J. Hortl. Sci.
Vol. 10(1):70-73, 2015

Economic analysis of post-harvest loss and marketing efficiency in guava (cv. *Allahabad safeda*) in Karnataka

T.M. Gajanana, D. Sreenivasa Murthy, A.K. Saxena[1], D.V. Sudhakar Rao[2], M. Sudha and V. Dakshinamoorthy

Section of Economics and Statistics
ICAR-Indian Institute of Horticultural Research,
Hesaraghatta Lake Post, Bengaluru – 560 089, India
E-mail: tmgajanana@yahoo.com

ABSTRACT

Post-harvest losses (PHL) in guava (cv. *Allahabad safeda*) were estimated at the field and retail levels in Karnataka, and impact of this loss on marketing efficiency was studied. Results indicated that the total PHL was 13.29% consisting of field-level loss (9.17%) and retail level loss (4.12%). The producer's share was 51.52% and PHL, when included as an item of cost, reduced the share to 45.80%. PHL also reduced marketing efficiency index from 1.06 to 0.88, thereby indicating the importance of PHL and scope for minimizing it to improve the efficiency of the marketing system in guava.

Key words: Guava, post-harvest losses, Allahabad safeda, economic analysis, marketing efficiency

INTRODUCTION

Guava (*Psidium guajava* L.) is an important nutritious fruit marketed in India and accounts for about 4% each of area and production among fruit crops grown in India. Like other fruits ((Srinivas *et al*, 1997; Jagtap and Katrodia, 1998; Wanjari *et al*, 2002; Gajanana *et al.*, 2011), guava is also subject to losses at various stages of handling after harvest. Information on economic aspects of marketing, associated costs and returns, and losses that occur at different stages of handling in guava in India is not available at present. Therefore, a study was undertaken to examine marketing arrangements and assess post-harvest losses in guava at different stages of handling in Karnataka, one of the major guava producing states of India.

MATERIAL AND METHODS

Karnataka is one of the major guava-producing states in the country producing 135,100 tonnes (5.4%) from an area of 7100 ha (3.23%). *Allahabad safeda* is the most popular variety of guava grown in Karnataka. Bengaluru (Rural & Urban) district produces the largest quantity of guava in the state, accounting for 19.7% area and 18.7% production in Karnataka (2011-12). Therefore, Bengaluru district was selected for the study at the first stage of sampling. At the second stage, three taluks, namely, Doddaballapur, Devanahalli and Bengaluru North, were selected and field-level loss was assessed from harvest at 39 sample-farmers' fields located in the three taluks. Retail-level loss was estimated from 31 retailers spread over the city of Bengaluru sourcing their material from K.R. market.

Estimating marketing efficiency: Efficiency of a marketing system is normally analyzed using the standard formula of Acharya and Agarwal (2001) which was later modified by Sreenivasa Murthy *et al* (2004) by including PHL as an item under the cost. The modified formula used in our study is given below:

$$ME = \frac{NP_F}{MC + MM + PHL}$$

where,

ME = Marketing efficiency index

NP_F = Farmer's net price

$NP_F = GP_F - \{C_F + (L_F \times GP_F)\}$ or

$NP_F = \{GP_F\} - \{C_F\} - \{L_F \times GP_F\}$

where,

NP_F represents the net price received by the farmer (Rs./kg)

GP_F represents the gross price received by the farmer (Rs./kg)

[1]Division of Plant Pathology, [2]Division of Post Harvest Technology, ICAR-Indian Institute of Horticultural Research, Hesaraghatta Lake Post, Bengaluru – 560 089, Karnataka, India

C_F represents the cost incurred by the farmer in the course of marketing (Rs./kg)

L_F represents the physical loss of produce at field-level (kg)

MC = Marketing-cost to the intermediaries

$MC = C_F + C_R$

where,

C_F represents the cost to the farmer in marketing (Rs./kg)

C_R represents the cost to the retailer in marketing (Rs./kg)

MM = Marketing margin of the intermediary

$MM = MM_R$

where,

MM_R represents the marketing margin of the retailer

PHL = Post-harvest loss in the course of marketing

$PHL = \{L_F \times GP_F\} + \{L_R \times GP_R\}$

where,

L_F and GP_F are the same as indicated above

L_R represents the physical loss during retailing (kg)

GP_R represents the gross retail price (Rs./kg)

RESULTS AND DISCUSSION

Marketing practices in guava

Guava fields under harvest in Bengaluru district were visited. Marketing practices followed and losses incurred at the field-level were studied. The main marketing channels followed by the guava growers in Bengaluru district were: Self marketing in the auction at K.R. Market, Bengaluru, and Field sale of guava to contractors besides leasing out the orchard to the pre-harvest contractor (PHC).

- *Producer – Commission agent – Retailer – Consumer (Self marketing)*
- *Producer – Contractor – Commission agent – Retailer – Consumer (Field sale)*
- *Producer – PHC – CA – Retailer – Consumer (PHC)*

After harvest, ripe and green (mature) fruits were graded as large, medium or small. Fruits are then packed in bags of 20-22kg or 32-35kg (with a bamboo base) and brought to the market in tempos (vans) or mini-trucks. Sale in Bengaluru wholesale market, field-level sale and sale to pre-harvest contractors (PHC) were the main channels used by guava farmers in the area under study. In all, 56.67% of the farmers marketed 62.95% of the produce through the self-marketing channel. About 20% of the farmers sold 37.05% of their guava product at the field itself. Another 23.33% of the farmers leased out guava fields to the PHC.

Marketing cost and price realization

Farmers were found to incur an expenditure of Rs. 2.40/kg towards marketing of guava, which consisted of harvesting, grading and packing (15.19%), packing-material cost (1.26%), transportation (30.38%), unloading (2.53%) and commission (50.63%). Farmers realized a net price of Rs. 11.34/kg. The retailers realized a gross price of Rs. 22.01/kg and, after deducting the cost incurred, their margin worked out to Rs. 8.04/kg. In the process, the producer's share worked out to 51.52% (Table 1).

Post harvest loss (PHL) in guava

Losses during different stages of handling in the Self-marketing channel were assessed in 39 guava fields under harvest and from 31 retailers of guava in Bengaluru.

Total PHL was 13.29% which included field-level loss (9.17%) and retail-level loss (4.12%) (Table 2).

Field level loss

Field level loss in guava consisted of over-ripe fruits (2.93%), bird attack (0.24%), mealy bug (0.54%) and diseases like stylar-end rot (1.32%) and canker (1.29%). Further, scratches on surface fruit due to thrips, friction, etc. working out to 2.71% were also observed in our study. Over-ripe fruits accounted for 2.93% of field-level loss.

Table 1. Marketing cost, price realized and producer's share in guava

Sl. No.	Particulars	Amount or %
1	Marketing cost of producers	Rs. 2.4 /kg
	Harvesting, grading and packing	15.19 %
	Packing-material cost	1.26 %
	Transportation	30.38 %
	Unloading	2.53 %
	Commission	50.63 %
2	Net price	
	Producer	Rs.11.34 /kg
	Retailer	Rs. 8.04 /kg
3	Producer's share	51.52 %

Table 2. Post-harvest loss in guava at different levels of handling

Sl. No.	Stage/level	Loss (%)
1	Field level (after harvest and before marketing - grading, sorting for damages)	9.17
	Over-ripe fruits, discards	2.93
	Damage due to bird attack	0.24
	Damage due to blossom (Stylar) end rot	1.32
	Damage due to canker	1.29
	Damage due to mealy bug	0.54
	Others (scratches due to thrips, friction, etc.)	2.71
2	Retail market level (damage due to pressing & fruits crushed during transit & loading/ unloading)	4.12
3	Total PHL in guava	13.29

Table 3. Incidence of disease on guava fruits collected from various localities

Fruit status	Locality											
	1	2	3	4	5	6	7	8	9	10	11	12
Healthy (%)	50.00	56.67	43.33	63.33	43.33	36.67	56.67	60.00	46.67	40.00	53.33	56.67
Diseased (%)	50.00	43.33	56.67	36.67	56.67	63.33	43.33	40.00	53.33	60.00	46.67	43.33
Disease (%)												
Canker (*Pestaliopsis psidi*)	13.33	13.33	15.00	8.33	16.67	16.67	13.33	8.33	11.67	15.00	10.00	11.67
Stylar end rot (*Phomopsis psidi*)	28.33	23.33	30.00	20.00	30.00	31.67	21.67	25.00	28.33	33.33	30.00	23.33
Anthracnose (*Collectotrichum gloeosporioides*)	8.33	6.67	11.67	8.33	10.00	15.00	8.33	6.67	13.33	11.67	6.67	8.33

Table 4. Post-harvest storage losses in *Allahabad Safeda* guava fruits stored at RT & at 12°C

PLW (%)					Spoilage (%)			
	Days after Harvest				Days after harvest			
At RT	2	3	5	6	2	3	5	6
	2.51	3.53	6.35	8.16	0.00	0.00	7.29	17.28
At 12°C	3	7	10	14	3	7	10	14
	2.52	4.70	6.29	8.37	0.00	0.00	0.45	1.36

Table 5. Valuation of post-harvest loss in guava (*Allahabad Safeda*)

Sl. No.	Stage	PHL (%)	Value loss (Rs./kg)
1	Field level	9.17	1.26
2	Retail level	4.12	0.91
	Total	13.29	2.17

Hence, select harvest of fruits can reduce the loss due to over-ripe fruits. Further, losses occurring at different stages of handling guava due to stylar-end rot, anthracnose, canker, thrips' attack, etc. need to be addressed.

Retail-level loss

Loss at the retail-level was 4.12% and was due mainly to press-damage and fruits crushed in transit, unloading and loading. Farmers currently use gunny/plastic bags with a bamboo basket at the base. Instead, they could use plastic crates to reduce losses in transit.

Pathological investigation

Guava fruits collected from orchards in 12 different localities of Bengaluru district were assessed for infection with various diseases. Fruits were found to be seriously infected by diseases. Disease incidence percentage ranged from 36.67 (Locality 4) to 63.33 (Locality 6). Stylar end rot (*Phomopsis psidi*) was the major disease, causing maximum spoilage of fruits, and varied from 20 % (Locality 4) to 33.33 % (Locality 10). Canker (*Pestaliopsis psidi*) incidence varied from 8.33% (Locality 4) to 16.67% (Locality 5 & 6). Anthracnose (*Colletotrichum gloeosporioides*) incidence varied from 6.67% (Locality 2) to 15.00% (Locality 6). Appropriate, timely or effective pre-harvest disease management schedule was not practiced in these orchards (Table 3).

Post-harvest storage losses in *Allahabd safeda* guava fruits

Storage losses in *Allahabd safeda* guava were estimated as 3.53 % at 3 days storage at room temperature (24-32°C). This was mainly due to physiological loss in weight (PLW). Spoilage started after 5 days of storage (7.29%), and reached 17.28% by 6th day of storage.

By storing the fruits at low temperature (12°C), total losses at 10 days of storage were reduced to 6.74%. This was due to PLW 6.29% and 0.45% to spoilage loss. The total storage losses at 12°C increased to 9.73% when storage was prolonged to 14 days. Spoilage in storage at room temperature as well as at 12°C was found to be mainly due to blossom-end rot in *Allahabad safeda* guava variety (Table 4). It was observed that at 3 days of storage, guava fruits lost 3-4% weight and, after 5 days, spoilage set in. Therefore, care should be taken to dispose of the fruits within five days from harvesting. However, it is possible to delay spoilage by storing the guava fruits at 12^{o}C.

Valuation of post-harvest loss, price spread and marketing efficiency

Post-harvest loss is calculated from the price prevalent at different levels of handling, and is presented in Table 5. Post-harvest loss accounts for 9.85% of the price to the consumer in a marketing channel (Table 6 & 7). As PHL escalates the cost of marketing, it has an impact on marketing efficiency. Price-spread was observed to be 54.2% which, minus the PHL, would be 48.48%. If PHL is to be included as an item under cost of marketing, efficiency of the marketing system would be reduced (Table 7). The producer's share in the consumer rupee is 51.52% indicating,

Guava harvest, sorting and packing in Bengaluru

Field-level loss in guava

Table 6. Price-spread in marketing of guava

Particulars	Price spread	
	Rs./kg	%
Net price received by the farmer	10.08	45.80
Marketing cost of the farmer	2.40	10.90
PHL at field level	1.26	5.72
Retailer's cost	0.23	1.04
PHL at retail level	0.91	4.13
Retailer's margin	7.13	32.39
Consumer price	22.01	100.00

Table 7. Efficiency in marketing guava and impact of post-harvest loss (PHL)

Sl. No.	Efficiency parameter	Efficiency parameter value
1	Producer's share (%)	51.52 (48.8)*
2	Marketing-cost (Rs./kg)	2.63 (4.80)*
4	Intermediary's margin (%)	36.53 (32.39)*
5	Post-harvest loss (PHL) (%)	9.85
3	Marketing-efficiency index	1.06 (0.88)**

*Producer's share, marketing-cost and margin after inclusion of PHL as an item of cost

** indicates marketing efficiency (ME) after inclusion of PHL as an item of marketing-cost

that, a scope exists for improving the marketing system. Therefore, it is inferred that inclusion of PHL in calculating marketing efficiency reduces the system's efficiency. This calls for efforts to reduce losses during post-harvest handling of guava, to help improve the efficiency of the marketing system.

Guava retailing in Bengaluru

REFERENCES

Acharya, S.S. and Agarwal, N.L. 2001. *Agricultural marketing in India*, Third Edition, Oxford & IBH Publishing Company, New Delhi

Gajanana, T.M., Sreenivasa Murthy, D. and Sudha, M. 2011. Post harvest losses in fruits and vegetables in South India – A review of concepts and quantification of losses. *Indian Food Packer,* **65**:178-187

Jagtap, K.B. and Katrodia, J.S. 1998. Post harvest losses in packaging and transportation of sapota, *Indian J. Hort.*, 55:48-51

Sreenivasa Murthy, D., Gajanana T.M. and Sudha, M. 2004. Post harvest loss and its impact on marketing cost, margin and efficiency: a study on grapes in Karnataka, *Indian J. Agril. Econ.*, **59**:772-786

Srinivas, R.N., Venkatesha Reddy, T., Ravi, P.C., Lalith Achoth and Chinnappa Reddy, B.V. 1997. Post Harvest Losses Assessment in Totapuri and Alphonso Mangoes. *J of Food Sci. and Tech.*, XXXIV:70-71

Wanjari,V., Ladaniya, M.S. and Gajanana, T.M. 2002. Marketing and Post harvest losses of acid lime in Andhra Pradesh, *Indian J. Agril. Marketing*, 16:32-39

(MS Received 04 June 2014, Revised 24 March 2015, Accepted 04 April 2015)