RESEARCH NOTES

Post-Harvest Loss and Its Impact on Marketing Cost, Margin and Efficiency: A Study on Grapes in Karnataka

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I

INTRODUCTION

Grape (*Vitis vinifera*) is one of the major fruit crops grown in India and accounts for about 2.5 per cent of total fruit production. A substantial quantity of production is subjected to post-harvest loss at various stages of marketing. The quantum of loss is influenced by several factors like perishable nature, method of harvesting and packing, transportation, etc. Grapes, being a high value commercial crop, any loss could result in significant revenue loss and deprives its availability to a large population and causes huge economic loss to the nation. Though many studies have attempted in the estimation of post-harvest loss in other fruits (Madan and Ullasa, 1993; Gajanana *et al.,* 2002: Sreenivasa Murthy *et al.,* 2002, Sudha *et al.,* 2002), little information is available regarding the post-harvest loss in grapes especially at different stages of marketing and its impact on marketing efficiency.

Another area of research in marketing and post-harvest loss, which requires more attention, is the estimation procedures of margins, costs and efficiency after taking into account the marketing loss. The present procedures for estimating the marketing margins and efficiency do not explicitly include the loss during marketing as a separate item, which could significantly alter the profit margins and thereby the efficiency of marketing. An attempt is made in this paper to develop a methodology for quantifying the post-harvest loss both in physical and value terms at various stages of marketing and compare the same with that of conventional methods while estimating the marketing margins and efficiency. Further, the extent of impact of post-harvest loss on producers' net share, marketing margins and marketing efficiency due to separating out the marketing loss are also quantified. Thus, the present paper is a modest attempt: (1) To examine the marketing practices for grapes

in Karnataka, (2) To explicitly estimate the physical and value loss at various stages of marketing in grapes in different markets and (3) To examine the impact of post-harvest loss on farmers' net price, marketing costs, margins and efficiency.

II

METHODOLOGY

2.1 Sampling Procedure:

Multi-purpose random sampling techniques were used for the selection of study regions and the sampling units. In the first stage, Karnataka state was purposively selected, as it is one of the major producers of grapes in India, contributing 20 per cent of production in India (Government of India, 2002). Bijapur district was selected for the estimation of post-harvest loss and to study the marketing practices because of its highest contribution (31 per cent) to the total production in Karnataka (Government of Karnataka, 2002). In the next stage, Bijapur taluk, which accounts for 91 per cent of grapes production in the district, was selected. Eight predominantly grape growing villages in this area, viz., Tikota, Babanagar, Bijargi, Somadevanahatti, Thindagurdhi, Rathanapura, Kotligi and Kanmadi were purposively selected. From each village, four grape fields were identified randomly from the comprehensive list of all grape growers. Thus, a total of thirty-two farmers' fields were identified randomly and three samples representing three different lots (harvested) in each field were drawn for larger representation. Data were collected from these farms on the actual loss by weight basis in the field. The average size of grape orchard was 1.30 ha with a coefficient of variation of 28.4 per cent. Fifteen out of 32 farmers, constituting about 47 per cent of the sample were producing raisin on the farm itself in addition to the fresh marketing. Data was collected from all raisin-making units to estimate the economics of raisin making.

Five wholesalers and fifteen retailers were selected randomly in Bijapur city and samples were drawn to estimate the loss during transit, wholesale and retail marketing. For examination of marketing practices in the major consumption centre, Bangalore city was selected as a substantial amount of grapes produced in Bijapur is marketed and consumed in Bangalore. Five wholesalers from K.R. Market and 15 retail outlets were selected randomly to estimate the loss during transit, wholesale and retail marketing stages.

Data were collected during February and March 2001 by using a well-designed pre-tested questionnaire by personal interview method.

2.2 Techniques for Analysis

2.2.1 Post-Harvest Loss: It is the loss that occurs from the point of harvest of grapes in the field till it reaches the ultimate consumers. Keeping in view the definition of agricultural marketing (Acharya and Agarwal, 2001; Kohls and Uhl, 2002) as well as the involvement of different groups in marketing, viz., farmers,

market intermediaries and consumers, three stages were identified in the present study to estimate the post harvest loss during marketing. These are field level loss, loss during transit and wholesale marketing and retail level marketing loss. Simple averages and percentages were used for the estimation of post-harvest loss at these stages of marketing.

2.2.2 Marketing Margins, Costs and Loss: Conventional methods were available to measure marketing costs and marketing margins. In these estimation procedures the loss at different stages of marketing was not included explicitly as a separate item. The post harvest loss at various stages of marketing was included either in the farmers' net margin or market intermediaries' margin. In the present study, the marketing loss at different stages is explicitly estimated. The modified formulae as described below are used for separating the 'post-harvest loss during marketing' at different stages of marketing as well as for estimating the producer's share, marketing margins and marketing loss.

2.2.3 Net Farmers' Price: The net price received by the farmer is estimated as the difference in gross price received by him and sum of his marketing costs and value loss during harvesting, grading, transit and marketing. For calculating the loss in the value of produce, gross price received by the farmer was used, as they would have realised the return had there been no loss. Thus, the net farmers' price is expressed mathematically as follows:

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

$NP_F = \{GP_F\} - \{C_F\} - \{L_F \times GP_F\}$.… (1)

where NP_F is net price received by the farmers (Rs./kg),

GP_F is gross price received by the farmers or wholesale price to farmers Rs./kg),

C_F is the cost incurred by the farmers during marketing (Rs./kg),

L_F is physical loss in produce from harvest till it reaches assembly market (per kg).

2.2.4 Marketing Margins: The margins of market intermediaries include profit and return, which accrue to them for storage, the interest on capital and establishment after adjusting for the marketing loss due to handling. The general expression for estimating the margin for intermediaries is given below.

| Intermediaries margin | = | Gross price (sale price) | − | Price paid (cost price) | − | Cost of marketing | − | Loss in value during wholesaling |

Net marketing margin of the wholesaler is given mathematically by

$MM_W = GP_W - GP_F - C_W - (L_W \times GP_W)$ or

$MM_W = \{GP_W - GP_F\} - \{C_W\} - \{L_W \times GP_W\}$.…(2)

where MM_W is net margin of the wholesaler (Rs./kg),

GP_W is wholesalers' gross price to retailers or purchase price of retailer (Rs./kg),

C_W is cost incurred by the wholesalers during marketing (Rs./kg),

L_W is physical loss in the produce at the wholesale level (per kg).

The definition of GP_F is same as given in equation (1).

In the marketing chain, when more than one wholesaler is involved, i.e., primary wholesaler, secondary wholesaler, etc., then the total margin of the wholesaler is the sum of the margins of all wholesalers. Mathematically,

$MM_W = MM_{W1} + \ldots + MM_{Wi} + \ldots + MM_{Wn}$

where MM_{Wi} is the marketing margin of the i-th wholesaler.

Net marketing margin of retailer is given by:

$MM_R = GP_R - GP_W - C_R - (L_R \times GP_R)$ or

$MM_R = \{GP_R - GP_W\} - \{C_R\} - \{L_R \times GP_R\}$ ....(3)

where MM_R is net margin of the retailer (Rs./kg),

  GP_R is price at the retail market or purchase price of the consumers (Rs./kg),

  L_R is physical loss in the produce at the retail level (per kg),

  C_R is the cost incurred by the retailers during marketing (Rs./kg).

The definition of GP_W is same as given in expression (2).

The first bracketed term in equations (1), (2) and (3) indicates the gross return, while the second and third bracketed terms indicate respectively the cost and loss at different stages of marketing.

Thus, the total marketing margin of the market intermediaries (MM) is calculated as

$MM = MM_W + MM_R$ …. (4)

Similarly, the total marketing cost (MC) incurred by the producer/seller and by various intermediaries is calculated as

$MC = C_F + C_W + C_R$ …. (5)

Total loss in the value of produce due to injury/damage caused during handling of produce from the point of harvest till it reaches the consumers is estimated as

$ML = \{L_F \times GP_F\} + \{L_W \times GP_W\} + \{L_R \times GP_R\}$ …. (6)

2.2.5 Marketing Efficiency: Most commonly used measures are conventional input to output marketing ratio, Shepherd's ratio of value (price) of goods marketed to the cost of marketing (Shephard, 1965) and Acharya's modified marketing efficiency formula (Acharya and Agarwal, 2001). However, all these measures do not explicitly mention the loss in the produce during the marketing process as a separate item in marketing. As reduction in loss itself is one of the efficiency parameters, there is a need to incorporate this component explicitly in the existing marketing ratios to get correct measures of marketing efficiency while comparing alternate markets/channels. 'Marketing loss' component is incorporated in the widely used formula as given by Acharya and Agarwal (2001)[1] and the modified marketing efficiency (ME) formula is given below.

$$ME = \frac{NP_F}{MM + MC + ML}$$ …. (7)

The definitions of NP_F, MM, MC and ML are the same as in equations (1), (4), (5) and (6).

III

RESULTS AND DISCUSSION

3.1 Marketing Practices and Channels

Grapes *var* Thomson seedless grown in Bijapur, Karnataka are marketed either for table purpose (fresh) or used in raisin making. The critical factor, which decides the decision of the farmers, is the price prevailing/offered to the farmers during the season. The farmers expected a price of Rs.14-15/kg for selling it as fresh grapes during that season and whenever they fell short of this expectation they decided to go for raisin making. About 15 per cent of the total production in the region goes for fresh grape market and the remaining 85 per cent is used for making raisins.

3.1.1 Fresh Grapes: Field sale is the major practice of marketing of fresh grapes by the farmers. Wholesalers, both from local and distant markets enter into agreement with the farmers through commission agents for the field sale. The commission agents charge Rs. 0.25 to Rs. 0.50 per kg of grapes from wholesalers. The wholesaler normally harvest, sort and pack the grapes as per their requirement. Grapes are marketed locally in bamboo baskets of 5, 10 and 15 kg capacity with newspaper cushioning. For distant markets, cardboard boxes of 2 or 4 kg and bamboo baskets of 5 kg capacity are used. The major distant markets are Bangalore, Mysore, Sangli, Mangalore, Chitradurga, etc. Lorries/tempos are used to transport grapes and some instances of transporting in buses were also observed.

The major marketing channels observed in local Bijapur market are *Farmers → Commission Agents(Local) → Wholesalers(Local) → Retailers(Local) → Consumers(Local)* and more than 75 per cent of grapes is marketed through this channel in Bijapur, though *Farmers→ Wholesalers(Local) → Retailers(Local) → Consumers(distant)* channel is also in practice but with little quantity. *Farmers → Commission Agents(Local) → Wholesalers(local/distant) → Retailers(distant) → Consumers(Local)* is the major marketing channel in distant Bangalore market and more than 75 per cent is marketed through this channel in Bangalore. Some farmers sold fresh grapes in the distant market at Bangalore but the extent of trade is less than 10 per cent.

3.1.2 Raisin: Farmers make raisins in the farm itself when the price offered to them is less than the expected price. Raisin, a dried processed grape requires about four kilograms of fresh grapes to make one kilogram.[2] The details on cost of production of raisin are presented in Table 1. About Rs. 3,060/kg, excluding the cost of fresh grapes, is required to process one tonne of fresh grapes and farmers could produce about 250 kg of raisins. Normally raisins are packed either in 12 or 15 kg boxes and brought to the auction centre located in Bijapur and almost all the farmers market their raisins in the local market only. The farmers realise a gross return of

Rs. 16,125 by selling it in the auction centre. Thus, the net return from raisin making worked out to Rs. 13,065/MT of fresh grapes. The farmers prefer to keep it in cold storage in case the price is very low. The cost of cold storage is Rs. 350/day/MT.

TABLE 1. COSTS AND RETURNS OF RAISIN MAKING IN KARNATAKA

Sr. No (1)	Particulars (2)	Cost (Rs.) (3)
1.	Production cost	
(i)	Quantity of fresh grapes (kg)	1000
(ii)	Annualised cost of raisin making unit based on the cost of Rs. 20/sq.ft establishment cost of unit and it is annualised for 3 years	1,333.33
	Cost of chemical treatments	
(iii)	Dipping oil (Ethail Eliate, Potassium) @ 1.25 per cent 1250ml of dipping oil @ Rs. 160/litre	200.00
(iv)	Potassium Carbonate	100.00
(v)	Labour charges 7 Men labour-days @ Rs. 50/day	350.00
(vi)	Machine grading (to sort raisin based on size)	250.00
(vii)	Quantity of raisin realised (kg)	250
(viii)	Manual grading (to grade the raisin based on colour)	165.00
2.	Marketing costs	
(i)	Transportation charges of raisin to local market	62.50
(ii)	Box and Padding paper charges (@ Rs. 14/box of 12 kg)	294.00
(iii)	Commission charges @ 2 per cent on the volume	305.00
3.	Total cost of production and marketing	3,059.83
4.	Cost of production per kg	12.24
5.	Returns	
(i)	Return from 70 per cent of 'A' Grade raisins @ Rs. 75/kg	13,125.00
(ii)	Return from 20 per cent of 'B' Grade raisins @ Rs. 50/kg	2,500.00
(iii)	Return from 10 per cent of 'C' Grade raisins @ Rs. 20/kg	500.00
6.	Total Gross Returns	16,125.00
7.	Total Net Returns	13,065.17

3.2 Post Harvest Loss (PHL) in Grapes

Grapes *var* Thompson seedless, once harvested, pass through various stages of marketing before reaching the consumers. The losses at different stages of handling, viz., field, wholesale market and retail market have been estimated and presented in the following section:

3.2.1 PHL at Field Level: Grapes are normally harvested in the field and packed in cardboard baskets or bamboo baskets after removing the damaged bunches and berries. The loss due to damages in bunches or berries, which were estimated in fields at Bijapur, Karnataka, worked out to 7.31 per cent (Table 2). The water berry or mummy is the major contributing factor, accounting for about 43.2 percent of loss at the field. Some of the other major causes of loss at the field level are damage to the berries due to insects and pests (24.8 per cent) and loose berries/berry drops at the time of harvesting (25 per cent). Small berries, sunburn injury and physical injury are some of the other damages/discards, which account for the remaining loss. All the

discards at the field level were treated as total loss as these were neither marketed nor consumed.

TABLE 2. POST-HARVEST LOSS AT FIELD LEVEL IN GRAPES *VAR.*
THOMSON SEEDLESS IN KARNATAKA

Sr. No. (1)	Particulars (2)	Quantity (grams) (3)	Per cent to total (4)
1.	Average quantity of grapes drawn	4,148	100.00
2.	'Good fruits' in the sample	3,845	92.70
3.	Damaged/injured grape berries		
3.1	Mummies/water berries	131	3.17
3.2	Small berries	8	0.19
3.3	Damage due to insects and pests	75	1.81
3.4	Berry drops and loose berries	76	1.83
3.5	Others	13	0.31
	Total damaged/injured	303	7.31

Thus, for every 100 kg of grapes harvested for table purpose to market either in the local or distant markets, 7.31 kg was found to be unfit during sorting and packing due to berry damages and the farmer himself bears this loss irrespective of channel of marketing. Since sorting and packing is the first function to be performed in the marketing process, any loss during this process is treated as marketing loss in the present study. This is more appropriate in perishable commodities like grapes as the whole production is 'marketed surplus'. However, in case of raisin making, the present practice was to use the entire quantity of harvested grapes for raisin making without sorting and thereby avoiding the loss of 7.31 kg for every 100 kg grapes harvested. The sorting and grading is done after the fresh berries are processed to raisins.

3.2.2 PHL during Transit and Wholesale Marketing Level: Loss at transit and wholesale marketing level was estimated at two spatially distributed markets, viz., local market at Bijapur representing the production centre, and distant market at Bangalore representing the major consumption centre. In local market at Bijapur, fresh grapes are packed in 5/10/15 kg bamboo baskets with paper cushioning and brought mostly in tempos. The average distance to market the grapes is around 45 km and the transit time in most of the cases is less than 2 hours. The loss in fresh grapes due to transit and wholesaling at local market is 4.24 per cent (Table 3), mostly due to injury to berries and detachment of berries (loose berries). The physical injury to berries accounted for 38 per cent of this loss while loose berries accounted for 59 per cent of loss. On the other hand, the PHL at the same stage of marketing but with a longer distance and transit time at Bangalore is 10.80 per cent even with relatively better packing material in some cases like cardboard boxes (Table 2). In this case also, physical injury to berries accounts for 30 per cent of loss, while loose berries accounts for 68 per cent loss. In this stage also, the market discards including the

loose berries were not further marketed as in the case of other fruits like mango, banana, etc., but mostly consumed by the labourers/hamalis.

TABLE 3. POST-HARVEST LOSS AT WHOLESALE MARKET LEVEL IN
GRAPES *VAR*. THOMPSON SEEDLESS IN KARNATAKA

Sr. No.	Particulars	Local market*		Distant market**	
		Quantity (grams)	Per cent to total	Quantity (grams)	Per cent to total
(1)		(2)	(3)	(4)	(5)
1.	Average quantity of grapes drawn	5,000	100.00	5,000	100.00
2.	'Good fruits'	4,788	95.76	4,460	89.20
3.	Damaged/injured grape berries				
3.1	Damage due to press and mechanical injury during transit and wholesaling process	81	1.62	162	3.24
3.2	Loose berries	122	2.44	367	7.34
3.3	Others	9	0.18	11	0.22
	Total damaged	212	4.24	540	10.80

* Bijapur market; ** Bangalore market.

Thus, it is evident that during transit and wholesaling stage of marketing, the PHL is higher by 150 per cent when grapes are marketed in the distant market instead of local market. Injury to berries and detachment of berries (loose berries) are the major causes of loss irrespective of distance of transportation, though the extent of loss is more than double in long distance transit. It is interesting to observe that the loss is more in the form of loose berries than the physical injury due to jerks/shaking during transportation.

3.2.3 PHL at Retail Level: The loss at retail markets in Bijapur (local) and Bangalore (distant) is estimated for 8-10 days of marketing (Table 4). At retail level of marketing, the losses in local market at Bijapur and distant markets at Bangalore are 2.85 per cent and 3.27 per cent respectively. The major cause for the loss in both

TABLE 4. POST-HARVEST LOSS AT RETAIL MARKET LEVEL IN
GRAPES *VAR*. THOMPSON SEEDLESS IN KARNATAKA

Sr. No.	Types of damages	Local market*		Distant market**	
		Quantity (grams)	Per cent to total	Quantity (grams)	Per cent to total
(1)	(2)	(3)	(4)	(5)	(6)
1.	Average quantity of grapes drawn	2,070	100.00	2,480	100.00
2.	Good fruits	2,011	97.15	2,399	96.73
3.	Damaged/injured grape berries in the sample				
3.1	Damage due to press and physical injury during transit and wholesaling process	43	2.08	51	2.06
3.2	Rotting of berries due to infection	9	0.43	16	0.65
3.3	Unmarketable loose berries	7	0.34	9	0.36
3.4	Others	-	-	5	0.20
	Total damaged/injured	59	2.85	81	3.27

* Bijapur market; ** Bangalore market.

situations is the damage caused to berries due to press and physical injury, which accounted for about 73 per cent loss in local market and 63 per cent in the distant market. The other important type of loss occurred is the rotting and infection of berries at the point of attachment, which accounts for 15 per cent in local market and 20 per cent in distant market. The discarded or damaged berries fetched no further economic gain to the retailers, as there were no buyers for this lot. Normally the retail traders consume themselves the loose berries after sorting it out from diseased and injured berries.

Thus, the aggregate post-harvest loss from harvest to consumption in grapes *var* Thompson seedless in two spatial markets ranges from 14.40 per cent in the local market at Bijapur to 21.33 per cent in the distant market at Bangalore, which indicates that the overall loss increases by 48 per cent when grape is marketed in distant market (Bangalore) instead of local market (Bijapur). The aggregate post-harvest loss in the local market at Bijapur comprises 7.31 per cent loss at field level, 4.24 per cent loss during transit and wholesale level and 2.85 per cent loss at the retail level. The corresponding PHL at different stages of marketing in the distant market at Bangalore are 7.31, 10.80 and 3.22 per cent. From the pattern of distribution of losses at different stages in two markets, it is clear that the major portion of loss in local market is accounted by loss at field level (51 per cent) where the transit distance and time is less, while the loss during transit and wholesaling accounts for the highest loss (51 per cent) in the case of distant market. Thus, three important recommendations may emerge from the present study for reducing the post-harvest loss in grapes. First, standard pre-harvest practices and harvesting methods are required to be developed to reduce the damages like pests and diseases, water berries and harvest injury. Secondly, efforts should be made to evolve better packages and cushioning technologies to absorb shocks during transportation. And finally, proper care should be taken during loading and packing of boxes to vehicles as well as of selection of vehicles to transport grapes especially to long distance markets, as loss during transit is more than double.

As regards the impact of post-harvest loss on the total availability of fresh grapes in absolute terms, it is estimated that for every 100 kg of fresh grapes produced and marketed, only 86.23 kg reached the consumers in the case of local marketing and 80.02 kg in the case of distant marketing (Table 5). On the other hand, in raisin making, the whole produce is used for raisin making without sorting it out for damages and discards and thus, avoided the loss in the range of 14 to 20 kg. This signifies the importance of processing of perishable grapes in reducing the post harvest loss. Further, it is heartening to note that 85 per cent of the grape production in the area is used for raisin making and virtually the total post-harvest loss is restricted to about 15 per cent of total grape production only. It is therefore very important to keep this in mind while extrapolating the harvest loss in grapes to the national level.

TABLE 5. AGGREGATE POST-HARVEST LOSS IN GRAPES *VAR*. THOMSON SEEDLESS IN KARNATAKA

Sr. No. (1)	Stages of handling (2)	Loss at local market*			Loss at distant market**		
		Per cent (3)	Absolute@ (kg) (4)	Share in total (5)	Per cent (6)	Absolute@ (kg) (7)	Share in total (8)
1.	Field level	7.31	7.31	50.76	7.31	7.31	34.27
2.	Transit and wholesale market level	4.24	3.93	29.45	10.80	10.01	50.63
3.	Retail market level	2.85	2.53	19.79	3.22	2.66	15.10
	Total loss	14.40	13.77	100.00	21.33	19.98	100.00

* Bijapur market; **Bangalore market; @ For a quantity of 100 kg produced and marketed.

3.3 Costs, Margins, Loss and Strategies of Marketing of Grapes in Karnataka

None of the existing methods explicitly included the loss in the value of produce during marketing for estimating costs and margin structure of different participants in marketing, viz., farmers, wholesalers and retailers. New formulae were developed to include marketing loss as a separate item in estimating profits and margins. Further, widely used market efficiency formula suggested by Acharya and Agarwal (2001) is modified to include the marketing loss for estimating the efficiency. The results as estimated by both new and old methods in the three major marketing practices and its implications are given in Table 6.

3.3.1 Marketing Costs: The aggregate cost of marketing of grapes *var* Thomson seedless worked out to Rs. 3.68/kg in field sale, Rs. 4.63 in local market sale (Bijapur) and Rs. 10.23 in distant market sale (Bangalore). The farmers incurred no marketing cost in field sale and only the wholesalers incurred Rs. 1.70/kg. In the case of self-marketing by farmers, the cost of local marketing worked out to Rs. 2.40/kg compared to Rs. 6.80/kg in the distant market. The higher cost in the distant market is obviously due to long distance transportation and additional incidental charges. As regards the cost of retailing, the retailers at the local market incurred less cost on retailing (Rs. 1.98/kg) compared to distant marketing at Bangalore (Rs. 2.93/kg).

The impact of method of estimation on marketing costs with the addition of loss has little relevance in this context as the cost has no direct relationship with loss in value. Had the study focused on different methods of packing or modes of transportation, there would have been a change in the marketing cost.

3.3.2 Marketing Loss: In the earlier methods of estimation, marketing loss component was not worked out separately and it was either included under net profit margins of farmers or market intermediaries. In the new method, loss is isolated at each stage of marketing along with persons who actually incurred loss with appropriate prices. Aggregate loss due to discards in the field sale channel amounts to Rs. 2.31/kg. The farmers have accounted for about 44 per cent of this loss (Rs. 1.02/kg), which is higher than wholesalers' (31 per cent) and retailers' (25 per cent) share. The marketing loss accounts for about 11.5 per cent of the consumer's price in this chain.

TABLE 6. IMPACT OF POST-HARVEST LOSS ON NET FARMER'S SHARE, MARKETING
COSTS AND MARGINS IN GRAPES *VAR.* THOMSON SEEDLESS

(Rs./kg)

Sr. No.	Particulars	Field sale			Local market			Distant market		
		Old[*]	New[**]	Difference (per cent)	Old[*]	New[**]	Difference (per cent)	Old[*]	New[**]	Difference (per cent)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1.	Marketing costs (Rs./kg)									
1.1	Farmers	0.00	0.00	0	2.40	2.40	0	6.80	6.80	0
1.2	Wholesalers	1.70	1.70	0	0.25	0.25	0	0.50	0.50	0
1.3	Retailers	1.98	1.98	0	1.98	1.98	0	2.93	2.93	0
1.4	Sub-total	3.68	3.68	0.00	4.63	4.63	0.00	10.23	10.23	0.00
2.	Marketing loss (Rs./kg)									
2.1	Farmers	0.00	1.02	100	0.00	1.17	100	0.00	1.90	100
2.2	Wholesalers	0.00	0.72	100	0.00	0.72	100	0.00	3.28	100
2.3	Retailers	0.00	0.57	100	0.00	0.57	100	0.00	1.05	100
2.4	Sub-total	0.00	2.31	100	0.00	2.46	100	0.00	6.23	100
3.	Profit margins (Rs./kg)									
3.1	Farmers' net price	14.00	12.98	-7.29	13.60	12.43	-8.6	19.20	17.30	-9.90
3.2	Wholesalers	1.30	0.58	-55.38	0.75	0.03	-96.00	3.83	0.55	-85.64
3.3	Retailers	1.02	0.45	-55.88	1.02	0.45	-55.88	2.54	1.49	-41.34
3.4	Sub-total	2.32	1.03	-55.60	1.77	0.48	-72.88	6.37	2.04	-67.97
4.	Share in consumers' price (per cent)									
4.1	Farmers	70.00	64.90	-7.29	68.00	62.15	-8.60	53.63	48.32	-9.90
4.2	Market intermediaries	11.60	5.15	-55.60	8.85	2.40	-72.88	17.79	5.70	-67.97
4.3	Marketing costs	18.40	18.40	0.00	23.15	23.15	0.00	28.58	28.58	0.00
4.4	Marketing loss	0.00	11.55	0.00	0.00	12.30	0.00	0.00	17.40	0.00
5.	Price spread (Rs./kg)	6.00	7.02	17.00	6.40	7.57	18.28	16.60	18.50	11.45
5.1	Marketing costs	61.33	52.42	-14.53	72.34	61.16	-15.46	61.63	55.30	-10.27
5.2	Marketing margins	38.67	14.67	-62.05	27.66	6.34	-77.07	38.37	11.03	-71.26
5.3	Marketing loss	0.00	32.91	0.00	0.00	32.50	0.00	0.00	33.68	0.00
6.	Market efficiency (index)	2.33	1.85	-20.76	2.13	1.64	-22.73	1.16	0.94	-19.15

 * Conventional method without inclusion of post-harvest loss; ** Modified methods with the inclusion of post-harvest loss.

In the local marketing channel, the marketing loss is marginally higher at Rs. 2.46/kg mostly due to valuation procedure followed in the estimation. The loss in value at the farmers' fields is estimated based on the gross price of Rs. 16/kg, which they realised in the local market, compared to Rs. 14/kg in the field sale channel. Here also the pattern of sharing of marketing loss is similar to field sale channel with farmers accounting for about Rs. 1.17/kg (48 per cent) of market loss.

In distant marketing sale practice, the aggregate loss in value worked out to be Rs. 6.23/kg, which is about 17.40 per cent of the consumer's price. The share of wholesaler is much higher (52.6 per cent) compared to loss incurred by the farmers (30.5 per cent) and the retailers (16.9 per cent).

Thus, it is clear that in short distance marketing, the farmers had borne most of the loss in value during marketing, while in the long distance marketing, the loss is more and majority of it is borne by the wholesalers.

3.3.3 Profit Margins: Farmers' net price as estimated by old method (without accounting for marketing loss) is the highest when they marketed grapes in the distant market (Bangalore). The farmers could realise a substantially higher net price of Rs. 19.20/kg compared to Rs. 14.0/kg in field sale and Rs. 13.60/kg in local market sale. As regards profit margin of the wholesaler at the local market in Bijapur, the profit margin is significantly higher for those wholesalers who purchased through field sale (Rs. 1.30/kg) than those who did the wholesaling at Bijapur market. This higher economic profitability perhaps made it as the major practice (75 per cent) of marketing by purchasing from field rather than do wholesaling in the market. However, the profit margin of the wholesaler in the distant market is much higher at Rs. 3.83/kg as compared to wholesalers at the local market. In retail marketing, the margin of retailers is substantially higher in the distant market than the local market, mostly due to the higher demand and price in the consumption centre at Bangalore.

Impact of Inclusion of Marketing Loss on Profit Margins

When marketing loss is taken into consideration for the estimation of profit margins, which is more appropriate, it is clear from the results that old estimation procedure has over-estimated the profit margins. For instance, the farmers' net price in field sale channel worked out to Rs. 12.98/kg, compared to Rs. 14.00/kg in conventional method of estimation. The loss incurred by the farmer due to discards and damages during harvesting and packing (Rs. 1.02/kg) is included in farmers' net price in old method. Similar is the case with the other two channels of marketing and the extent of over estimation is limited to less than 10 per cent.

On the other hand, the impact of inclusion of marketing loss in the estimation of wholesalers' and retailers' margins is quite apparent with over-estimation ranging from 41 per cent in retailers in distant market to about 96 per cent in wholesalers' margin in local market sale, i.e., when marketing loss is taken into account, then the profit margins of market intermediaries worked out to be substantially lower. For example, in field sale channel, market intermediaries realise a combined net profit of Rs. 1.03/kg as compared to Rs. 2.32/kg in old estimation procedure. The loss during wholesale and retail marketing worked out to Rs. 1.29/kg which is earlier included in the profit margins. Similar results are also observed in the local market and distant market sale with substantial reduction in the profit margins in the market inter-mediaries.

Thus, it clearly reflects that by excluding one of the important components in the marketing process, i.e., post-harvest loss, the margins of various participants are unduly over estimated particularly for the market intermediaries. This will have further bearing on the share of market intermediaries in consumers' price.

3.3.4 Distribution of Consumer's Price: Farmers' share in the consumer price as estimated by conventional method is higher in the case of field sale channel at 70 per cent than local market sale (68 per cent) and distant market sale (53.4 per cent) mostly due to lower marketing costs, while the combined share of profit of market intermediaries worked out to 11.60, 8.85 and 17.80 per cent respectively in field sale, local market sale and distant market sale. The higher share of market intermediaries in the consumer's price in the distant market sale at Bangalore could be attributed to higher demand from large population. As expected, the share of market cost in the consumer's price is higher in distant market due to higher transportation cost and involvement of more number of market intermediaries.

The marketing loss is isolated at different stages of marketing by employing the modified method and it is found that the aggregate marketing loss worked out to 11.55, 12.30 and 17.40 per cent respectively in the field, local market and distant market sales. The immediate impact of inclusion is on the shares of farmers' net price and profit margin of intermediaries as these losses are earlier borne by the market participants. The farmers' share in the consumer's price is reduced to 65, 62 and 48 per cent from 70, 68 and 54 per cent, respectively, in field, local market and distant market sales. Similarly, the share of combined profit margins of market inter-mediaries reduced to 5.15, 2.40 and 5.70 per cent, respectively, in the field, local market and distant sales, respectively, from 11.60, 8.85 and 17.79 per cent after accounting their costs and marketing loss.

3.3.5 *Price Spread:* The price spread in fresh grapes in Karnataka ranges from Rs. 6.00/ kg in field sale channel (30 per cent of the consumer's price) to Rs. 18.28/kg in distant market sale (47 per cent) in conventional method of estimation. The major component of the price spread is marketing costs, which accounts for 61 per cent in field sale, 72 per cent in local market sale and 62 per cent in distant market sale channels. Marketing loss, which is earlier, included in farmer's net price and intermediaries' profit margin is now separated and added as a separate component under price spread. The immediate implication is the increase in price spread by 17.0, 18.3 and 11.5 per cent in field sale, local market sale and distant market sale respectively and the aggregate share of marketing loss in total price spread in all channels are in the range of 32-33 per cent. Thus, the marketing costs followed by marketing loss are the two major contributing factors accounting for nearly 68 per cent of price spread in fresh grapes. Immediate measures like improved packing material and better means of transportation need to be implemented to reduce substantial loss.

3.3.6 *Marketing Efficiency:* The marketing efficiency indices were calculated for both Acharya's method and modified method (Table 6). For comparing the marketing efficiency of alternate channels, it must be recognised that the time, place and form of commodity at the beginning and end of the channel should be the same (Acharya and Agarwal, 2001). In the present case, field sale and local market channels can only be compared for examining the efficiency. The market efficiency is higher in the field

sale channel mainly due to lower marketing costs and higher net price realised by the farmers in both methods of estimation. However, by including the marketing loss in the equation, the market efficiency is reduced. This recognises the fact that physical loss is also one of the important factors in deciding the efficiency and the relationship is also found to be inverse, i.e., higher the marketing loss, lower is the efficiency.

On the other hand, an examination of lower marketing efficiency index of the distant market, though not comparable, it should not be interpreted as inefficiency in the marketing process. The index is low because of higher marketing costs and margins even though the farmers have realised highest net price in this channel. A number of other factors especially the place of production determines the marketing costs and margins as it happens in the present case. Thus, higher marketing cost in general is not a reflection of the inefficiency of the marketing system and similar views were also expressed in many studies (Kohls, 1958; Dantwala, 1957).

IV

SUMMARY AND POLICY IMPLICATIONS

Post-harvest loss assessment in marketing and the methods of estimation are important areas of research in post-harvest management. A study was taken up in Karnataka on grapes and the modified formulae are suggested to include marketing loss in the estimation procedures of marketing margins and efficiency. Based on the results presented, the following conclusions and policy implications are drawn.

1. Field sale channel is the major marketing practice of grapes in Karnataka and farmers realised higher net price compared to the local market sale. However, it is also demonstrated by some farmers that the net price could be increased by Rs. 5.60/kg by marketing grapes in the distant markets like Bangalore. This calls for co-ordination of procurement process and supplying the same in the consumption centre as individual marketing is quite strenuous and requires determined efforts. Though a farmer's marketing co-operative society exists in Bijapur, it restricted its operation more to input marketing. There is a need either to strengthen the existing co-operative society for grape marketing or establishment of mobile procurement units by the Government organisations during peak seasons or supply the same in consumption centres. Like the Horticultural Produce Co-operative Marketing Society (HOPCOMS), Bangalore, which is doing a similar operation for banana and vegetables in southern Karnataka, it may be tried for fruit crops in this region as many fruits grown in this region are marketed in Bangalore.

2. The aggregate post harvest loss in grapes ranges from 14.4 per cent in the local market sale to 21.3 per cent in distant market sale. Improper packing and transportation are the major causes of post-harvest loss and efforts should be initiated to reduce the loss by developing efficient packing material to reduce injury to the berries during transportation. In addition, it is also important to develop appropriate cushioning material to absorb the shocks and reduce the detachments of berries

during transportation. Standard pre-harvest practices and harvest methods need to be developed and given to the farmers to reduce the loss at field level.

3. Market intermediaries especially the wholesalers are actively involved in procuring grapes directly from the farm gate and supplying to distant markets, as there is a substantial profit margin. Mobile procurement units either by the farmers' co-operative societies or the Government organisations would bring down price spread and benefit for both the producers and consumers. In addition, this process could also reduce the post-harvest loss due to specialised transport vehicles and less number of handling of produce.

4. By including marketing loss, which so far has been ignored in the estimating procedures of marketing margins and efficiency, it is found that the existing methods have unduly over- stated the farmers' net price and marketing margins of intermediaries. Further, it is demonstrated that the marketing loss is inversely proportional to the marketing efficiency. It is appropriate to use the correct measure of estimation for calculating the marketing margins and market efficiency.

NOTES

1. $\text{MME} = \dfrac{\text{FP}}{\text{MC} + \text{MM}}$, the definitions of FP, MC and MM are as same in equations 1,4 and 5.

2. Fresh grapes are dipped in a mixture of potassium carbonate (2.5 kg/100 lts) and ethyl olate (Australian dipping oil- 1.25 lts/100 lts) solution for about five minutes and spread on a net specially made for this purpose. Same solution is sprayed three times, viz., 3, 6 and 9 days with varied level of concentration. On the 12th day raisins are machine graded based on size into Grade-I, Grade-II and Grade-III. Further, manual sorting is done for uniform colour and better quality.

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