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Journal of Stored Products and Postharvest Research

Full Length Research Paper

Micro level investigation of marketing and post harvest losses of tomato in Coimbatore district of Tamilnadu

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Most vegetables are perishable in nature, and in that post harvest losses and distribution channel plays a vital role in price fixation of vegetables, especially in tomato which is sensitive to much environment-genetic interaction disorders which may be manifested during post harvest ripening or post harvest inspection. A substantial quantity of production is subjected to post-harvest losses at various stages of its marketing. The quantum of loss is governed by factors like perishable nature, method of harvesting and packaging, transportation, etc. Tomato being a third most cultivated crop, the post-harvest losses is significant in terms of quantity and economic value. This study undertaken in Coimbatore on tomato has suggested marketing loss in the estimation of marketing margins, price spread and efficiency and has used a modified formula for it. It has been observed that a majority of tomato producers sell their produce to the wholesalers facilitated by commission agents at different stages. The aggregate post-harvest losses from farm gate to consumers in tomato ranges from 13 to 26%. It has indicated the necessity of reducing the market intermediaries, for minimizing post-harvest losses and providing remunerative price to the producers. The results have emphasized that efforts should be made to adopt improved packaging techniques, cushioning material at the farm level. The producer's share in consumer's price as estimated by old method has been found higher and the inclusion of marketing loss in the estimation of marketing margins, price spread and efficiency has indicated that the old estimation method unduly over-states the farmers' net price and profit margins to the market middlemen. It is appropriate to use modified method for the estimation of marketing margins and price spread.

Key words: Post harvest loss, price spread, consumer price, marketing margin, marketing loss, marketing efficiency.

INTRODUCTION

Tomato is a major vegetable crop that has achieved tremendous popularity over the last century. Tomato is grown in an area of 8.65 lakh hectares with an average production of 168.26 lakh tones in India (NHB, 2012) and

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in Tamilnadu majority of the Tomato growers are from Coimbatore, Salem, Dindugal district (Tamil Nadu Agricultural Department). Tomato, aside from being tasty, promotes healthy nutritional balance as it is a good source of vitamins A and C. Tomato is also an excellent source of Lycopene (a very powerful antioxidant) that helps to prevent development of many forms of cancer. Tomatoes are sensitive to much production and environment-genetic interaction disorders which may be manifested during post harvest ripening or post harvest inspection (Kumar, 2010). A substantial quantity of production is subjected to post-harvest losses at various stages of its marketing (Kishore et al., 2006). The quantum of loss is governed by factors like perishable nature, method of harvesting and packaging, transportation, etc. Tomato being a third most cultivated crop (NHB, 2012), the post-harvest losses is significant in terms of quantity and economic value. Keeping this in view, the post-harvest losses of tomato have been estimated in both physical and value terms at different stages during transportation and marketing by using plastic crates as packaging materials. Further, the impact of post-harvest losses on producer's share, marketing margins, price spread and marketing efficiency in different markets has been studied. The specific objectives of this study were: (1) To identify major channels in marketing of tomato in Coimbatore District; (2) To identify the variety preferred in the study area; (3) To analyze the nature of seasonal price fluctuation in tomato; (4) To estimate the price spread of tomato marketing; (5) To study the post harvest losses at various stages of handling in tomato, and (6) To explore the scope for introducing the post harvest technology practices, largely to reduce wastages.

METHODOLOGY

Sampling procedure

Tamilnadu was purposively selected, as it is one of the major producers of tomato in India. In Tamilnadu, the Coimbatore district was selected because of its maximum contribution to the total state production. In Coimbatore District, Pollachi, Kinathukadavu, Madukkarai, Anaimalai blocks were selected based on the area of production and marketing. Then five villages from each block were selected randomly. From each block, thirty tomato growers were randomly selected. Thus, a total of 120 tomato growers were selected randomly, in the entire population 30 commission agents, 30 wholesalers and 30 retailers were covered in the study area. The market functionaries are selected from the vegetable markets such as Pollachi, Kindathukadavu and Anaimalai. The data related to production and marketing practices, post-harvest losses, price received and returns from produce, during the year of 2011 to 2012 were collected through personal interview with the help of survey schedule.

Analytical techniques

Simple averages and percentages were used to calculate the post-harvest losses at different stages of tomato marketing, marketing margins, costs and losses. In this study, post-harvest losses were measured at different stages. The modified formulae used for estimating the post-harvest losses during tomato marketing are given below.

Producer's net price

The net price realized by the tomato grower was estimated as the difference in gross price received by him and the sum of marketing costs incurred and economic value of fruits loss during harvesting, grading, transit and marketing (George, 1972). Thus, producer's net price may be explained mathematically as:

$$NPG = GPG – \{CG + (LG \times GPG)\}$$

Where, NPG is the net price received by the tomato growers (Rs/tonnes); GPG is the gross price received by tomato growers or wholesale price to Traders (Rs/tonnes); CG is the cost incurred by the producers during marketing (Rs/tonnes), and LG is the physical loss in fruits from farm to market (per tonnes).

Marketing margins

The margins of market middlemen include profit, which accrue for trading facility provided and market establishment after adjusting the marketing loss during handling and transit (Gajanana, 2002). The expression for estimating the margins for middlemen is:

Middlemen = Gross price – Price paid – Cost of – Loss in value during marketing transit/wholesaling.

Net marketing margin of the wholesaler is given mathematically as:

$$MMW = GPW – GPG – CW – (LW \times GPW)$$

Where, MMW is the net margin of the wholesaler (Rs/kg); GPW is the wholesaler's gross price to retailers or purchase price of retailer (Rs/kg); CW is the cost incurred by the wholesaler during marketing (Rs/kg), and LW is the physical quantitative loss in produce at wholesaler's level (per kg).
As said by Chandra (1994), mathematically, the net marketing margin to the retailer is given as:

$$MMR = GPR – GPW – CR – (LR \times GPR)$$

Where, MMR is the net margin of the retailer (Rs/kg); GPR is the price at the retail market or purchase price of consumers (Rs/kg); CR is the cost incurred by the retailer during marketing (Rs/kg), and LR is the physical loss in produce at the retailer level (per kg).
The total margins for the market middlemen (MM) are calculated as:

$$MM = MMW + MMR$$

Similarly, the total marketing cost (MC) incurred by the producer/ traders and various middlemen is calculated as:

$$MC = CF + CW + CR$$

The total value loss due to damage during handling of fruits from farm till reaching the ultimate consumers is estimated as:

$$ML = \{LG \times GPG\} + \{LW \times GPW\} + \{LR \times GPR\}$$

Marketing efficiency

The conventional methods, Shepherd's method

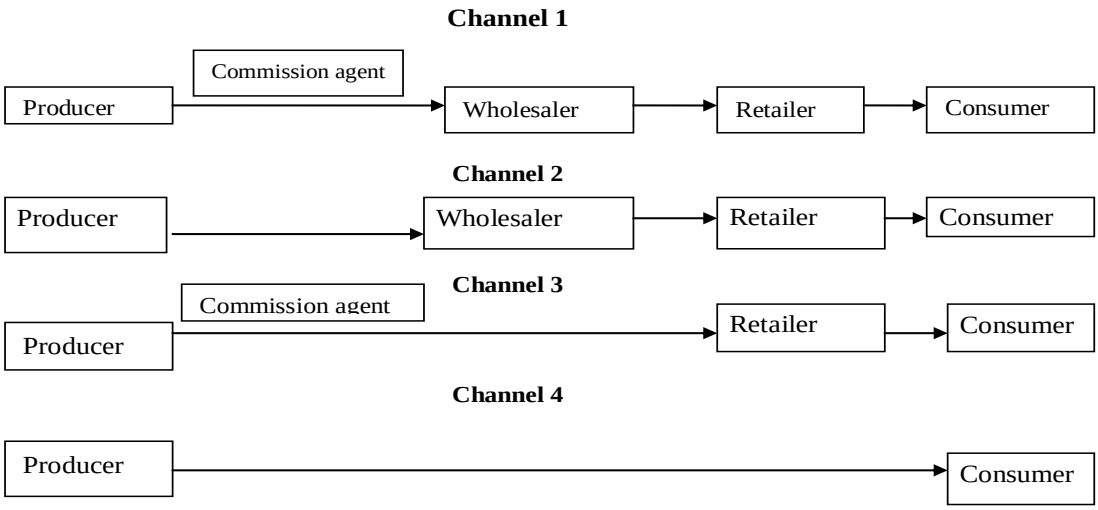

Figure 1. Distribution channels in tomato marketing in Coimbatore.

(Shepherd, 1965) and Acharya's modified formula (Acharya and Agrawal, 2001) do not mention the loss in produce during marketing process as a separate item. However, reduction due to post-harvest losses is one of the efficiency parameters. Therefore, it is pivot to incorporate the loss component explicitly in the existing marketing ratios to get the correct measures of marketing efficiency while comparing the market channels. The post-harvest loss/marketing loss component was incorporated in the formula given by Acharya and Agrawal (2001) and the modified marketing efficiency (ME) was measured as:

$$ME = \frac{NPG}{MM + MC + ML}$$

RESULTS AND DISCUSSION

Marketing practices and distribution channels

As said by Sreenivasa et al. (2002), the main factor which plays the key role in decision-making of the growers is the price offered by the traders during harvesting season. The producer selling wholesaler is a common marketing practice in the area. The tomatoes are marketed locally in plastic crates, gunny bags, bamboo basket, and wooden box or loose. For distant markets, plastic crates of 15-kg capacity are used by the traders. It was observed that some tomato growers sell the produce directly to the consumers. It was found that tomato producers in Coimbatore follow several marketing channels, as given in Figure 1.

Variety preference

Lakshmi (NP5005) is the most preferred variety in Coimbatore as 60% of the tomato growers go for this variety which is followed by US3140 and Red ruby. The reason for preferring NP5005 variety is as follows:

1. The fruits are round, pale green when unripe and capsicum red when fully ripe.
2. The fruits are uniform ripening, very firm, and the ripened fruits store well on the vine.
3. It has very good transport and keeping quality, 8-10 days at room temperature amongst the round-fruited varieties.

Seasonal index

To analyze the seasonal price fluctuation in tomato seasonal index is constructed using average percentage method as: (Season average/over time price average)*100

Seasonal price fluctuation in tomato

Seasonal index (Cundiff and Still, 1968) calculated for five years taking the farmer's market price of tomato shows that the tomato prices were least in the months of March and February shown in Table 1. Tomato market in Tamilnadu is highly affected by the arrivals from Karnataka and Andhra Pradesh in these months as it is a peak season in Karnataka. The prices were high in the month of May, June, July, November and December. Prices were high in these months as sowing takes up in Coimbatore during June and July month and the tomato

Table 1. Seasonal price fluctuation in tomato in Coimbatore District of Tamilnadu.

Month	Seasonal index
January	96
February	66
March	62
April	75
May	122
June	130
July	105
August	75
September	97
October	94
November	152
December	126

availability in the month of November and December is scarce as it is rainy season. In November prices where 52% higher than base prices in which producer can receive best price.

Post-harvest loss in tomato

At farm level

The post-harvest loss due to harvesting injuries due to pest and disease infection, physiological damage, mechanical damage of tomato fruits were worked out to be 6 to 7% (Table 2). Also the loss during the transit is calculated around 5 to 6%. All the thrown away or discarded fruits at the farm were treated as post-harvest loss. These fruits were neither marketed nor consumed in any form the grower has to bear this post-harvest loss, irrespective of the marketing channel. Since sorting, grading and packaging is the first function to be performed in the marketing process, any loss during this process is considered as post-harvest loss. It is more appropriate in the perishable commodities like tomato, as the entire production is marketable surplus.

At wholesale level

Tomato fruits were packed in different packaging materials such as plastic crates and wooden boxes. The plastic crates and wooden boxes having capacity of 15 kg were used for transportation of fruits to medium- and long-distant markets. Tomato fruits are transported from the study area to distant markets such as Kerala, Chennai and Bangalore, by trucks. The loss in tomato fruits during transportation and wholesalers' level was 6% (Table 2), largely due to bad transportation practices, improper packaging materials, lack of infrastructure facilities, and lack of cold storage and environment conditions.

At retail level

The losses at retailer's level are estimated to be 8%. The main cause of loss in market was the damage due to press/ bumped and physical injury, which accounted for 50%. The discarded tomato fruits fetched no economic value to the retailers. These were eaten by stray animals or thrown away by the retailers. The aggregate post-harvest loss from production to consumption level in ranged from 13 to 26%. The results revealed that the efforts should be made to adopt improved packaging techniques, cushioning material and cold storage facilities at the retailers' level.

Costs, margins, losses and strategies for tomato marketing

The results obtained through new and old methods in the three marketing practices and their implications have been given in Table 3.

Marketing costs

The marketing cost of tomato was estimated to be Rs. 5.81 / kg in channel 1, Rs.4.19 / kg in channel 2, Rs.4.05 / kg in channel 3 and Rs.1 /kg in channel 4. The cost of collecting, sorting, grading packaging, plastic crates, commission and marketing fee were the major components of the marketing cost. The marketing cost is higher in marketing channel 1 as it involves too many market intermediaries. It is evident from Table 3 that the wholesaler had incurred less cost on marketing compared to producer and retailer in all the channels. Thus the overall post harvest loss of produce is less in channel 4, when compared to channel 1, 2 and 3.

Table 2. Aggregate post-harvest loss in tomato produced in Coimbatore district of Tamilnadu.

Particulars	Channel 1 Qty (kg/Qtl)	Channel 2 Qty (kg/ Qtl)	Channel 3 Qty (kg/ Qtl)	Channel 4 Qty (kg/ Qtl)
Farm level				
Collection	3.15	3.17	3.38	3.18
Sorting	2.00	2.52	2.75	2.57
Packaging	1.70	1.87	1.43	1.95
Transportation	2.60	2.50	2.86	3.10
Unloading	2.75	2.69	2.00	1.49
Customer handling				1.58
Subtotal	**12.20**	**12.75**	**12.42**	**13.87**
Wholesaler level				
Repacking	2.50	1.30	-	-
Sorting	-	2.00	-	-
Loading	1.00	-	-	-
Unloading	0.50	-	-	-
Transportation	2.10	-	-	-
Subtotal	**6.10**	**3.33**	-	-
Retailer level				
Repacking	2.00	1.50	1.43	-
Sorting	2.00	2.00	2.50	-
Unloading	1.00	1.60	1.00	-
Transportation	1.46	1.90	2.20	-
Customer handling	1.50	1.30	0.50	-
Subtotal	7.96	8.30	7.63	-
Grand Total	26.26	24.38	20.05	13.87

Table 3. Impact of post-harvest loss on producer's share, marketing costs and Margins in Tomato in Coimbatore District of Tamilnadu

Particulars	Channel 1			Channel 2			Channel 3			Channel 4		
	Old	**New**	**Differ. (%)**	**Old**	**New**	**Differ. (%)**	**Old**	**New**	**Differ. (%)**	**Old**	**New**	**Differ. (%)**
Producer's net price (Rs/kg)	5.94	4.98	16	6.8	5.84	14	6.9	5.82	16	9	7.77	14
Marketing cost (Rs./kg)												
Producer	2.06	-	-	1.20	-	-	2.10	-	-	1.00	-	-
Wholesaler	1.86	-	-	1.07	-	-	0	-	-	-	-	-
Retailer	1.89	-	-	1.92	-	-	1.95	-	-	-	-	-
Sub total	5.81	-	-	4.19	-	-	4.05	-	-	1.00	-	-
Profit margin (Rs/kg)												
Wholesaler	1.14	0.48	-	0.93	0.63	-	-	-	-	-	-	-
Retailer	1.11	0.13	-	2.08	0.96	-	2.05	1.14	-	-	-	-
Sub total	2.25	0.61	73	3.01	1.59	47	2.05	1.14	44	-	-	-
Marketing loss (Rs/kg)												
Marketing loss (Rs/kg)	2.74	-	-	2.41		-	1.99		-	1.3		-
Consumer price (Rs./kg)	14	14	-	14	14	-	13	13	-	10	10	-
Marketing efficiency (Rs./Kg)	0.73	0.55	-	0.94	0.71	-	1.13	0.81	-	9	3.37	-
Price spread (Rs./kg)	**8.06**	**9.02**	**-**	**7.2**	**8.16**	**-**	**6.1**	**7.18**	**-**	**1**	**2.23**	**-**

Table 4. Economics of packaging material.

Particulars	Wooden box	Bamboo basket	Plastic crates
Cost (Rs/box)	25	60	120
Capacity (kg)	15	10	20
Cost (Rs/qtl)	175	600	720
Durability (year)	1	2.5	5
Post harvest loss (Rs/qtl)	80	24	4
Labour requirement (Rs/qtl)	360	120	
Subtotal (Rs/qtl)	440	144	4
Replacement cost (Rs/qtl)	140	500	-
Total cost (Rs/qtl)	**755**	**1244**	**724**

Marketing loss

Marketing loss was calculated at different stages of marketing along with the functionaries who had actually incurred the loss with relevant prices. The total marketing loss due to discarded fruits in channel 1 amounted to Rs.2.74 / kg. The retailer had accounted for 38% of the loss (Re 0.98/ kg), which was higher than that of producers' (36%) and wholesalers' (37.69%) share. The pattern of sharing of marketing loss in channel 2 was similar to that in the market channel 1, with retailer accounting for Rs 1.12/ kg (46%) of market loss. The marketing loss in channel 3 is Rs.1.99/kg in which the producer has major share of 54% (Rs.1.08/kg). Marketing loss in channel 4 is minimum with Rs1.3/kg which constitute 13% of consumer's price.

Profit margins

The producer's net price as calculated was highest when they sold tomato in the farmers market. The tomato producers could reap a substantially higher net price of Rs.9 / kg in the channel 4 as compared to Rs.5.94/ kg in the channel 1 and Rs 5.94/ kg which is least comparatively. When marketing loss was taken into account for the estimation of profit margins of different marketing intermediaries, which was more relevant, it was found that the old estimation method had overestimated the profit margins. The impact of inclusion of marketing loss in estimation of wholesalers' and retailers' margins considerably reduced middlemen margin by 72%. Hence, it was concluded that by excluding one of the prime components in the marketing process, viz. post harvest loss, the profit margins of different market intermediaries were unduly over-estimated.

Price spread

The price spread in tomato was found to range from Rs 8.06 per kg in channel 1 to Rs 1.00 per kg in the channel 4 in the conventional method. The main component of price spread was marketing cost, which accounted for 72% in channel 1. The impact of post harvest loss increases the price spread in channel 1, by 12%, channel 2 by 13%, channel 3 by 17% and channel 4 by 23%.

Marketing efficiency

The marketing efficiency was found higher in farmers market compare to other channels, primarily because of lower marketing costs and higher price realized by the tomato producers in both the methods of estimation. However, by inclusion of marketing loss in the equation, the marketing efficiency declined. It revealed the fact that post harvest loss was also one of the pivot factors in deciding the marketing efficiency and the relationship was found inverse, that is, 'the higher the post-harvest loss, the lower will be the efficiency'. The marketing efficiency index was low in channel 1 because of higher marketing costs and profit margins to the middlemen. Better efficiency could be achieved by reducing the cost of marketing particularly the commission charges, and marketing losses. By providing viable alternate markets, the farmer's net share could be increased.

Packaging material

The additional cost incurred by farmer for purchasing plastic crates from wooden box is Rs.545 and for replacing bamboo basket it is Rs.180/qtl respectively (Table 4). Additional cost incurred in wooden box, is RS.440, bamboo basket is Rs.144, and plastic crate is Rs.4. The plastic crates incur minimum cost and by using plastic crates instead of bamboo basket the farmer can save Rs.520/quintal. The replacement cost incurred for replacing wooden box and bamboo basket are Rs.140 and Rs.500, respectively for one year, which is not incurred in plastic crates. Wooden box is found to be economical than bamboo basket but still it is not used by

farmers widely due to the handling inflexibility. Thus plastic crates are found to be economical and the farmers should be encouraged to use plastic crates.

Conclusion

This study undertaken in Coimbatore on tomato has suggested including the marketing loss in the estimation of marketing margins, price spread and efficiency. Conventional wholesale marketing was prevalent in tomato. The post harvest loss was found to be high in marketing channel which involves more intermediaries. Post harvest loses of tomato in each marketing channel was due to lack of storage facilities and improper handling. The overall post harvest losses were estimated to 26% of tomato. Since the tomato is a highly perishable crop and improper handling of produce the post harvest loss is high. Marketing efficiency is high, when the farmer sells his product directly to the consumer which benefits both the producer and the consumer. Necessary steps should be taken by the government to sell the farmers produce directly to the consumer which proportionately raises the farm income level. It is concluded that the marketing loss is inversely proportional to the marketing efficiency. Plastic crates are found to be best packaging material as it incurs minimum loss.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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