

---

## Working Paper Series

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

Study: Management of sap burn study and monitoring quality along  
the chain

Date: June 2021

Prepared by: San Tram Anh, SIAEP      Peter Johnson, Griffith University  
Le Minh Hung, SIAEP  
Lam Dong Pho, SIAEP  
Nguyen Hoai Nam, SIAEP  
Nguyen Vinh Phuc, SIAEP

---

# Context

---

## Introduction

Mangoes produced in the MRD of Southern of Vietnam are predominantly marketed within the major domestic cities of Vietnam and into China via the informal cross-border trade.

Traditionally minor attention has been paid to the maintaining the fruit skin quality within the existing chains. As the modern retail markets develop and expand their share of fruit sales within Vietnam and China, requirements for low blemished fruit become greater.

The study conducted by SOFRI (Activity 1.6) identified that sap burn is the leading cause of skin defects on fruit supplied through traditional chains to Hanoi and HCMC. With more than 10% of the fruit damaged at farm level increasing to in excess of 50% at the packhouse. The study concluded that the current practices, particularly, harvest & transport are exacerbating this issue. Previous experience from Australia has shown that the further the destemming process occurs from the point of harvest, the greater this issue will be.

Sap management systems have already been tested in packhouses in Vietnam but never before in the field. Significant improvements in quality can be made if this system can be relocated to the farm level. This activity specifically aims at testing the effect, practicality and acceptance of on-farm desapping.

Under the ACIAR Project *“Improving smallholder farmer incomes through the strategic market development of mango supply chains in southern Vietnam”* (AGB/2012/061), Griffith University and Sub-institute of Agricultural Engineering and Postharvest Technology (SIAEP) conducted a study of sap burn management and monitoring mango fruit quality along the chain in Tien Giang and Dong Thap provinces.

---

## Activities

### 1. Improving sap burn management with mechanisation - Trolley Study

#### Focus

- ▶ To identify & demonstrate opportunities to improve productivity & quality in fresh mango supply chains

#### Research questions

- ▶ What on-farm, post-harvest and marketing innovations are likely to generate the most significant impacts to reduce losses, increase productivity and quality outputs that will improve returns directly related to smallholder incomes?

What innovations have the most cost-effective and positive impacts on productivity, losses, quality and harvest timing, leading to improved price and farmer income?

#### Background

- The process of sap burn management when applied in the field can be cumbersome
- A number of requirements are necessary to undertake the task
  - Assess to sources of “uncontaminated” Water
  - System for drying fruit racks or well-ventilated crates
  - Tubs to hold water and Desapping solution.
  - Working benches or stands
  - Which may need to be relocated around the orchard.
- The proposal was to develop an integrated approach can combine many of these requirements into one piece of equipment, that would suit local farm conditions.

### 2. Trial on farm sabburn management and monitor its quality impact along the chain

#### Focus

- ▶ To identify & demonstrate opportunities to improve productivity & quality in fresh mango supply chains

#### Research questions

- ▶ What on-farm, post-harvest and marketing innovations are likely to generate the most significant impacts to reduce losses, increase productivity and quality outputs that will improve returns directly related to smallholder incomes?
- ▶ What innovations have the most cost-effective and positive impacts on productivity, losses, quality and harvest timing, leading to improved price and farmer income?

#### Methodology

Mango fruits were harvested from four farm sites in Tien Giang and Dong Thap provinces.

**Treatment 1:** Control (no de-stemming and de-sapping) Following current on farm practice.

**Treatment 2:** Water in tank was pretreated with chlorine to sanitize before adding in the Desapping solution 2.5 g/l, fruit was destemmed and then placed int solution for 2-3 minutes, then removed from solution. Fruit was then air dried and packed.

Assessments were conducted at 4 critical control points in the chain **1:** Farm, **2:** packhouse **3:** Wholesaler **4:** Retailer. Impact on quality loss was measured at each point.

Additional fruit was taken to the laboratory in HCM City for controlled assessment this was ripened at.

### **Sapburn damage assessment**

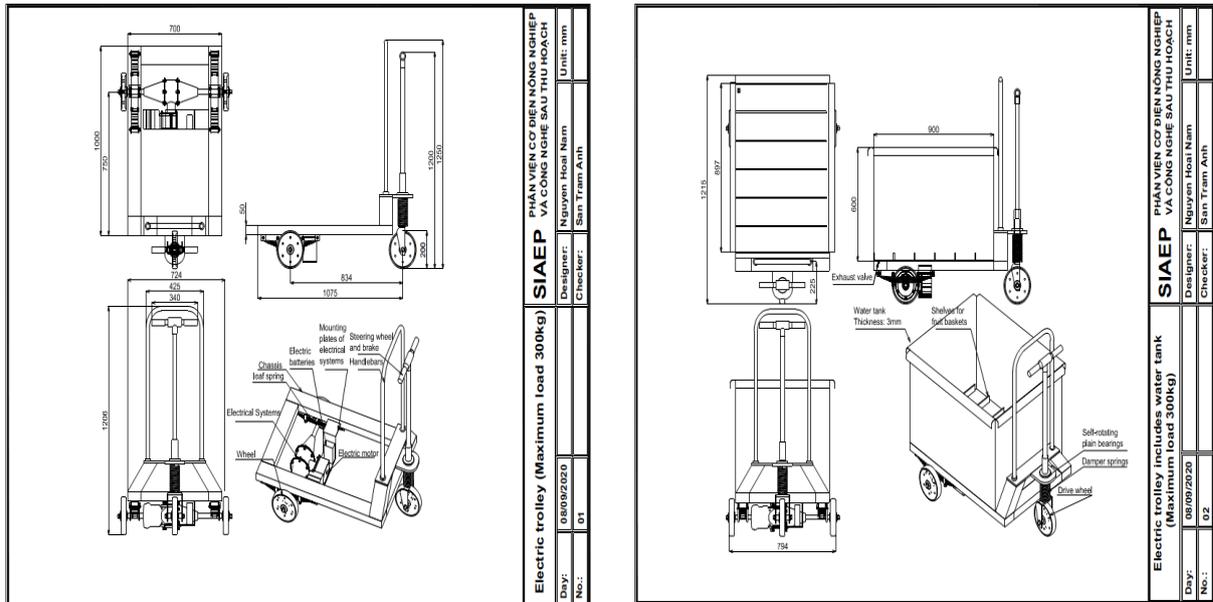
The severity of sap burn damage and other defects on each fruit were rated according to the following scale (Hofman et al., 2010a): 0 = nil; 1 = < 3% (1 cm<sup>2</sup>) of skin surface affected; 2 = ~ 3% (1 – 3 cm<sup>2</sup>); 3 = ~ 10% (3 – 12 cm<sup>2</sup>); 4 = 10% – 25% (12 - 25 cm<sup>2</sup>); and 5 = > 25% of skin surface affected.

# Results and discussion

## Results

### 1. Trolley manufacturing with the new design

Technical drawings of the electric bin trolley.



Picture 1. The design of electric bin trolley

The trolley was manufactured at SIAEP and field tested. It was then used for undertaking the desapping process within the trial.



Picture 2. The trolley with new design was operated at the farm for the trial

### ***Achievement:***

- Manufactured prototype electric trolley bin for infield de-sapping.
- Trolley utilised for full scale sap burn trial testing with evaluation for efficiency and fit for purpose
- Demonstrated its ability to resolved the issues of onsite potable water availability, ability to move operations around the orchard efficiently, and proved to be an time efficient process.

### ***Capacity Building:***

- Scientific – engineering based solution with manufacturing & infield testing
- Capacity – project team evaluation & training related to
- Opportunity analysis
- Concept design
- Collaborative approach to work through & deliver a solutions based outcome
- Economic – financially viable solution
- Environmental – field based solutions to manage per individual farm/commune

### ***Pathway to completion***

#### **July '21 – March '22**

- Test & refine trolley development until end of '21
- Collect data to demonstrate economic and efficiency comparisons with non trolley and traditional systems.
- Integration into demonstration chain activity (A2.3)
- Development of Factsheet.
- Presentation of findings and Working Paper at the annual workshop in Nov '21.

#### **Future Opportunities**

- Integrate the Sap burn Practice (SP) Guide and the use of trolley in southern Vietnam mango farms.
- Share and translate the use of the SP Guide with trolley within partner countries to produce clean/ premium fruits

## **2. Sapburn management trial and monitoring quality at the second farm**

The fruit was harvested at the farm in Cai Be, Tien Giang province. The fruit were purchased and delivered to packhouse nearby and then transported to retail store in Ho Chi Minh City.

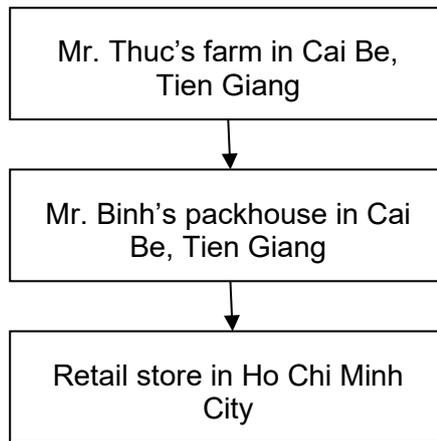


Diagram 1. Monitor quality at farm site 2, packhouse and wholesaler/retailer points in the chain

**Sapburn management trial**



Testing trolley into sap burn trials



Control and desapped fruit at retailer in Ho Chi Minh City



Control and desapped fruit at retailer in Cai Be, Tien Giang



Selling desapped fruit at retail store

Picture 3. Photo of sap management trial

The results show that the sapburn injury was stable through the chain from farm to retail store. The desapping treatment showed that the desapping fruit had less sapburn damage as compared to control fruit at farm stage, packhouse stage and retail store.

Table 1. Sapburn injury of control and desapping fruit from the third farm, packhouse and retail store

Sapburn damage rating	Farm (n=30)	Packhouse (n=30)	Retail store (n=30)
Control	0.87	0.83	0.57
Desapping	0.13	0.07	0.03

**3. Sapburn management trial and monitoring quality at the third farm**

The fruits were harvested at the farm in Cai Be, Tien Giang province. The fruits were purchased and delivered to packhouse nearby and then transported to retail store in Cai Be, Tien Giang.

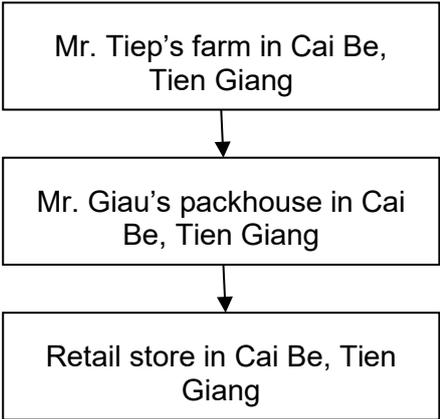


Diagram 2. Monitor quality at farm site 3, packhouse and wholesaler/retailer points in the chain

The fruits were cover individually with paper by packhouse as their normal practice to prevent the damage and then quickly delivered to retail store in the same district with the short distance. Therefore, the results showed that the desapping fruit had similar sapburn damage as compared to control fruit at the farm stage, packhouse stage and retail store because of short delivery distance and good packaging.

Table 2. Sapburn injury of control and desapping fruit from the third farm, packhouse and retail store

Sapburn damage rating	Farm (n=30)	Packhouse (n=30)	Retail store (n=30)
Control	0.33	0.63	0.30
Dessapping	0.70	0.73	0.33

**4. Sapburn management trial and monitoring quality at the fourth farm**

The fruits were harvested at the farm in Cao Lanh, Dong Thap province. The fruits were purchased and delivered to packhouse nearby and then transported to wholesaler market in Ho Chi Minh City.



Diagram 3. Monitor quality at farm site 3, packhouse and wholesaler/retailer points in the chain

The fruits were covered individually with paper by packhouse workers at the farm as their normal practice to prevent the damage and then quickly delivered to the packhouse in the same district with a short distance. Therefore, the results showed that the desapping fruit had similar sapburn damage as compared to control fruit at the farm stage and packhouse stage. However, the sapburn damage was more severe in the control fruit at the wholesale market stage as compared to desapped fruit. It recommends that the long travel distance could cause more sapburn damage to the control fruit without sap management practice. It is suggested that the sapburn management practice should be implemented at the farm or packhouse to prevent damage to the fruit during transport.

Table 3. Sapburn injury of control and desapping fruit from the third farm, packhouse and retail store

Sapburn damage rating	Farm (n=30)	Packhouse (n=30)	Wholesaler market (n=30)
Control	1.33	1.39	2.20
Dessapping	1.20	1.23	1.38

---

## Insights

- Postharvest disease management. It is recommended that further trials should be conducted to eliminate the postharvest diseases on fruit consignment.
- That work is directed towards the preparation of a recommended guide of sapburn management practice.

---

## Achievements

- Impact of treatment monitored throughout the chain
- Reductions in sap damage can achieve levels as high as
  - ✓ 90% at packhouse level
  - ✓ 94% at retail level
- Practicality of sap management at farm level confirmed
- The videos of desapping protocol at the farm are illustrated

---

## Capacity Building

- Skills in research design
- Training for SIAEP & SOFRI research team to conduct the trial (6 person)
- Stakeholder hands-on training with farmers in sap burn management techniques (4 farmers and 8 harvesters )
- Preparedness for researchers to undertake de-sapping and quality management activities for the demonstration chain.

---

## Lessons learnt

### What worked well:

- At wholesale & retail levels - results confirmed & validated use of treatments
- This system can be incorporated into current farm practices.

### What could be changed or improved next time:

- Variations in results indicated, movements away from system principles occurred
- Further structured training of researchers to undertake system evaluation would develop capacity in the research team to deliver validated results.

---

## Pathway to completion

### July '21 – March '22

Collect data for efficiency and economic evaluation

Test, refine & document Sap burn Practice (SP)

Guide for farmers (Fact Sheet)

Present finding and Fact Sheet at the annual workshop in Nov '21.

### Future Opportunities

To advance the integration of the SP Guide & principles through commercial entities in southern Vietnam who are seeking to trade with modern retailers in Vietnam & export destinations.

To identify opportunities to integrate & implement the SP Guide & principles for mango trade in partner countries to produce clean/ premium fruits.

# Appendices

## 1. Sapburn management trial

Sapburn management trial and monitoring quality at the second farm

1 day after storage at 20°C

Treatment	Box 1	Box 2	Box 3
Farm stage – control			
Farm stage – Desapping			
Packhouse – Control			
Packhouse – Desapping			

Retailer-  
Control



Retailer-  
Desapping



4 days after storage at 20°C

Treatment

Box 1

Box 2

Box 3

Farm stage-  
Control



Farm stage-  
Desapping



Packhouse -  
Control



Packhouse –  
Desapping



Retailer –  
Control



Retailer –  
Desapping



**8 days after storage at 20°C**

Treatment

Box 1

Box 2

Box 3

Farm stage –  
Control



Farm stage –  
Desapping



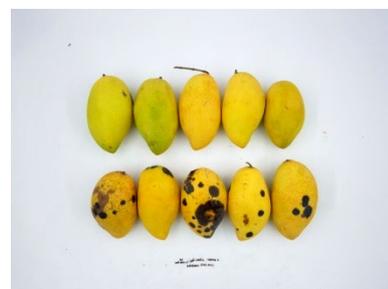
Packhouse –  
Control



Packhouse –  
Desapping



Retailer –  
Control



Retailer –  
Desapping



### Sapburn management trial and monitoring quality at the third farm

1 day after storage at 20°C

Treatment

Box 1

Box 2

Box 3

Farm stage –  
Control



Farm stage–  
Desapping



Packhouse –  
Control



Packhouse –  
Desapping



Retailer–  
Control



Retailer–  
Desapping



6 days after storage at 20°C

Treatment

Box 1

Box 2

Box 3

Farm stage-  
Control



Farm stage-  
Desapping



Packhouse -  
Control



Packhouse -  
Desapping



Retailer-  
Control



Retailer-  
Desapping



**8 days after storage at 20°C**

Treatment

Box 1

Box 2

Box 3

Farm stage-  
Control



Farm stage-  
Desapping



Packhouse -  
Control



Packhouse -  
Desapping



Retailer-  
Control



Retailer-  
Desapping



**Sapburn management trial and monitoring quality at the fourth farm**

**1 day after storage at 20°C**

Treatment

Box 1

Box 2

Box 3

Farm stage-  
Treatment 1



Farm stage-  
Treatment 2



Farm stage-  
Treatment 3



Packhouse –  
Treatment 1



Packhouse –  
Treatment 2



Retailer–  
Treatment 1



Retailer–  
Treatment 2



**5 days after storage at 20°C**

Treatment

Box 1

Box 2

Box 3

Farm stage–  
Treatment 1



Farm stage—  
Treatment 2



Farm stage—  
Treatment 3



Packhouse —  
Treatment 1



Packhouse —  
Treatment 2



Retailer—  
Treatment 1



Retailer-  
Treatment 2



7 days after storage at 20°C

Treatment

Box 1

Box 2

Box 3

Farm stage—  
Treatment 1



Farm stage—  
Treatment 2



Farm stage—  
Treatment 3



Packhouse —  
Treatment 1



Packhouse —  
Treatment 2



Retailer-  
Treatment 1



Retailer-  
Treatment 2



## **Griffith Agribusiness**

Griffith Asia Institute  
Griffith University South Bank campus  
Brisbane Queensland 4101

Email: [agribusiness@griffith.edu.au](mailto:agribusiness@griffith.edu.au)

[griffith.edu.au/asia-institute/our-research/agribusiness](http://griffith.edu.au/asia-institute/our-research/agribusiness)