

**ECONOMIC ANALYSIS OF POST-HARVEST LOSSES IN MARKETING OF
MAJOR VEGETABLES IN ALLAHABAD DISTRICT OF UTTAR PRADESH**

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ABSTRACT

The study has examined the nature and extent of post-harvest losses of major vegetables supply chain in Allahabad district of Uttar Pradesh. Multistage cluster sampling has been used for selection of 120 major vegetable growers. Of the total 60 farmers from the Trans-Yamuna region and 60 farmers from the Trans – Ganga region were selected for the study. The sample has also included 18 market functionaries. Although many kinds of vegetables grown in the district but only ten major grown vegetables were selected for the purpose. The aggregate maximum post-harvest losses was found in tomato, followed by okra, onion, cabbage, chilly, cauliflower, brinjal pumpkin and potato.

KEYWORDS: Post-harvest losses, Trans Yamuna, Trans –Ganga, Vegetable supply chain, Tomato, Potato, Brinjal, Chilly, onion, Cauliflower, Cabbage.

INTRODUCTION

India is the second largest vegetables producing country after China. India produces 14 % (146.55 million tonnes) of world's vegetables on 15 % (8.5 million hectares) of world area under vegetables. Productivity of vegetables in India (17.3t/ha) is less than the world average productivity (18.8t/ha). Major vegetable producing countries of the world during 2010-2011 were: China [473.06 million t (48% world production)]; India [146.55 million t (14% world production)]; USA [35.29 million t (3% world production)]; Turkey [25.83 million t (2.2% world production)]; and Egypt [19.51 million t (2% world production)].

The growing importance of vegetables in India's economy can be well appreciated in terms of their rising domestic demand on account of increase in population and per capita income; their increasing export potential; need for providing employment opportunities in the rural area, and vegetables being relatively more remunerative crops. While domestic and export demand is

steadily rising, the production and marketing of vegetables face tremendous uncertainties on several counts. The production of most of the vegetables is seasonal and highly localized in favour of agro-climatic conditions in the country. The extremely perishable nature of vegetables results in inability on the part of producer to manage supply in the assembling markets. Further, the large distances that separate the production area and the sub-optimal post-harvest technology management (including the method of picking/plucking/digging/harvesting, grading, packing, storing and transporting), a large proportion of vegetables is lost or spoiled at various stages of post-harvest activities. Verma and Singh (2004), found that the overall losses in vegetables was up to 25 per cent of total production. Severe losses occur because of poor transportation facilities, lack of know-how, poor management and improper market facilities or due to careless handling of the produce by farmers, market intermediaries and consumers (Singh *et al.*, 2008). The study by Hazarika *et al.*, 2008 had revealed that well managed post-harvest activities for vegetables led to higher yields and profits to producers. It is therefore, important that the post-harvest practices be given as much attention as production practices. The Allahabad offers enormous opportunities to practice vegetable crops as it has several inherent and unique advantages in terms of agro-climatic conditions and rich biodiversity. However, local varieties, rainfed production, improper input-mix and traditional practices characterize the present status of agricultural technology in the district. The vegetables are grown in almost every Tehsil of the district without any organized back up of post-harvest management techniques like packaging, storage, transport and marketing. The district also suffers from poor infrastructure, poor accessibility to technology, lack of irrigation infrastructure, incidence of small and fragmented land holdings and low investment capacity of farmers. All this lead to low productivity and high spoilage of vegetables. Therefore, keeping all these problems into consideration, a study on post-harvest losses of vegetables was undertaken.

Methodology

The present study was conducted in the Allahabad district of Uttar Pradesh. For the study of whole scenario of the district. It was divided into two part first is Trans – Ganga region and second is Trans – Yamuna region. Since both the region is vast potential for production, marketing and interstate trading of vegetables, therefore this district was purposively selected. Selection of major vegetable growers and market functionaries multistage cluster sampling was used. At the first stage, two principal vegetable markets one in each region,

namely Shiv Garh and Jasara based on maximum annual arrival of vegetables was selected respectively. At the second stage, eight primary markets out of four were selected in Trans – Ganga and rest four was in Trans –Yamuna region. These markets in Trans –Ganga were: Shiv Garh, Phapha Mau, Mau Aima, Sahsaon and in Trans – Yamuna markets namely Jasara, Jari, Sirsa and Koraon were selected purposely. Besides two primary markets Muredera and Jasra mandi Parishad in both areas were also selected purposively in consultation with officials for the secondary data. At the third stage, eight clusters of villages were selected. Of the total four villages from each primary markets (2 near the road and 2 at least 2-3 km away from the road) were selected purposively, considering the status of vegetable production. Keeping the geographical condition of the area, out of 8 clustered villages, four villages were selected from the Trans-Ganga region and other four villages from the Trans Yamuna region were selected. Finally, 10 farmers per cluster were randomly selected. Thus, the sample size was consisted of 80 vegetable growers, comprising 40 farmers from the Trans Ganga and 40 farmers from the Trans Yamuna region of the district.

Basically fifteen retailers were also selected. The sample of market functionaries of each category, viz. commission agents, wholesaler-cum- commission agents and retailers were also included. Ten wholesale-cum- commission agents were included in the sample. Five retailers each from secondary as well the two selected primary markets were taken for the purpose.

Several vegetable crops are cultivated in the Trans - Ganga in different seasons. For the present study, only major vegetables grown in the study area were considered. The selection of major vegetables was done on the basis of total annual production of different vegetables in the Allahabad district. Thus, Pumpkin, tomato, potato, cauliflower, cabbage, onion, chilly, , okra and brinjal were selected for the study. The study was based on the primary data collected from the selected farmers, wholesalers and retailers involved in the marketing using a pre-structured schedule by personal interview method. Data from the different agencies were collected during the year -2013-2014.

Tool of Analysis

In this study post-harvest losses of major vegetables have been estimated at different stages. The losses were estimated to find out which vegetable incurred the maximum loss, as

well as at which stage. Simple statistical techniques like averages and percentages were used in this purpose.

RESULTS AND DISCUSSION

The post-harvest losses were estimated at producer level to trader level. Yet the losses at producer level have been estimated at different stages like; harvesting, grading & packing, handling & transportation and marketing; whereas the losses at trader level have been estimated at loading-unloading, transportation, grading and selling stages. The findings of whole post – harvested losses of major vegetables were analyzed and the findings are depicted in the tables 1 to 5.

Post-harvest Losses of Major Vegetables

Perusal of Table -1 reveals that the sample vegetables varied in nature, from semi-perishables like potato, cauliflower, cabbage, onion to highly perishables like tomato. Therefore, the extent of losses varied from vegetable to vegetable as well as at different stages. On an average, the maximum loss was estimated in potato (45.08%), followed by onion (44.24%), chilly (40.77%), tomato (35.49%), cauliflower (24.68%), okra (19.14%), cabbage (12.11%), brinjal (8.89%), and pumpkin (2.11%) respectively.

On studying the losses at different stages, it was observed that heavy rain fall during the month of October and November caused losses of tomato, onion, potato, chilly, cauliflower, cabbage, brinjal and pumpkin, the maximum loss was at the harvesting stage.

Table: 1- Post-harvest losses of major vegetables on farmers in Trans-Ganga Region (in Quintals).

Vegetables	Total production	Stages				Total losses
		Harvesting	Grading & Packaging	Handling & Transportation	Marketing	
Potato	348.18	9.13 (31.78)	1.56 (5.43)	1.25 (4.35)	1.01 (3.52)	12.95 (45.08)
Tomato	68.12	12.48 (18.32)	6.16 (9.04)	3.41 (5.00)	2.13 (3.12)	14.18 (35.59)
Cauliflower	35.17	5.05 (14.36)	2.18 (6.19)	0.81 (2.30)	0.64 (1.82)	8.68 (24.68)
Cabbage	37.15	2.15 (5.78)	1.13 (3.05)	0.70 (1.89)	0.52 (1.92)	4.50 (12.41)
Onion	8.50	1.14 (13.41)	1.18 (13.88)	0.95 (11.18)	0.49 (5.76)	3.76 (44.24)
Brinjal	64.65	2.32 (3.59)	1.85 (2.86)	0.65 (1.00)	0.93 (1.44)	5.75 (8.89)
Okra	37.78	3.47 (9.18)	2.16 (5.72)	0.48 (1.27)	1.12 (2.96)	5.23 (19.14)
Pumpkin	120.13	1.19 (0.90)	0.80 (0.66)	0.32 (0.27)	0.23 (0.29)	2.54 (2.11)
Chilly	05.47	1.03 (18.33)	0.58 (10.60)	0.41 (7.49)	0.21 (3.84)	2.23 (40.77)

Note: Figures in parentheses represents percentage of the total production

Table: 2- Post-harvest losses of major vegetables on farmers in Trans-Yamuna region (in quintals)

Vegetables	Total production	Stages				Total losses
		Harvesting	Grading & Packaging	Handling & Transportation	Marketing	
Potato	276.45	8.41 (3.04)	3.14 (1.14)	1.12 (0.40)	0.56 (0.20)	13.26 (4.78)
Tomato	42.18	15.16 (35.94)	2.45 (5.80)	2.49 (5.90)	0.87 (2.06)	20.97 (49.72)
Cauliflower	70.62	1.49 (2.11)	0.56 (0.79)	0.71 (1.00)	0.18 (0.25)	2.94 (4.16)
Cabbage	68.94	1.17 (1.69)	0.67 (0.97)	0.24 (0.32)	0.16 (0.23)	2.24 (3.24)
Onion	50.12	2.50 (4.99)	1.95 (3.89)	1.16 (2.31)	0.23 (0.46)	5.84 (11.65)
Brinjal	38.23	1.81 (4.73)	2.28 (3.35)	1.24 (3.24)	0.48 (1.26)	4.81 (12.580)
Okra	65.13	2.35 (3.61)	1.43 (2.19)	0.96 (1.47)	0.43 (0.66)	5.17 (7.94)
Pumpkin	120.13	1.19 (0.90)	0.80 (0.66)	0.32 (0.27)	0.23 (0.29)	2.54 (2.11)
Chilly	3.98	0.94 (21.11)	0.12 (3.02)	0.42 (10.55)	0.30 (7.54)	1.68 (42.22)

Note: Figures in parentheses represents percentage of the total production

Table: 3- Over –All Post-harvest losses of major vegetables in farmers farm. (in quintals)

Vegetables	Total production	Stages				Total losses
		Harvesting	Grading & Packaging	Handling & Transportation	Marketing	
Potato	303.23	8.55 (2.82)	2.29 (0.75)	1.16 (0.38)	1.57 (0.53)	13.57 (4.48)
Tomato	53.80	13.48 (25.05)	4.20 (7.81)	2.87 (5.33)	3.00 (5.58)	23.55 (43.77)
Cauliflower	51.60	3.19 (6.18)	1.34 (2.59)	0.74 (1.43)	0.82 (1.59)	6.09 (11.80)
Cabbage	51.75	1.62 (3.13)	0.88 (1.70)	0.46 (0.89)	0.68 (1.31)	3.64 (7.03)
Onion	28.59	1.78 (6.23)	1.53 (5.35)	1.03 (3.60)	0.72 (2.52)	5.06 (17.69)
Brinjal	50.18	2.01 (4.00)	1.53 (3.04)	0.92 (1.83)	1.41 (2.81)	5.87 (11.69)
Okra	50.20	2.84 (5.66)	1.75 (3.49)	0.70 (1.39)	1.55 (3.09)	6.84 (13.63)
Pumpkin	30.12	1.08 (0.35)	0.75 (2.49)	0.81 (2.68)	0.92 (3.05)	24.13 (8.57)
Chilly	4.61	0.11 (2.38)	0.08 (1.74)	0.40 (8.68)	0.51 (11.06)	1.08 (23.42)

Note: Figures in parentheses represents percentage of the total production

Table: 4 - Post-harvest losses of major vegetables at retailer level. (in quintals)

Vegetables	Average Quantity Purchased	Stages				Total losses
		Harvesting	Grading & Packaging	Handling & Transportation	Marketing	
Potato	10.24	0.15 (1.46)	0.08 (0.78)	0.06 (0.59)	0.7 (6.68)	0.36 (3.52)
Tomato	5.56	0.22 (3.95)	0.95 (17.08)	0.18 (3.24)	0.05 (0.89)	1.38 (24.83)
Cauliflower	1.24	0.13 (10.48)	0.08 (6.450)	0.03 (2.42)	0.02 (1.61)	0.26 (20.96)
Cabbage	1.32	0.12 (9.09)	0.10 (7.57)	0.04 (3.03)	0.01 (0.75)	0.27 (20.45)
Onion	2.48	0.03 (1.21)	0.07 (2.82)	0.08 (3.23)	0.09 (3.63)	0.27 (10.88)
Brinjal	1.85	0.14 (7.56)	0.05 (2.70)	0.12 (6.48)	0.10 (5.51)	0.41 (22.16)
Okra	1.49	0.09 (6.04)	0.05 (3.36)	0.02 (1.34)	0.07 (4.690)	0.23 (15.44)
Pumpkin	1.38	0.04 (2.89)	0.03 (2.17)	0.01 (0.72)	0.02 (1.45)	0.10 (7.24)
Chilly	0.85	0.01 (1.17)	0.04 (4.70)	0.08 (9.41)	0.06 (7.06)	0.19 (22.35)

Note: Figures in parentheses represents percentage of the total production

Table: 5 – Total Post-harvest losses of major vegetables during marketing.

Vegetables	Quantity Purchased	Losses during marketing			Total
		Grower	Wholesaler	Retailer	
Potato	13.57	4.48	2.35	3.52	10.35
Tomato	23.55	18.77	1.54	9.83	30.14
Cauliflower	6.09	11.80	2.05	2.96	16.81
Cabbage	3.64	7.03	0.09	20.45	27.57
Onion	5.06	17.69	1.02	10.88	29.59
Brinjal	5.87	11.69	0.80	8.16	20.65
Okra	6.84	13.63	1.03	15.44	30.10
Pumpkin	7.32	5.41	0.06	7.24	12.71
Chilly	1.08	13.42	0.03	10.35	23.80

Note: Figures in Per cent

Post-harvest Losses on Trans Yamuna Region

The result of post-harvest losses in vegetables on the Trans Ganga farms, presented in Table 2, reveal that maximum loss was in tomato (49.72%), followed by chilly (42.22) brinjal (12.58%) onion (11.65%) okra (7.94%) potato(4.78) cauliflower (4.16%) and cabbage (3.24%) respectively. It exposed that tomato and chilly registered highest losses at the harvesting stage, while maximum loss was recorded at the handling & transportation stage. The remaining vegetables, viz. brinjal and cauliflower registered maximum loss at the grading & packaging stage.

Post-harvest Losses on Overall Sample Farms

It revealed from the Table 3 that the overall scenario of post- harvest losses of major vegetables at different stages on sample farms. The maximum post- harvest loss of 43.77 per cent was found in tomato, followed by chilly (23.42%), onion (17.69%), okra (13.67%), cauliflower (11.80%), brinjal (11.69%), cabbage (7.03%) and potato (4.48%) respectively. However, the tomato and chilly registered maximum losses at the harvesting and marketing, while tomato and okra had maximum losses during the harvesting stage.

Post-harvest Losses of Vegetables at Trader Level

The post-harvest losses at the wholesale and retail levels have been discussed. The wholesale transactions in vegetables were being performed from early morning till around 11 am every day. The wholesaler-cum-commission agents were found not taking title in the case of green vegetables in the study area, except in potato and onion. The functionaries informed that they lost up to 10 per cent in potato and 7 per cent in onion during storage and about half of the quantity was sold without storing for a long period. Therefore, the half of these losses, viz. 5 per cent and 3.5 per cent were considered the losses at wholesale level for potato and onion, respectively. The losses at retail level were also worked out as depicted in table -4. It was found that the maximum losses was registered tomato (24.83%), followed by chilly (22.35%), brinjal (22.16%), cauliflower (20.96%), okra (15.44%), pumpkin (9.14%) and potato (3.52%) respectively. As far as losses different stages were concerned, the maximum losses were estimated during the loading and unloading of tomato. The maximum loss during selling stage was registered in chilly.

Post-harvest Losses of Vegetables in Marketing

The aggregate post-harvest losses in sample vegetables were calculated by adding together the losses at producer level, wholesale level and retail level as absorbed in table- 5. It revealed that post-harvest losses were maximum in tomato (30.14%) and minimum in potato (10.35%). Hazarika (2006) observed in their study that maximum post- harvest losses were observed in tomato. The okra ranked second in the list recording 30.10 per cent loss, followed by onion (29.59%), cabbage (27.57%), brinjal (20.65%), cauliflower (16.81%), pumpkin (12.71%), and potato (10.35%) respectively. It was critically examined from the different levels; it was found that the losses were maximum at the grower level in all the vegetables, except pumpkin as obtained by Gajanana *et al.* (2006) and Kumar *et al.* (2006).

Conclusions and Policy Implications

The study has estimated post-harvest losses in major vegetables grown in Allahabad district. At producer level, the post-harvest losses have been found maximum in tomato (18.77%) followed by onion (17.69%), okra (13.63%), chilly (13.42%), cauliflower (11.80%), brinjal (11.69%), pumpkin (5.41%) respectively and minimum in potato (4.48%). At the retail level also, tomato has registered maximum loss, followed by okra, chilly and pumpkin. It was also observed that major losses have been found at the grower level in all the vegetables, except

pumpkin. This loss of vegetables at the grower level results from lack of his knowledge about proper post-harvest management. Improper grading, packing, lack of storage and inadequate transportation facilities contribute more to the problem. One of the most important causes of post-harvest losses is harvest at inappropriate maturity, resulting in erratic ripening and poor quality. Therefore, there is an urgent need of training the vegetable growers on scientific post-harvest techniques, if the vegetable production is to be sustained on a profitable basis in the region.

This study suggested that possible solution to tackle the problems could be the establishment of producer co-operatives to switch various activities in relation to production and marketing of major vegetables. It will not only help to reduce the post-harvest losses but also will increase the negotiating power of producers in marketing.

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