
Working Paper Series

This document forms part of the ACIAR Project AGB/2012/061
*Improving smallholder farmer incomes through strategic market
development in mango supply chains in Southern Vietnam*

Resource: A2.3 Mango productivity and quality improvement in fresh
supply chains
Study focus - Demonstration chain appendices
Evaluation of the financial impacts associated with enhanced
Mango quality from farm to retailer in Southern Vietnam

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Appendix 1. Survey Questionnaires

Survey Sheet #	Description of the survey questionnaire sheet	Who is targeted (to provide the information)	When information will be collected (week number)						
			1	2	3	4	5	6	
1	Financial analysis of sap burn treatment	Farmers/SIAEP; 4 farmers each complete 1A and 1B		■					
2	Farmer data collection sheets for treated fruit	Farmers/SIAEP 4 farmers each complete sheets once per week for 4-week period		■	■	■	■		
3	Farmer attitude assessment	Farmers; 4 farmers each complete sheet after trial period							■
4	Pack house hot water treatment financial analysis	Pack houses		■					
5	Printed carton costs	SIAEP	■						
6	Supermarket survey of supplied fruit on a weekly basis	Complete one survey per week for each consignment of supplied fruit x four supermarkets		■	■	■	■		
7	Pack house experiences relating to mango treatment	All pack houses (x2) complete the sheet after trial period							■
8	Supermarket analysis for selling each consignment of treated mango	Supermarkets (x4?) Each supermarket visited by SIAEP (x4) and info is completed each week over 4 week trial period		■	■	■	■		
9	Supermarket post-trial assessment	SIAEP will visit supermarkets (x4) and record observations at end of trial period							■
10	Vendor experiences in supplying treated fruit	SIAEP will visit Vendor and record information after trial period							■

Sheet 1: Financial assessment of sap burn treatment

Please complete the following information. This will help us calculate the cost of undertaking the sap burn treatment on-farm.

Item		Response
1	SIAEP Team member:	
2	Date survey completed:	
3	Did you buy your trolley or make it yourself?	BUY TROLLEY / I MADE MY TROLLEY
4	What was the cost of the trolley?	.....Dong
5	Expected life span of trolley (years)	.....years
6	Allowance for repairs and maintenance	<i>for example 5% of purchase price</i>
7	How many kg of fruit are processed per year using trolley equipment?	.....kg (in one year)
8	What is the de-sapping powder used, the cost and kg of fruit that each batch will process? Options for de-sapping powder (1) sodium carbonate, (2) sodium metasilicate, (3) anhydrous sodium dichloroisocyanurate dihydrate (4) food grade lime wash (calcium hydroxide)	<i>De-sapping powder name:</i> <i>1 2 3 4 (circle one number)</i> <i>Other (specify)</i>
9	What is the <i>cost for one batch of the mixed powder solution</i>	.....Dong
10	How many kg of fruit are treated with each batch of dipping solution?	.....kg
11	Other associated costs with treatment (specify)	
12	Quantity (kg) of fruit treated in 1 hour	.....kg of fruit treated in 1 hour
13	How many people treat the fruit in one hour (labour units)	.....number of people treating the fruit (in 1 hour)
14	Cost of labour for employing one person Dong/hour	.....Dong per hour for labour
15	Fruit Wastage: was there more or less wastage with the treated fruit? Please indicate the % increase or decrease in wastage	FRUIT WASTAGE MORE/LESS/ABOUT THE SAME % increase or% decrease
16	Did you EXPECT to receive additional income for treated fruit due to quality improvements?	Additional income received from treated fruit YES/NO/UNSURE
	If so, what % increase in price do you EXPECT to receive?	% price increase (compared with untreated)
17	Do you plan to continue with de-sapping next mango season?	YES/NO/UNSURE
	Please explain your answer	Please explain your answer

Sheet 2: Farmer data collection for treated fruit

(sent from the farm to the packing house). Complete the requested information relating to 4 separate sales of TREATED fruit that are sent to the packing house, over a 4-week period.

Treated Fruit Sale Number 1, 2, 3 and 4		Farmer name:	Village location:
Characteristic		Response	
1	Variety/varieties		
2	Date fruit left the farm:		
3	Quantity sold (kg):		
4	Price received (per kg):		
5	Details ejected fruit (if any) (kg)		
6	Consignment Number (if available)		
7	Additional comments		

Sheet 3: Farmer attitude assessment

Complete this survey after the 4 week trial

For each statement below, tick one box that indicates your level of agreement.

STATEMENT		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
A1	The sap burn treatment prevents the mango fruit from deteriorating (or being down-graded)					
A2	I think that in the future the sap burn treatment may result in receiving higher prices for my mangoes					
A3	It doesn't matter how much I try to improve the quality of the mangoes I sell, I never receive higher prices					
A4	I plan to continue to undertake sap burn treatment of future mangoes that I produce					
A5	Treating the mangoes for sap burn is an easy activity to undertake on my farm					
A6	I received clear instructions and training on how to undertake sap burn treatment					
A7	I consider that I have a bright future as a mango farmer					
A8	If I had more money, I would like to expand the area of mangoes I farm					
A9	I would like my children one day to be farmers					

Sheet 4: Pack house hot water treatment financial analysis

Kim Nuang Packhouse System

Please provide the necessary information relating to the cost of hot water treatment in the following table

Item		Response
1	SIAEP Team member	
2	Date form completed	
Answer the following questions based on the system that you use (as above)		
4	Size of tank (litres) or alternatively dimensions (length X width X height)	
5	Equipment purchase price	
6	Expected life span of the equipment (years)	
7	Allowance for repairs and maintenance e.g. 5% purchase price	
8	Fruit processed in 1 hour (kg)	
9	Number of labour units (persons treating the fruit) in 1 hour	
10	Cost of labour employing one person Dong/hour	
11	Indicate % average level scald damage to fruit experienced	
12	Total kg processed fruit per year	
13	Operating costs for using the equipment (dipping solution)	
14	How do you measure water temperature to maintain the correct temperature?	
15	Are there any issues/problems you experience in maintaining a consistent temperature?	
16	Other associated costs with treatment (specify)	
17	Where do you get information and technical assistance for hot water treatment of the mango fruit?	
18	Is there any additional information or assistance that you require on hot water treatment? Please explain	
19	Other comments most welcome	

Sheet 5: Printed carton costs

(cost of producing and supplying the cartons to the packing house)

Carton type: 6 mangoes per box most likely to be the approach taken

Item		Small GIFT Box (6-mangoes)
1	Initial set-up costs for cartons (artwork/graphics)	Establishment cost:
2	Production costs for cartons (for example printing, supply and delivery of cartons) Please estimate the cost of the cartons if produced on a commercial scale (larger production run than what was used in this trial exercise). Please liaise with the carton producer	Total cost:
		Number of cartons produced:
		Kg of fruit per carton:
3	Please describe the cartons produced in terms of size, dimensions	
4	Please record specific comments you may have received from the vendor/pack house/supermarket in terms of the carton design, how useful they consider the cartons will be and the relative advantages	Comments made (and by who) How useful the cartons are expected to be (and by who) The relative advantages of the cartons (and by who)
5	Please record photographs of the cartons and send to Jay	To note

Sheet 6: Survey for fruit supplied to the supermarket (via the Vendor)

To be completed at the supermarket by the SIAEP Team member who will make the observations themselves AS WELL AS seek feedback from supermarket manager where possible (*information relating to the consignment of fruit to the supermarket made on a weekly basis over a 4 week period – visit to supermarket each week to conduct assessment*)

Fruit supplied to the supermarket from the packing house (via the Vendor) Week 1, 2, 3 and 4 deliveries to the supermarket		
Details / Characteristic		Response
1	SIAEP Team member name:	
2	Date of survey data collection	
3	Packing house name and location (supplying mangoes)	
4	Supermarket name	
6	Supermarket location	
7	Date this information is recorded	
8	Date fruit delivered to the supermarket:	
9	Quantity fruit sold in this consignment (kg): (you may wish to include the number of boxes)	
10	Price the supermarket paid for the consignment of mangoes (per kg):	
11	What was the variety of mango supplied?	
12	Quantity (kg) of rejected fruit (by the supermarket) expressed either as a % of the consignment or no. kg rejected	.....% rejected
	On what basis was the fruit either rejected/downgraded? Please provide the reason	
Mango Quality assessment upon delivery FOR SUPPLIED FRUIT when first delivered to the supermarket >>> complete on day 1		
13	Visual quality: skin defects score VP = Very Poor >25% surface area P = Poor 10-25% surface area F = Fair 5-10% surface area G = Good 0-5% surface area E = Excellent No defects	Score:
14	Visual quality: skin colour score 1 = 100% green 2 = green > yellow 3 = green area same as yellow area 4 = yellow > green 5 = 100% yellow	Score:
15	Firmness quality score 1 = no give 2 = slight give strong thumb pressure 3 = flesh deforms 2-3mm moderate thumb pressure 4 = whole fruit deforms moderate hand pressure 5 = whole fruit deforms slight hand pressure	Score:
16	Mango smell score 1 = dislike a lot 2 = dislike a little 3 = neither like or dislike 4 = like a little 5 = like a lot	Score:
17	Weight Grading (<i>approximate scale</i>)	

18	Grade	Cat Hoa Loc	Cat Chu	Indicate the grade quality: Winmart quality parameters to be supplied by Hung	
	1	>500gm	400-500gm		
	2	400-500gm	300-400 gm		
	3	<400gm	<300gm		
19	QUALITY ASSESSMENT OF FRUIT ON THE SHELF BETWEEN AND 7 DAYS AFTER DELIVERY) FEEDBACK ON THE SUPPLIED FRUIT – ASSESSED BY TEAM MEMBER VISITING THE SUPERMARKET WITHIN ONE WEEK OF THE SUPPLY TO THE SUPERMARKET – FOR EXAMPLE DAY 4 Assessment of the consignment sale at the supermarket (to identify price variances according to quality) DAYS AFTER SUPPLY THE MANGOES WERE ASSESSED:..... days after delivery				
	Quality description (please use the descriptions that the supermarket use) the following are possible descriptions etc. you may need to ask supermarket manager for the following information on what fruit has been sold			ESTIMATED % of the consignment of fruit sold At this quality level	Retail price that the fruit sold for
	Excellent quality premium fruit				
	Average quality premium fruit				
	Poor quality fruit				
	Fruit made into fruit salad				
	Fruit thrown out				
	TOTAL			10%	
20	Shelf life of the mango What was the shelf life of the mangoes? Comments relating to shelf life Comments relating to disease incidence (if provided)			Shelf life.....days	
	Additional Comments				
21	Additional Comments				

Sheet 7: Pack house experiences relating to mango treatment

Question		Response
1	SIAEP Team member name:	
2	Date of survey data collection	
3	Packing House Name	
4	Packing House location	
5	What advantages do you consider you have gained from sending treated mango to the supermarket?	
6	What has been the price premium (if any) that you have received from selling the treated mangoes to the supermarket?	% increase in price received (premium)
7	Please list any specific comments that you may have received relating to the treated mangoes from the supermarket (both positive and negative)	
8	Did you experience any scalding damage to the fruit (from hot water treatment)?	
	Indicate the % fruit on average damaged	.....% fruit damaged
	How can the problem of scalding be reduced?	
9	What other problems (if any) have you experienced when conducting the hot water mango treatment?	
10	How do you think that these problems can be solved? Please explain.	
11	Do you plan to continue the hot water treatment for the mangoes that you will sell in the future?	I plan to continue hot water treatment YES/NO/UNSURE
12	Are there any other quality issues affecting mango that should be addressed/solved	
13	Were there any differences between treated and untreated fruit noted in terms of fruit damaged during transport? Please explain your answer	
14	Is there any further information you would like to know about the hot water treatment? Please list	
15	Would you recommend hot water treatment to other pack houses?	I would recommend sap burn treatment to other farmers YES/NO/UNSURE

Sheet 8: Supermarket experiences in selling treated fruit

Please complete the following information in relation to your experiences in selling the treated mango fruit in your supermarket. Questions to be asked to the Supermarket Manager and responses recorded

Question		Response	
1	SIAEP Team member name:		
2	Supermarket Name		
3	Supermarket location		
4	Supermarket representative's name		
5	Today's date		
6	What benefits have you experienced through selling the treated mango in your supermarket?		
7	What problems (if any) have you experienced in selling the treated mango?		
	Please explain how do you think that these problems can be solved?		
8	Did you experience any less wastage with the treated mango fruit in comparison to untreated fruit?	Less wastage experienced YES/NO/UNSURE	
	If so, what % reduction in wastage did you achieve?	% reduction in wastage	
	What do you think was the cause of the damaged fruit? Please explain in detail		
9	What did you do with the wasted fruit? For example used in fresh fruit salad		
10	Do you consider that the shelf life of the treated fruit has improved in comparison to untreated fruit?	Improved shelf life of treated fruit YES/NO/UNSURE	
	IF Yes (shelf life has been improved), what was the average number of days of shelf life for the mangoes? How many extra days of shelf life was gained (over normal mangoes)?	Number of days of shelf life for treated mangoes: Number of days increased in shelf life of treated fruit:	
11	Were there any differences in fruit quality between the different mango varieties?	YES/NO/UNSURE	
12	Did you receive any comments from customers who purchased the treated mangoes (either positive or negative)? If so can you provide examples of their comments	Comments received: YES/NO	
		Examples of comments from customers:	
13	Question	Small GIFT Box (6-mangoes)	
	Did you display the mangoes in your supermarket using the supplied cartons?	YES/NO	
	Please explain your answer - if you did not use the cartons for displaying the fruit		
14	Did the printed cartons (containing mangoes) helped to increase sales?	YES/NO/UNSURE	
	Please explain your answer		
15	Would you prefer to see the mangoes sold in the cartons in the future?	YES/NO/UNSURE	

	Please explain your answer		
16	Would you recommend your company sell the treated mangoes at other locations across Vietnam?	YES/NO/UNSURE	
	If YES, which other cities across Vietnam would you recommend? Why would you recommend the expansion in locations where the treated fruit should be sold?		
	If NO or UNSURE, please explain why?		
17	Was selling the treated mangoes in your supermarket a worthwhile exercise for your company?	YES/NO/UNSURE	
	If YES, indicate why selling the treated fruit was a worthwhile activity for your business	1. Less damaged fruit YES/NO/UNSURE	
		2. Longer shelf life YES/NO/UNSURE	
		3. Customers willing to pay a higher price YES/NO/UNSURE	
		4. Fruit looks more attractive to customers YES/NO/UNSURE	
		5. Selling the treated fruit was more profitable for our business YES/NO/UNSURE	
	6. Other reasons (please list them)		
18	Are there any other quality issues affecting mango that you consider needs to be solved, that would then convince you to sell more treated mango fruit? Please list them and explain why		
19	Were there any differences between treated and untreated fruit noted in terms of fruit damaged during transport?	YES/NO/UNSURE	

Sheet 9: Supermarket attitude assessment

To be completed after the 4-week marketing trial in week 5 by a Supermarket Manager or representative. For each statement below, tick one box that represents your level of agreement.

STATEMENT		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
A1	The quality of the treated mango fruit is much higher than untreated mango fruit.					
A2	In the future, I would prefer to sell the supplied treated mango fruit instead of other locally sourced mango fruit.					
A3	The treated mango fruit was able to maintain quality a lot longer than most other local mango fruit I sell.					
A4	The treated mango fruit had less wastage in comparison to untreated fruit.					
A5	It is likely that consumer demand for mangoes will increase if I am able to sell the treated mangoes in my supermarket into the future					
A6	Increasingly, consumers are demanding higher quality mango fruit					
A7	Consumers are willing to pay a higher price for high quality mango fruit					

Sheet 10: Vendor experiences in supplying the treated fruit

To be completed after the 4 week marketing trial in week 5

Please complete the following information in relation to your experiences in selling the treated mango fruit in your supermarket.

Question		Response
1	Vendor name:	
2	What benefits have you gained through supplying the treated mango to the supermarkets?	
3	What price premium if any (expressed as the % additional gain in wholesale price value) did the treated mangoes achieve compared with untreated mangoes?	% price premium
		Please provide any comments
4	Do you think that the treated mangoes were able to achieve a longer shelf life in the supermarket?	YES/NO/UNSURE
5	Do you think that the treated mangoes had fewer physical damage/marks than untreated fruit?	YES/NO/UNSURE
6	What problems (if any) have you experienced in supplying the treated mango?	
	Please explain how do you think that these problems can be solved	
7	Did you receive any comments from the supermarket in relation to the treated mangoes (either positive or negative)? If so can you provide examples of their comments	Comments received: YES/NO
		Examples of comments from the supermarkets:
8	Question (relating to packaging)	Small GIFT Box (6-mangoes)
	Did you think that supplying the mangoes in printed cartons was a worthwhile exercise?	
	Would you recommend using such cartons in the future for selling the mangoes at the supermarket?	
	Do you have any suggestions how packaging (carton size, design, printing) could be improved in the future?	
9	In the future, will you prefer to supply treated mangoes to supermarkets in preference to other sourced untreated fruit?	Recommend future sale of treated mangoes: YES/NO/UNSURE
10	Are there any other quality issues affecting mango from this trial supply that should be addressed/solved?	
11	Were there any differences between the supplied treated and untreated fruit observed in terms of fruit damaged during transport?	YES/NO/UNSURE

Appendix 2. Analysis of the costs associated with sap burn (trolley) treatment of mangoes

Cost to treat 240 tonnes of mango per year

Variables for calculation of sap burn treatment		Value VND	Value AUD
	De-sapping equipment depreciation	10 000 000	\$620.00
1	Purchase price of trolley	50 000 000	\$3 100.00
2	Annual cost (based on 5 year life-span)	10 000 000	\$620.00
3	Supply of tools, crates and other consumables	6 000 000	\$372.00
4	Sap burn chemical supply (for treatment)	33 000 000	\$ 2046.00
5	Labour cost (2 persons) for treating fruit	240 000 000	\$14 880.00
6	Total (items 2 to 5)	289 000 000	\$17 918.00
7	Total kg treated	240 000 kg	240 000 kg
8	Cost to treat 1 kg (item 6 divided into item 7)	1 204	0.07
Additional comments			
<ul style="list-style-type: none"> • Mango wastage is minimal (1% or less) as only quality fruit is harvested. • Additional price premium in the order of 15% • Quality of harvested mango much better, improved shelf life. • Limitations: unsure as to what the wastage rate is in terms of the discarded fruit in the orchard. 			

Note: Data sullied by research team

Appendix 3. Analysis of the costs associated with HWT of mangoes

Variables for calculation of hot water treatment		Value VND	Value AUD
1	Equipment purchase price VND	750 000 000	\$46 500.00
2	Depreciation allowance (6 year lifespan of equipment) VND	125 000 000	\$7 750.00
3	Repairs and maintenance (5% purchase price) VND	37 500 000	\$2 325.00
4	Fruit processed in 1 hour (kg)	1000kg/hr	1000kg/hr
5	Labour cost (2 persons per hour @ 40,000 VND (\$2.48 AUD) /hr)	80 000	\$4.96
6	Indicate % average level scald damage to fruit experienced	Less 1%	Less 1%
7	Total kg processed fruit per year	60 000kg	60 000kg
Cost to treat 1,000 kg of fruit			
1	Equipment depreciation	2 083 333	\$129.17
2	Equipment repairs and maintenance	625 000	\$38.75
3	Labour cost (VND/hour, for two labour units)	80 000	\$4.96
4	Total cost for treatment (1,000 kg treated fruit)	2 788 333	\$172.88
5	Cost to treat 1 kg of fruit	2 788	\$0.17
Additional comments			
<ul style="list-style-type: none"> • Technical information for treatment sourced from SIAEP & SOFRI • <1% of fruit is damaged by scald as a result of the hot water treatment • Temperature of the water is measured using a heat sensor (part of the equipment). 			

Appendix 4. Pre-trial market assessment of mangoes sold in WinMart supermarkets

Sheet 10A: Mango quality market assessment in supermarket

– pre-trial period Week 1 *To be completed two weeks prior to commencement of the 4 week marketing trial of treated fruit SIAEP to complete the following information when visiting supermarket.*

1	SIAEP Team member name:	Phuc-Nam				
2	Supermarket Name	Winmart				
3	Supermarket location	Vincom Center Landmark 81				
4	Today's date	18/10/2021				
5	Parameters for comparison between different mango lines for sale in supermarket	<i>Variety and scoring (select up to 5 different lines from the supermarket shelves that are for sale to the public)</i>				
6	Sample number	1	2	3	4	5
7	Variety	Dài Loan	Tu Quy	Catchu	Giong Uc	Cat Hoa Loc
8	Source of Variety (region of Vietnam or other country)	VN	VN	VN	VN	VN
9	% of this mango line making up total mangoes on sale in supermarket	10%	20%	20%	30%	20%
10	Retail price (dong/kg)	44 900 (\$2.78AUD)	38 900 (\$2.41AUD)	42 900 (\$2.66AUD)	56 900 (\$3.53AUD)	64 900 (\$4.02AUD)
11	Price discount Indicate evidence of mango being discounted (and by how much?)	39 900 (\$2.47AUD) (discount 11,13%)	34 900 (\$2.16AUD) (discount 10,28%)	39 900 (\$2.47AUD) (discount 7%)	47 900 (\$2.97AUD) (discount 15,8%)	54 900 (\$3.40AUD) (discount 15,4%)
12	Packaging Is the variety presented for sale in special cartons or packaging YES/NO (describe)	NO	NO	YES	YES	NO
13	Visual quality: skin defects score VP = Very Poor >25% surface area P = Poor 10-25% surface area F = Fair 5-10% surface area G = Good 0-5% surface area E = Excellent No defects	Score: E	Score:G	Score:G	Score:E	Score:G
14	Visual quality: skin colour score (relates to maturity) 1 = 100% green 2 = green > yellow 3 = green area same yellow area 4 = yellow > green 5 = 100% yellow	Score:1	Score:2	Score:2	Score:2	Score:1
15	Firmness quality score 1 = no give 2 = slight give strong thumb pressure	Score:1	Score:2	Score:2	Score:1	Score:1

	3 = flesh deforms 2-3mm moderate thumb pressure 4 = whole fruit deforms moderate hand pressure 5 = whole fruit deforms slight hand pressure					
16	Mango smell score 1 = dislike a lot 2 = dislike a little 3 = neither like or dislike 4 = like a little 5 = like a lot	Score: 4	Score:4	Score: 5	Score:4	Score:5

1	SIAEP Team member name:	Phuc-Nam				
2	Supermarket Name	Winmart				
3	Supermarket location	Vincom Plaza Thao Dien				
4	Today's date	26/10/2021				
5	Parameters for comparison between different mango lines for sale in supermarket	<i>Variety and scoring</i> (select up to 5 different lines from the supermarket shelves that are for sale to the public)				
6	Sample number	1	2	3	4	5
7	Variety	Đai Loan	Tu Quy	Catchu	Giong Uc	Keo
8	Source of Variety (region of Vietnam or other country)	VN	VN	VN	VN	VN
9	% of this mango line making up total mangoes on sale in supermarket	0%	0%	35%	35%	30%
10	Retail price (dong/kg)	44 900 (\$2.78 AUD)	38 900 (\$2.41 AUD)	42 900 (\$2.66 AUD)	56 900 (\$3.53 AUD)	27 900 (\$1.73 AUD)
11	Price discount Indicate evidence of mango being discounted (and by how much?)	39 900 (\$2.47AUD) (discount 11,13%)	34 900 (\$2.16 AUD) (discount 10,28%)	39 900 (\$2.47 AUD) (discount 7%)	47 900 (\$2.97 AUD) (discount 16%)	24 900 (\$1.54 AUD) (discount 10,75%)
12	Packaging Is the variety presented for sale in special cartons or packaging YES/NO (describe)	YES /NO	YES /NO	YES	YES	NO
13	Visual quality: skin defects score VP = Very Poor >25% surface area P = Poor 10-25% surface area F = Fair 5-10% surface area G = Good 0-5% surface area E = Excellent No defects	Score:	Score:	Score:G	Score:E	Score:G
14	Visual quality: skin colour score 1 = 100% green 2 = green > yellow 3 = green area same as yellow area 4 = yellow > green 5 = 100% yellow	Score:	Score:	Score:1	Score:2	Score:1
15	Firmness quality score 1 = no give 2 = slight give strong thumb pressure 3 = flesh deforms 2-3mm moderate thumb pressure 4 = whole fruit deforms moderate hand pressure 5 = whole fruit deforms slight hand pressure	Score:	Score:	Score:1	Score:1	Score:1
16	Mango smell score 1 = dislike a lot 2 = dislike a little 3 = neither like or dislike 4 = like a little 5 = like a lot	Score:	Score:	Score: 5	Score:4	Score:5

1	SIAEP Team member name:	Phuc-Nam				
2	Supermarket Name	Winmart				
3	Supermarket location	Vincom Đông Khoi				
4	Today's date	26/10/2021				
5	Parameters for comparison between different mango lines for sale in supermarket	<i>Variety and scoring</i> (select up to 5 different lines from the supermarket shelves that are for sale to the public)				
6	Sample number	1	2	3	4	5
7	Variety	Dai Loan	Tu Quy	Catchu	Giong Uc	Keo
8	Source of Variety (region of Vietnam or other country)	VN	VN	VN	VN	VN
9	% of this mango line making up total mangoes on sale in supermarket	10%	15%	20%	30%	25%
10	Retail price (dong/kg)	44 900 (\$2.78AUD)	38 900 (\$2.41AUD)	42 900 (\$2.66AUD)	54 900 (\$3.40AUD)	27 900 (\$1.73AUD)
11	Price discount Indicate evidence of mango being discounted (how much?)	39 900 (\$2.47AUD) (discount 11,13%)	34 900 (\$2.16AUD) (discount 10,28%)	39 900 (\$2.47AUD) (discount 7%)	47 900 (\$2.97AUD) (discount 12,75%)	24 900 (\$1.54AUD) (discount 10,75%)
12	Packaging Is the variety presented for sale in special cartons or packaging YES/NO (describe)	NO	NO	YES	YES	YES/NO
13	Visual quality: skin defects score VP = Very Poor >25% surface area P = Poor 10-25% surface area F = Fair 5-10% surface area G = Good 0-5% surface area E = Excellent No defects	Score: E	Score:G	Score:G	Score:E	Score:G
14	Visual quality: skin colour score 1 = 100% green 2 = green > yellow 3 = green area same as yellow area 4 = yellow > green 5 = 100% yellow	Score:1	Score:2	Score:1	Score:2	Score:1
15	Firmness quality score 1 = no give 2 = slight give strong thumb pressure 3 = flesh deforms 2-3mm moderate thumb pressure 4 = whole fruit deforms moderate hand pressure 5 = fruit deforms slight hand pressure	Score:1	Score:2	Score:1	Score:1	Score:1
16	Mango smell score 1 = dislike a lot 2 = dislike a little 3 = neither like or dislike 4 = like a little 5 = like a lot	Score: 4	Score:4	Score: 5	Score:4	Score:5

1	SIAEP Team member name:	Phuc-Nam				
2	Supermarket Name	Winmart				
3	Supermarket location	Vincom plaza Cong Hoa				
4	Today's date	26/10/2021				
5	Parameters for comparison between different mango lines for sale in supermarket	<i>Variety and scoring (select up to 5 different lines from the supermarket shelves that are for sale to the public)</i>				
6	Sample number	1	2	3	4	5
7	Variety	Dai Loan	Tu Quy	Catchu	Giong Uc	Keo
8	Source of Variety (region of Vietnam or other)	VN	VN	VN	VN	VN
9	% of this mango line making up total mangoes on sale in supermarket	10%	20%	30%	15%	25%
10	Retail price (dong/kg)	44 900 (\$2.78AUD)	38 900 (\$2.41AUD)	42 900 (\$2.66AUD)	56 900 (\$3.53AUS)	27 900 (\$1.73AUD)
11	Price discount Indicate evidence of mango being discounted (and by how much?)	39 900 (\$2.47AUD) (discount 11,13%)	34 900 (\$2.16AUD) (discount 10,28%)	39 900 (\$2.47AUD) (discount 7%)	47 900 (\$2.97AUD) (discount 16%)	24 900 (\$1.54AUD) (discount 10,75%)
12	Packaging Is the variety presented for sale in special cartons or packaging YES/NO (describe)	NO	NO	YES	YES	NO
13	Visual quality: skin defects score VP = Very Poor >25% surface area P = Poor 10-25% surface area F = Fair 5-10% surface area G = Good 0-5% surface area E = Excellent No defects	Score: E	Score:G	Score:G	Score:E	Score:G
14	Visual quality: skin colour score 1 = 100% green 2 = green > yellow 3 = green area same as yellow area 4 = yellow > green 5 = 100% yellow	Score:1	Score:2	Score:1	Score:2	Score:1
15	Firmness quality score 1 = no give 2 = slight give strong thumb pressure 3 = flesh deforms 2-3mm moderate thumb pressure 4 = whole fruit deforms moderate hand pressure 5 = fruit deform slight hand pressure	Score:1	Score:1	Score:1	Score:1	Score:1
16	Mango smell score 1 = dislike a lot 2 = dislike a little 3 = neither like or dislike 4 = like a little 5 = like a lot	Score: 4	Score:4	Score: 5	Score:4	Score:5

Appendix 5. Summary of the main characteristics (quality, price) supplied fruit for the trial

Characteristic		Week Number				Average value
		Week 1	Week 2	Week 3	Week 4	
A.	Farmer to pack house					
1	Farmer name	Pham Van Minh Vuong	Pham Thi Cuc Duyen	Nguyen Duc Thien/ Nguyen Huu Minh	Pham Van Toan/Vo Tran Minh Trong	
2	Village location	Dong Thap	Dong Thap	Dong Thap	Dong Thap	
3	Variety supplied	Cat Hoa Loc	Cat Hoa Loc	Cat Hoa Loc	Cat Hoa Loc	
4	Date fruit left the farm:	16/11/2021	23/11/2021	30/11/2021	07/12/2021	
5	Quantity selected for sale out of total harvested (kg)	120 kg/547kg	160kg/557 kg	180kg/500kg	220kg/500kg	170kg fruit 526 kg/fruit
	% of harvested crop that was graded to be sold	21.9%	28.7%	36.0%	44.0%	32.3%
6	Price received (VND per kg) By the farmer	70 000 (\$3.40 AUD)	90 000 (\$5.58 AUD)	90 000 (\$5.58 AUD)	95 000 (\$5.89 AUD)	86 250 (\$5.35 AUD)
B.	Pack house to Supermarket					
	Characteristics	Week 1	Week 2	Week 3	Week 4	Average
	Pack house	Kim Nhung Packhouse	Kim Nhung Packhouse	Kim Nhung Packhouse	Kim Nhung Packhouse	
	Date of supply of fruit	16/11/2021	24/11/2021	1/12/2021	8/12/2021	
	Quantity of fruit supplied	120 kg (16 boxes 9 fruits & 16 boxes 6 fruits)	160 kg (10 boxes 9 fruits & 10 boxes 6 fruits)	180 kg (24 boxes 9 fruits & 24 boxes 6 fruits)	220 kg (25 boxes 9 fruits and 26 boxes 6 fruit)	260 kg delivered
	Price supermarket paid for the mangoes (VND/kg)	90 000 (\$5.58 AUD)	90 000 (\$5.58 AUD) Vendor made no margin, willing to forgo to see the trial proceed	90 000 (\$5.58 AUD)	90 000 (\$5.58 AUD)	90 000 (\$5.58 AUD)
	Number of supermarket outlets provided	4	6	6	6	
	% rejection on delivery	0	0	0	0	0
	Kg of fruit returned to Vendor after 1 week	3	28 (approx.)	33	17.5	20.4
	% return rate	2.5	17.5	18.3	8.0	11.6%
	Visual quality: skin defects score VP = Very Poor >25% surface area P = Poor 10-25% surface area F = Fair 5-10% surface area	Excellent	Good	Good	Excellent	

	G = Good 0-5% surface area E = Excellent No defects					
	Visual quality: skin colour score 1 = 100% green 2 = green > yellow 3 = green area same as yellow area 4 = yellow > green 5 = 100% yellow	Score: 1	Score: 2	Score: 1	Score: 1	
	Firmness quality score 1 = no give 2 = slight give strong thumb pressure 3 = flesh deforms 2-3mm moderate thumb pressure 4 = whole fruit deforms moderate hand pressure 5 = whole fruit deforms slight hand pressure	Score: 1	Score: 2	Score: 2	Score: 1	
	Mango smell score 1 = dislike a lot 2 = dislike a little 3 = neither like or dislike 4 = like a little 5 = like a lot	Score: 5	Score: 5	Score: 5	Score: 5	
	Weight Grading (approximate scale)	>=500gm	>=500gm	>=500gm	>=500gm	
Mango Fruit assessment 4 days after delivery to supermarket						
	Fruit quality	>80% premium <20% poor quality	70% premium 10% average 20% poor quality	60% premium 20% average 20% poor quality	80% premium 20% poor quality	
	Shelf life comments	3-7 days	2-4 days	5-7 days	5-7 days	5 days
	Retail price of the fruit VND/kg	125 000 (\$7.75 AUD)	125 000 (\$7.75 AUD)	125 000 (\$7.75 AUD)	125 000 (\$7.75 AUD)	125 000 (\$7.75 AUD)
7	Additional comments (farmer perspective)	Cat Hoa Loc mango grade 1 accounts for 40% of the total number of mangoes harvested 10-15% of mangoes harvested are 500gm and above 60-65% mangoes are from 350-650gram (or 20% of skin surface have dark spots 20-25% mangoes are affected by disease, pest and small On-farm price of untreated mango price in the order of 70-78,000 VND, (\$4.34-\$4.84 AUD) average value 74,000 VND ((\$4.59 AUD)				

Appendix 6. Attitudinal responses to mango treatments

FARMER RESPONSES (n=4)

STATEMENT		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
A1	The sap burn treatment prevents the mango fruit from deteriorating (or being downgraded)				1	3
A2	I think that in the future the sap burn treatment may result in receiving higher prices for my mangoes				4	
A3	It doesn't matter how much I try to improve the quality of the mangoes I sell, I never receive higher prices		4			
A4	I plan to continue to undertake sap burn treatment of future mangoes that I produce			3		
A5	Treating the mangoes for sap burn is an easy activity to undertake on my farm				4	
A6	I received clear instructions and training on how to undertake sap burn treatment				4	
A7	I consider that I have a bright future as a mango farmer			2	2	
A8	If I had more money, I would like to expand the area of mangoes I farm			1	3	
A9	I would like my children one day to be farmers		2	2		

SUPERMARKET

STATEMENT		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
A1	The quality of the treated mango fruit is much higher than untreated mango fruit.				4	
A2	In the future, I would prefer to sell the supplied treated mango fruit instead of other locally sourced mango fruit.			3	1	
A3	The treated mango fruit was able to maintain quality a lot longer than most other local mango fruit I sell.		1	2	1	
A4	The treated mango fruit had less wastage in comparison to untreated fruit.		1	2	1	
A5	It is likely that consumer demand for mangoes will increase if I am able to sell the treated mangoes in my supermarket into the future			4		
A6	Increasingly, consumers are demanding higher quality mango fruit				4	
A7	Consumers are willing to pay a higher price for high quality mango fruit				3	1

Appendix 7. Experiences and feedback from the value chain stakeholders

(relating to their experiences from the trial treatment and marketing of the mangoes)

Farmer
<ul style="list-style-type: none"> • Recognise the opportunity to market mangoes of high quality particularly when treated. • Difficulty in ability to supply sufficient amounts of fruit (off season) is a major barrier. • Appreciative of the support of the SIAEP team in assisting in the selection and grading of mangoes so that they satisfy the premium market requirements. • Interested in exploring further opportunities to supply fruit and receive a price premium (which they rarely achieve). • Are aware of damage that may occur during the harvesting process, and so try and address this issue through improved harvest practices. • Many are aware of how best to improve fruit quality, recognising that the harvesting process should avoid breaking the stem, the fruit should be covered when the fruit is young to avoid harmful insects, use fruit bags to reduce insect damage and that the fruit should be handled carefully to avoid damage at harvest
Packhouse
<ul style="list-style-type: none"> • Price premium for selling the higher quality treated mangoes: 10 to 20% • Feedback on the quality of the mangoes (from Supermarket): Mangoes ripen faster, but mangoes are more beautiful and less damaged by sap burn • No scalding from hot water treatment was observed. • There is the intention to continue the hot water treatment. • Prior to this trial, hot water treatment was only practiced for the export trade, with such treatment for the domestic market occurring on an infrequent basis. • Treated mangoes are usually transported via refrigerated truck, whilst untreated mangoes are transported by unrefrigerated truck transport. • The pack house would recommend hot water treatment for mangoes sold domestically, since it is possible to increase the value of the mangoes sold. • The “6-pack” mango boxes were considered to be a positive development, making an ideal gift for consumers to purchase.
Vendor (wholesaler)
<ul style="list-style-type: none"> • Sap burn and hot water treated mangoes had a better appearance, appearing cleaner with minimal fungal diseases on the skin. • Treated mangoes had a longer shelf life than untreated mangoes, however the ripeness of the mango influenced the overall shelf life of the fruit. • The packaging of the mangoes (using the “6-pack” cartons) were considered to increase the product’s value when displayed on the supermarket shelves. • The demand for mangoes (and purchasing power of the consumer) tends to increase on weekends, full moon days and the last days of the month. • Damaged fruit is largely caused by over-ripening of the fruit. As the fruit ripens beyond the optimum stage, black spots appear on the fruit’s skin, spread out and infect the tissue causing it to rot. • Of the 4 batches of fruit provided, batch #2 (supplied on November 24) were found to ripen very quickly. Some of the fruit when more closely examined were found to rot from the inside, fruit flesh was soft and the fruit changing colour, affecting 15-20% of fruit. • Overall the vendor received positive feedback from the supermarket in relation to the quality of the supplied fruit (largely due to less fungal disease and subsequent deterioration in the fruit appearance). • The treated mangoes resulted in a price premium of 20-30% over untreated fruit. • It is important that the mango fruit is handled carefully during the harvest, treatment, packaging and transportation stages prior to the mangoes being placed on the supermarket shelves. Large variations in temperatures, bruising during transportation and storage and fruit being harvested when over ripened are all factors that need to be better managed and minimised where possible. It was also suggested that stiffer cartons should be used to lessen the impact of bruising when the mangoes are transported over large distances. • The vendor has a preference to only supply treated fruit to the supermarkets in the future, since the benefits and price premium has been demonstrated through this trial activity.

- The vendor also suggested that there is the opportunity to provide farmers with support to further develop improved agricultural farming practises associated with the minimisation of pests and diseases in mango production.

Supermarket

- The treated mango fruit was considered to be more appealing visually than other supplied fruit.
- Where sap burn treatment had taken place, the level of damage was less during the period that the fruit was being sold.
- Overall, less wastage of fruit was experienced, though it is difficult to quantify
- Up to 20% of mango fruit supplied in any one week was described as being “wasted fruit”, and was returned to the vendor because of the poorer quality.
- Despite the mangoes being treated (and the presumption that shelf life is increased), there is the issue that the mangoes will ripen and so appear to be spoilt. (The research team did indicate that some of the supplied mangoes tended to be harvested when too ripe), so this issue may be explained by the inability to source fruit that was in the early stages of ripening.
- Currently one of the supermarkets were selling many different varieties of mangoes such as Cat Chu mango, Tuong Da Xanh mango, and Tu Quy mango. Each type of mango has different properties, so the shelf life is also different. Cat Hoa Loc mangoes usually ripen quickly, so the shelf life may be shorter than other mango varieties, if the of this mango variety is slow, the mango will easily appear spoiled during the shelf life.
- Some supermarkets were concerned about the high price of the treated mangoes
- During the initial phases of the trial the Winmart supermarket concerns about the safety issues, originally 60 kg, but will now be only 30 kg supplied for each store (X 4 stores), this may be increased from the second week onwards

The SIAEP Project team

- High level of difficulty in being able to source the mangoes in sufficient quantities for each week for the trial. The vendor and supermarket required mangoes of 500 gm in size or greater, and this was a difficult task to track down such large mangoes in the off-season (ideally this should be reviewed down to 450 gm); this would be a good compromise situation particularly in the off season when there is less supply of suitable mangoes.
- Farmers have not invested in latex treatment machines, and so the project team had to take the equipment to the field that required a lot of time and effort.
- After the mangoes are harvested, if not handled immediately, the stem should be left intact. If the mango has been treated, it should be transported immediately to a hot water treatment facility.
- Mangoes after hot water treatment should be transported by cold supply chain until reaching supermarket shelves. This helps the mango retain its original quality and avoid spoilage during shelf life.
- Overall, the treated mangoes were considered to have achieved a higher shelf life with less disease incidence compared with untreated mangoes.
- The 6-pack box is attractive to the consumers as a gift to purchase for family and friends, whilst the packaging reduces fruit damage during transportation. Opportunities to reduce the cost of such packaging needs to be explored as the packaging is relative expensive.
- The original intentions were to source mangoes from farmers who were involved in earlier sap burn treatments, however none of these farmers had any available supplies. Other farmers were then contacted to supply the mangoes.
- The supermarkets exhibited a high level of market influence, in terms of the strict quality requirements (they want high quality, but only willing to pay a low price). Negotiations resulted in the supermarket paying a maximum price of 95,000 VND per kg, with the retail value in the range of 115-120,000 VND.
- The issue of concern amongst project team members is that through the trial the team want to maximise the retail value of the mango, whilst being able to identify what the consumer will pay for the mangoes, it needs to be a premium price.
- Team members personally delivered the treated mangoes to the four different stores on a weekly basis, usually on the same day that the mangoes were picked, treated and packaged.
- The team visited the supermarkets to inspect the mangoes usually on day 4 that the mangoes were “on the shelf”. It was noted that there was variance between how the stores received the mangoes, one store for example weighed each mango individually and rejected any less than 500 grams in weight. Other stores for example were not so concerned about the weight of the provided fruit.
- It is evident that there is a strong demand for on-site treatment of mangoes, so the upscaling of this practice will help increase the value of local mangoes to farmers as well as provide consumers with greater access to premium quality mangoes.
- Despite the hot water treatment of mangoes taking place, the practice was not completely satisfactory, in terms of the fruit still being affected by fungal diseases with notable physical damage after being displayed on supermarket shelves after a few days. Therefore, further research is required in the hot water treatment.