

Mango Supply Chain Monitoring Report 2008

June – July 2008

Monitoring Studies of the Export and Domestic Supply Chains of Pakistani Mango

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1. Introduction

The ASLP mango supply chain management project, “*Optimising Mango Supply Chains for More Profitable Horticultural Agri-enterprises in Pakistan and Australia*” has been initiated in Pakistan with the basic objective of *addressing key constraints currently limiting the competitiveness of supply chains of Pakistan and Australian mangoes.*

In order to improve the level of understanding of working in supply chains with identified stakeholders, the monitoring studies initiated during the first year of the project were continued during the second year as well with some added interventions, leading to the improved confidence and increased profitability of the stakeholders.

Accordingly, monitoring of six export market consignments (four being by air and two by sea) and six domestic market consignments was conducted. This report includes the determination of harvest maturity, temperature profile of the consignments from harvest till the consumption of the produce and mango quality evaluation at different levels of the supply chain.

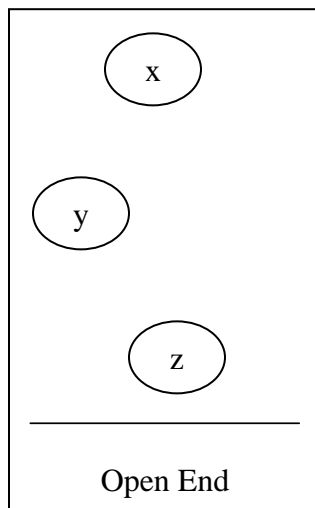
2. Method of conducting Monitoring Studies

Harvest Maturity

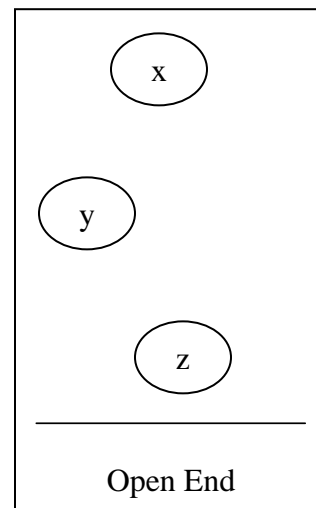
The harvest maturity of the fruit was determined by the use of refractometer and the colour guide of Australian Calypso variety. Nine fruits from three trees were harvested randomly and their flesh colour was compared with the Australian mango variety, Calypso. The TSS of the same fruits was recorded by the use of refractometer.

Temperature Profile

The atmospheric temperature and the pulp temperature at harvest were taken with a probe thermometer. To view the complete temperature profile, two or three data loggers were installed in different crates, which were placed at different locations in the consignment.



Position of Data Loggers in the Open Top Truck



Position of Data Loggers in the Reefer Container

x: 2nd Row; 3rd Box from Bottom; Middle Layer
y: Middle Row of Truck/Container; 2nd Box from Top; Middle Layer
z: 2nd Last Row; Middle of the Row; Middle Layer

The boxes were marked with identification numbers and printed tape was wrapped around the boxes to make the identification of experimental boxes at each level.

Quality Assessment

Fruit quality was assessed at different levels of postharvest handling (harvest, packing, cold store and retail stores) for skin colour change, firmness, presence of rots and skin blemishes. The data of each component was recorded with the help of following guides.

Skin Colour/ Blush rating scale

Rating	Skin colour	Blush
1	0-10% yellow	0-10% blush
2	10-30% yellow	10-30% blush
3	30-50% yellow	30-50% blush
4	50-70% yellow	50-70% blush
5	70-90% yellow	70-90% blush
6	90-100% yellow	90-100% blush

Fruit firmness rating scale

Rating	Description
0	Hard, no give in fruit
1	Rubbery, slight give in fruit under extreme figure pressure
2	Sprung, can feel the flesh deform under firm finger pressure
3	Soft, can feel 2-3mm deformation with moderate finger pressure
4	Very soft, deformation occurs with light finger pressure, whole fruit may deform

Defect rating scale

Rating	Rots	Skin browning	Sapburn	Lenticel spotting	Physical damage
0	Nil	Nil	Nil	Nil	Nil
1	To 3cm ²	To 3cm ²	To 3cm ²	To 25%	To 3cm ²
2	3cm ² to 25%	3cm ² to 25%	3cm ² to 25%	25 to 50%	3cm ² to 25% or crease >2cm long
3	> 25%	> 25%	> 25%	> 50%	> 25% or open wound

A detailed guide for monitoring of commercial consignments is attached as annex 1.

3. Monitoring of Export Market Consignments

The monitoring studies of export market consignments were undertaken for air freight as well as for sea freight. The air freighted consignments were exported to Singapore, United Kingdom (UK), and United Arab Emirates (UAE); while the sea freighted consignments were exported to UAE only.

a. Monitoring of Air Freight Export Market Consignments

As is given earlier, the air freighted consignments were exported to Singapore, UK, and UAE. One consignment each to Singapore, UK and UAE was exported from Sindh province, while another exported to UK was sent from Punjab province. The details of the monitoring of each consignment are given;

i. Asim Agriculture Farm, T.A. Yar to Altaf Alkhammas & Co, UAE

Consignment Details

Brand: Lush **Grower/Packer:** Asim Agriculture Farm, T.A. Yar
Variety: Chaunsa **Harvest Date:** 22 June 2008
Transport: Open top truck **Packing Shed:** IAC, Karachi
Packed Date: 23 June 2008 **Count:** 10-11
Packaging: Single layer, 5 Kg Card Board Boxes (Precooling at 16°C)
Departure from IAC: 24 June 2008 (via Islamabad)
Destination (Importer): Altaf Alkhammas & Co, UAE
Retailer: Lu Lu Supermarket
Date of Arrival at Destination: 25 June 2008 (straight to Lu Lu Distribution centre then straight out to stores for sale that afternoon)

General Feedback

The Dubai market for mangoes is diverse with many high income earners (local and exporters) which require premium end fruits and vegetables. However there is also the low income earners (labourers, etc) who like to eat mangoes. Therefore there needs to be quality at different levels to match up with these different market segments. At this stage all Pakistani mango imports were untargeted and lumped into the same category. There were some attempts by the local supermarket chain, Lu Lu to differentiate between airfreight/reefer transport and that of open top to target a premium Pakistani mango market.

There was a definite preference for mangoes that have been managed in a cool chain over those that have not. This is considered the most important factor in improving Pakistani mango quality above all other factors.



Mango retail summary

Country	Variety	Price (DS/kg)	Quality Comments
Union Co-operative Supermarket, Aweer			
Pakistan	Sindhri	3.70	A little stem end rot, marks not too bad, National brand.
India	Alphonso	9.50	Small, blushed, reasonably firm, relatively clean of blemish
Kenya	Round	10.50	Quality generally not good, some blush, sapburn and browning.
Comments: All wastage from the shelves is returned to the wholesaler. On average this is 20%			
Carrefour, City Centre Shopping mall			
Pakistan	Sindhri	4.95 (special)	Mixed size (200 – 1,000g) mixed colour, some over ripe, rots, Roshan and Aroma, 2 displays – one smaller with the other mango varieties the other a large bin end.
India	Alphonso	11.85 (special)	Reasonable quality, small and sound
	Badami	12.95	Reasonable quality

Country	Variety	Price (DS/kg)	Quality Comments
Brazil	Palmer	22.95	Large, some unsound, typical Palmer colour (red and green), body rots on most fruit
Philippines	Carabou	22.95	Best quality of all mangoes, medium size, clean of blemish, firm, just sprung (starting to turn yellow)
Lu Lu Hypermarket, Near Mall of Emirates (high income area)			
Lu Lu Hypermarket, Qusais (middle income area)			
Pakistan	Sindhri	3.25	Mixed size, mixed maturity/colour, internal breakdown, marks, dirty, misshapen, Roshan
Pakistan Air freight	Langra	10.95	Not full colour, mostly good quality
	Deseri	10.95	
	Anwar Ratoool	10.95	
	Chaunsa	9.95	
	Sanera	9.95	
Kenya	Long	8.95	Not good quality, body rots
India	Kesar	3.95	Small, rots
Comments: The Qusais store was a more high volume store. This store is also where the Lu Lu head office is. Contact: Zulfiga, F&V buyer			



Desireable quality attributes for Pakistani mangoes:

- Good bright colour characteristic of the variety (eg Sindhri)
- No rots
- Firm
- Not too ripe
- Good flavour
- Medium size – not too small, not too large

Quality issues observed

- Mixed sizes in boxes
- Mixed maturity, mixed colour
- Short shelf life
- Dirty dusty fruit
- Sap damage
- Skin rub and marks from insect damage
- Misshapen
- Physically pressed/squashed mangoes

Mango handling and logistics

Open top containers

Open top sea containers are slowly being phased out as a mode of transporting Pakistani mangoes to Dubai. They are currently being accepted only because there are inadequate reefer containers to manage the volume during the peak of the mango season. Open top shipments are variable in their delivery of the quality the market will accept. Some shipments may have reasonable quality but others don't. As a result of the variable quality a lot of sorting is practiced at the Wholesale market as each box of mangoes contains rejected fruit.



Reefer containers

All wholesalers/importers said there was definitely less wastage with mangoes arriving by reefer containers or air freight. All Indian mangoes are sent by reefer containers.

Wastage

One of the missions for this year's international market research is to verify the loss of Pakistani mangoes when they reach the market. In 2007 30% losses were reported by importers and retailers in the Dubai market.

The market research activity in June 2008 interviewed, six wholesalers, five small fruit and vegetable retailers and two Lulu's supermarkets on mango wastage in their businesses. Four of the wholesalers/importers interviewed reported that mangoes packed into the standard domestic wooden box and sent by sea in an open top sea container from Pakistan, had wastage of 2 to 5

pieces of fruit per box (20 fruits/box). The other two wholesalers reported wastage of 10% to 20%, which is equivalent to 2 to 4 pieces of fruit wasted for each box containing 20 fruits.

At the retail point, five small retailers were interviewed with all reporting 2 to 4 mangoes discarded out of a 20 mango box. Two Lulu Supermarkets claimed that they discarded 50 to 100 kg per day from the fruit they brought in each day about (500 to 1000 kg), which is 10 percent wastage which is slightly lower in comparison with small fruit retail shops.

Adding up the loss from the wholesale and retail point together, we can confidently say that the total loss of Pakistan mango at Dubai market is around 30%. This confirming the loss claim reported in the 2007 research.

General logistics issues

Refrigerated sea freight is the preferred freight mode over air freight to Dubai based on better temperature management and much cheaper costs. Sea freight costs around 4 RS/kg compared with air freight at 75RS/kg. This is largely due to the limited air freight capacity out of Pakistan.

Packaging

Packaging is still largely an issue. Wooden boxes often don't stand up to the conditions they are sea freighted under causing damage to the fruit. Fibreboard cartons require strengthening also as many are getting crushed during refrigerated sea freight.

Smaller single layer packs (5-8kg) are receiving the same price, if not more than larger (10-12kg) wooden boxes. This means a higher price per kilogram is being paid for better quality fibreboard cartons that deliver better quality mangoes. This is evident in both Pakistan and Indian mangoes in the Dubai wholesale market.

Distribution of dollar value in the supply chain for improved Pakistani mangoes

Step in supply chain	Sell price	Rupee equivalent
Farm gate price	30 RS/kg	30 RS/kg
Exporter	4.6 DS/kg (23DS/5kg box)	92 RS/kg
Sell price of Importer in Dubai	5.2 DS/kg (26DS/5kg box)*	104 RS/kg
Supermarket retail	8.99 DS/kg	178 Rs/kg

- most of the mango boxes in Lulu's supermarket weighed 4.5 to 5kg.

Quality evaluation

Fruit was assessed at packing on 23/6/08. At this stage most of the mangoes were hard green with some just starting to slightly colour (10% yellow). They were all assessed as being firm. There was small amounts of skin browning recorded on 70% of the fruit and very small amounts of physical damage on 80% of the fruit. No rots were evident.

The fruit was again assessed on 25/6/08 on arrival in Dubai. Skin colour averaged 2.5 (20-40% yellow) (see Figure 1) and firmness 2 (sprung). There were still only small amounts of skin browning and physical damage showing on fruit.



Figure 1: (a) Tray 1 – 25/06/08

(b) Tray 2 – 25/06/08

Temperature

The temperature loggers that were inserted in the consignment were removed by customs at Karachi airport therefore we were unable to track temperature throughout the supply chain. On arrival in Dubai the pulp temperature of the mangoes ranged between 15-18°C indicating maintenance of the cool chain during airfreight.

ii. Jamoth Farm, T.A. Yar to Kingdom Green, Singapore

Consignment Details

Brand:	Roshan	Grower/Packer:	Jamoth Farm, T.A. Yar
Variety:	Sonehra	Harvest Date:	22 June 2008
Transport:	Open top truck	Packing Shed:	Roshan, Karachi
Arrival at Roshan, Enterprises, Karachi:	23 June 2008		
Date of Carbide Application:	23 June 2008		
Packed Date:	24 June 2008		
Packaging:	Single layer, 3 Kg Card Board Boxes (Precooling at 16°C)		
Departure from Roshan Enterprises, Karachi:	24 July 2008		
Destination:	Kingdom Green, Singapore		
Date of Arrival at Destination:	25 June 2008		

Key Findings

- The fruit was harvested with long stem and lime desapping was done in the field.
- There is an obvious rise in temperature during the ripening phase (while held at packing shed).



Fruit Desapping at Orchard

- Temperature slightly decreased just prior to being shipped to the airport.
- The out turn analysis revealed that Pakistani exporters are not very careful in terms of fruit desapping and grading (matching colour). The sap creates a bad outlook to the produce besides giving place to lenticel spots (black spots appear on the place where the sap has actually ousted).
- Fruits even in the same box are significantly different from each other in terms of colour and size.
- Disease incidence was high in untreated fruit boxes.
- On a comparison, mango which had been washed (desapped) was more attractive than the one without desapping.
- The mangoes from different countries were mostly treated, desapped, blemish free and found in even colour.
- The Thai mangoes which were exposed to forced air cooling followed by transportation in refrigerated containers were the best to be taken to the high end super stores, where as Pakistani mangoes, despite of its qualities, were not enjoying reputation for the obvious reasons.



Consignment ready for Departure at Airport



Pakistani Mangoes at Display in Singapore

Recommendations

- As there is no forced air cooling available it may be wise to use rooms set at slightly lower temperatures (6-8°C) after packing to help pull the temperature down

- Ripening needs to take place in a cool room (set around 18-20°C) in clean plastic crates that are not lined with newspaper (to allow ventilation).
- Ripening using calcium carbide is not effective and requires high doses to really make a change.
- For short term air freight temperature can remain at 18-20°C.

Currently, no one in supply chain from Pakistan has the facility & understanding to ripe mangoes with ethylene, and more importantly the temperature management throughout the chain till fruit reaches at last hand.

iii. Jamoth Farm, T.A. Yar to Saliko, UK

Consignment Details

Brand: Roshan **Grower/Packer:** Jamoth Farm, T.A. Yar
Variety: Sonehra **Harvest Date:** 22 June 2008
Transport: Open top truck **Packing Shed:** Roshan, Karachi
Packed Date: 23 June 2008 **Count:** 5-6
Packaging: Single layer, 2/3 Kg Card Board Boxes
Departure from Roshan: 25 June 2008
Destination (Importer): Saliko London, UK
Date of Arrival at Destination: 25 June 2008 (By Air)

Preliminary Out-turn Summary

	Trial shipment		Standard shipment	
	Top	Middle	Top	Middle
Temp (°C)	30.1	33.4	40.2	38
Skin Colour	2.8	4.8	5	5
Fruit Firmness	3	3	3.2	3
Stem end rot	0	0	0.2	0
Browning	0.2	0.6	0.6	1.0
Sapburn	0	0.2	0.2	0.2
Lenticel	0	0	0	0
Abrasion	1	1	0.8	0.8
Immature	40%	60%	20%	20%
Bruising /compression	0%	40%	20%	40%
Grading:	uneven	uneven	uneven	uneven
Residues:	low	low	low	low

General Comments

The treated fruit was at a less advanced stage of ripening which is quite evident in Fig 1-4 in the fruit colour. The blemish level in particular the sap burn was very low. There was however a high amount of immature fruit in the both consignments. There also appears to be a significant

amount of moisture loss in the fruit, particularly in the standard shipment. The amount of moisture loss needs to be quantified; in future trial shipments by conducting some weight measurements on selected cartons pre and post shipment.



Figure 1: Non treatment top of pallet



Figure 2 Non treatment middle of pallet.



Figure 3 Treatment top of pallet



Figure 4 Treatment middle of pallet

The shipment was well received, its quality was far superior to anything else we saw in the market although there is much room for improvement - sizing, grading of blemishes. The product was sold immediately on release from evaluation.

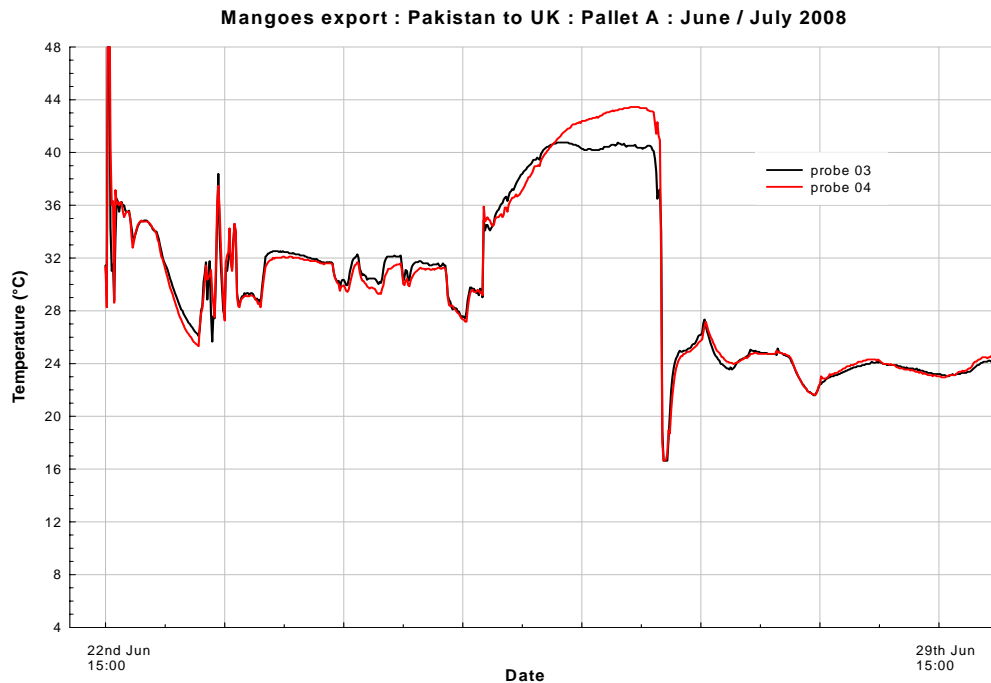
Sap burn has almost been eliminated on the fruit, although the overall blemish level on the fruit is still reasonably high due to skin browning and abrasion damage, tighter grading standards would significantly reduce this level of blemish.

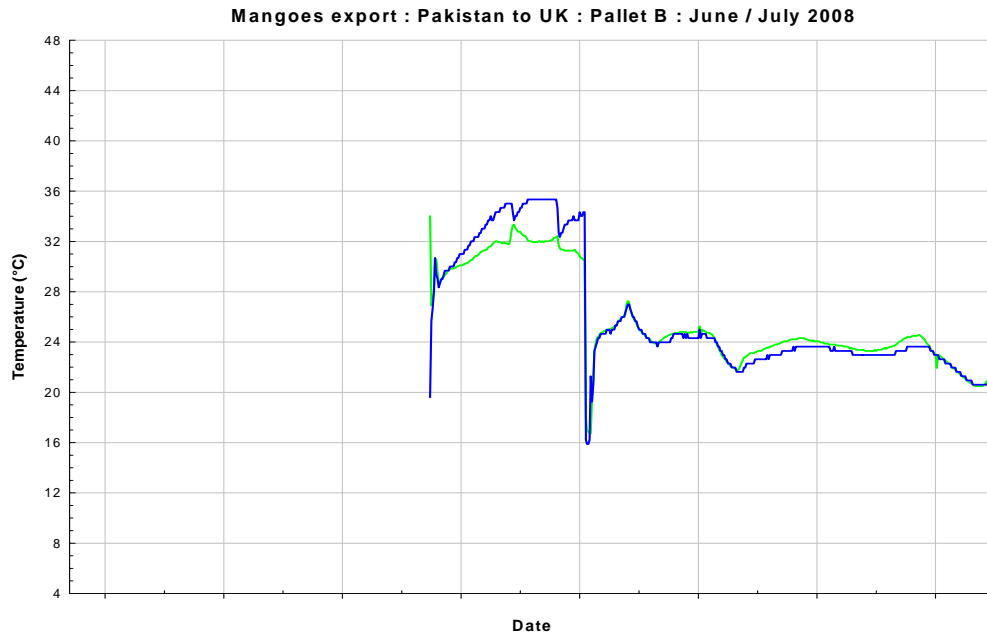
Temperature: Pulp temperature of the pre-cooled consignment was some 10⁰c lower than the conventional shipment; the pre-cooled shipment however only received 4 hours of pre-cooling prior to dispatch. As can be seen front the logger data the non cooled fruit temperature rose quickly peaking just under 44⁰ C, whilst the precoolde fruit peaked just below 36⁰ C Even with this it has had a significant result in delaying the ripening and thus increasing the post shipment shelf life. The non pre-cooled fruit was mostly over mature on arrival and unlikely to last more than 24 hours post arrival. It is important to now that even the precooled load was well above an acceptable temperate, yet it still had a positive result. This is a very clear indicator by handling Pakistani fruits at correct temperatures post shipment shelf life can be drastically improved.

The current supply chain has developed to handle the fruit very quickly with no one having any excess storage space to hold fruit, thus relying on a continued daily/(some every 2nd,day)supply. Therefore while fruit arriving slightly backward with longer shelf life presents some problems in the current system as it needs full colour to sell.

To manage this fruit could be coloured to the a more advanced stage pre-dispatch then pre-cooled

Temperature Profile of the Consignment





Market Observations/Feedback

1. Retailers: The Broadway, Southhall (many small retailers)
 Consumers: mainly Pakistani and Indian expats
 Prices: 2kg box: £3.50 per box (3 for £10)
 (prices were the same as June 2007)
 Quality: advanced stage of maturity fruit; full colour some evidence of dulling;
 poor sizing, sap burn evident but not excessive; high degree of shrivelling;
 residues evident;
 Volume: 50-60 boxes to a pallet per day
 Sourcing: direct from Western International Market each day
 Brands: IQT; Rizwan;
 Comments:

2. Wholesale Market, Birmingham
 Wholesales: Minor Weir and Willis
 Caribbean Produce
 Prices: 2kg box: £3 per box
 4kg box: £5.20
 Quality: *Roshan* - hot, immature fruit, full colour, sizing ok, some rots (half pallet
 of very poor fruit was seen) all packs had five fruit placed in box to fit -not
 arranged for presentation) residues evident
 Aroma - hot suspect high 30's low 40's pulp temp(excessive sweating
 evident on shrink-wrap to the point it was saturating the cartons), sap burn
 and skin browning, over ripe and some diseased.
 Volume: driven by the exporters - shipments arriving every day
 Sourcing: specific exporters
 Brands: Roshan; Aroma; Moody International (packaging weak) Al Abbas

- (weak packaging)
- Comments: Kesar variety from India was still in the market - it was well presented, uniform grading and tight packing, no sap burn
3. Retailers: Stratford Road
 Consumers: mainly Asian
 Retailers: Sardar Supermarket (100 boxes -Monday and Friday)
 RAI Supermarket (whole pallet - Monday and Friday)
 Prices: 2kg box: £3.20 per box (2 for £6) and as high as (2 for £6.50)
 Quality: Roshan - high waste - dropped price to clear today, quality not as good as Al Abbas very high levels of shrivelling; immature fruit, full colour
 Aroma - about 5% wastage, prefer medium size -5 fruit/2kg; would prefer 65% ripened so as to extend shelf life over the 3 days
 Sourcing: direct from Birmingham Markets
 Brands: Roshan, Aroma, AL ABBAS
 Comments: Kesar retailing (£8 for a 4 kg box), minimal wastage according to store owners apart from the small amounts of disease.

Overall Impressions

- The fruit was generally below average in quality - sap burn and abrasion damage, grading, sizing, disease, residue
- Short shelf life - the product has to be shifted quickly - therefore prone to discounting at both the wholesale and retail level
- Market coverage restricted mainly to Pakistani and Indian communities - where the product is well known and liked
- The product was sold by the carton - preferred 2-3 kg carton
- Disease is present to some degree in most lines of fruit although the actual level is not particularly high. All diseases observed are characteristic of stem end rots not anthracnose. The rapid ripening of the fruit is most likely masking the actual levels of disease as the fruit is physiologically breaking down within 24 -36 hours post arrival. This is due to the excessive heat that the fruit is exposed to during the accelerated ripening process and the transportation system.
- Shrivelling is a major issue in all lines of fruit, some of this is due fruit immaturity, but substantial dehydration is occurring during the handling process (the exact amount needs to be quantified). The onset of shrivelling is occurring rapidly within 24 - 36 hours post arrival.
- Packs of fruit need to be more uniform in sizing and much tighter, loose packs are causing problems with the retailers; customers are physically placing more fruit into each box, which is resulting in significant reduction in saleable boxes.
- Retailers did not like the tissue paper placed on top of the fruit as it was creating a mess in their stores and often gives the boxes of fruit an untidy appearance. This top layer of paper is not contributing anything to enhance the fruit outturn and we can see no reason why the practice shouldn't be stopped.

iv. Asim Agriculture Farm, Lodhran to Saliko, UK

Consignment Details

Brand:	Roshan	Grower/Packer:	ATF, Lodhran
Variety:	Chaunsa	Packaging:	Single layer, 2 Kg Card Board Boxes
Count:	4-5	Harvest Date:	26 July 2008
Arrival at Roshan, Enterprises, Karachi:	27 July 2008 (8 a.m.)		
Date of Carbide Application:	27 July 2008		
Packed Date:	29 July 2008		
Departure from Roshan Enterprises, Karachi:	29 July 2008		
Destination:	Khan Brothers, UK		
Date of Arrival at Destination:	30 July 2008		

Trial Consignment Feedback

The fruit had been harvested and de-sapped in lime solution at Ali Tareen Farm Lodhran. The clean and air dried fruit was packed in cardboard boxes and transported to Karachi in a mazda truck. It was ripened at Roshan Enterprises facility and packed in 3 Kg cardboard boxes before air freight shipment to UK.



Fruit Consignment at Karachi Airport



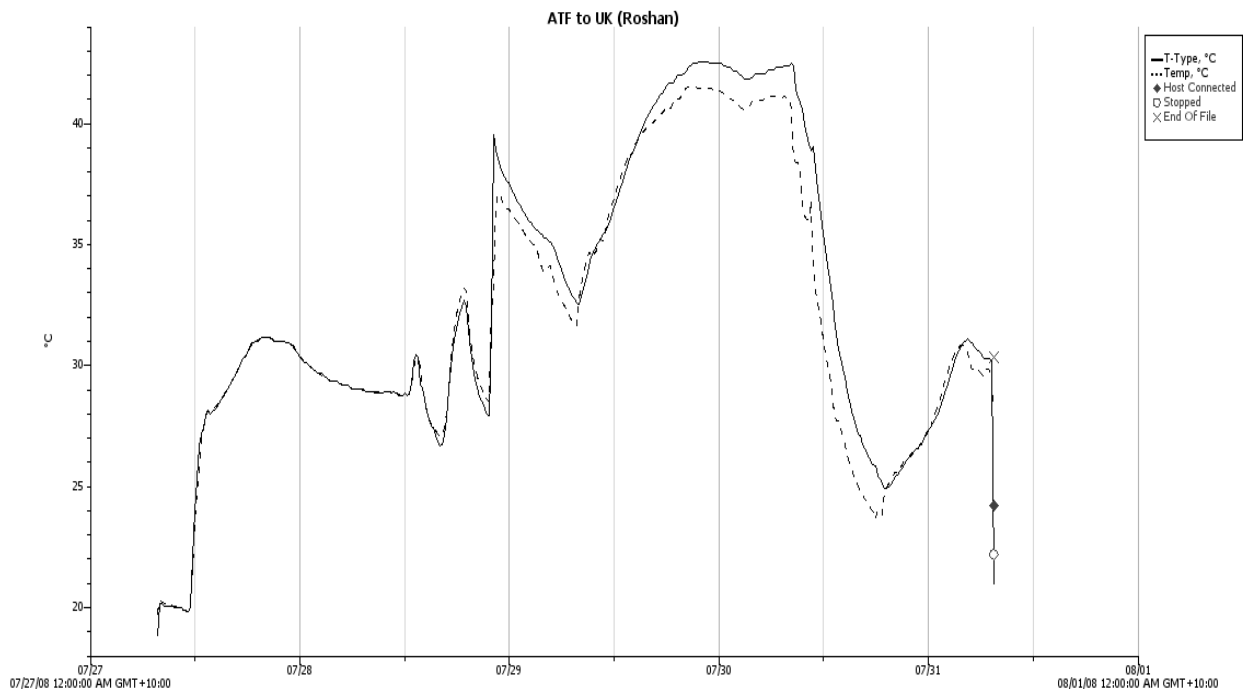
Fruit Quality at destination

Parameter	Rating	
	Orchard	Retail Out let
<i>Skin Colour</i>	0	4
<i>Fruit Firmness</i>	0	2
<i>Stem end rot</i>	0	0
<i>Browning</i>	0	0
<i>Sapburn</i>	0	0
<i>Lenticel</i>	0	0
<i>Abrasion</i>	0	1
<i>Immature</i>	0	0
<i>Bruising /compression</i>	0	0

The fruit reached its destination in approximately five days after its harvest. It was found at 90 – 100% colour level, sprung level of firmness, no sap burn and rots were recorded in the sample fruits.

Temperature Profile

A data logger was inserted in the fruit just prior to application of Calcium Carbide, which took its temperature up to 43°C. During the air travel, the temperature was recorded around 32°C and the logger was removed in UK at 25°C. The temperature profile of the consignment is plotted below.



A team comprising of two project team members and a commercial stakeholder visited the wholesale and retail markets of London and Birmingham for evaluation of mango quality of Pakistan with comparison of the mango from other countries and to get feedback from the wholesalers and retailers, having experience in trade of Pakistani mangoes.

Western International Market, London

The New Western International Market is the local wholesale market that mostly meets the fruit and vegetable requirements of London. The traders represent locals (white) and ethnic communities, Pakistani and Indians. The team visited Asian as well as European wholesale outlets as follows:

- 1) M/s Saliko Exotic Fruits
- 2) M/s M. J. Exotics
- 3) M/s Dhillon Farms Veg (UK) Ltd
- 4) M/s Ahmad Exotics

- 5) M/s Paul's Fruits and Vegetables
- 6) M/s Khan Brothers
- 7) M/s Darns Fruit and Vegetables



Visit and Discussions with Wholesalers at Western International Market, London

The fruits had received sourced from different countries including Asia, Africa and Europe and had been nicely displayed. The availability of mango from different origins with average prices was reported as follows:

Country of Origin	Variety	Packing (Weight)	Average Price	Unit Price
India	Alfanzo	2 Kg	£ 4.5	£ 2.2/Kg
Israel	Haden	5 Kg	£ 10.0	£ 2.0/Kg
Dominican Republic	Keit	5 Kg	£ 8.5	£ 1.7/Kg
Israel	Tomy atkins	4 Kg	£ 6.5	£ 1.6/Kg
Brazil	Keit	4 Kg	£ 6.0	£ 1.5/Kg
Pakistan	Chaunsa	2 Kg	£ 2.8	£ 1.4/Kg



Pakistani mango and Israeli mango in Western International Market, London

Dominican mangoes had been packed in unprinted simple boxes. Indian Kaiser and Alfanzo had been reported as best sellers among Asian mangoes. Some organic mangoes were also being sold but had little preference perhaps being at wrong place. The Pakistan mangoes shipped by M/s Roshan Enterprises, Union Fruit, Ahmed Exotics, Saanco Enterprises, Al-Abbas Enterprises and MAMA Raza IQT were available in the market.

The feedback indicated that oversupply and underweight lead to the lower price of Pakistani mangoes in the market. The mango export from other countries is regulated (even India regulates the export volume of mango) and they get better prices in return. Non professionals and seasonal exporters should be discouraged.

One of the importers suggested that there is need for promoting Pakistan mangoes especially the improvements being made through ASLP project interventions and other means. This will help restore improve image of both the product (mango) and country. One of the European importers informed that he used to be the major importer of Pakistan mangoes and was named as ‘mango king’. But now he hardly deals in Pakistan mangoes. He is not directly importing and demand for Pakistan mangoes if any from his clients he buys from the other importers and supplies. The reasons being very low margins attributed to unhealthy competition and bad trade practices like underweight & inconsistent quality. It is very difficult to work in this situation. The wastage level reportedly varied from 5% to 20%. The short shelf life and inconsistent maturity of fruits packed in one box was common.

Spitalfield’s Market, London

The Spitalfield’s market is a comparatively larger market where business is transacted as terminal market and re-exports to other destinations within UK and neighbouring European markets. The team visited different wholesaler and collected information from M/s M. M. Exotics and Akbar General Importers. Mainly the Pakistani and Israeli mangoes were on display in this market.



Discussions with Mango Trader at Spitalfield’s Market, London

The prices of mangoes from Israel and Pakistan are reported below:

Country of Origin	Variety	Packing (Weight)	Average Price	Unit Price
Israel	Maya/Shelly	5 Kg	£ 11.0	£ 2.2/Kg
Pakistan	Chaunsa	3 Kg	£ 4.0	£ 1.2/Kg

The wholesalers expressed views almost similar to the wholesalers in New Western International Market. The regulation of supplies and weight standardization were emphasized as areas of critical importance. There was a common observation that three boxes of 2 Kg mangoes were sold for £ 10.00 as against one box for £ 3.5. This practice is due to manipulation in weight.

Wholesale Market, Birmingham

The market research team visited the wholesale market of Birmingham for evaluation of mango quality of Pakistan and to get feedback from the wholesalers/commission agents who operate in the market.

The Birmingham Wholesale market is highly ethnic. The wholesalers selling Pakistani mangoes were either Pakistani or Indians, no white. Only the Pakistani Chaunsa mangoes were available on display at the time of the visit and its average price was recorded £ 2.8 per 2Kg box. The team visited and collected information from the following wholesalers:

- 1) M/s Bidwalla (Fruit & Veg) Ltd
- 2) M/s M. A. Sharif, Importers & Wholesalers
- 3) M/s New Fresh Veg
- 4) M/s A. S. Fruit & Vegetable
- 5) M/s Amin Sons & Co
- 6) M/s Minor, Weir & Willis Limited



Visit and Discussions with Wholesalers at Birmingham Wholesale Market, Birmingham

The produce (mangoes) from M/s A. A. Traders, Rishad Mateen & Co, Zulfiqar & Co, Aroma Enterprises, Al-Abbas Enterprises, Al-Habib, Nawa-e-Pakistan and MAMA Raza IQT were available for sale in the market at the time of visit. The rate of commission was reported as 10% on sales.

The importers/wholesalers expressed views similar to those of the New Western International Market with emphasis on over supply and underweight. They opined that there is a room for improvement in volume up to 50% and value up to 20% provided supplies are regulated; quality is consistent and no short weight.

To sum up, feedback received from importers/wholesalers of the three markets including New Western International Fruit Market, Spitalfield Market and Birmingham Market revealed that mangoes from Pakistan were sold both on commission basis and at agreed prices. However, the quality was inconsistent, markets was often over supplied, a number of unscrupulous exporters and importers emerged during the season thereby offering unhealthy competition, a part of mango imported went direct to retailers who operated in front of different shops in Southall area (a unique practice only in case of Pakistan), mango was sold to ethnic community, mango was

supplied to Pakistani or Indians and no white person was found interested due to small margins. Weight standardization had been appreciated by all but they stressed further vigilance as some companies were still supplying underweight packages by playing around with 5% margin of error (fluctuation). It clearly transpired that mango had a good market because of exotic fruit but had earned bad reputation due to unhealthy trade practices. The importers urged that Pakistan must exercise control on supplies and number of exporters especially those who operated on seasonal basis.

TESCO Extra Superstore, London

The market research team visited TESCO Extra superstore in London on 28 July 2008. Tesco is a leading superstore chain of Europe. At the display of this store, one pack of two mangoes was £ 1.89; one Gambia mango was as high as £ 1.78 per piece and an Israel mango of large size was £ 2.5 per piece.



Mango display at TESCO Extra, London

The mangoes were free of any type of blemishes, with hard texture and green-blush red bi-colour, uniform colour and size. The mangoes had been offered in single and two pieces (tray pack) and had been properly labeled. The label contained following information:

Country of Origin:
Variety:
Eating stage indication:
Health & Safety Instructions:
Shelf Life:
Traceability Code Bar:

The sticker/label on a single piece read as “*Variety- Shelly, fruit is ripe when the skin is predominantly red and slightly soft to touch, wash before use, best consumed within 3-4 days, smooth flesh and traceability bar code*”.

M/s Minor Weir & Willis (MWW) Ltd., Birmingham

The MWW is one of the leading importers of UK and a main supplier of fresh fruit and vegetables to Sainsbury’s retail stores. The team held meeting with the Ms Katy Gasparovicova

Technologist (the Director Technical was on leave) and discussed the business prospects with particular reference to mangoes.



Meeting at Minor Weir and Willies, Birmingham

Ms Katy informed the team that they would be interested in Pakistan mangoes. However, the imports will have to meet the minimum criteria as follows:

- EurepGap certification
- Proposed Pesticides Usage (PPU), no pesticides that has been banned in UK
- Maximum Residual Limits (MRLs)
- Registration with SedEx

The product (mango) should

- Packed in 5Kg cardboard boxes in single layer
- Unripe mangoes at a specific maturity level are appreciated. The Brix level must not increase 12°-15° at the time of harvest. The Brix level of 20° is maximum acceptance limit at sale.
- No post-harvest fungicide spray/application is mandatory, however, any recommended fungicide can be applied keeping in view the produce condition
- Each consignment be given a traceability code
- Mode of shipment both sea and air

Ms Katy will arrange information on produce specifications and post-harvest handling. They were interested in organic mangoes.

M/s Utopia UK Limited, Spalding

In the afternoon the market research team traveled to Spalding (120 miles from London) to conduct meeting with M/s Utopia UK Limited. The Utopia UK Limited is also one of the largest fresh fruits and vegetables importer and distributor of UK. The Utopia UK has got 15 years of experience of dealing in tropical fruits.

The team met with Director Procurement and Senior Procurement Manager, followed by detail discussions and visit of the pack-house/ware-house with the latter (Mr Geoff White). The Utopia

UK Ltd. Utopia supplies major portion of its imports to TESCO (the largest superstore chain in Europe).



Meeting at Utopia UK, Ltd. Spalding

The pre-conditions for supplying to M/s Utopia were almost same as reported for MWW. However, M/s Utopia were interested in other products as well like chikoo & pomegranates. Also, they would be interested in marketing Pakistani produce in France, Holland and Germany.

The compliance to ethical trading is an emerging protocol. The Tesco has refused accepting produce sourced from Zimbabwe on the pretext that acceptance will tantamount to supporting the current Government as it collects levy on exports.

The research team visited all the facility of Utopia UK Ltd. as well. Mr Geoff offered the team that Utopia can help if the project needs any assistance from Maersk shipping company.



Research team visiting Utopia UK Ltd., facility

Mr Geoff White took some Israeli mangoes (Shelli) for comparison with the Pakistani mangoes (Chaunsa). The apparent difference in the fruit quality was packing, washing and postharvest treatment. Internally, the Israeli mango was uniformly ripened while Pakistani mango was suffering from internal breakdown.



Israeli mangoes in comparison with the Pakistani mangoes

The market research team traveled back to London in the afternoon.

To start with, the supplier will have to submit a self assessment questionnaire for prequalification which mainly contains information on proposed pesticides usage.

They would like to have 7 to 11 graded mangoes depending on size & weight (650 to 450 gm), packed in 5 kg cardboard boxes, green with appropriate harvest maturity. They will ripen them (through temperature manipulations, no ethylene injection) on arrival and prepare according to super stores requirements. The fruit should be clean and not necessarily treated by fungicide etc. They asked for details on EUREPGAP certified orchards, pesticides applied, shipping details etc. The information will be shared with the ASLP supply team participants and commercial consignments organized during the next mango season. Both parties own and operate huge pack-houses equipped with ripening chambers, blast chillers, cold storages & packaging facilities.

Areas of Improvement in Air Freight of Mangoes

Following the areas need improvement for air freight of mangoes.

- Fruit maturity
- Sapburn treatment
- Proper grading
- Packing
- Strapping
- Temperature management

b. Monitoring of Sea Freight Export Market Consignments

As stated earlier, the two sea freighted consignments were exported to UAE only, one being from Tando Allah Yar (Sindh province) to Dubai and the other from Multan (Punjab Province) to Dubai. The details of the monitoring of each consignment are given;

i. Iftikhar Ahmad & Co. (IAC), Karachi to Altaf Al Khammas & Co., UAE

Consignment Details

Brand: IAC **Grower/Packer:** Khokhar Farm, T.A. Yar
Variety: Sunera **Packaging:** 5 Kg Corrugated Boxes
Count: 6 **Harvest Date:** 1 July 2008
Arrival at IAC: 1 July 2008 (Kept in Cool Room for 2 Days)
Departure from IAC: 3 July 2008
Destination: Altaf Al-Khammas & Co., Dubai
Date of Arrival at Destination: 8 July 2008

Key Findings

- The precooling of fruit by storing in a cool store (13°C) prior to loading into the reefer container was effective in reducing the fruit temperature.
- Average TSS of fruit with refractometer was found 7°.
- Fruit quality at retail was not considered good enough.
- The fruit was sourced from the orchard directly.
- The fruit was sorted by the skilled graders in the farm shed and was packed in 5 Kg cardboard boxes followed by keeping it under shade.
- The fruit was transported in an open top truck to the cold store facility (about 250 kilometers away from the orchard), and the distance was traveled in about 12 hours.



Mangoes at Destination

- The fruit coming from different orchards were labeled differently for traceability.
- The fruit was kept in cold store (adjusted at 13°C) (usually the fruit from orchards is gathered in the cold store till the quantity of a container is collected, which usually does not take more than three days) followed by loading in a 40 feet reefer container and ship to the destination market (Dubai).
- The container was set at 8°C. The container reached the destination at sixth day of the harvest and the fruit was held in the container at the same conditions of temperature and RH till it was marketed to the retailers (different number of boxes were removed from the container at different times and the last boxes were kept in the container till twelfth day of the harvest).

- The fruit was allowed to ripe naturally without treatment of Calcium Carbide or Ethylene.

Harvest Maturity

The average TSS as determined by refractometer was 7° Brix.

Temperature Profile

The temperature was recorded 33°C at the time of harvest. During the transportation from orchard to the cold store, the temperature was recorded 30°C. In cold storage (13°C) the fruit temperature decreased and reached around 15°C. The temperature slightly increased when the consignment was shifted from cold store to the reefer container, however it gradually decreased during the shipment and finally reached around 11°C before the removal of consignment from the reefer container. The temperature of retail store was set at 22°C.

Quality Assessment

The mango quality was assessed at different levels of supply chain. The extent of evaluated factors (%) at different levels was recorded as follows;

Factor	Score	Cold Store	Retail Outlet
Skin Colour (Yellow)	1	100%	20%
	2		75%
	3		5%
	4		
	5		
	6		
Firmness (Hardness)	0	100%	
	1		100%
	2		
	3		
	4		
Blush	1	100%	100%
Skin Browning	0	90%	15%
	1	10%	50%
	2		15%
	3		20%
Sap Burn	0	100%	100%
	1		

	2		
	3		
Lenticel Spots	0	95%	15%
	1	5%	50%
	2		25%
	3		10%
Rots	0	100%	10%
	1		25%
	2		50%
	3		15%
Physical Damage	0	100%	90%
	1		10%
	2		
	3		

Feedback:

According to the existing system of supply chains, the fruit reached at the destination in fair condition and was sold accordingly.

ii. Iftikhar Ahmad & Co. (IAC), Karachi to Altaf Al Khammas & Co., UAE

Consignment Details

Brand: MHA **Grower/Packer:** Ghais Ali, Multan
Variety: Chaunsa **Packaging:** Wooden crates
Count: 24-28 **Packed Date:** 26 July 2008
Departure from Orchard: 26 July 2008
Arrival at IAC: 27 July 2008
Departure from IAC: 28 July 2008
Destination: Altaf Al-Khammas & Co., Dubai
Date of Arrival at Destination: 3 August 2008

Key Findings

The market research team visited Wholesale Market and few superstores of Dubai to record the data of fruit quality of the trial consignment. The key findings include;

- The fruit consignment was harvested from Multan and was transported to Karachi in truck, where it was kept in cold store of IAC. The fruit was exported by sea freight to UAE in open top container.

- The fruit quality was found inferior at the export destination. Fruit was over-ripe and soft in texture. Disease incidence was also high and sap as well as other blemishes were also recorded.
- The wholesale market of Dubai was found not satisfied with the quality of Pakistani mangoes. They blamed the importers that they seek high margin with low investment, resulting in poor fruit quality.
- The importers, when asked about the poor fruit quality, blamed exporters that they are the responsible persons for poor fruit quality, because the market does not respond the quality in comparison to the price, so the fruit imported through reefer container and open top container are sold at the same prices, thus there is no use of additional inputs.
- The solution of the current situation is that the supply chains must be completed involving importers from the selected markets, who are willing to buy good quality for higher returns and this way, the quality mangoes can be sold for higher returns.

There were Pakistani, Indian and Kenya mangoes available on display in the wholesale market and their comparative prices were as follows;

Country of Origin	Unit Price
Pakistan	AED 6/Kg
Kenya	AED 10/Kg
India	AED 9/Kg

Fruit quality of Pakistani mangoes at display was below average and the retail store suppliers told that the Pakistani exporters have blocked the supply of mango at this time, and probably they will start exporting Pakistani mangoes in the month of Ramadan, expecting higher returns at that time.

The market research team visited the superstores of Dubai for evaluation of mango quality of Pakistan and to get feedback from the consumers and retailers involved in trade of Pakistani mangoes. In this regards, Carefore Superstore, Lulu Super market and United Superstore were visited. In Carefore Superstore, a variety of mangoes was available from different countries of origin. The prices were as follows;

Country of Origin	Unit Price
India	AED 24.95/Kg
Brazil	AED 24.95/Kg
Philippines	AED 19.95/Kg
Egypt	AED 15.95/Kg
Kenya	AED 12.95/Kg
Pakistan	AED 6.95/Kg

The display of Carefore is given in following picture as well.



Mangoes from different origins at display in Carefore, Dubai

The prices of mango in a UAE government operated superstore “United Superstore” were very low; however, there were no Pakistani mangoes on display at this store.

Country of Origin	Unit Price
Indonesia	AED 16.90/Kg
Kenya	AED 7.8/Kg
Oman	AED 6.5/Kg

Besides the prices, mango quality at these stores was also poorer due to the reason that the mango season in this area was going to be finished.



Discussion with Mango Trader at Spitalfield’s Market, London

Harvest Maturity

The fruit harvest maturity level was 9 on average according to the Australian Calypso mango variety while the average TSS as determined by refractometer was 8.5° Brix.

Temperature Profile

The atmospheric temperature at the time of harvest was 38°C while the average pulp temperature of six fruits was recorded 36°C. During the transportation from orchard to the cold store, the temperature was recorded around 35°C. In cold storage (10°C) the fruit temperature decreased and reached around 11°C. The temperature slightly increased when the consignment was shifted from cold store to the reefer container, and finally reached around 26°C at the retail store.

Quality Assessment

The mango quality was assessed at different levels of supply chain. The extent of evaluated factors (%) at different levels was recorded as follows;

Factor	Score	Packing	Retail Outlet
Skin Colour (Yellow)	1	100%	5%
	2		10%
	3		10%
	4		30%
	5		5%
	6		40%
Firmness (Hardness)	0	100%	
	1		10%
	2		20%
	3		50%
	4		20%
Blush	1	100%	100%
Skin Browning	0	90%	15%
	1	10%	50%
	2		15%
	3		20%
Sap Burn	0	100%	20%
	1		75%
	2		5%

	3		
Lenticel Spots	0	95%	35%
	1	5%	50%
	2		15%
	3		
Rots	0	100%	30%
	1		45%
	2		10%
	3		15%
Physical Damage	0	100%	40%
	1		60%
	2		
	3		

Feedback:

According to the existing system of supply chains, the fruit reached at the destination in good quality and was marketed easily in the retail stores.

Areas of Improvement in Sea Freight of Mangoes

Following the areas need improvement for sea freight of mangoes.

- Fruit maturity
- Sapburn treatment
- Proper grading
- Packing
- Strapping
- Temperature management

4. Monitoring of Domestic Market Consignments

For monitoring studies of domestic market supply chains, six consignments were undertaken from Sindh and Punjab province to the retail markets of Karachi and Lahore. Each consignment was prepared using conventional practices, however, a lot of 20 crates of desapped fruit was also included to record certain comparative studies.

i. Tando Allah Yar, Sindh to MHA, Karachi

Consignment Details

Brand:	IMD	Grower/Packer:	Bachani Farms, T.A. Yar
Variety:	Sindhri	Packaging:	5 Kg Cardboard Boxes
Count:	9-10	Packed Date:	7 June 2008
Arrival at Wholesale Market:	7 June 2008		
Arrival at Retail Market:	10 June 2008		
Destination:	Sohrab Goth, Karachi		

Harvest Maturity

The fruit was harvested at proper level of maturity and its average TSS as determined by refractometer was 6.0° Brix.



TSS determination

Harvesting, Grading and Packing

The major component of the consignment was prepared according to the conventional methods applied in mango industry of Pakistan (detailed in Monitoring Studies 2007). During the current year, a special lot of 100 crates was prepared by careful harvesting followed by desapping the fruit in lime solution and included in the consignment.



Fruit harvest at Bachani Farm



On Farm Fruit desapping

Packing and Transportation

The major component of the consignment was packed in 10-12 kg wooden crates, while the specific trial boxes were packed in 5 Kg cardboard boxes and transported to the relevant market in the open top Hino trucks.



Fruit Packed for Domestic Market



Fruit at Wholesale Market, Karachi

Temperature Profile

A data logger was used to monitor the temperature fluctuations during the fruit handling throughout the supply chain.

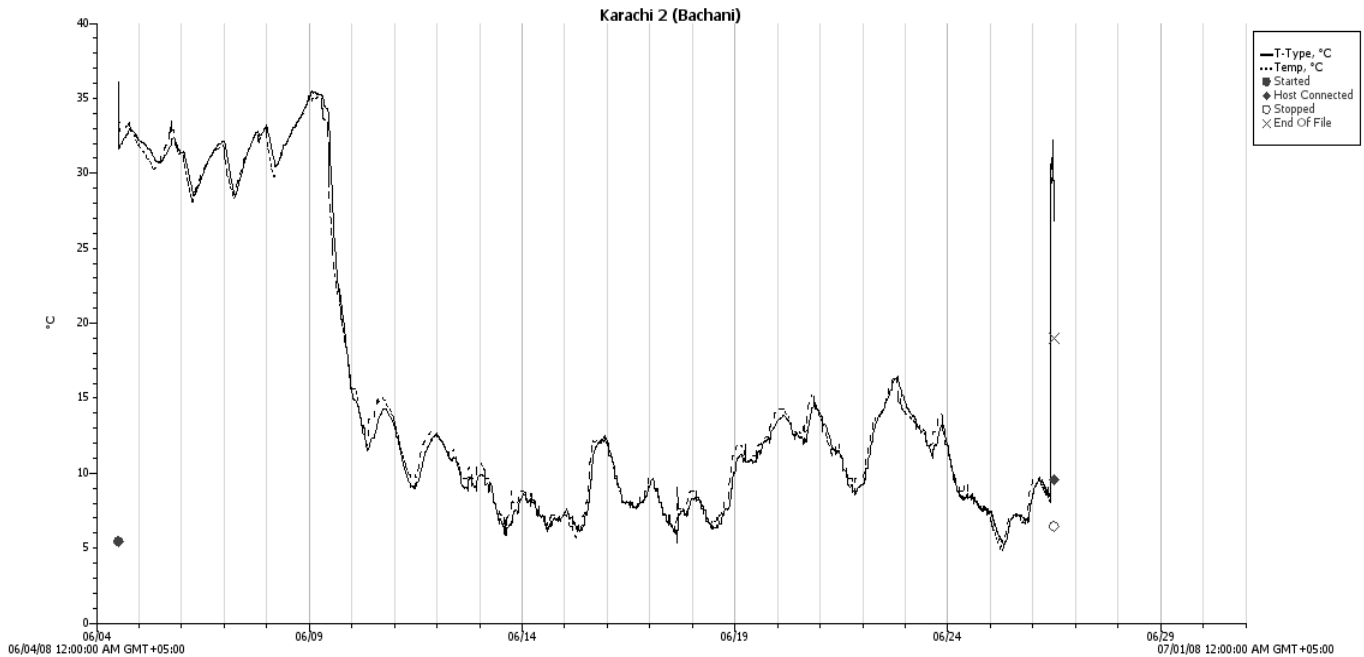


Fruit Box with Data Logger at Orchard



Fruit Quality at Retail Out let

The fruit temperature was recorded 32°C at the time of harvest, which remained fluctuating between 28 °C and 32°C during transportation and 36°C during the process of ripening. The fruit was sold at the temperature of 25°C. The data logger graph is given below.



Quality Assessment

The mango quality was assessed at different levels of supply chain. The extent of evaluated factors (%) at different levels was recorded as follows;

Percentage values of different Quality Traits

Factor	Score	Conventional Method		Desapped Fruit	
		Packing Shed	Retail Outlet	Packing Shed	Retail Outlet
Skin Colour (Yellow)	1	100%		100%	
	2				
	3		10%		
	4		5%		15%
	5		5%		80%
	6		80%		5%
Firmness (Hardness)	0	100%		100%	
	1		15%		5%
	2		15%		15%
	3		55%		75%
	4		25%		5%
Blush	1	100%	100%	100%	100%
Skin Browning	0	90%	25%	100%	80%
	1	10%	40%		20%

	2		15%		
	3		20%		
Sap Burn	0	85%	15%	100%	70%
	1	15%	65%		25%
	2		20%		5%
	3				
Lenticel Spots	0	100%	50%	100%	55%
	1		50%		40%
	2				5%
	3				
Rots	0	100%	20%	100%	65%
	1		40%		25%
	2		20%		10%
	3		20%		
Physical Damage	0	90%	60%	100%	90%
	1	10%	40%		10%
	2				
	3				

Feedback:

The selected lot was sold to a high end superstore in Karachi. At retail end, the selected fruit boxes earned premium price of Rs. 75/Kg compared with the ordinary consignment, which was sold for Rs. 25-35/Kg.

ii. Tando Allah Yar, Sindh to Kalyar Brothers, Lahore

Consignment Details

Brand:	AAF	Grower/Packer:	Asim Agriculture Farm, T.A. Yar
Variety:	Sindhri	Packaging:	Wooden crates
Count:	20-22	Packed Date:	9 June 2008
Arrival at Wholesale market Lahore:	12 June 2008		
Arrival at Retail Store:	14 June 2008		
Destination:	Retail market, Lahore		

Harvest Maturity

The average TSS as determined by refractometer was 6.5° Brix.

Harvesting, Grading and Packing

The major component of the consignment was prepared according to the conventional methods applied in mango industry of Pakistan (detailed in Monitoring Studies 2007). During the current year, a small lot of 20 crates was prepared after desapping the fruit in lime solution and included in the consignment.



Fruit harvest at Asim Agriculture Farm, T.A. Yar



Fruit packing for Lahore Market

Packing and Transportation

The fruit was packed in 10-12 kg wooden crates and is transported to the Lahore market in the open top Hino trucks. It took four days to arrive Lahore from T.A. Yar.



Fruit Packed for Lahore Market

Temperature Profile

The air temperature at the time of harvest was 38°C and the temperature of the fruit (in shade) was 34°C. The maximum and minimum temperatures recorded during the travel were 37°C and 31°C respectively and after application of Calcium Carbide, the temperature raised to 43°C. The data logger was removed from the consignment at 37°C at retail store.



Temperature Determination at Orchard

Quality Assessment

The mango quality was assessed at different levels of supply chain. The extent of evaluated factors (%) at different levels was recorded as follows;

Percentage values of different Quality Traits

Factor	Score	Conventional Method		Desapped Fruit	
		Packing Shed	Retail Outlet	Packing Shed	Retail Outlet
Skin Colour (Yellow)	1	100%		100%	
	2				
	3		5%		
	4		5%		5%
	5		5%		85%
	6		85%		10%
Firmness (Hardness)	0	100%		100%	
	1				10%
	2		25%		5%
	3		50%		75%
	4		25%		10%
Blush	1	100%	100%	100%	100%
Skin Browning	0	90%	25%	100%	70%
	1	10%	30%		20%
	2		20%		10%
	3		25%		
Sap Burn	0	85%	10%	100%	80%

	1	15%	55%		20%
	2		35%		
	3				
Lenticel Spots	0	100%	60%	100%	70%
	1		30%		25%
	2		10%		5%
	3				
Rots	0	100%	10%	100%	75%
	1		40%		15%
	2		40%		10%
	3		10%		
Physical Damage	0	80%	70%	100%	70%
	1	20%	30%		30%
	2				
	3				

Feedback:

The fruit acceptance of desapped fruit was significantly higher as compared with the ordinary boxes, however, price appreciation was not significant because the wholesaler was not sure of the consistent supply of the uniform quality and thus treated the special boxes similar to the ordinary consignment.

The packing (wooden and/or cardboard boxes) has significant impact on price appreciation.

iii. DJ Orchard R.Y. Khan to IAC, Karachi

Consignment Details

Brand:	IAC	Grower/Packer:	Mr Nek Alam, R.Y. Khan
Variety:	Chaunsa	Packaging:	Wooden crates
Count:	28-32	Packed Date:	6 July 2008
Arrival at Wholesale market Karachi:	7 July 2008		
Arrival in Retail Store:	9 July 2008		
Date of Evaluation at Destination:	9 July 2008		

Harvest Maturity

The average TSS of 10 fruits as determined by refractometer was 8° Brix.



Use of Maturity Guide to determine Fruit harvest



TSS determination Using Refractometer

Harvesting, Grading and Packing

The fruit was harvested, graded and packed mostly using the conventional practices. A special lot of 20 crates was however included in the consignment to evaluate the market response for the lime desapped fruit.



Fruit harvesting in Specially designed Net



Fruit Transportation to Packing Shed

The fruit is packed in 10-12 kg wooden crates (over filling is common practice) and is transported to the relevant market in the open top Hino trucks. The special lot was avoided for being over filled.



Destemming to avoid Sap Oozing



Fruit Packing for Karachi Market

Temperature Profile

The fruit temperature at the time of harvest was 30°C, which raised to 34°C during the travel from R.Y. Khan to Karachi. The temperature rose to 39°C after application of Calcium Carbide and when the data logger was removed it was 39°C.



Temperature Determination at Orchard

Quality Assessment

The mango quality was assessed at different levels of supply chain. The extent of evaluated factors (%) at different levels was recorded as follows;



Fruit boxes in Orchard Shed



Fruit boxes in wholesale market, Karachi

Percentage values of different Quality Traits

Factor	Score	Conventional Method		Desapped Fruit	
		Packing Shed	Wholesale	Packing Shed	Wholesale
Skin Colour (Yellow)	1	85%	10%	95%	20%
	2	15%	25%	5%	50%
	3		50%		30%
	4		15%		
	5				
	6				

Firmness (Hardness)	0	90%		95%	5%
	1	10%	45%	5%	35%
	2		25%		40%
	3		15%		20%
	4		15%		
Blush	1	100%	100%	100%	100%
Skin Browning	0	75%	25%	100%	95%
	1	20%	50%		5%
	2	5%	15%		
	3		10%		
Sap Burn	0	20%	10%	85%	85%
	1	50%	35%	15%	15%
	2	30%	35%		
	3		20%		
Lenticel Spots	0	100%	70%	100%	100%
	1		15%		
	2		15%		
	3				
Rots	0	70%	20%	90%	80%
	1	30%	30%	10%	20%
	2		30%		
	3		20%		
Physical Damage	0	80%	50%	100%	90%
	1	20%	30%		10%
	2		20%		
	3				

Feedback:

The retailer passed satisfactory remarks about the consignment in existing practices, and appreciated the improvement made through desapping of the fruit. Further, he ensured that consistent supply of similar quality can fetch very good economic returns as well.

iv. DJ Orchard R.Y. Khan to Kalyar Brothers, Lahore

Consignment Details

Brand: Al-Murtaza **Grower/Packer:** Mr Nek Alam, R.Y. Khan
Variety: Chaunsa **Packaging:** Wooden crates
Count: 30-34 **Packed Date:** 8 July 2008
Arrival at Wholesale market Lahore: 9 July 2008
Arrival at Retail Stores: 11 July 2008
Date of Quality Evaluation: 11 July 2008

Harvest Maturity

The average TSS as determined by refractometer was 8.4° Brix.

Harvesting, Grading and Packing

The fruit consignment was harvested, graded and packed as per traditional practices, inclusive of specially prepared 20 crates of carefully picked and desapped fruit.



Fruit harvest with hook attached at a net



Fruit Desapping for Quality Improvement

The fruit is packed in 12 kg wooden crates and is transported to the relevant market in the open top Hino trucks.



Desapped Fruit with better appearance



Fruit packed for Lahore market

Temperature Profile

The atmospheric temperature at the time of harvest was 32°C and the fruit temperature was recorded 31°C. The temperature at wholesale market, Lahore was 35°C and after application of Calcium Carbide the temperature raised to 42°C.



Data logger for temperature monitoring



Packing of fruit boxes for Lahore market

Quality Assessment

The mango quality was assessed at different levels of supply chain. The extent of evaluated factors (%) at different levels was recorded as follows;



Comparison of treated and untreated fruit at Retail

Percentage values of different Quality Traits

Factor	Score	Conventional Method		Desapped Fruit	
		Packing Shed	Retail Outlet	Packing Shed	Retail Outlet
	1	100%	5%	100%	10%
	2		5%		25%
	3		30%		35%
	4		25%		25%

	5		25%		5%
	6		10%		
Firmness (Hardness)	0	100%		100%	
	1		20%		25%
	2		30%		40%
	3		40%		35%
	4		10%		
Blush	1	100%	100%	100%	100%
Skin Browning	0	80%	30%	100%	70%
	1	20%	30%		30%
	2		40%		
	3				
Sap Burn	0	85%	20%	100%	90%
	1	15%	55%		10%
	2		15%		
	3		10%		
Lenticel Spots	0	100%	75%	100%	85%
	1		15%		15%
	2		10%		
	3				
Rots	0	100%	20%	100%	80%
	1		40%		10%
	2		40%		10%
	3				
Physical Damage	0	90%	60%	100%	85%
	1	10%	35%		15%
	2		5%		
	3				

Feedback:

According to the retailer, the fruit quality was found satisfactory as usual for the whole of the consignment. The lot of specially packed (desapped) mangoes was appraised at an additional value of Rs. 100/box over the ordinary consignment.

The completely desapped consignments will be supervised during the coming year with the involvement of same stakeholders.

v. Sabri & Co., Multan to MDS, Karachi

Consignment Details

Brand:	MDS	Grower/Packer:	Mr. Ghulam Fareed
Variety:	Chaunsa	Packaging:	Wooden crates
Count:	26-32	Packed Date:	17 July 2008
Arrival at Wholesale market Karachi:	18 July 2008		
Arrival in Retail Store:	21 July 2008		
Date of Evaluation at Destination:	21 July 2008		

Harvest Maturity

The average TSS of fruit as determined by refractometer was 8.6° Brix.



Fruit TSS Determination with Refractometer



Fruit harvest with Picking pole

Harvesting, Grading and Packing

The fruit consignment was harvested, graded and packed as per traditional practices, inclusive of specially prepared 20 crates of carefully picked and desapped fruit.



Fruit Harvested following Traditional Practices

The fruit was packed in 10 kg wooden crates and transported to Karachi in the open top Hino truck.



Desapped Fruit kept for Drying

Temperature Profile

Temperature at the time of harvest was 42°C, which remained approximately 40°C during the transportation from Multan to Karachi. The temperature rose to 44°C after application of Calcium Carbide and when the data logger was removed it was 32°C in Karachi.

Quality Assessment

The mango quality was assessed at different levels of supply chain. The extent of evaluated factors (%) at different levels was recorded as follows;



Quality Analysis in Orchard Shed



Fruit boxes in wholesale market, Karachi

Percentage values of different Quality Traits

Factor	Score	Conventional Method		Desapped Fruit	
		Packing Shed	Retail Outlet	Packing Shed	Retail Outlet
Skin Colour (Yellow)	1	90%	5%	95%	5%
	2	10%	20%	5%	25%
	3		20%		25%

	4		25%		30%
	5		30%		15%
	6				
Firmness (Hardness)	0	100%	20%	100%	20%
	1		40%		30%
	2		20%		30%
	3		20%		20%
	4				
Blush	1	100%	100%	100%	100%
Skin Browning	0	90%	70%	90%	80%
	1	10%	20%	10%	20%
	2		5%		
	3		5%		
Sap Burn	0	65%	40%	95%	85%
	1	15%	30%	5%	15%
	2	20%	15%		
	3		15%		
Lenticel Spots	0	100%	90%	100%	95%
	1		10%		5%
	2				
	3				
Rots	0	85%	60%	100%	80%
	1	15%	30%		20%
	2		10%		
	3				
Physical Damage	0	90%	80%	100%	95%
	1	10%	20%		5%
	2				
	3				

Feedback:

The retailer passed satisfactory remarks about the consignment in existing practices, however, no price appreciation was gained in Karachi.

vi. ATF Lodhran to Sajid & Co., Lahore

Consignment Details

Brand: ATF **Grower/Packer:** Ali Tareen Farm, Lodhran
Variety: Chaunsa **Packaging:** Wooden crates
Count: 30-34 **Packed Date:** 20 July 2008
Arrival at Wholesale market Lahore: 21 July 2008
Arrival at Retail Stores: 24 July 2008
Date of Quality Evaluation: 24 July 2008

Harvest Maturity

The average fruit TSS as determined by refractometer was 8.8° Brix.

Harvesting, Grading and Packing

The fruit was harvested, graded and packed as per traditional practices and 100 crates of specially harvested and desapped fruit were included in the consignment.



Fruit harvest at ATF Lodhran



Fruit grading and packing at Orchard Shed



pH of Water before Adding Lime (7.5)



pH of Lime Solution (12.5)

The routine consignment was packed in wooden crates of 10-12 Kg, whereas the lot of trial boxes was packed in cardboard boxes of 10 Kg capacity.



Fruit Packed in Wooden Crates



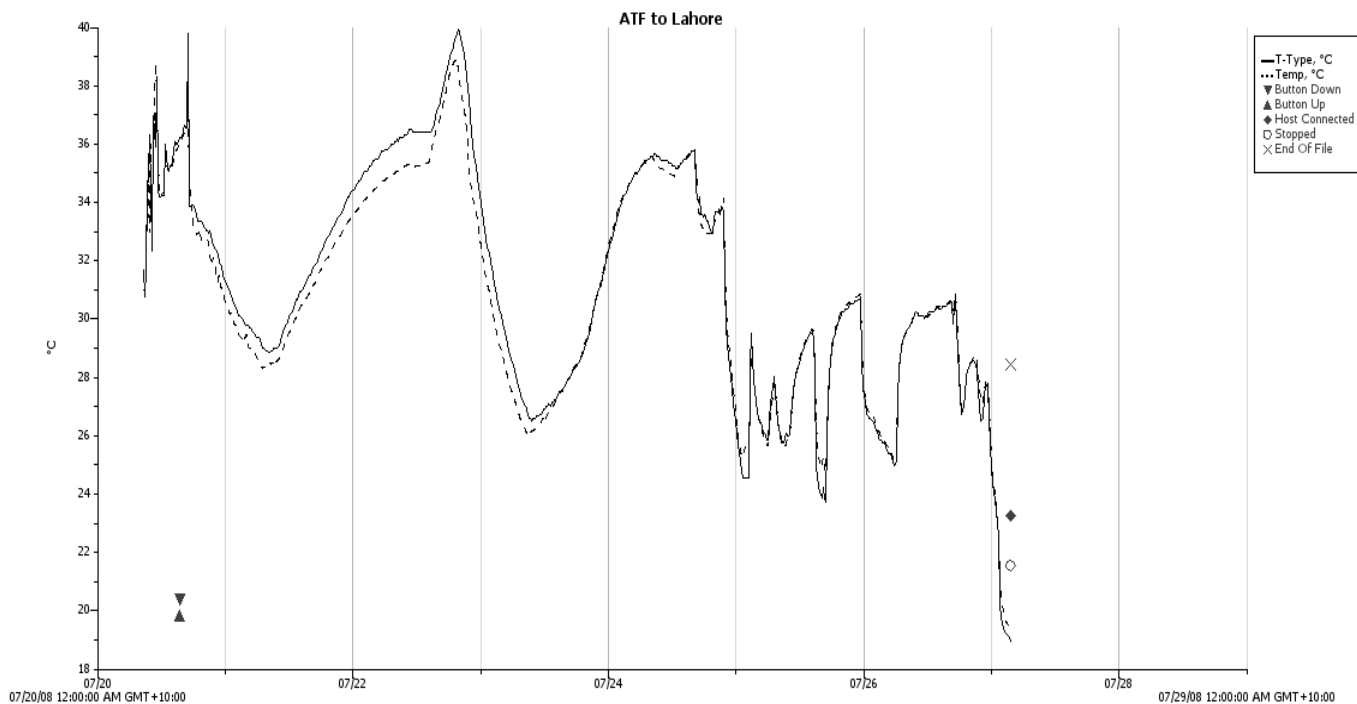
Desapped Fruit boxes

Temperature Profile

The fruit temperature at the time of harvest was 34°C. The temperature went down during the night time and reached about 29°C, however, after application of Calcium Carbide the fruit temperature rose to 40°C. The temperature at retail store was 35°C, when the data logger was removed from the boxes. The graphical presentation of temperature fluctuation over the supply chain channels is given below.



Fruit Box with Data Logger at Retail store, Lahore



Quality Assessment

The mango quality was assessed at different levels of supply chain. The extent of evaluated factors (%) at different levels was recorded as follows;



Ultimate Fruit Quality at Retail End

Percentage values of different Quality Traits

Factor	Score	Conventional Method		Desapped Fruit	
		Packing Shed	Retail Outlet	Packing Shed	Retail Outlet
Skin Colour (Yellow)	1	100%	15%	100%	25%
	2		25%		25%
	3		20%		30%
	4		30%		10%
	5		10%		10%
	6				
Firmness (Hardness)	0	100%	10%	100%	25%
	1		40%		25%
	2		40%		25%
	3		10%		25%
	4				
Blush	1	100%	100%	100%	100%
Skin Browning	0	80%	75%	100%	85%
	1	10%	15%		15%
	2	10%	10%		
	3				
Sap Burn	0	75%	65%	95%	95%
	1	15%	25%	5%	5%
	2	10%	10%		

	3				
Lenticel Spots	0	100%	85%	100%	95%
	1		15%		5%
	2				
	3				
Rots	0	70%	60%	90%	85%
	1	30%	40%	10%	15%
	2				
	3				
Physical Damage	0	80%	75%	100%	85%
	1	20%	20%		15%
	2		5%		
	3				

Feedback:

The routine consignment was of usual acceptance and was sold in an open auction in the Lahore market. However, the specially prepared lot was sold to HKB (High end superstore), where it was sold @ Rs. 60/Kg compared with Rs. 30/Kg for the common market places for ordinary quality.

Annex 1: Monitoring fruit and vegetable consignments

Introduction

Monitoring of fruit and vegetable consignments is used to identify the actual practices and handling conditions occurring in supply chains and the impact of these practices and conditions on produce quality. Often the practices and conditions are different to what people expect. By sampling and assessing quality at different steps in the supply chain, the points where quality is lost and the reasons for quality loss can be determined.

Monitoring is an important tool for improving knowledge and practices in supply chains but requires a collaborative effort by all participants in the supply chain to be successful. Monitoring of a consignment typically involves the following activities:

- mapping supply chain processes
- monitoring of practices and handling conditions
- monitoring produce quality
- communication of monitoring results

Planning a monitoring activity

Thorough planning is required to ensure that the monitoring activity is effective. This involves:

1. Establish clear objectives. Be clear about why you are monitoring and what you want to achieve.
2. Decide which steps in the supply chain are to be monitored. Are you monitoring all of the supply chain from production to purchase by consumers or segments of the supply chain – for example, packing to sale by wholesaler.
3. Assemble a team to undertake the monitor. It is unlikely that one person can do all of the monitoring as different locations are usually involved. Do not rely on the people working in the supply chain businesses to do the monitoring tasks as they are usually too busy doing their own job.

Typically, one person is required to monitor growing, harvesting and packing processes and another person to monitor wholesale and retail practices. If you are monitoring from different production districts to different markets, a person is required in each production district and market.

4. Develop and test the methods for monitoring and prepare the materials, tools and record sheets required.
5. Prepare clear instructions on the responsibilities and tasks for team members and the methods for doing the tasks.
6. Provide training to ensure people are aware of their responsibilities and capable of doing the tasks.
7. Ensure that the supply chain participants are informed about the monitoring activity. Do not keep the monitoring activity hidden from the participants as it may result in valuable information or equipment being lost.

Setting the date for the monitoring activity needs to be done in close consultation with the supply chain participants. It is best to plan the monitoring to suit typical commercial practice rather than when it suits you.

Participants in the supply chain need to be informed about when the monitoring is occurring, what is happening and what you expect from them. For example when monitoring packing, the farmer or packing shed manager needs to know when monitoring will start and what will be monitored.

Similarly, wholesalers/ retailers/ exporters/ freight forwarders/ importers need to know when consignments are arriving, how to identify packages that are being monitored, whether there are any specific actions they need to take, and who they need to inform when the consignment arrives.

Mapping supply chain processes

The purpose for mapping the supply chain is to describe the processes that occur at each step and to identify where quality may be lost and where monitored of handling practices, conditions and quality is required. The actions involved in mapping a supply chain are:

1. Identify the steps and businesses involved in the flow of product through the supply chain and draw a diagram to represent the linking of these steps. This is completed by talking to key businesses involved in the supply chain.
2. Identify the processes occurring at each step and the critical practices and conditions for each process. This is completed by talking to key people in each business. For example, for precooling collect information on the precooling temperature and humidity, when it is done, the type of cooling system used (room cooling, forced-air etc), and the length of the cooling period. An example of a record form for collecting this information is attached.
3. Verify the supply chain map by observing commercial operations at each step in the supply chain.

Monitoring of practices and handling conditions

Monitoring of practices and handling conditions involves observing and recording what actually happens during processes and measuring specific conditions such as temperature.

Observing and recording the actual practices and conditions is important to help interpret monitoring results and identify possible causes for quality lost. Identify the information to collect at each step in the supply chain and develop a record sheet to collect the information. Separate record sheets are usually required for each step. Examples of record sheets for harvesting and packing, transport and market handling are attached.

Monitoring temperature

It is important to monitor the temperature of the produce (pulp) and the air surrounding the produce. Pulp temperature is slower to change than the air temperature conditions around the produce. A number of temperature data loggers are available to measure both pulp and air temperature at regular intervals (every 10-15 minutes) during extended periods in the supply chains. The data from the loggers is downloaded using computer software and the results are presented in graphical form.

The positioning of the loggers in the consignment must be planned to measure the potential variations in temperature. Temperature may vary within a stack or between separate stacks. The produce may be stacked in handling units such as pallets or stacked loose in transport vehicles and containers. The positioning of the loggers will depend on the type of package used, type and size of handling unit and stacking pattern, the type and mode of transport and stowing pattern.

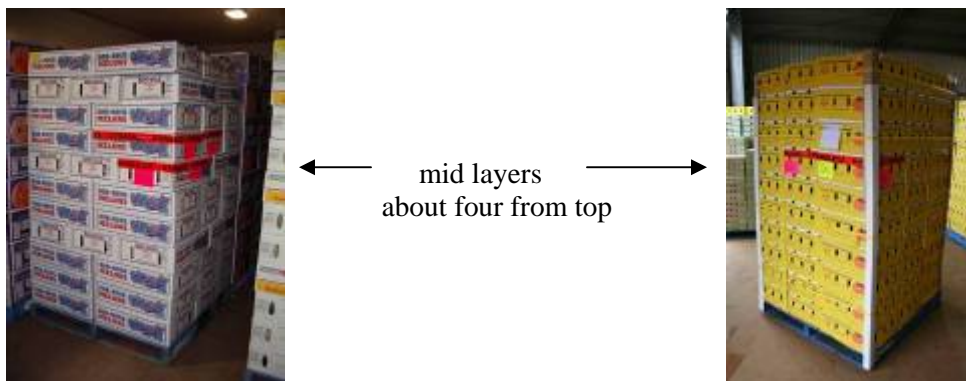
To gain an understanding of the temperature variations within a consignment, loggers are typically placed on the top, bottom, sides and middle of the stack. The number of stacks monitored will depend on the likely of temperature variations between stacks and the availability of loggers. Some compromise may be needed between the number of positions monitored within the stack and the number of stacks monitored.

To ensure that data loggers are retrieved, it is essential that the packages containing loggers are clearly labeled. The label must be bright and easily seen and contains the contact details for where to return the logger. Inform the person receiving the consignment (wholesaler, exporter, freight forwarder, importer, retailer) about when it is expected to arrive, the location and number of loggers, how the packages are labeled and when and who is to collect the loggers.

Provide clear instructions to the person collecting the loggers on when the consignment is expected to arrive, when to collect the loggers, the location and number of loggers, how the packages are labeled, information to collect and the contact details for return of the loggers. Including a prepaid courier package with the loggers will help improve the retrieval of loggers.

The examples below show typical logger placements for Australian handling systems:

Standard pallet



Airline pallet



Airline AV container



bottom layer

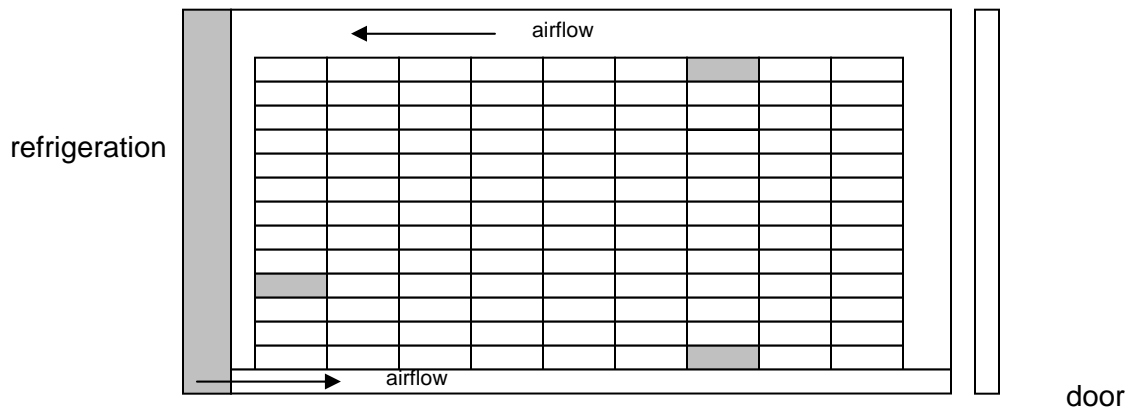


mid layer

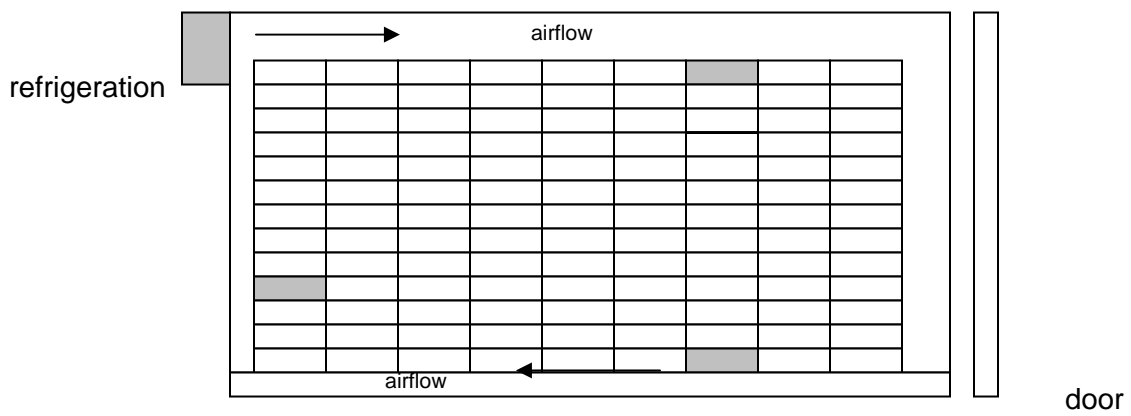


top layer

Shipping container



Refrigerated truck



Monitoring produce quality

The purpose for monitoring produce quality is to identify the points where quality is lost and the impact of handling practice and conditions on produce quality. Factors to consider are the number of monitoring points, sampling frequency and size, holding conditions before assessment and assessment methods.

It is best to start broad when deciding on the points to monitor quality. Once some monitoring has been completed, refining of the monitoring points may be needed for further investigations.

The sampling frequency and size will depend on the likely variation in quality within the consignment and the size of produce. The larger the variation, the higher the sampling frequency and size. For most produce, the number of units to sample should be at least 20. For large produce such as watermelon, it may not be possible to sample this number.

Produce is typically assessed for quality at the time of sampling and then held under specific conditions to simulate storage or retail handling. The produce is then assessed at defined intervals to measure storage or shelf life.

The methods used to assess quality must be objective and practical. The first step is to identify the critical quality attributes to measure. For some attributes, measuring instruments or tools will be available – for example, rulers or calipers to measure size, balances to measure weight, penetrometer to measure firmness. For other quality attributes, rating scales may be required for assessments – for example, colour charts for skin and pulp colour, rating scales for blemish and eating quality. Examples of rating scales are attached.

Record forms for quality assessments must contain sections to record the following information:

- the identity of the sample, where and when the sample was taken and when the assessment was done
- the sample number
- quality assessment measurement or rating
- name of the assessor

Photographing of produce at the time of quality assessment is useful in providing feedback on the monitoring results to the supply chain participants. Label each photograph to identify the consignment details, sample point, sample date, and assessment date. When taking photographs of the same sample under simulated conditions, ensure the produce is oriented in the same direction each time so that changes in produce quality can be easily observed.

