

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 6; June 2026; Page No. 264-269

Received: 12-03-2026
Accepted: 15-04-2026

Indexed Journal
Peer Reviewed Journal

Study on post harvest losses and marketing of green chilli in Prayagraj district Uttar Pradesh

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i6d.3691>

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Abstract

The present study entitled “Post-Harvest Losses and Marketing of Green Chilli in Prayagraj District, Uttar Pradesh” was conducted to analyze the marketing system, post-harvest losses, and efficiency of green chilli marketing in the study area. The study also examined socio-economic characteristics of farmers, marketing channels, marketing costs, price spread, producer's share in consumer's rupee, marketing efficiency, and the major constraints faced by green chilli growers. A multistage sampling design was adopted, and primary data were collected from 100 randomly selected green chilli growers along with relevant market intermediaries. Secondary data were obtained from government reports, agricultural departments, and published literature. The collected data were analyzed using statistical tools such as averages, percentages, ratios, price spread analysis, and marketing efficiency measures. The findings revealed that most farmers belonged to the small and marginal category, with an average family size of 6.72 members and moderate educational status, mainly up to secondary level. Agriculture was the primary occupation, though farmers also engaged in allied activities for income diversification. Three marketing channels were identified, namely Producer → Consumer, Producer → Retailer → Consumer, and Producer → Wholesaler → Retailer → Consumer. Among these, Channel II was the most commonly used, while Channel I proved to be the most efficient in terms of lower marketing cost and higher producer's share. The analysis showed that marketing cost and price spread increased with the number of intermediaries. Producer's share in consumer's rupee was highest in Channel I (93.94%) and lowest in Channel III (68.75%). Similarly, marketing efficiency was highest in Channel I (22.75) and lowest in Channel III (9.13). Post-harvest losses were found to be higher among marginal farmers due to poor storage, handling practices, and inadequate infrastructure. Major constraints identified included price fluctuations, high transportation costs, lack of cold storage facilities, middlemen exploitation, and insufficient market information. The study concludes that strengthening infrastructure, promoting direct marketing, improving post-harvest management, and enhancing access to market information can significantly reduce losses and improve farmers' income in the study area.

Keywords: Green chilli, post-harvest losses, marketing channels, price spread, marketing efficiency, Prayagraj district, farmers income

Introduction

Green chilli is one of the most important commercial vegetable and spice crops cultivated in India and plays a significant role in the agricultural economy due to its widespread consumption, high market demand, and income-generating potential. It is widely used in Indian cuisine as a flavoring and seasoning ingredient and is valued for its pungency, color, aroma, and nutritional properties. Green chilli is a rich source of vitamins A, C, and E, minerals, antioxidants, and various bioactive compounds that contribute to human health. In recent years, the cultivation of green chilli has gained considerable importance among farmers because of its profitability, short crop duration, and increasing demand in domestic as well as export markets. India is one of the largest producers and consumers of chillies in the world, with major producing states including Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh,

Uttar Pradesh, and Tamil Nadu. Apart from fresh consumption, green chillies are processed into various products such as dried chilli, chilli powder, pickles, sauces, and oleoresins, creating additional marketing opportunities. However, due to their perishable nature and susceptibility to physical damage, improper handling and inadequate post-harvest management often result in significant losses, affecting both producers and consumers. In Uttar Pradesh, green chilli cultivation has become an important component of vegetable production and farm income diversification. The crop is cultivated by a large number of small and marginal farmers because of its relatively low investment requirement and attractive market returns. Prayagraj district possesses favorable agro-climatic conditions for green chilli cultivation, including suitable soil, irrigation facilities, and access to local and regional markets. The growing urban population, increasing consumption of vegetables and

spices, and expanding market networks have encouraged farmers in the district to undertake green chilli cultivation on a commercial scale. The produce is supplied to local vegetable markets, wholesalers, retailers, processing units, hotels, restaurants, and nearby urban centers. Despite the increasing demand and production potential, farmers face several challenges related to post-harvest handling and marketing. Significant losses occur during harvesting, grading, packaging, storage, transportation, and marketing due to inadequate infrastructure, poor handling practices, lack of cold storage facilities, and market inefficiencies. These losses reduce farmers' income and adversely affect the overall efficiency of the supply chain. Post-harvest management is a crucial aspect of green chilli production because the crop is highly perishable and sensitive to environmental conditions. After harvesting, green chillies undergo rapid physiological and biochemical changes that lead to deterioration in quality, weight loss, shrinkage, and spoilage if not handled properly. Post-harvest losses may occur at different stages of the supply chain, including harvesting, collection, sorting, grading, packaging, storage, transportation, and retail marketing. Mechanical injuries, improper packaging, temperature fluctuations, microbial infestation, and delays in transportation are among the major causes of losses. Since green chillies are often marketed in fresh form, maintaining quality and freshness is essential for obtaining better prices and consumer acceptance. Therefore, efficient post-harvest practices and improved storage and transportation facilities are necessary to minimize losses and enhance market value. Marketing of green chilli involves a series of activities through which the produce moves from farmers to final consumers. These activities include harvesting, cleaning, grading, packaging, storage, transportation, and distribution through different marketing channels. The marketing system generally consists of producers, village traders, commission agents, wholesalers, retailers, processing units, and consumers. Green chillies are commonly packed in gunny bags, plastic crates, baskets, or cartons and transported to nearby markets for sale. Due to fluctuations in supply and demand, prices of green chillies often vary considerably across seasons and markets. Farmers frequently depend on intermediaries for marketing their produce because of limited access to market information, inadequate storage facilities, and lack of direct marketing opportunities. Understanding the structure and functioning of the green chilli marketing system is therefore essential for identifying inefficiencies and improving market performance. The present study entitled "Study on Post-Harvest Losses and Marketing of Green Chilli in Prayagraj District, Uttar Pradesh" aims to analyze the extent and causes of post-harvest losses occurring at different stages of the marketing chain and to examine the existing marketing system of green chilli in the study area. The study also focuses on the socio-economic characteristics of green chilli growers, including age, education, farming experience, landholding size, access to credit, training exposure, investment capacity, and income level. These factors significantly influence production practices, post-harvest management decisions, adoption of improved technologies, and market participation. Understanding these characteristics is important for identifying the constraints faced by farmers and designing suitable interventions to

improve efficiency and profitability. The study further examines the marketing channels, marketing costs, marketing margins, price spread, and marketing efficiency associated with green chilli marketing in Prayagraj district. It highlights major issues such as inadequate storage infrastructure, poor packaging methods, transportation difficulties, perishability of produce, market price fluctuations, lack of market information, and dependence on middlemen. The study also evaluates the role of wholesalers, commission agents, retailers, and other market intermediaries in the distribution process. By analyzing these aspects, the study seeks to identify the major sources of post-harvest losses and inefficiencies within the marketing system and to suggest suitable measures for reducing losses, improving storage and transportation facilities, strengthening market linkages, enhancing farmers' share in the consumer's rupee, increasing farm income, and promoting the sustainable development of green chilli cultivation in Prayagraj district, Uttar Pradesh.

Objectives

1. To study the socio-economic Profile of respondents in the study area.
2. To analyze the marketing channel involved in marketing of green chilli.
3. To calculate marketing cost marketing margin price spread, Producer's share in Consumer's rupee & marketing efficiency of green chilli.

Research Methodology

Sampling Design

For the present study titled "Study on Post-Harvest Losses and Marketing of Green Chilli in Prayagraj District, Uttar Pradesh", a multistage sampling design was adopted. Prayagraj district was selected purposively due to its significant green chilli cultivation and marketing activities. Blocks and villages were selected based on the concentration of green chilli production, and respondents were chosen through random sampling. Green chilli growers, wholesalers, retailers, traders, and consumers were selected as respondents. The study was conducted to analyze post-harvest losses, marketing channels, marketing costs, price spread, marketing efficiency, and the major constraints faced by green chilli growers in the study area.

Selection of District

The study was conducted in Prayagraj district of Uttar Pradesh, selected purposively because it is an important vegetable and spice-producing district where green chilli cultivation is prevalent. Farmers in this district supply produce to both local and regional markets. The district has fertile alluvial soil, access to irrigation, and well-developed road connectivity that supports green chilli production and marketing. Prayagraj district has favorable climatic conditions, fertile soil, and well-developed market facilities that support the production.

Selection of Blocks

Prayagraj district comprises Total 23 blocks. For this study, blocks with significant area under green chilli cultivation were purposively selected based on secondary data from the District Horticulture and Agriculture Departments. Meja

Block – High area under green chilli; active in vegetable and spice cultivation.

Selection of Villages

A list of villages cultivating green chilli in the selected block was obtained from the District Agriculture and Horticulture Department, Prayagraj. Out of the total green chilli-growing villages, five villages were selected randomly for the present study. From these selected villages, 100 green chilli growers were chosen through random sampling for detailed investigation. The selected respondents were surveyed to collect information on post-harvest losses, marketing channels, marketing costs, price spread, marketing margins, marketing efficiency, and the major constraints faced in the marketing of green chilli in the study area.

Selection of Respondents/Farmers

From the selected villages, 100 green chilli growers were chosen randomly for detailed investigation regarding production, post-harvest losses, marketing channels, marketing costs, price spread, and marketing efficiency. Farmers were categorized into different groups based on their size of landholding:

- Price spread and marketing efficiency
- Constraints faced in mushroom marketing

Sr.no	Type of farmers	Area in hec
1	Marginal farmers	farmers having land holding less than 1 hectare
2	Small farmers	farmers having land holding 1 to 2 hectares.
3	Semi Medium farmers	farmers having land holding 2 to 4 hectares.
4	Medium farmers	farmers having land holding 4 to 10 hectares.
5	Large farmers	farmers having land holding above 10 hectares

This classification helped in analyzing differences in production, post-harvest losses, and marketing efficiency across farm sizes.

Analysis of data/ analytical tools used

For the present study titled “Study on Post-Harvest Losses and Marketing of Green Chilli in Prayagraj District, Uttar Pradesh”, both primary and secondary data were used. Primary data were collected from green chilli growers, wholesalers, retailers, traders, and other market intermediaries involved in the marketing process, while secondary data were obtained from government reports, records of the Agriculture and Horticulture Department, research publications, journals, and other relevant literature. The collected data were compiled, tabulated, and analyzed using appropriate statistical tools such as averages, percentages, and ratios. To assess post-harvest losses and marketing of green chilli, indicators such as post-harvest losses at different stages, marketing channels, marketing costs, price spread, transportation facilities, storage practices, market margins, marketing efficiency, and constraints faced by growers were analyzed to evaluate the performance of the green chilli marketing system in the study area.

Analytical techniques employed

$$\text{Arithmetic Mean} = \text{AM} = \frac{1}{n} \sum_{i=1}^n a_i$$

Where, AM = Arithmetic Mean

n = Number of values

a_i = Data set values

Cost and returns per hectare of Green Chilli in the study area

Cost of soybean production

Cost- A1

value of hired human labor

Value of hired bullock labor

Value of owned bullock labor

Value of owned machinery labor

Hired machinery charges

Value of seed (both farm produced and purchased)

Value of insecticide and pesticide

Value of manures (owned and purchased)

Value of fertilizer

Depreciation on implements and farm buildings

Irrigation charges

Land revenue, cases and other taxes

Interest on working capital

Miscellaneous expenses (artisans etc.)

Cost A2: Cost A1 + rent paid for leased in land

Cost B1: Cost A1 + interest on value of owned fixed capital assets (excluding Land)

Cost B2: Cost B1+ rental value of owned land (net of land revenue) and rent paid for leased-in land

Cost C1: Cost B1+ imputed value of family labor

Cost C2: Cost B2+ imputed value of family labor

Cost C2*: Cost C2 adjusted to take into account valuation of human labor at market rate or statutory minimum wage rate whichever is higher

Cost C3: Cost C2*+ value of management input at 10% of total cost (C2*)

Cost C is the total cost of cultivation

1. Farm business income = Gross income – Cost A1 or A2
2. Family labor income = Gross income – Cost B
3. Net income = Gross income – Cost C
4. Farm investment income = Farm business income – imputed value of family labor

Benefit Cost (B:C) Ratio

The ratio of economic yield to biological yield. Also the ratio of present worth of gross returns to the present worth of costs. It is the ratio of the sum of the project's or policy's discounted benefits to the sum of its discounted costs. If BCR>1 go ahead with the project/policy.

$$BCR = \frac{PV [Benefits]}{PV [Cost]} = \frac{\sum_{t=0}^N \frac{CF_t [Benefits]}{(1 + i_t)^t}}{\sum_{t=0}^N \frac{CF_t [Costs]}{(1 + i_t)^t}}$$

Formula Where,

PV[Benefits] = Present value of benefits,

PV[Cost] = present value of costs,

CFt [Benefits]= Benefits in the tth year,

CF_t [Costs] = Costs in the tth year,
 t = Number of years,
 i = Interest (discount) rate.

Marketing Cost

The total cost, incurred on marketing either in cash or in kind by the producer seller and by the various intermediaries involved in the sale and purchase of the commodity reaches the ultimate consumer.

$$C = C_f + C_{m1} + C_{m2} + C_{m3} + \dots + C_{mn}$$

Where,

C = Total cost of marketing of commodity

C_f = Cost paid by the producer from the time of produce leave farm till he sale it

C_{mn} = Cost incurred by the nth middleman in the process of buying and selling the product.

Price spread

Price spread is defined as the difference between the price paid by the consumer and the net price received by producer for an equivalent quantity of farm produce.

$$\text{Price spread} = \frac{\text{Consumer price} - \text{Net price of producer} \times 100}{\text{Consumer price}}$$

Marketing Efficiency

The ratio of price paid by the consumer's (total value of goods) to total marketing cost is used as a measure of marketing efficiency.

$$ME = \frac{V}{I} - 1$$

Where,

ME = Marketing efficiency

V = Price paid by consumer (value of goods purchased)

I = Total Marketing Cost (Cost + margins)

8) Producer's share in consumer's rupee

It is the price received by the farmer expressed as a percentage of the retail price (i.e., price paid by the consumer)

$$P_s = \frac{PF}{Pr} \times 100$$

Where,

P_s = Producer's share

PF = Price received by the farmer

Pr = Retail price paid by the consumer

Results and Discussion

The socio-economic characteristics of green chilli growers influence production practices, post-harvest management, marketing decisions, and income generation. Factors such as age, education, family size, farming experience, landholding size, and investment capacity affect green chilli cultivation,

handling, and marketing behavior.

Therefore, the present study on "Study on Post-Harvest Losses and Marketing of Green Chilli in Prayagraj District, Uttar Pradesh" examined the socio-economic profile of respondents to understand their role in green chilli production, post-harvest management, and marketing activities in the study area.

Socio-Economic Profile of Sample Green Chilli Growers

Particulars	Value
Average Family Size	6.93
Male Members	3.05
Female Members	2.50
Children	1.38
Average Age (Years)	42
Average Area under Green Chilli (ha)	0.84

The average family size was 6.93 members. Green chilli cultivation was mainly practiced by middle-aged farmers with an average cultivated area of 0.84 ha.

Educational Status of Respondents

Education Level	Number	Percentage
Illiterate	7	7.00
Primary	20	20.00
Secondary	50	50.00
College	23	23.00
Total	100	100.00

Most farmers (50%) had secondary education, indicating a moderate level of awareness regarding improved cultivation and marketing practices.

Farm Size and Area under Green Chilli

Farm Category	Number of Farmers	Average Farm Size (ha)	Area under Green Chilli (ha)
Marginal	30	0.80	0.25
Small	45	2.10	0.78
Medium	25	4.50	1.50
Overall	100	2.40	0.84

Small and medium farmers contributed significantly to green chilli production, with an overall average area of 0.84 ha under the crop.

Marketing Cost and Price Spread in Different Channels (Rs/q)

Particulars	Channel I	Channel II	Channel III
Producer Price	950	900	850
Marketing Cost	38	65	107
Intermediary Margin	–	80	180
Consumer Price	988	1045	1137
Price Spread	38	145	287

Price spread increased with the number of intermediaries. Channel I had the lowest price spread, while Channel III had the highest.

Producer's Share and Marketing Efficiency

Channel	Producer Share (%)	Marketing Efficiency
Channel I (Producer → Consumer)	96.15	26.0
Channel II (Producer → Retailer → Consumer)	86.12	15.3
Channel III (Producer → Wholesaler → Retailer → Consumer)	74.78	9.9

Channel I was the most efficient marketing channel, providing the highest producer share and marketing efficiency due to the absence of intermediaries.

Conclusion

Based on the findings of the study on post-harvest losses and marketing of green chilli in Prayagraj District, Uttar Pradesh, it is suggested that adequate cold storage, pack-house facilities, and improved rural transportation infrastructure should be developed to reduce post-harvest losses and marketing costs. Promotion of direct marketing channels such as farmers' markets and FPOs should be encouraged to reduce intermediaries and increase farmers' share in the consumer price. Strengthening regulated markets, providing timely market information through digital platforms, and improving extension services will help farmers make better marketing decisions. Farmers should also be trained in post-harvest handling, grading, packaging, and value addition to improve product quality and income. In addition, development of small-scale processing units and price stabilization measures can help reduce price fluctuations and ensure better returns. Overall, these policy interventions will improve marketing efficiency, reduce losses, and enhance the income and livelihood of green chilli growers in the study area.

Summary

The present study on "Post-Harvest Losses and Marketing of Green Chilli in Prayagraj District, Uttar Pradesh" was conducted using data from 100 sampled farmers. The results showed that most farmers were small and marginal landholders, with an average family size of 6.72 members and moderate educational status, mainly up to secondary level. Agriculture was the main occupation, though many farmers also engaged in allied and non-farm activities for additional income. The majority of farmers belonged to the middle-age group (30–50 years), indicating active involvement in farming and marketing activities, and the average landholding with green chilli cultivation highlighted its importance as a cash crop in the study area. Three marketing channels were identified, with Channel II being the most commonly used. Marketing cost and price spread increased with the number of intermediaries, being lowest in Channel I and highest in Channel III. Consequently, producer's share and marketing efficiency were highest in Channel I and lowest in Channel III, indicating that direct marketing is more profitable for farmers. Post-harvest losses were higher among marginal farmers due to poor storage and handling practices. Major constraints included price fluctuations, high transportation costs, lack of cold storage, middlemen exploitation, and inadequate market information. Overall, the study concludes that improving infrastructure and promoting direct marketing can reduce losses and increase farmers' income.

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