

## **Final Report**

# **Mango Supply Chain Data Collection – Phase 4**

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**Project code:**

MG17006

**Project:**

Mango Supply Chain Data Collection – Phase 4 – MG17006

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## Summary

The objective of project MG17006 is to provide Australian Mango growers and industry on two critical factors that influence the grower profitability; wholesale data and mango quality objective reporting. The objectives of the services are:

- to provide quality and wholesale data pricing information to Australian mango growers through industry publications and website.
- to create more transparency and trust between growers, wholesalers and retailers by sharing supply chain information and enabling informed discussions with supply chain stakeholders.

Key industry stakeholders (the target audience) include growers (levy payers), marketers, retailers and wholesalers. Providing timely communication about market pricing and mango quality allows key industry stakeholders to be well informed and enriches the transparency of what's happening in the marketplace.

The project aimed to provide, wholesale price data to allow growers to make informed decisions, and mango quality data (objective reporting data) results to ensure key stakeholders within the industry are focused on eating quality. This project utilised resources, skills and expertise both within and outside of the Australian Mango Industry to deliver the relevant information. Price data was collected by Ausmarket Consultants. Objective reporting data was collected by experienced market assessors in Brisbane, Sydney and Melbourne.

As a result of research undertaken during Hort Innovation project MG15002, conducted by Kerry Walsh and Phul Subedi (Central Queensland University) demonstrating that hand held near infrared (NIR) technology (Felix 750 Produce Quality Meter) can be used to measure dry matter (DM) at and prior to full maturity (prior to the ripening process commencing) and this non-invasive method was adopted for objective reporting in subsequent mango harvest seasons 2016/17 and 2017/18.

Key outputs (activities) included:

- Publishing weekly wholesale market price reports throughout each mango season which was available on the Australian mango industry website <https://www.industry.mangoes.net.au/market-prices/>.
- Publishing objective reporting results providing key industry stakeholders information on the eating quality of mangoes on randomly selected consignments throughout the season.

Key outcomes included:

- Ensuring timely access to growers and other industry participants of the weekly wholesale price reports.
- Ensuring key stakeholders within the industry remained focused on eating quality.
- Improving industry productivity, sustainability and fruit quality.

From reviewing the feedback as part of the measurement and evaluation, it is recommended that a uniform approach to the detail required when labelling cartons be adopted industry wide. It has been recommended that publications which due to funding were only available to growers on a weekly basis be available on a daily basis as they once were (part of Hort Innovation Project 15003). Recommendations were that the market price data includes retail pricing for premium grade product. Currently wholesale price reports capture namely class 2 (second grade) product, bulk product and downgraded fruit due to issues post ripening with very minimal premium product in the marketplace (as nearly all premium product is sent directly to retailers).

## Keywords

Wholesale market prices; objective reporting; NIR technology; Dry Matter; Data-driven decisions; Mangoes.

## Introduction

Mangoes are grown commercially throughout many areas of tropical and sub-tropical Australia. Their production is principally located in northern Australia but there are smaller, yet significant production regions throughout Australia. Key production areas include Gingin, Carnarvon and Kununurra in Western Australia; Darwin, Katherine and Mataranka in the Northern Territory; Mareeba / Dimbulah region, Townsville/ Burdekin/Bowen regions, Rockhampton/ Yeppoon and Bundaberg in Queensland; and northern New South Wales. There are also several growers developing small orchards in the Mildura region of Victoria.

The Australian Mango Industry comprises of approximately 800 growers, a wide cross section of wholesalers and many food retailers, including larger retailers, through to specialist green grocers and many family operated businesses. This project will be undertaken to provide information to growers and industry on two critical factors that influence the grower profitability. These two critical factors are wholesale data and mango quality.

Most production regions are a significant distance from Australia's major markets. Regular reporting from the wholesale markets with independently collected wholesale prices provides growers with indications on market conditions. This information is important to allow growers to make sound business decisions, especially as distance to market and the relatively short but busy harvest window mean that growers have little opportunity to undertake further analysis of markets during their harvest window.

Mango quality is a critical factor for consumers. Mangoes harvested before they reach the correct maturity will not reach their optimum flavour as they ripen. The impact of poor flavour (as measured by brix) is a loss of consumer appeal. There are a range of factors that may influence the harvest of mangoes prior to the optimum maturity, such as market pressures, the likelihood of weather events and the lack of skilled mango pickers who have difficulty in selecting mature mangoes compared with immature fruit.

## Methodology

The project was undertaken to provide information to key industry stakeholders, growers (levy payers), marketers, retailers and wholesalers, on two critical factors that influence grower profitability. These two critical factors are wholesale data and mango quality. This project will be undertaken utilising the following methodology.

### I. Wholesale Data collection

The mango market reporting service provided by Ausmarket Consultants provided the Australian mango industry with weekly prices and throughput (Brisbane market) for the duration of each season. The start and finish dates were influenced by the seasonality of the mango harvest.

The service provided a valuable resource for mango growers and associated businesses throughout the supply chain, including:

- Price reporting on a weekly basis throughout the season for the following capital city markets: Brisbane, Sydney, Melbourne, Adelaide.
- Price reporting on each variety in the market, with a high, low and average price.

The methodology used by Ausmarket Consultants and their representatives in each reporting wholesale market included:

- On a daily basis accessing market prices through the credit service in each market and assign price to the descriptors included in the weekly prices reports. This included assessing sales by variety, packaging size (tray size, bulk pack), fruit size (tray count), quality (premium, class 1, class 2) for all mangoes sold.
- On a daily basis speaking with wholesaler representatives, major retailer buyers and green grocers to verify price trends.
- On a daily basis speaking with wholesaler representatives to determine the following characteristics of the market on that day: supply, demand, quality, carryover stock in the market.
- Compiling and collating data and publish the weekly report throughout the season for each market.
- Collating and summarising the daily information into weekly reports.

A link on the AMIA website redirects people to the Ausmarket website. Weekly data were updated on Fridays. (<https://www.industry.mangoes.net.au/market-prices/>).

### II. Objective Reporting

Objective reporting is a key component of the Australian Mango Industries program to closely align the eating quality of Australian mangoes with consumer’s expectations. Consumer research identified that consumer satisfaction is closely aligned with sweetness of ripe mangoes measured as Brix of the fruit flesh and to fruit dry matter.

The industry has adopted and promoted the minimum standard for mangoes according to cultivar. (Henriod.r 2015)

Kensington Pride, Calypso, Honey Gold	Dry Matter 15% Brix 14%
R2E2	Dry Matter 13% Brix 12%

#### a) Process Overview

To understand industry compliance with these recommendations, the industry undertakes random sampling of consignments at the three major wholesale markets (Brisbane, Sydney and Melbourne), to measure the maturity of fruit and to report the results together with identification of grower and region in industry communications.

The testing is undertaken by third party service providers using a written procedure for sampling, and measuring dry matter using a Felix 750 Produce Quality Meter. To ensure accurate measurement the industry provides pre-season training to the service providers on procedures, use and calibration of equipment and data collection and reporting. Further the industry undertakes a mid-season audit to ensure the accuracy of results and reporting.

b) Sampling of the consignment

A sample of a minimum of thirty (30) fruit per consignment are drawn from a commercial consignment of mangoes. The sample must be representative of the grades and sizes available for sale in the sampled consignment. The sample is identified with a unique code that identifies the grower, region and sample date. Grades and sizes of mangoes must be consistent with the consignment available for sale. For example, if the predominant sizes in the consignment are counts 14 to 18, then the sample should be consistent with mangoes of these sizes.

c) Testing

Testing should be undertaken where the fruit is sampled (wholesaler's warehouse, retailer distribution centre). A minimum of thirty (30) pieces of fruit sampled from at least six (6) trays should be sampled and tested.

d) Dry Matter measurement

Dry Matter is measured as a percentage using near infrared technology. The Felix 750 Produce Quality Meter will be used to assess dry matter. Both cheeks of each mango will be sampled and the results of the two tests averaged. The average is the result recorded for that mango.

e) Position of sampling

The position of sampling on the cheek should be mid-point between stem end and nose.

f) Recording results

The results (average for each mango) are recorded. The record also needs to record the following information:

- Grower name and require the image of end panel of at least one tray/carton confirming name from which fruit is sampled
- Variety – photo of sample of mangoes collected for assessment
- Market location
- Pack date
- Date sampled and tested
- Sample number
- Vendor
- Fruit class
- Skin colour (1 to 6)
- Flesh colour (1 to 6)
- Firmness (1 to 4)
- Dry Matter
- Name of assessor

g) Reporting process

Once the testing has been undertaken and the results compiled for each sample, these results are emailed to Australian Mangoes by Friday 12 pm (noon) of each week. Australian Mangoes receives results, reviews and summarises for publication in My Mango. Where a testing result (average of 30 pieces of fruit) for the sample is below the industry standard, the grower of the sampled mangoes is contacted, prior to publication of the sample test results. Contact with the grower will be by phone, in the first instance. In the event of being unable to contact the grower by phone, an email will be sent to the grower advising the result of the objective reporting. A detailed



report of the sample will be sent to the grower (individual results from each of the 30 mangoes sampled and an image of the end panel of one of the trays from the consignment). If the grower is concerned that the fruit sampled was not representative of the consignment, Australian Mangoes may agree not to publish the first result, and rather, a second sample from the same (or following consignment) may be collected and tested. The result of the second test will be published. In the event the result of the second test is below the industry standard, this information will be communicated to the grower prior to publication.

### **III. Co-ordination and facilitation of project activities**

To be effective the activities undertaken in this project need to be facilitated and coordinated. Significant input from Australian Mangoes is required in the management and communication involved in both activities, in particular the objective reporting component.

Activities undertaken by Australian Mangoes include the following;

- Prepare project funding application, prepare milestone reports and final report and act as information source for project collaborators
- Amendment of descriptors for the market prices
- Prepare and publish weekly prices in the weekly publication, My Mango
- Develop communication material on the objective reporting system and processes
- Collate and summarise objective reports for weekly publication
- Engage with growers, wholesalers and retailers with regard to the objective reporting
- Communicate with growers on a weekly basis and resolve issues as they arise during the season
- Develop appropriate processes for the objective reporting and implement a training and audit process.

## Outputs

Throughout the mango season, we have:

- Gathered weekly mango pricing from the wholesale market for reporting; (appendix 1)
- Collected and compiled mango quality data from the markets, using objective quality measurements (appendix 2) within the supply chain;
  - Market quality data were used in conjunction with the on-farm quality data being generated in MG17000 for analysis and reporting
  - A NIR DM testing frequently asked questions document (appendix 3) for Australian mango team and in market objective reporters to refer to when queried by growers', wholesalers, quality assurers and buyers was developed as a result of queries that were raised throughout the season by stakeholders
- And distributed the reports of the collected and compiled data to the industry via the weekly publications *My Mango* and the website [www.industry.mangoes.net.au](http://www.industry.mangoes.net.au).

**Wholesale prices** on a weekly basis for the Brisbane, Sydney, Melbourne and Adelaide markets.

The weekly wholesale market prices included the following information for each of the four markets included in the market reports:

- Variety
- Pack size – single layer tray 7kg, 10kg, bulk pack
- Pack size – fruit count per tray
- Quality Premium, No.1, No 2, out of grade
- Price range - high to low, most sales
- Supply
- Demand
- Carryover
- Quality.

**Objective reports** on randomly sampled mangoes published on a weekly basis in *My Mango*.

The objective reports included:

- Grower name
- Pack date
- Variety
- Dry Matter (average of sample of thirty mangoes).

## Outcomes

### Wholesale prices

Growers and the industry have an improved understanding of the following information for each of the four markets included in the market reports:

- Variety
- Pack size – single layer tray 7kg, 10kg, bulk pack
- Pack size – fruit count per tray
- Quality Premium, No.1, No 2, out of grade
- Price range - high to low, most sales
- Supply
- Demand
- Carryover
- Quality.

### Mango quality (objective reporting)

Growers and industry participants have a very clear understanding of the need to manage harvest to ensure minimum maturity levels prior to commencing harvest. Where trees are to be picked multiple times due to multiple flowering, the importance of good picker training and good supervision is important so only those mangoes that reach minimum maturity standards are harvested.

### 2018/19 Results

During the 2018/19 season, 389 samples were tested for dry matter. These samples were taken from the Brisbane, Sydney, Melbourne and Perth Markets (first season using NIR testing in Perth) and Woolworths distribution centres in Brisbane, Sydney and Melbourne.

A comparison of the sampling over the past two seasons is in table 1. The use of the Felix F 750 Produce Quality Meter has allowed a greater number of samples to be undertaken over the periods, as the process is quicker than the destructive sampling process used for measuring brix.

**Table 1.**  
**Testing for**  
**Dry Matter**

2017/18**	2018/19
505 samples/tests	389 samples/tests
79% pass*	83% pass*

\*pass = at or above minimum dry matter standard for the variety tested

\*\*Perth season Brix testing was used due to availability of NIR machine

Note; one sample/test = 60 scans

Less NIR samples were conducted during this season (2018/19) versus the previous season (2017/18). The project commenced after the Darwin, Katherine and Kununurra seasons had started; Darwin was almost completed, and the Bowen/Burdekin region was just commencing. It was noted that some Queensland growers were vocal in commenting on this and it was noted by board members at the AMIA board meeting.

## Monitoring and evaluation

The Australian mango industry is characterised by a large number of small to medium size production enterprises, operating at a significant distance from their markets. The harvest season is also comparatively short, meaning that decisions of market destination and pack quality are vital if businesses wish to continue to operate sustainably.

If prices are at a level that impact negatively on consumption, then at high production times of the year this can cause a back log of fruit which consequently causes quality issues. Price transparency is therefore of vital importance in order to monitor trends and predict the impact of current retail prices on stocks of fruit and on returns to growers.

The growers that deal directly with retail don't need the market report as they know exactly the wholesale prices being paid. It's the majority of growers who send to the central markets that are looking for something to compare their returns with. The market reporting is the best option here.

The ability to access the supermarket purchase prices and to publish would be a better outcome however how this would be collected and whether or not the supermarkets would be consenting is going to be the challenge. A better medium to long term strategy would be to increase the percentage of growers either entering into transparent trading relationships with their marketers and or going direct to retail would be another option to consider.

Overall results indicate that the desired outcomes were achieved for MG17006 Mango supply chain data collection – phase 4 and services provided were to the best standard with the tools, information and resource available.

### Market price reporting

Most growers find the data invaluable and use it to make business decisions. The market prices page was the second most viewed page on our website with 6290 views last season. On the whole, most growers were very disappointed about the move from daily price availability to weekly prices only as a result of the Strategic Industry Advisory Panel (SIAP) recommendations for available funding. AMIA worked with AusMarket to come up with some alternatives to be able to offer discounted solutions to industry requiring more than the weekly prices.

Australian Mango Report has been a service that growers have relied on for over 15 years and it is suggested we should look at reinstating it in full for next season.

AusMarket is willing to discuss ways of funding it, through a possible reduction in content and cost and/or other alternatives.

Feedback from Service Provider;

- *we received approximately 45+ phone calls and enquiries as to why there were no daily prices online and after explaining the situation, we received mixed reactions*
- *a majority were extremely unhappy and complained that as they already have enough expenses with mango production, they felt their levies etc should continue to cover these services*
- *some were quite angry and after a little outburst just hung up*
- *some were not too bothered either way and finished with slightly sarcastic responses or none at all.*

*In summary the discounted offer generated the following;*

- *reasonable take-up of the discounted reports though there were some who didn't take up the opportunity out of principle and anger*
- *some growers were given prices over the phone due to their persistent complaints about it not being available*
- *it was evident that some growers who were not quite certain how it all worked and who had been previously funding the reports*
- *request for/sending out approximately 20+ forms for the growers to fill out and send back (note; this wasn't set up until well into the beginning of the season so early calls didn't have the opportunity to receive the offer)*
- *only 16 individual growers receiving a Mango Price Report*

- *of those 16, only 6 took up the offer of just the Special Mango Report*
- *the remaining 10 either got other crops of interest or added Mangoes to their current subscription.*
- *we received pretty good feedback from those who received Mango prices as it was not too different to what they would have previously seen online.*

### **Objective reporting**

In summary, 389 tests were conducted over a 3-month period which equated to 33 consignments tested per week. The number of consignments below the recommended minimum dry matter standards was 66 of the 389 (or 17%).

Feedback from growers included the following;

- *need to ensure the testing starts at the beginning of the season*
- *some growers do not have their fruit DM tested on farm, and therefore many do not understand the relationship between DM and eating quality (not decision to pick)*
- *there continues to be some distrust between growers and those people providing service or testing with NIR machines as they don't understand statistics/how machines work/calibrations*
- *growers are definitely looking at the objective reporting results and taking notice and for those who do not have their fruit tested on farm, their practices have not changed*
- *AMIA is aware that some Felix owners are not using machines properly as they decline the complementary annual calibration service which means these machines are not validated and therefore varied results are more than likely and therefore this can lead to the owners not believing values from the devices as they may not be a true representation of the actual .*

Feedback from retailers;

- *retailers have embraced the testing process and industry minimum standards*
- *there has been great feedback, particularly from the most recent two seasons, about the consistent eating quality reported by consumers.*

## Recommendations

The recommendations for future **mango industry wholesale data** publications:

- to provide retailer pricing as well as wholesale market pricing
- requests to receive the market prices in a better format, for example ensuring the same 'language' is spoken when referring to class of product

Note: classification of product on tray labels is an issue across many fruit and vegetable produce lines. Some consideration for a cross industry project to align classification should be considered. The Australian Mango industry engaged in a mango levy funded project that defined the Mango Industry Quality Standards including defining the terminology of each grade and was completed and communicated to industry September 2016. The classifications are defined as Class 1 (First grade fruit that meets Retailer and Exporter specification), Class 2 (second grade fruit). It should be noted that not all growers have adopted the standard. They continue to label trays with Premium (first grade) and Grade 1 (second grade) potentially in the hope it confuses a less astute buyer of the quality of product they potentially are purchasing. AMIA continue to update growers at every field day or face to face events and provide these industry poster guides at these events. Our IDO will continue to educate growers at face to face (orchard/pack house) visits.

The recommendations for future **mango industry objective reporting** publishing of results:

- continued capturing of data as presented through this season's DM results to understand trends by region or variety
- there are very mixed views in relation to the process of publishing results therefore we need to closely monitor the effectiveness and value of publishing objective reports
- some false information being spread, and few people have good understanding of how the NIR testing works and what it means, many people believe the machine is not accurate, does not benefit their business in any way and therefore refuse to embrace the technology; a fact sheet has been created to assist IDO's and objective reporters to respond to such queries. The plan is for this fact sheet to be rolled out to growers to help increase their understanding of how NIR testing works. We will be updating growers and industry at the upcoming grower roadshows and including it as part of our Best Practice resource on our website. The IDO's will have this fact sheet on hand at any orchard visit to share the information with growers where required.

## Refereed scientific publications

Nil

## References

Henriod, R (2015) Industry moves on quality standards, *Mango Matters*, Vol 20, Page 10

Subedi, P., Walsh, K.B., Owens, G. (2007) Prediction of mango eating quality at harvest. *Postharvest Biology and Technology*.



## **Intellectual property, commercialisation and confidentiality**

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

## Acknowledgements

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Mango growers of Australia

Kerry Walsh and Phul Subedi (Central Queensland University)

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Terry Rudge (Rudge Produce Market Solutions)

AMIA staff members.

## Appendices

Appendix 1 Weekly wholesale market price reports (AMIA publication *My Mango* and Ausmarket publications via AMIA website)

## Appendix 1

Weekly wholesale market price reports (AMIA publication *My Mango* and Ausmarket publications via AMIA website).

The weekly wholesale market reports are funded through Mango Industry R&D Levies, with matching funding from the Federal Government, and managed by HIA.



### Australian Weekly Mango Report

Compiled by Ausmarket Consultants. Ph (07) 3379 4576 Fax (07) 3379 4163

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Weekly Mango prices for the week ending Friday 12 April 2018

Species/Variety/Tonnes	Market	State/Region	Pack	Price Range			
				Low	High	Best	Avg
MANGOES, Brook, No1		BRS Q	Sl,Tray	18.00	24.00	24.00	22.00
Brook, No2		BRS Q	18L,Ctn	24.00	28.00	28.00	28.00
Brook, No2		BRS Q	Sl,Tray	20.00	24.00	24.00	22.00
Kensington Pride, No1, Unspecified		SYD S	Sl,Tray	30.00	50.00	55.00	40.00
Kensington Pride, Unspecified		MLB V-Mildura	Sl,Tray	30.00	50.00	50.00	40.00
Tommy Atkins, No1		SYD S	Sl,Tray	30.00	45.00	50.00	37.50

Intakes (tonnes) for each Market appear beside the first listing for that Market. States N=NSW, Y=Northern Territory, Q=QLD, V=Victoria W=WA, I=Imported.

For outturn inspections and quality problems refer to <http://www.marketinfo.com.au>