvesting and handling (including sap & rain)

Reporting on the USDA audit fund

Activity	$
INCOME	
2015/16 contributions from participating growers/exporters	$21,566.00
sub total	**$21,566.00**
EXPENDITURE	
USDA payments	
Nov-15	$2,082.00
Jan-16	$11,030.00
pre export MRL testing payments	$1,942.00
sub total	**$15,054.00**
Surplus (to carry over to 16/17 season)	**$6,512.00**

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DoAWR presentation

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Exporter comments & questions

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Improvements for 2016/17

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Consistency and volumes

- Compliance
- Date format on carton label
- 2 packaging options available
- Improve ripeness / temperature control
- Consistency of ripeness and quality
- Bigger shipment sizes
- Longer program with consistent weekly volume
- Routing via SYD, AKL, etc to increase capacity?
- Direct into SFO, DFW and JFK?

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Target seasonal program for 2016/17

Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17

- ≈ 3,000 trays / week per importer
- Consistent ripeness & quality
- PMA? (Oct 14-16, Orlando)

Mod 12 tray / netted pallet

- Components
  - Mod12 tray (3 heights)
  - Compliant net
  - Compliant 1200x1000 pallet
  - Pallet pad, corner board/net protectors + lid
  - Pallet wrap/strapping
- Height of pallet
- Temperature control
- No mixed counts
- Availability

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Mod12 tray / netted pallet – wrapping / strapping options

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US marketing guidelines 2016/17

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Questions and wrap up 2016/17

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Lessons and messages (from 2015)

- Compliance essential
- Appropriate level of ripeness
- Cool chain management
- ‘Australia’ resonates
- Cross selling opportunities

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THANK YOU

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Guide for Australian Mango Growers considering participating in the 2016/17 US mango program

Version 2, March 2016 – correct at the time of writing but subject to change without notice. Growers are encouraged to contact AMIA or NT DPIF if they have questions or queries.

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Background

The United States is the world's largest mango import market at around 350,000 t p.a. and growing in volume and value. After 15 years of negotiation the Australian mango industry gained access in January 2015 under a four year pilot program developed between the Australian Department of Agriculture and Water Resources (DoAWR) and the United States Department of Agriculture (USDA). The requirements of the program are detailed in the Operational Work Plan (OWP)[1].

The opportunity for Australian mangoes in the US market, where they land for typically four times the cost of mangoes from other sources, is as better flavoured, better coloured, attractive appearance fruit from Australia. The better flavour and colour requires ripe fruit which brings cool chain management challenges.

To improve the information flow amongst growers and exporters the Australian Mango Industry Association (AMIA) facilitates a US Working Group, certified by the Australian Competition and Consumer Commission (ACCC) of participating exporters to discuss and coordinate the US program.

Two initial commercial shipments of Australian mangoes (Calypso, Keitt) were successfully made to the US in the 2014/15 season, a total of 5 tonnes. 13 commercial shipments of Australian mangoes were made to the US in the 2015/16 season (Calypso, Keitt, Honey Gold, R2E2, Kensington Pride), principally in January and February, a total of approximately 75 tonnes. Two of these shipments were over heated or over ripe, unsaleable and dumped. The other 11 shipments sold successfully in US supermarkets in Texas, Arizona, the US North East and North West. Two of these 11 shipments were short shipped due to the interception of more than one mango seed weevil in the lot at the export inspection resulting in those lots not being permitted to be exported.

Challenges at the Australian side in the 2015/16 season were;

- Labelling not complying with the OWP,
- Boxes not complying with the OWP,
- Interception of mango seed weevil at inspection,
- Inadequate cool chain management leading to overheated and / or over ripe fruit on arrival in the US,
- Not transmitting shipment details and documentation to the US importer in a timely manner.

Challenges at the US side in the 2015/16 season were;

- Late start to the program leading to less time to develop retailer interest,
- Lack of clear, consistent, supply and variety information leading to retailer confusion / reduced confidence in the 'Australian mango' story',

[1] The latest version of the Operational Work Plan is available at http://micor.agriculture.gov.au/Plants/Pages/Documents.aspx If a grower or packer cannot access this site, copies are available from AMIA or NT DPIF

- Shipments not arriving in the US accordance with plans with US importers leading to a lack of supply and not fulfilling retailer orders,
- Lack of information from Australian growers and shippers on events and activities impacting on supply,
- Overheated shipments leading to a shortfall in volume to retailers and disposal costs.

There is a significant opportunity to expand the US program by lengthening the season and by increasing distribution to further US retailers and regions. The AMIA target for the 2016/17 US program is 1,000 tonnes. This will be achieved by committed growers and exporters working with US importers to deliver planned and consistent programs of high quality Australian mangoes across the season. This will require a level of commitment from growers and exporters to follow through and deliver on commitments.

While the details you are about to review may look complex, in the 2015/16 program two committed growers delivered consistent quality and volume as planned agreed with their US customer over multiple shipments in their season; achieving great outcomes at US retail (see the images later in this guide) and attractive farm gate returns.

Grower and packing shed requirements

The OWP details grower and packing shed requirements;

- Crop monitoring, from flowering, by trained and DoAWR approved crop monitors who are subject to DoAWR audit. The timing of crop monitor training and approval will be set by DoAWR in consultation with AMIA,
- Property (US blocks) and packing shed approved by DoAWR for the US program including passing DoAWR audit. US program growers and packers are required to have a copy of the OWP on hand and be familiar with it. The timing of grower and packaging shed applications and audits for the US program will be set by DoAWR in consultation with AMIA,
- Crop monitors, growers and packaging sheds are also subject to audit by USDA,
- Growers are encouraged to consider the size of the property blocks they register for the US program as fruit from each block will be inspected as a separate lot at the export inspection (see **Inspection** below),
- The packing shed is required to certify either a post harvest fungicide treatment or freedom from the fungi of concern. A template certificate format will be available prior to the 2016/17 season commencing.

In addition to the OWP;

- Fruit for the US must compliant with US EPA pesticide MRLs, supported with a C6 (equivalent to *Freshcare*) analysis prior to the start of US packing. AMIA commissioned Kevin Bodnaruk to prepare an US/US MRL comparison table for mangoes in 2015 to assist growers. This is attached as Annex A,
- The packing shed must be registered with US FDA (foreign food packing facility) prior to export to the US. Information and registration is available at https://www.access.fda.gov/oaa/createNewAccountflow.htm?execution=e1s1 , (this link may change without notice. Alternatively try fda.gov registration of food facilities or contact AMIA or NT DPI&F)
- *Suggested / recommended*– Packing sheds register with Department of Infrastructure and Regional Development's 'Known Consignor Scheme'[2]. This will be compulsory from July 2017 for US bound air cargo. Packers are encouraged to discuss this with your exporter and / or freight forwarder.

Packaging

All Australian mangoes are airfreighted to the US. The shipment size should optimise the airfreight unit (assuming the use of 4.5 tonne PMCs) to minimise the $/kg airfreight cost.

There are two packaging options:

- Pest secure 5 kg '*Australian Mangoes*' branded box available from Orora. 832 of these boxes stow on the airline PMC. No inserts or fruit pockets are required.

[2] https://infrastructure.gov.au/security/air-cargo/us-bound-air-cargo-security-arrangements.aspx

- Mod 12 tray (5 kg) on a netted 1200x1000 ISPM 15 compliant pallet. No inserts or fruit pocket are required. 120 standard height (120mm) Mod 12 trays load on to a 1200x1000 pallet and 6 x 1200x1000 pallets (720 trays) load on to airline PMC pallet. A deeper 134mm Mod 12 tray (suitable for R2E2) and a shallower 100mm Mod 12 tray (suitable for small fruit) are also approved.

14 layers / 140 trays of the 100mm Mod 12 will fit on a pallet. 11 layer / 110 trays of the 134mm Mod 12 will fit on a pallet (*to be confirmed*).

The Mod 12 tray / netted pallet consists of;

- OWP compliant net and net tie,
- ISPM 15 compliant 1200x1000 pallet,
- Pallet pad,
- Corner boards/net protectors,
- Tray or pallet lid (to ensure the net does not drape on to the top layer of fruit),

- Pallet strapping or ventilated stretch wrapping.

There are strict requirements (detailed in the OWP) on the net specifications. At the time of writing ProFresh Systems[3] are the only supplier of a US compliant net. Profresh Systems can supply packers with a kit of all the above elements. Recognising that some packers may already have their own 1200x1000 pallets, 1200 x1000 pallet pads, lids for the Mod 12 and pallet stretch wrap, Profresh must, at a minimum, supply the net and corner boards/net protectors.

[*to be confirmed* – Profresh will have a system in place with clear deadlines to take orders / deliver to packing sheds in time for US packing]

[*to be confirmed* – Profresh will include pallet / net assembly instructions with their kit]

[*to be confirmed* - the netted pallet should have a pallet card with the information required on the package label (see **Package labelling** below) + "pallet 1 of X"]

[*to be confirmed* – an *Australian Mangoes* branded Mod12 tray may be available / an option]

For correct fruit temperature and cool chain performance, it is critical that packer, transport and exporter assess the ventilated pallet stretch wrapping or strapping options. This assessment needs to also take account of the netting which also reduces air flow. Some ventilated stretch wrapping, with smaller vent holes, requires forced draft cooling for effective cooling.

Commercially, it is important that only one count is loaded per pallet. It is very inconvenient for the US importer, your customer, if there are mixed counts on a pallet.

Quality

To deliver the US consumer the attractive, better flavoured and well coloured mangoes they are looking for it is important that;

- Fruit is mature. At a minimum, fruit should meet AMIA/Australian industry maturity standards,
- Fruit is Class 1 or better in terms of appearance,
- Fruit is not subject to sap burn or rots,
- Fruit has been harvested with care and not subject to recent stress events such as rain,
- *Green ripe* fruit is avoided. The opportunity for Australian mangoes in the US market is as coloured (yellow) fruit.

[3] Profresh Systems - http://www.profreshsystems.com/

Examples of out of spec Australian mangoes at retail in the US in 2015/16 season.

These examples (over heating, lenticel discolouration, and possibly sap burn) were a very small % of the 2015/16 volume but will need to be reduced even further as volume increases.


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Counts

Counts and fruit size are a commercial matter and subject to discussion and agreement with your importer. The experience over two US seasons to date is that 11 and 13 counts in the 5 kg box / mod 12 tray are preferred by the US market.

Varieties

Varieties are a commercial matter and subject to discussion and agreement with your importer. Over two US seasons to date Calypso, Keitt, Honey Gold, R2E2 and Kensington Pride have been shipped. It is too soon to be confident on US variety preferences and preferences may be subject to whether the customer has had a consistent, high quality experience with a particular variety. The target retailers and consumers are sophisticated, well informed, critical and seeking attractive food experiences. No Kensington Pride have been retailed in the US at the time of writing.

Fruit labels

Fruit labels are a commercial matter and subject to discussion and agreement with your importer. The experience over two seasons to date is importers will require fruit labels with PLUs aligned to US retail.

Package labelling

The OWP is specific on package labelling. The package label must have;

- PUC – this is a combination of your property code and the block number where the fruit was sourced from. DoAWR will provide you with your PUC after completion of your US audit and will confirm the block numbers. The format is 'PUC- block number',
- PHC – this is your packing shed code and will be provided to you by DoAWR after completion of your US audit,
- TFC – this is the Steritech treatment facility number and is always 2997,
- TIN – this is your treatment identification number for the specific shipment and is a combination of your PHC and your unique identifier for that shipment. The format is 'PHC – your unique identifier'. We strongly suggest that your unique identifier is a simple sequential number starting at 1 for your first US shipment.
- Packing date – this should be in the format of 01-JAN-2017 to avoid confusion between AU and US date formats.

It is important that the above information is grouped, clearly and in a similar prominent font, for Australian and US inspectors to easily locate; a clear and simple label layout with no unnecessary items or clutter.

NT DPI&F and / or Steritech are happy to review labels prior to packing to confirm they are compliant with the OWP. Growers are encouraged to submit draft package labels for review prior to packing, and to avoid a major problem for you and your exporter at export if the box label is non- compliant.

The package must also have either printed on the package or on the package label;

- "Treated with Radiation" or "Treated by Irradiation",
- The radura symbol.

In addition the package and / or package label must comply with Australian export requirements including the grower's names and address, the variety, count, grade and "Product of Australia" or equivalent.

Ripening and cool chain management

The marketing objective is to deliver the US consumer a high flavour, sweet and coloured mango, along with shelf life for the US importer and retailer that rewards the Australian mango grower. This will involve ripening the fruit. In addition, research and experience indicates that ripening the mango prior to the export treatment reduces the treatment damage[4].

The current recommendation is that the mango is ripened to colour stage 2/softness stage 1[5] prior to export treatment. This requires active cool chain management to succeed as you are exporting (sealing in the airline pallet for ≈24 hours) ripening fruit, which is then subject to US distribution of up to 5 – 7 days and in-store shelf life of another 5-7 days.

There is no current recommendation on the ripening time, temperature or whether gas (ethylene) is required. There are a range of successful commercial practises at the time of writing using different combinations of time / temperature and gas/ no gas.

There may be variety differences in the ripening / time / temperature response. There are differences with fruit from the same block as the season progresses; later season, more mature fruit, will ripen faster.

What is clear is that;

- Active cool chain management is required from packing to arrival in the US,
- It is essential to cool the fruit (at least to 16c, preferably using forced draft) after ripening and prior to inspection & treatment,
- Fruit must be firm at the point of inspection prior to export. Soft fruit at this point should be a **No Go** decision,
- Fruit should be cooled again after the export treatment to at least 16c, preferably using forced draft.

As the carton / pallet is sealed to comply with the OWP, it is difficult to get a comprehensive picture of the temperature of the fruit throughout the shipment. This needs to be considered when looking at temperature data and managing the fruit temperature through the cool chain from packing shed to import arrival. Grower, domestic road transport, treatment facility, freight forwarder and exporter need to be working together.

[4] The most recent research is Ainsworth, N., (2015) Predicting the impact of irradiation on mango quality, Department of Agriculture and Fisheries, Brisbane

[5] Mango Quality Assessment Manual (2009); Holmes, Hofman and Barker, DEEDI

Inspection

Prior to treatment in Brisbane DoAWR undertake an inspection of the export shipment. The OWP specifies the parameters;

- Each 'Lot' or approved block will be inspected separately,
- A minimum of 150 pieces of fruit per lot will be inspected,
- A minimum of 30 pieces of fruit per lot will be cut in half through the centre. Assuming a '10' count, this means that 3 cartons or trays per lot are lost at inspection; e.g. if the export lot is 720 trays, a minimum of a further 3 trays, identical in every respect, total 723 trays, need to be included in the shipment ex the packing shed. The DoAWR inspector will select the fruit for inspection using a normal random method,
- The OWP specifies the inspection tolerances,
- The DoAWR inspector will also check the packaging and package label for compliance with the OWP requirements and Australian export requirements such as 'Product of Australia' and grower / packer name and address.

Shipment size

Lot and shipment size is a commercial decision and subject to discussion with your US importer. However unit costs in both Australia and the US are reduced as the lot (inspection per lot) and shipment size increase. Packers and exporters are encouraged to think of minimum shipments in 2016/17 of two PMCs.

Marketing and promotion

The US market is large, sophisticated and very competitive. The opportunity for Australian mangoes is as *better flavoured*, *better coloured*, *attractive appearance mangoes* from *Australia* and objective is attractive returns for the Australian mango grower.

There are a number of US food retailers, who have a clear vision of their customers and how they are seeking to satisfy their needs, who are interested to offer Australian mangoes to their customers. The Australian mango marketing effort is to work, with the US importers, with those retailers with consistent information on Australian mangoes, varieties and supply season and then deliver a programmed consistent supply of attractive, consistent quality Australian mangoes.

Australia and all matters Australian resonate with US consumers. The *Australian Mangoes* branded package is a very useful promotion tool. US retailers use the *Australian Mangoes* boxes to build displays; visually connecting consumers to the Australian mangoes. [*to be confirmed* – there may be an option for *Australian Mangoes* branded Mod 12 trays]

AMIA, working with the working group and US importers, plan to have an *Australian Mangoes* presence with fruit at PMA 2016 in October 2016.

To support the development of the US market opportunity during the pilot phase, AMIA has;

- Established and facilitated a working group of participating exporters[6], growers and other interested stakeholders. The working group, open to all interested exporters, growers and other stakeholders, meets through a weekly teleconference to share information and come to a collective view on all matters concerning Australian mangoes to the US including packaging and pricing guidance,
- Developed US marketing guidelines (2015 guidelines attached as Annex B) for exporters marketing Australian mangoes to the US. The guidelines nominate two US importers and participating exporters are required to deal with one or other nominated US importer. These guidelines have been endorsed by the working group and certified by the ACCC,
- Supported HIA project MG15004 which funded a NT DPI&F officer to undertake and report on in-market observations during the 2015/16 season.

[6] Participating exporters – exporters who have signed the US marketing guidelines and paid their contribution to the USDA audit fund


AUSTRALIAN MANGOS
$4.98


AUSTRALIAN MANGOES
Only available for a limited time! It's summer down under, so these mangoes are peak-of-season. They contain a smaller seed so you get more mango. They're air-freighted direct to Central Market for optimum freshness.


Only available for a limited time!
Australian Mangoes
Summer From Down Under
$4.98
$4.98


THERE ARE
27
FRUITS and VEGETABLES
139
ORGANIC PRODUCTS
AVAILABLE TODAY
APPLE PAZAZZ
$2.69
MANGOS
$4.98

Exporters

Participating exporters are encouraged to actively participate in AMIA's weekly teleconference (expected to restart in June 2016 for the 2016/17 season).

One element of the OWP is that the USDA audit Australian processes and procedures each season. This is arranged by DoAWR and funded by participating exporters through the AMIA managed USDA audit fund. Participating exporters are required to contribute to the USDA audit fund on a pro-rata basis based on exporters forecast program volume. The fund pays the USDA audit costs (required to be paid in advance to USDA) and the cost of the pre export MRL testing (one sample per exporting property in 2015/16) program.

Participating exporters are also required to commit to AMIA's US marketing guidelines. It is anticipated that AMIA will apply to the ACCC for certification for 2016-17.

Communication

AMIA facilitates;

- Pre-season crop monitor training and grower briefing,
- A weekly teleconference with all US program participating exporters and other stakeholders such as service providers,
- An *Australian Mangoes* presence at PMA 2016,
- Post season debrief for participating exporters and other stakeholders.

There are also communications in Mango Matters and AMIA and NT DPIF are available to answer any further questions or queries.

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March 2016

In-market visits to the US which inform this Guide were supported by AMIA and NT DPI&F.

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ANNEX A

Australian – USA Mango MRL analysis (August 2015).

Product	Aus MRL (mg/kg)	*Aust WHP (Days)*	USA MRL (mg/kg)	COMMENT
Buprofezin (Applaud)	0.2	*28*	0.9	
Carbaryl (Bugmaster)	2	*7*	-	In Australian trials[1] residues were still detectable 14 days after treatment in washed and unwashed fruit. To achieve non-detectable levels a withholding period significantly longer than 14 days would be required.
Chlorpyrifos (Lorsban)	0.05*	*21*	-	MRL at LOQ should not be a compliance issue if label directions followed.
Beta-cyfluthrin (Bulldock) (PER13027 & PER80374)	T0.1	*7*	-	One study from the Philippines, cyfluthrin applied at 400 mL/100 L water (compared to the permit rate of 25-40 mL/100L) with residues below LOQ at 28 days.
Dicofol (Kelthane)	5	*7*	-	No information available
Dimethoate (Saboteur)	1	*7*	-	Residue trials completed in 2001/02. Residues following four applications at 75 mL/100L 7 days after the final application were 0.03 and 0.07 mg/kg. To reach LOQ a withholding period longer than 14 days would be required.
Fenthion (Lebaycid)	5	*7*	-	Permit and approvals expire October 31st 2015.
Fipronil (Various)	T*0.01	*56*	-	MRL at LOQ should not be a compliance issue
Imidacloprid (Various)	1		1	Should not be a compliance issue
maldison (Malathion, Fyfanon)	2	*3*	8	Should not be a compliance issue

[1] HIA Project MG04024: Determination of carbaryl residues in mangoes

Product	**Aus MRL (mg/kg)**	***Aust WHP (Days)***	**USA MRL (mg/kg)**	**COMMENT**
Methidathion (Suprathion)	2	*21*	0.05	Trial data from Brazil found residues below 0.05 mg/kg 30 days after treatment. To reach LOQ a withholding period longer than 30 days would be required US MRL Expires 31/12/2016
Pyrethrins (Various)	1	*1*	1	Should not be a compliance issue
pyriproxyfen (Admiral)	0.05	*56*	1	Should not be a compliance issue
spinetoram (Success Neo Insecticide)	0.3	*NR*	0.3	Should not be a compliance issue
spirotetramat (Movento 240 Insecticide)	0.3	*14*	0.6	Should not be a compliance issue
thiamethoxam (Actara) (PER14286)	T0.2	*130*	0.4	Should not be a compliance issue
trichlorfon (Lepidex) (PER14743)	T3	*7*	-	No information available on mango. Residues in stone fruit 7 days after three applications were 0.67 and 0.12 mg/kg[2].

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Product	**Aus MRL mg/kg**	***Aust WHP (Days)***	**USA**	**COMMENT**
azoxystrobin (Amistar)	0.5	*3*	2	Should not be a compliance issue

[2] SF12011: Trichlorfon residues in stonefruit.

Australian – USA Mango MRL analysis (August 2015)

Product	**Aus MRL (mg/kg)**	***Aust WHP (Days)***	**USA MRL (mg/kg)**	**COMMENT**
Chlorothalonil (PER14830)	1	*NR*[3]	1	
Copper (Various)	Exempt	*1*	Exempt	US 74 FR 47457, Sept. 16, 2009
Ethephon (Ethrel) PER14970	T*0.02	*NR*[4]	-	MRL at LOQ should not be a compliance issue
Fludioxonil (Scholar) (post-harvest)	3	*NR*	5	Should not be a compliance issue
Iodine (AIS Iodine Granules Post-harvest sanitizer)	Exempt	*NR*	Exempt	US 74 FR 26534, June 3, 2009
Mancozeb (Dithane)	7	*14*	15	Compliance with the tolerance levels specified is to be determined by measuring only those mancozeb residues convertible to and expressed in terms of the degradate carbon disulphide (CS_2).
metiram (Polyram)	7	*1*	-	Compliance with the tolerance levels specified is to be determined by measuring only those metiram residues convertible to and expressed in terms of the degradate carbon disulphide (CS_2).
methylcyclopropene (Smartfresh)	Exempt	*NR*	Exempt	US 73 FR 19150, Apr. 9, 2008
Paclobutrazol (Syntar PGR, Austar PGR, Ospray Pack-out)	T1	*Post-harvest foliar spray*	-	No information
Peracetic acid (Tsunami on farm)	Exempt	*NR*	Exempt	US 76 FR 11969, Mar. 4, 2011
Petroleum oil	Exempt		Exempt	77 FR 59128, Sept. 26, 2012

[3] Spray applications during bud burst to late flowering only.
[4] Apply initial foliar spray at early vegetative to first floral bud development. Apply the second application approximately 28 days later

Product	**Aus MRL (mg/kg)**	***Aust WHP (Days)***	**USA MRL (mg/kg)**	**COMMENT**
Prochloraz (Octave)	5	*NR*	-	In residue trials from South Africa, prochloraz applied 3-5 times at comparable rates to that approved in Australia, residues ranged from 0.17 to 0.5 mg/kg 19-25 days after the final application. In residue trials from Israel, prochloraz applied 3 times at comparable rates, the residues ranged from 0.62 to 0.8 mg/kg 15 days after the final application. To achieve non-detectable levels a withholding period significantly longer than 25 days would be required.
pyraclostrobin (Aero Fungicide)	0.1	*14*	0.6	Should not be a compliance issue
Thiram (Barmac Thiram DG)	7	*14*	-	Compliance with the tolerance levels specified is to be determined by measuring only thiram.

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Product	**Aus MRL mg/kg**	***Aust WHP (Days)***	**USA**	
carfentrazone-ethyl (Hammer, Punch, Spike)	*0.05	*NR*	0.1	Australian MRL at LOQ should not be a compliance issue
diquat (Spray.Seed)	*0.05	*NR*	-	Australian MRL at LOQ should not be a compliance issue
fluazifop (Fusilade)	0.05	*14*	-	No information available
glufosinate (Basta)	0.2	*NR*	-	No information available
glyphosate (Roundup)	*0.05	*NR*	0.2	Australian MRL at LOQ should not be a compliance issue
haloxyfop (Verdict)	*0.05	*NR*	-	Australian MRL at LOQ should not be a compliance issue
isoxaben (Gallery)	*0.01	*NR*	-	Australian MRL at LOQ should not be a compliance issue

Australian – USA Mango MRL analysis (August 2015)

Product	**Aus MRL (mg/kg)**	***Aust WHP (Days)***	**USA MRL (mg/kg)**	**COMMENT**
Oxyfluorfen (Goal, Crossbar)	*0.01	*NR*	-	Australian MRL at LOQ should not be a compliance issue
paraquat (Gramoxone)	*0.05	*NR*	0.05	Australian MRL at LOQ should not be a compliance issue
pendimethalin (Stomp)	*0.05	*NR*	-	Australian MRL at LOQ should not be a compliance issue

NR Not required
FR - Federal Register

Table 1. Residues of prochloraz in mangos from supervised trials (foliar treatments with a WP formulation of a prochloraz-manganese chloride complex).

Country, year (variety)	Application				PHI (days)	Total residues, mg/kg			Ref
	kg ai/ ha	kg ai /hl	water, l/ha	no.		peel	pulp	whole fruit[1]	
Israel, 1982 Zikim		0.05		3	15	3.1	<0.1	0.62	A87812
Israel, 1982 Mishmar		0.05		3	15	3.7	<0.1	0.8	A87812
Malaysia, 1989 Dusun Habu (Apple)	0.25	0.08	300	16	21			0.57	A88067 A88068
Malaysia, 1987 Dusun Habu (Apple)	1.0	0.33	300	1	33	1.2 (c0.74)	0.09	0.44 (c0.39)	A88004
Malaysia, 1987 Dusun Habu (Apple)	1.1	0.37	300	1	33	0.16 (c0.74)	<0.05	0.09 (c0.39)	A88004
Malaysia, 1987 Dusun Habu (Harumanus)	2.1	0.25	850	1	6	1.8 (c0.74)	0.07	0.43 (c0.39)	A88004
South Africa, 1983 Schoemanskloof (Long green)		0.04		5	25	<0.1	<0.1	<0.1	A87887
South Africa, 1983 Schoemanskloof (Long green)		0.06		5	25	0.53	<0.1	0.17	A87887
South Africa, 1983 Schoemanskloof (Long green)		0.08		5	25	0.64	0.17	0.27	A87887
South Africa, 1982 Nelspruit (Saber)	0.51			3	19	0.59	<0.1	<0.2	A87834
South Africa, 1982 Nelspruit (Saber)	0.77			3	19	3.1	<0.1	0.5	A87834
South Africa, 1982 Nelspruit (Saber)	1.02			3	19	3.0	0.1	0.42	A87834
Taiwan, 1988 Tainan (Cantonment)	0.14	0.009	1500	8	35			<0.1	A88007

[1] including stone

ANNEX B

AMIA guidelines for the export of fresh mangoes to the US

Australian mangoes have achieved access to the US market, the world's largest mango import market, on a three year pilot basis.

Access to the US market is a valuable opportunity for Australian mango growers, but this access comes with significant compliance requirements across biosecurity, chemical MRLs and aviation security.

It is important that compliance is maintained at a high level particularly during the pilot program period when it is anticipated there will be a high level of regulatory monitoring.

The US market is large and sophisticated, selling around 350,000 tonnes per annum of mainly low priced mangoes from Central and South America.

Australian mangoes are high cost to grow and pack. Adding on the cost of compliance and the freight from Australia to the US means the landed price of Australian mangoes is significantly higher (≈4x) than mangoes from Central and South America.

The sustainable opportunity for Australian mangoes in the US market is only as a high quality mango from Australia. The challenge for Australian mango growers and exporters to locate US consumers interested to buy high quality mangoes from Australia, and then consistently deliver them an attractive, value for money, mango from Australia.

The purpose of these guidelines is to support that positioning of Australian mangoes in the US market during the three year pilot as high quality mangoes from Australia;

1. Exporters participating in the US mango program are termed 'participating exporters'

2. Exporters are free to join as a participating exporter at any time

3. AMIA will facilitate a working group of participating exporters to discuss and decide issues regarding the export of Australian mangoes to the US market. In the absence of a working group discussion or consensus, AMIA will decide on an issue

4. Participating exporters agree to abide by the terms of these guidelines

5. Participating exporters agreed contribute funds to activities agreed by the working group e.g. USDA audits, dose mapping, MRL testing, etc. Failure to contribute funds as decided by the working group will result in the exporter no longer being a participating exporter

6. Participating exporters agree on packaging specifications that may be decided by the working group from time to time

7. Participating exporters agree on minimum quality specification that may be decided by the working group from time to time

8. Participating exporters agree to deal only with US importers that may be nominated by the working group from time to time. At the time of writing the agreed importers are Melissa's World Variety Produce and Giumarra Corp

9. Participating exporters agree to minimum pricing by count and variety to the US market that may be decided by the working group from time to time (A$ or US$, FAS or C&F tbc)

10. Participating exporters agree on an MRL testing program that may be decided by the working group from time to time (details attached)

11. Participating exporters agree on a USDA audit funding process that may be decided by the working group from time to time (details attached)

12. Steritech P/L agrees to only deal with participating exporters for the US mango program

13. These guidelines are subject to any required approval by ACCC

14. There guidelines are subject to annual post season review by AMIA, the Dept of Agriculture, and possibly HIA and AHEA.

Signed by Participating exporter or other party to this agreement

Company name:_____

Company addres:_____

_____

Authorised officer (name):_____

Authorised officer (signature):_____

Date:_____