P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating: 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 5; May 2025; Page No. 572-575

Received: 17-02-2025
Accepted: 19-03-2025

Indexed Journal
Peer Reviewed Journal

An analysis of post-harvest losses and marketing practices of banana in Khagaria district of Bihar

[1]Shivangi and [2]Rebecca Nelson

[1]Research Scholar (P.G), Department of Agricultural Economics, SHUATS, Naini, Prayagraj, Uttar Pradesh, India

[2]Assistant Professor, Department of Agricultural Economics, SHUATS, Naini, Prayagraj, Uttar Pradesh, India

DOI: https://www.doi.org/10.33545/26180723.2025.v8.i5h.1943

Corresponding Author: Shivangi

Abstract

The present study, entitled "An Analysis of Post-Harvest Losses and Marketing Practices of Banana in Khagaria District of Bihar," was undertaken to examine the extent of physical and economic losses and to evaluate the efficiency of various marketing channels. The study was confined to the Khagaria district, where Gogri block was selected purposively due to its significant banana production. From this block, five percent of banana-growing villages were selected, and ten percent of banana cultivators were chosen randomly for data collection. The analysis revealed substantial variations in post-harvest losses and marketing efficiency across three identified marketing channels. In Channel I, physical loss was limited to 3.5 kg and economic loss amounted to Rs. 130.37, occurring solely at the farm level, with no additional losses at packaging, wholesale, or retail stages. Channel II showed a total physical loss of 6.4 kg and economic loss of Rs. 238.30, with losses incurred at farm, packaging, and wholesale levels. Channel III recorded the highest physical and economic losses—7.7 kg and Rs. 286.72 respectively—spanning all stages including retail. Marketing cost and efficiency varied significantly, with Channel I showing the highest marketing efficiency at 115.40%, while Channel II and III recorded lower efficiencies of 6.49% and 4.62% respectively. These findings indicated that the number of intermediaries and increased handling contributed to both higher losses and lower efficiency. The study concluded that enhancing post-harvest management practices in packaging, storage, and transportation is essential to minimize losses and improve marketing efficiency.

Keywords: Banana, post-harvest losses, marketing channels, economic loss, marketing efficiency

Introduction

Banana (*Musa* spp.) represented one of the most important tropical fruit crops, widely cultivated across tropical and subtropical regions for its nutritional, economic, and commercial value. It served as a staple food and a significant source of income for millions of smallholder farmers, especially in developing countries. Rich in carbohydrates, essential vitamins, and minerals, banana contributed considerably to food and nutritional security. India held the position of the largest banana producer globally, with key producing states including Tamil Nadu, Maharashtra, and Kerala. Despite its commercial significance, banana cultivation faced substantial challenges related to post-harvest losses, which adversely affected both the quantity and quality of produce reaching consumers. Post-harvest losses in bananas occurred due to a range of factors, including improper handling, inadequate packaging, inefficient transportation, lack of cold storage infrastructure, and the involvement of multiple intermediaries. These losses were manifested physically through spoilage, bruising, and wastage, and economically through reduced farmer income and increased consumer prices. Studies revealed that post-harvest losses in banana could range between 20 to 30 percent of total production in certain regions, undermining profitability and sustainability. Furthermore, the marketing of bananas involved various channels with differing levels of efficiency, where higher losses were observed with increased handling and longer supply chains. The need for effective post-harvest management strategies, including improved storage, scientific packaging, efficient transportation, and streamlined marketing channels, became increasingly evident. This study aimed to analyze the extent of post-harvest losses and evaluate marketing practices of banana in Khagaria district of Bihar to identify potential areas for intervention and improvement.

Research methodology

The present study adopted a purposive-cum-random sampling methodology for the selection of the district, block, villages, and respondents. Khagaria district in Bihar was purposively selected to minimize logistical challenges and time constraints faced by the investigator. Among the blocks within the district, Gogri block was chosen based on the predominance of banana cultivation among the farming population. A comprehensive list of villages under Gogri block was prepared, and five percent of villages with a high concentration of banana growers were randomly selected. From these selected villages, a complete list of banana farmers was compiled and categorized into five landholding size groups: Marginal (less than 1 hectare), Small (1-2 hectares), Semi-medium (2-4 hectares), Medium (4-10

hectares), and Large (more than 10 hectares). Using proportionate random sampling, a total of 100 banana farmers were selected for the study. Additionally, 15 wholesalers/commission agents and 25 retailers were selected to examine aspects such as marketing costs, margins, price spread, post-harvest losses, and marketing efficiency. Primary data were collected using a pre-tested and well-structured schedule through personal interviews with the respondents. Secondary data were obtained from relevant books, journals, reports, and official records available at district and block headquarters. The data collection process employed a structured survey method, and statistical tools were applied to analyze the findings and draw conclusions. The data pertained to the agricultural year 2024-2025, providing an updated and context-specific analysis of banana post-harvest losses and marketing practices in the study area.

Analytical Tools

1. **Marketing Cost:** $C = Cf + Cm^1 + Cm^2 + Cm^3 + ... + Cm^n$
2. **Market Margin:** AMI=Pri-(Ppi+Cmi)
3. **Price Spread:** Marketing Cost + Market Margin
4. **Marketing Efficiency:** $= \frac{\text{Price received by producer}}{\text{Marketing Cost + Marketing Margin}}$
5. **Post-harvest loss =** Qualitative Loss + Quantitative Loss + Food Waste

Results and Discussion

Table 1: Physical loss in Banana /Quintal

Physical Post-Harvest Loss in Banana			
Levels	**Channel I**	**Channel II**	**Channel III**
Farm level	3.5 kg	3.5 kg	3.5 kg
Packaging		1.7 kg	1.7 kg
Wholesale market level		1.2 kg	1.2kg
Retail level			1.3 kg
Total	3.5 kg	6.4 kg	7.7 kg

Table 1: The study illustrated the physical post-harvest losses of bananas across three distinct marketing channels, each exhibiting different patterns of loss at various stages. In Channel I, the total loss amounted to 3.5 kg, occurring solely at the farm level, with no further losses recorded during packaging, wholesale, or retail stages. This indicated minimal handling and limited intermediary involvement. In Channel II, a similar initial farm-level loss of 3.5 kg was recorded, but additional losses occurred—1.7 kg during packaging and 1.2 kg at the wholesale market—resulting in a total loss of 6.4 kg. Channel III experienced the highest total physical loss of 7.7 kg, including 3.5 kg at the farm level, 1.7 kg during packaging, 1.2 kg at the wholesale market, and 1.3 kg at the retail level. The findings demonstrated a clear correlation between the number of handling stages and increased post-harvest losses. As the number of intermediaries and stages in the supply chain increased, so did the extent of physical loss, largely due to inadequate packaging methods, improper handling, and inefficient transport systems. These cumulative losses not only reduced the quantity of bananas available to consumers but also affected overall supply chain efficiency. The results emphasized the urgent need for targeted interventions in post-harvest practices, particularly in improving packaging standards, transportation infrastructure, and storage facilities. Addressing these issues at each stage of the marketing channels is critical to minimizing losses, preserving fruit quality, and enhancing farmer profitability and consumer satisfaction.

Table 2: Economic loss in Banana/Quintal

Economic Post-Harvest loss in Banana			
Levels	**Channel I**	**Channel II**	**Channel III**
Farm level	Rs.130.37	Rs. 130.37	Rs.130.37
Packaging		Rs.63.23	Rs. 63.32
Wholesale market level		Rs.44.7	Rs.44.7
Retail level			Rs. 48.42
Total	Rs. 130.37	Rs. 238.30	Rs. 286.72

Table 2: The study highlighted the economic post-harvest losses of bananas across three marketing channels, revealing a significant increase in losses as bananas moved through various stages of the supply chain. In Channel I, the total economic loss amounted to Rs. 130.37, all of which occurred at the farm level, with no additional losses recorded at subsequent stages. In Channel II, economic losses increased with the addition of Rs. 63.23 during packaging and Rs. 44.7 at the wholesale market, resulting in a total loss of Rs. 238.30. Channel III experienced the highest economic loss of Rs. 286.72, with losses at each stage: Rs. 130.37 at the farm level, Rs. 63.32 during packaging, Rs. 44.7 at the wholesale market, and Rs. 48.42 at the retail level. These findings illustrated the cumulative impact of handling, storage, and transportation on the overall financial burden faced by banana producers. The results emphasized the importance of improving post-harvest practices at each stage, including better packaging, efficient storage, and enhanced transportation systems, in order to reduce economic losses, increase profitability for banana farmers, and improve the efficiency of the banana supply chain as a whole.

Table 3: Reveals the preferred marketing channel by the respondents

Sr. No.	Channel Type	No of respondent	Percentage
1	Channel - I	21	21.00
2	Channel -II	28	28.00
3	Channel-III	51	51.00
Total		100	100.00

Channel-I: Producer-Consumer
Channel-II: Producer - Wholesaler - Consumer.
Channel-III: Producer- Wholesaler - Retailer - Consumer.

Table 3: The study revealed that among the 100 respondents surveyed, 21% (21 respondents) preferred Channel I for buying and selling bananas, indicating a preference for direct marketing with minimal intermediaries. Additionally, 28% (28 respondents) preferred Channel II, which involves more intermediaries, including packaging and wholesale stages. The remaining 51% (51 respondents) favored Channel III, which included all stages of marketing, from farm to retail. This distribution highlights the varying preferences of banana producers and traders in the study area, with a significant proportion opting for more intermediated channels, possibly due to perceived convenience or better market reach despite higher losses and costs.

Table 4: Marketing cost, Marketing margin, Marketing efficiency and Price spread of Banana in Channel-I.

S. No	Particulars	Rs/Quintals
1	Producer's Sale price	3725
2	**Cost incurred by the producer**	
a	Packing cost	5
b	Packing material cost	3
c	Spoilage and losses	8
d	Miscellaneous charges	16
2	Total marketing cost	32
3	Net price received by producer	3693
A	Total Marketing cost	32
B	Price spread	32
C	Marketing Efficiency	115.40%

Channel-I: Producer-Consumer

Table 4: The study revealed that in Channel I, the marketing price of bananas supplied by the producer was Rs. 37.25 per quintal. The net price received by the producer was Rs. 3,693. The cost incurred by the producer for marketing was Rs. 32 per quintal. Consequently, the total marketing cost in Channel I amounted to Rs. 32, and the price spread in this channel was also Rs. 32. The marketing efficiency of Channel I was calculated to be 115.40%, indicating a highly efficient marketing system, where the producer's income relative to the total marketing cost was favorable, reflecting minimal intermediary involvement and effective price realization.

Table 5: Marketing cost, Marketing margin, Marketing efficiency and Price spread of Banana in Channel-II.

S. No	Particulars	Rs/Quintal
1	Producer's Sale Price to wholesaler	3775
2	**Cost incurred by the producer**	
a	Packing cost	9
b	Transportation cost	13
c	Loading and unloading charges	14
d	Miscellaneous charges	26
	Total Marketing cost (a-d)	62
3	Net price received by producer	3713
4	Wholesaler sale price to Consumer	4285
5	**Cost incurred by the Wholesaler**	
a.	Loading and unloading Charges	19
b.	Carriage up to shop	28
c.	Grading and sorting charges	20
d.	Miscellaneous charges	22
e.	Spoilage and losses	66
	Total Marketing cost(a-e)	155
6	Margin of Wholesaler	355
A	Total Marketing cost	217
B	Total Marketing margin	355
C	Price Spread	572
D	Marketing Efficiency	6.49%

Channel-II: Producer-Wholesaler-Consumer

Table 5: The study revealed that in Channel II, the marketing price of bananas supplied by the producer was Rs. 3,775 per quintal. The net price received by the producer in Channel II was Rs. 3,713, after incurring a marketing cost of Rs. 62 per quintal. The wholesaler in Channel II incurred a marketing cost of Rs. 155 and had a margin of Rs. 355 for each quintal of banana marketed. The wholesaler's price to the consumer was Rs. 4,285 per quintal. Consequently, in Channel II, the total marketing cost amounted to Rs. 217, while the total marketing margin was Rs. 355. The price spread in Channel II was Rs. 572, and the marketing efficiency of this channel was calculated to be 6.49%. This lower marketing efficiency compared to Channel I reflects higher handling costs and intermediaries, which reduce the overall profitability for the producer.

Table 6: Marketing cost, Marketing margin, Marketing efficiency and Price spread of Banana in Channel-III.

S. No	Particulars	Rs/Quintal
1	Producer sale price to Wholesaler	3775
2	**Cost incurred by the producer**	
a	Packing cost	9
b.	Transportation cost	13
c.	Loading and unloading charges	14
d.	Miscellaneous charges	26
	Total Marketing cost (a-d)	62
3	Net price received by producer	3713
4	Wholesaler sale price to Retailer	4168
5	**Cost incurred by the wholesaler**	
a	Loading and unloading and repacking charges	23
b	Grading and sorting charges	19
c	Spoilage and losses	31
	Total Marketing cost (a-c)	73
6	Margin of wholesaler	320
7	Retailer Sale price to Consumer	4516
8	**Cost incurred by the retailer**	
a.	Loading and unloading Charges	22
b.	Carriage up to shop	16
c.	Miscellaneous charges	22
d.	Spoilage and losses	31
	Total Marketing cost (a-d)	91
9	Margin of Retailer	257
A	Total Marketing cost	226
B	Total Marketing Margin	577
C	Price Spread	803
D	Marketing Efficiency	4.62%

Channel-III: Producer-Wholesaler-Retailer-Consumer

Table 6: The study revealed that in Channel III, the marketing price of bananas supplied by the producer was Rs. 3,775 per quintal. The net price received by the producer in Channel III was Rs. 3,713 after incurring a marketing cost of Rs. 62 per quintal. The wholesaler in Channel III incurred a marketing cost of Rs. 73 and had a margin of Rs. 320 for each quintal of banana marketed. The wholesaler's sale price to the retailer was Rs. 4,168, and the retailer's sale price to the consumer was Rs. 4,516. The retailer's marketing margin was Rs. 257 per quintal, with a marketing cost of Rs. 91 incurred by the retailer. Consequently, the total marketing cost in Channel III was Rs. 226, and the total marketing margin was Rs. 577. The price spread in Channel III was Rs. 803, and the marketing efficiency was calculated at 4.62%. This lower marketing efficiency, compared to Channel I, indicates the higher costs and margins associated with the multiple intermediaries and stages in Channel III, which ultimately reduces the producer's share of the final price received by the consumer.

Table 7: Comparison between Marketing cost, Marketing margin, Marketing efficiency and Price spread in marketing of Banana through channel-I, channel-II and Channel-III in the study area.

Sr. No.	Particulars	Value in Rupees / quintal Channel I	Value in Rupees / quintal Channel II	Value in Rupees / quintal Channel III
1	Net price received by the producer	3693	3713	3713
2	Consumer paid price	3725	4516	4516
3	Total marketing cost	32	217	226
4	Total marketing margin	-	355	577
5	Price spread	32	572	803
6.	Marketing Efficiency	115.40%	6.49%	4.62%

Table 7: The comparison of marketing costs, marketing margins, price spreads, and marketing efficiencies across the three banana marketing channels revealed significant differences. In Channel I, the total marketing cost was Rs. 32, with a price spread of Rs. 32, leading to a high marketing efficiency of 115.40%. This indicates a cost-effective system with minimal intermediaries. In Channel II, the total marketing cost increased to Rs. 217, with a marketing margin of Rs. 355 and a price spread of Rs. 572, resulting in a marketing efficiency of 6.49%. This reflects higher costs and margins due to the involvement of more intermediaries. Channel III saw the highest total marketing cost of Rs. 226, with a marketing margin of Rs. 577 and a price spread of Rs. 803, yielding a marketing efficiency of 4.62%. This lower marketing efficiency is indicative of the greater number of intermediaries and higher costs at each stage. The comparison underscores how the number of intermediaries, marketing costs, and price spreads increase as bananas move through successive channels, ultimately reducing marketing efficiency and farmer profitability.

Conclusion

In conclusion, the study highlighted the significant impact of marketing channels on the post-harvest losses, costs, margins, price spreads, and marketing efficiencies in banana marketing. The findings revealed that Channel I, with minimal intermediaries, resulted in the lowest marketing costs and highest marketing efficiency (115.40%), demonstrating an effective and cost-efficient marketing system. In contrast, Channels II and III, which involved more intermediaries, saw a progressive increase in marketing costs, price spreads, and corresponding decreases in marketing efficiency. Channel II had a marketing efficiency of 6.49%, while Channel III, which included additional handling and retail stages, recorded the lowest marketing efficiency of 4.62%. The physical and economic losses in Channels II and III underscored the negative impact of additional stages in the supply chain, leading to increased financial burden on producers and higher consumer prices. These findings emphasized the importance of improving post-harvest practices, particularly in packaging, transportation, and storage, to reduce losses and enhance profitability. The study also suggested that a reduction in intermediaries and a more direct supply chain, as seen in Channel I, could improve marketing efficiency and reduce costs, benefiting both producers and consumers. Overall, the results highlighted the need for targeted interventions at each stage of the supply chain to enhance the efficiency and sustainability of banana marketing systems.

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