International Journal of Agriculture and Environmental Research

ISSN: 2455-6939

Volume: 12, Issue: 04 "July-August 2026"

EFFECTS OF POST-HARVEST LOSSES ON MARKETING EFFICIENCY AMONG TOMATO TRADERS IN EKITI STATE, NIGERIA

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DOI: https://doi.org/10.51193/IJAER.2026.12402

Received: 08 Jul. 2026 / Accepted: 20 Jul. 2026 / Published: 27 Jul. 2026

ABSTRACT

This study examined the effects of post-harvest losses on marketing efficiency among tomato traders in Ekiti State, Nigeria. A multistage sampling procedure was used to select 160 tomato traders across four major tomato-marketing Local Government Areas in the state. Data were collected with the aid of a structured questionnaire. Information was collected on the traders' socio-economic characteristics, marketing activities, and the extent of losses experienced during trading operations. Descriptive statistics, stochastic frontier analysis, and correlation analysis were employed to analyse the data. The findings showed that tomato trading was largely undertaken by economically active individuals with an average age of about 41 years, while women formed the majority of market participants. Although most traders had some level of formal education, access to critical productive resources such as credit facilities and cold storage infrastructure remained limited. The study revealed considerable (18.7%) post-harvest losses within the tomato marketing chain, indicating serious economic consequences for traders and market performance. Transportation accounted for the highest proportion of losses (8.5%), while sorting and grading accounted for least losses (1.9%). Factors such as poor road conditions, prolonged transport time, inadequate packaging, absence of cold storage, and poor handling practices intensified spoilage. The stochastic frontier results showed that increased trading volume, longer travel distance, extended transport duration, and prolonged storage significantly increased post-harvest losses. In contrast, education, access to credit, cold storage facilities, and improved packaging reduced inefficiency. Marketing efficiency remained low (0.42), and a strong negative relationship ($r = -0.67$) confirmed that higher post-harvest losses significantly reduced marketing efficiency. The study recommends investment in storage infrastructure, transportation improvement, trader training, and better access to finance to improve marketing efficiency.

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Keywords: Post-harvest losses, marketing efficiency, tomato traders, stochastic frontier, food supply chain

1. INTRODUCTION

The marketing of agricultural commodities serves as a vital element which drives food systems change while creating job opportunities, generating income and building rural economies across numerous developing countries (FAO 2022). The horticultural industry regards tomato as its most valuable vegetable crop because of its nutritional benefits and its use in various industrial products and its popularity as a home food item. Nigeria stands among Africa's top tomato producers because its tomato industry serves as a vital force for food security and agribusiness growth and livelihood protection. The crop shows high production potential yet the value chain experiences major tomato losses because of insufficient post-harvest handling systems and weak transportation infrastructure and inadequate storage facilities and ineffective market coordination systems (Korie *et al*. 2023 Olayide *et al.* 2024).

Post-harvest losses (PHL) describe the actual quantity and quality decrease of agricultural products which happens from the point of harvest until the time of their complete consumption. The tomato value chain experiences product losses which happen through the processes of harvesting, sorting, grading, packaging, transportation, storage, and marketing. The high moisture content of tomatoes combined with their fragile tissue structure causes them to become extremely vulnerable to mechanical damage and microbial contamination and physiological decay and fast decay when exposed to tropical weather conditions. The Food and Agriculture Organization reports that about one-third of all food which people produce for eating purposes gets lost or wasted every year, while perishability causes fruits and vegetables to experience the greatest level of food waste (FAO, 2022). The latest estimates found that in Nigeria as much as 50% of tomatoes after harvest face post-harvest losses which create serious problems for food production and market operations and profit generation within the tomato value chain (Yami *et al*., 2025; Suleiman et al., 2024).

The economic consequences of post-harvest waste reach multiple sectors of the economy. The trading system faces multiple challenges because traders lose excess inventory which reduces their available products and makes food prices rise while their marketing operations become less efficient. Marketing efficiency measures how well a marketing system generates output and value while keeping its operational costs and waste at minimal levels. An agricultural marketing system achieves efficiency through its ability to enhance price distribution and market connectivity which results in better resource distribution and improved welfare for producers, traders, and consumers. The developing world experiences heightened commodity losses because inefficient marketing systems lack proper infrastructure and sufficient market data and effective storage methods and strong institutional assistance (Abubakar *et al*., 2022).

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In Nigeria, tomato marketing is primarily conducted by informal market operators who work under substandard conditions for both storage and transportation of tomatoes. Tomatoes are transported over long distances by using woven baskets and open vehicles which result in the creation of excessive compression and bruising and vibration damage and spoilage before the tomatoes arrive at their final markets. The market experiences additional product deterioration because modern cold chain infrastructure remains unavailable during times when markets face high temperature conditions and market excess. Previous studies have shown that poor road conditions, inadequate packaging materials, inefficient transportation systems, and limited adoption of post-harvest technologies significantly contribute to tomato deterioration and economic losses along the supply chain (Bada *et al*., 2021).

The increasing urban demand and expanding agricultural commercialization of Ekiti State in southwestern Nigeria have established this region as an emerging center for tomato marketing operations. The state depends on tomato trading as its main economic activity which sustains both rural and urban households. The traders in the industry battle through substantial post-harvest losses which result from their insufficient market facilities and their improper product handling and their extensive transportation routes and their unpredictable customer demand and their missing storage spaces. The challenges traders face lead to decreased income and they create food price inflation and marketing system inefficiencies.

Multiple studies investigate post-harvest losses in Nigeria yet existing research mostly focuses on production-level losses that occur at farms (Adewuyi *et al*., 2022) and on food waste that happens during household consumption (Olayemi et al., 2021). The academic field has not studied how post-harvest losses affect marketing efficiency which constitutes a knowledge gap in tomato value chain research. The previous studies depended on descriptive loss estimates which forgot to separate technical inefficiencies from managerial and infrastructural causes of losses. The existing research about post-harvest losses among tomato traders in Ekiti State shows insufficient evidence about their loss size and financial impact and the factors that cause these losses. The state requires a complete evaluation of post-harvest tomato losses because tomato marketing supports food security and rural community development. The investigation provides essential information for developing interventions which will reduce losses while enhancing market operations and increasing trader profits and improving the entire efficiency of the Nigerian tomato value chain. This study therefore examined post-harvest losses and marketing efficiency among tomato traders in Ekiti State, Nigeria.

The strength of this on lies on the fact that it offers an integrated assessment of post-harvest losses and marketing efficiency among tomato traders using a stochastic frontier modeling framework. The present study differs from previous works that focused on loss estimation by quantifying losses at the trader level, identifying determinants of technical inefficiency, and empirically showing how

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post-harvest losses reduce marketing efficiency. It adds to the knowledge by giving evidence on targeted interventions along the tomato value chain.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Ekiti State, which is in the southwestern part of Nigeria. The state is located around latitude 7°15′ and 8°5′ North of the Equator and longitude 4°45′ and 5°45′ East of the Greenwich Meridian. The state is bounded by Kwara State to its north, Kogi State in its northeast, Ondo State to the south and southeast, and Osun State on its western side (National Population Commission [NPC], 2022). This state falls within the rainforest agro-ecological zone of Nigeria, with a humid tropics climate having both wet and dry seasons. Annual rainfall in the region ranges between 1,200 mm and 1,800 mm, with the temperatures varying between 21°C and 28°C. With favourable weather patterns, rich soils, and relatively high humidity levels, various food items can be produced and marketed in the area, including tomatoes, peppers, and greens (Adebayo & Tukur, 2021).

2.2 Sampling Procedure and Sample Size

A multistage sampling technique was adopted for the study. In the first stage, four Local Government Areas were purposively selected based on intensity of tomato marketing activities. The selected LGAs were: Ado- Ekiti, Ikere- Ekiti, Ikole- Ekiti and Ijero- Ekiti. In the second stage, two major tomato markets were identified and purposively selected from each of the selected LGA. In the final stage, 20 tomato traders were randomly selected from each of the selected markets, giving a total sample size of 160 respondents.

2.3 Data Collection

Primary data were collected using a structured questionnaire administered face-to-face by trained enumerators. Variables included: trader demographics (age, education, experience), marketing characteristics (volume purchased, transport mode, storage type, credit access), and loss quantification (weight of spoiled tomatoes at each marketing stage over two weeks, averaged to represent typical month). Losses were physically weighed where possible or estimated via recall for small quantities. Marketing efficiency data included purchase price, transport cost, labour, market levy, and selling price.

3. ANALYTICAL TECHNIQUES

3.1 Descriptive and Loss Magnitude: Mean and percentage losses were computed.

Monetary value of losses = (total purchase volume × loss %) × average selling price per kg.

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3.2 Stochastic Frontier Model for PHL Determinants: following the works of Akinwumi & Oke, (2023), the Stochastic Frontier Model (SFM) was to analyse the determinants of post-harvest losses (PHL) among tomato traders in the study area. SFM is grounded in both theoretical appropriateness and empirical superiority over conventional regression techniques

A Cobb-Douglas stochastic frontier loss function was specified:

$$\ln Li = \beta_0 + \beta_1 \ln V_i + \beta_2 \ln D_i + \beta_3 \ln T_i + \beta_4 \ln S_i + (v_i - u_i)$$

Where L_i = percentage loss for trader i, V_i = volume purchased (kg), D_i = distance to market (km), T_i = transport time (hours), S_i = storage duration (days). The v_i is random error, u_i is inefficiency term.

Inefficiency model: $u_i = \delta_0 + \delta_1(\text{age}) + \delta_2(\text{education}) + \delta_3(\text{cold storage dummy}) + \delta_4(\text{credit access dummy}) + \delta_5(\text{crate type}) + \varepsilon_i$

3.3 Marketing Efficiency: Efficiency was computed as:

$$ME = \frac{Net\ Marketing\ Margin}{Total\ Marketing\ Cost} X100$$

Where Net Marketing Margin = (Selling price – Purchase price – Total marketing costs).

ME >1 indicates efficiency.

Pearson correlation will be used to test the association between PHL and ME.

4. RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of Traders

The socio-economic characteristics of the sampled tomato traders are as presented in Table 1. The findings indicate that tomato marketing was predominantly undertaken by economically active adults, with a mean age of 41.28 ± 8.35 years. More than half of the respondents (56.25%) were aged 36–45 years, while 22.50% were above 45 years. Respondents aged 26–35 years constituted 13.13%, and only 8.13% were 25 years or younger. This distribution suggests that tomato trading is largely driven by mature individuals who are likely to possess accumulated marketing experience and stronger decision-making capacity. Their active age status may enhance their ability to manage the operational demands of handling highly perishable commodities, although increasing age may reduce adaptability to emerging post-harvest technologies.

Gender distribution showed female dominance in tomato trading, accounting for 61.25% of respondents compared to 38.75% males. This reflects the central role women play in agricultural marketing and food distribution in Nigeria. The finding suggests that interventions aimed at

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improving tomato marketing efficiency and reducing post-harvest losses should prioritise women through targeted access to finance, training, and market infrastructure.

Most respondents (72.50%) were married, while 17.50% were single, and smaller proportions were widowed (6.88%) or divorced (3.13%). This pattern indicates that tomato trading serves as an important livelihood activity that supports household welfare and family responsibilities. Marital commitments may also influence labour use, business engagement, and income allocation decisions.

Educational attainment varied among traders. About 35.63% had primary education, 30.00% attained secondary education, 11.25% had tertiary education, while 23.13% had no formal education. Although many respondents possessed basic formal education, the relatively low level of advanced education may limit business management capacity, technology adoption, access to market information, and effective post-harvest practices.

Access to productive resources remained limited. Only 21.88% of traders had access to credit facilities, while 78.13% lacked financing opportunities. Similarly, access to cold storage facilities was extremely low, with only 8.75% reporting availability. Limited financing and inadequate storage infrastructure constrain business expansion, increase reliance on inefficient handling methods, and contribute significantly to spoilage and post-harvest losses. Finally, respondents demonstrated considerable market experience, with an average trading experience of 11.97 ± 2.87 years. More than half (54.38%) had traded tomatoes for 11–15 years.

Table 1: Socio-economic Profile of Tomato Traders (N=160)

Variable	Category	Frequency	Percentages	Mean
Age	≤25	13	8.13	
	26-35	21	13.13	
	36-45	90	56.25	
	>45	36	22.50	41.28±8.35
Sex	Male	62	38.75	
	Female	98	61.25	
Marital Status	Single	28	17.50	
	Married	116	72.50	
	Widowed	11	6.88	
	Divorced	5	3.13	
Education	None	37	23.13	
	Primary	57	35.63	
	Secondary	48	30.00	
	Tertiary	18	11.25	

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Credit access	Yes	35	21.88	
	No	125	78.13	
Cold storage	Yes	14	8.75	
	No	146	91.25	
Experience (years)	≤5	12	7.50	
	6 -10	35	21.88	
	11- 15	87	54.38	
	>15	26	16.25	11.97±2.87

Source: Field Survey, 2025

4.2 Post-Harvest Losses

The result on the estimated magnitude and monetary value of post-harvest losses among tomato traders in Ekiti State reveals substantial quantitative and economic losses within the tomato marketing system. Findings showed that the sampled 160 tomato traders purchased an average of 392,000 kg of tomatoes monthly. Out of this quantity, approximately 73,280 kg were lost before final sale, representing a mean post-harvest loss of 18.7%. This indicates that nearly one-fifth of the tomatoes handled by traders were wasted due to spoilage, mechanical damage, poor storage, transportation challenges, and the highly perishable nature of tomatoes.

The estimated loss level is considerably high and suggests serious inefficiencies in tomato handling and marketing activities across the study area. Such losses reduce the effective market supply of tomatoes and negatively affect traders' profitability and household income. The result also implies that despite significant investment in tomato procurement, a substantial proportion of the commodity fails to reach consumers in good condition.

Furthermore, the average selling price of tomatoes was estimated at ₦650 per kilogram. Based on the quantity lost monthly, the total estimated monetary loss incurred by the traders amounted to ₦47,632,000 per month. This enormous financial loss demonstrates the severe economic implications of post-harvest losses on tomato marketing enterprises in Ekiti State. The value lost monthly represents capital that could have been reinvested into business expansion, improved storage facilities, transportation, or household welfare.

The findings underscore the urgent need for improved post-harvest management practices, including better storage technologies, efficient transportation systems, improved packaging methods, and access to cold chain infrastructure. Strengthening extension services and training traders on proper handling techniques could also contribute significantly to reducing losses. Reducing post-harvest losses would not only improve traders' incomes and marketing efficiency but also enhance food availability and food security within the state.

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Table 2: Estimated Magnitude and Monetary Value of Post-Harvest Losses among Tomato Traders in Ekiti State

S/N	Variables	Value
i	Average monthly tomato purchase by the traders (kg)	392,000 kg
ii	Average Quantity lost monthly (kg)	73,280 kg
iii	Mean post-harvest loss (%)	18.7%
iv	Average selling price per kg	₦650
v	Monetary loss monthly ii x iv	₦47632000
vi	Number of sampled traders	160

Source: Field Survey, 2025

4.3 Mean Post-Harvest Losses across Marketing Stages among Tomato Traders

Table 3 shows the distribution of post-harvest losses among the respondents at the various marketing stages. From the table, transportation stage accounted for the highest 8.5% post-harvest loss. Findings show that tomato rotting and physical damage during marketing activities are greatly influenced by poor transportation situations. When tomatoes are transported from producing locations to markets, bruising, crushing, and degradation are likely to rise due to their extremely perishable nature, bad road conditions, severe vibration, overloading, inadequate packing, and extended transit times. It follows that in the study area, transportation inefficiencies continue to be a major obstacle to tomato marketing success and profitability. Retail display and storage ranked second with a mean loss of 5.7%. This indicates that substantial losses also occur during the period tomatoes are displayed for sale or temporarily stored before final purchase by consumers. In many local markets, tomatoes are often exposed to harsh environmental conditions such as high temperatures, direct sunlight, and poor ventilation, which accelerate ripening and spoilage. Inadequate storage facilities and the near absence of cold chain infrastructure among traders further aggravate product deterioration at this stage. The result highlights the vulnerability of tomato traders to losses arising from inadequate preservation and market handling practices.

According to the findings, loss through loading and unloading of tomatoes ranked third with an average loss of 2.6%. This implies that the overall post-harvest losses are somewhat influenced by physical handling during product transportation. Tomato quality and shelf life may be lowered by mechanical damage caused by frequent falling, compression, and harsh handling of baskets or containers during loading and unloading activities. The outcome suggests that physical damage during product transfer operations might be greatly reduced by enhancing handling methods and packaging solutions. Sorting and grading came in fourth place with the lowest mean loss of 1.9%.

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Although comparatively smaller compared to previous phases, the losses happening during sorting and grading remain substantial since broken, bruised, or overripe tomatoes are sometimes removed at this point to achieve market quality criteria. The comparatively lower loss level might suggest that merchants sort products carefully to reduce waste and guarantee consumer acceptability. The overall mean post-harvest loss across all marketing stages was 18.7%, suggesting that nearly one-fifth of tomatoes handled by the traders were lost before reaching end customers. This amount of loss is economically significant and indicates significant inefficiencies in Ekiti State's tomato marketing chain.

Table 3: Distribution of Post-Harvest Losses along Marketing Stages

Marketing Stage	Mean Loss (%)	Rank
Transportation	8.5	1st
Retail display/storage	5.7	2nd
Loading and unloading	2.6	3rd
Sorting and grading	1.9	4th
Total Mean Loss	18.7	

Source: Field Survey, 2025

4.4 Stochastic Frontier Estimates for Determinants of Post-Harvest Losses among Tomato Traders

Table 4 shows the results of the stochastic frontier analysis used in identifying the major drivers of post-harvest losses (PHL) among tomato traders in Ekiti State, as well as the factors influencing inefficiency in loss management. The model demonstrated adequate fit, with a sigma-squared value of 0.18 while gamma (γ) parameter of 0.81 indicates that approximately 81% of the variation in post-harvest losses is attributable to inefficiency effects rather than random shocks. The estimated model achieved a log-likelihood value of −128.64, indicating satisfactory convergence. The likelihood ratio (LR) test model yielded LR = 48.73 ($p < 0.001$), rejecting the null hypothesis that the inefficiency component is absent ($\gamma = 0$). This confirms that the stochastic frontier specification provides a significantly better representation of the data. The mean Variance Inflation Factor (VIF) was 2.14, shows that the model does not suffer from multicollinearity problem. The model estimates confirm that both operational and socio-economic variables significantly affect the magnitude of tomato losses during marketing activities.

The table reveals a statistically significant positive constant term ($\beta = 1.42$, $p < 0.01$), showing the presence of baseline losses independent of the included explanatory variables. Trading volume shows a positive significant effect on PHL ($\beta = 0.28$, $p < 0.01$), implying the higher the t trade

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volume the higher the PHL recorded. Both the distance traveled during transportation ($\beta = 0.41$, $p < 0.01$) and transport time ($\beta = 0.35$, $p < 0.01$), shows significant positive relationships with PHL. This might be due to the perishable nature of tomatoes and road infrastructural constraints. Also, it is an indication that prolonged transit accelerates quality deterioration possibly due to heat exposure, inadequate ventilation, and delayed market arrival. Again, storage duration shows a positive significant relationship with PHL, ($\beta = 0.19$, $p < 0.01$) showing that higher storage duration is associated with increases PHL and reduces product quality particularly in the absence of cold storage facilities.

The inefficiency model indicates, educational attainment substantially reduces inefficiency ($\beta = -0.11$, $p < 0.01$), suggesting that more educated traders are better positioned to adopt improved handling and management practices. Access to cold storage facilities also significantly reduces inefficiency ($\beta = -0.41$, $p < 0.01$), highlighting the essential role of adequate storage infrastructure in preserving tomato quality. Likewise, credit access enhances efficiency ($\beta = -0.22$, $p < 0.05$) by enabling investments in improved transportation, storage, and packaging technologies. The use of modified plastic crates further reduces inefficiency ($\beta = -0.29$, $p < 0.01$), indicating that superior packaging minimizes physical damage during handling and transit. Conversely, transport delays exceeding two hours significantly increase inefficiency ($\beta = 0.34$, $p < 0.06$), thereby exacerbating product deterioration and spoilage.

Table 4: Stochastic frontier estimates for PHL determinants

Variable (Loss frontier)	Coefficient	Std. Error	p-value
Constant	1.42	0.31	0.000
ln(Volume)	0.28	0.09	0.002
ln(Distance)	0.41	0.11	0.000
ln(Transport time)	0.35	0.08	0.000
ln(Storage duration)	0.19	0.07	0.008
Inefficiency model			
Age	0.02	0.01	0.120
Education (years)	-0.11***	0.04	0.006
Cold storage (dummy)	-0.41***	0.12	0.001
Credit access (dummy)	-0.22**	0.09	0.014
Crate type (modified plastic)	-0.29*	0.10	0.005

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Transport delay (hours >2)	0.34*	0.09	0.060
Sigma-squared	0.18	0.02	

Source: Data Analysis, 2025
Sig *** =1% ; **=5%; * = 10%
Gamma (γ) = 0.81
Log-likelihood = 128.64
LR test = 47.83 (p = 0.001)
VIF = 2.41

4.5 Tomato Marketing Efficiency in the study area

The analysis of marketing efficiency among tomato traders revealed a relatively low level of market performance within the study area. The mean marketing efficiency (ME) index was 0.42 with a standard deviation of 0.19, implying that traders realized an average net margin of ₦0.42 for every ₦1.00 incurred as marketing cost. This finding indicates that tomato marketing activities were characterized by substantial operational inefficiencies, largely resulting from high post-harvest losses, transportation costs, spoilage, and inadequate storage facilities.

Further analysis showed that only 12.5% of the sampled traders recorded marketing efficiency values greater than one (ME > 1), indicating that the majority of traders operated below optimal efficiency levels. The low efficiency performance observed among most traders suggests that post-harvest losses significantly reduced profitability and weakened market returns.

Pearson correlation analysis revealed a strong and statistically significant negative relationship between post-harvest losses and marketing efficiency ($r = -0.67$; $p < 0.01$). This indicates that increases in post-harvest losses were associated with substantial declines in marketing efficiency among tomato traders. The result further showed that traders experiencing higher spoilage rates incurred higher marketing costs and lower net returns.

The trend analysis also indicated that marketing efficiency declined sharply when post-harvest losses exceeded 30%. At this threshold, efficiency indices dropped below 0.30, suggesting severe reductions in profitability and operational performance.

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Table 5: Distribution of Marketing Efficiency among Tomato Traders in Ekiti State

Marketing Efficiency Indicators	Value
Mean marketing efficiency index	0.42
Standard deviation	0.19
Minimum efficiency value	0.11
Maximum efficiency value	1.24
Traders with ME > 1	20 (12.5%)
Traders with ME ≤ 1	140 (87.5%)
Total respondents	160

Source: Field Survey, 2025

4.6 Relationship between Post-Harvest Losses and Marketing Efficiency

The result of the relationship between post-harvest losses and marketing efficiency among tomato traders in Ekiti State is as presented in table 6. The findings revealed that increasing levels of post-harvest losses significantly reduce the marketing efficiency of the sampled tomato traders. The results indicate a consistent decrease in marketing performance with increasing losses, which corroborates that spoilage, is a major source of inefficiency in the tomato value chain. From the table, the traders with post-harvest losses below 10% had the highest mean marketing efficiency index (0.81). This relatively higher efficiency may be linked to improved handling practices, quicker product turnover, better market access and less spoilage in transit and storage. The marketing efficiency fell off progressively as percentages of post-harvest increases. Traders with losses between 10% and 20% had marketing efficiency index of 0.59, which means even moderate spoilage significantly reduces profitability because of higher marketing costs and lower saleable output. This drop can be attributed to factors such as delays in transportation, lack of storage, inadequate packaging, and unstable market demand. The reduction was more pronounced for traders with losses between 21% and 30% with mean marketing efficiency of 0.41. This indicates large inefficiencies in the marketing system, with a greater percentage of tomatoes becoming unmarketable, reducing profit margins and raising the average marketing cost.

The lowest efficiency level (0.28) was for traders with losses over 30% an extremely low return in relation to the marketing costs. The high spoilage levels likely caused capital losses, lowered business sustainability, slow turnover of capital, and financial instability. These results also reflect the effects of poor transportation infrastructure, limited cold storage facilities, market congestion and prolonged exposure of tomatoes to high temperature.

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Generally, the observed pattern shows a distinct inverse relationship between post-harvest losses and efficiency of marketing. As losses increase, efficiency consistently decreases. The findings of the Pearson correlation further supported this conclusion, which showed a strong and statistically significant negative correlation between post-harvest losses and marketing efficiency ($r = -0.67$; $p = 0.000$). The coefficient indicates that more spoilage is associated with less marketing efficiency. This suggests that post-harvest losses are a major determinant of tomato traders' marketing performance. Better post-harvest handling, transport systems, storage facilities and market infrastructure would probably improve marketing efficiency, boost profitability, stabilise food supply and reduce price volatility in tomato markets through reduced spoilage. These results are consistent with previous findings by Olayide et al. (2024), which identified poor post-harvest handling practices, weak transportation systems, inadequate storage facilities, and inefficient market infrastructure significantly reduce marketing efficiency and profitability among tomato traders in Nigeria

Table 6: Relationship between Post-Harvest Losses and Mean Marketing Efficiency at Different Levels

Post-Harvest Loss Category (%)	Mean Marketing Efficiency	Correlation Coefficient (r)	p-value	Decision
Less than 10	0.81	-0.67	0.000	Significant at 1%
10 – 20	0.59			
21 – 30	0.41			
Above 30	0.28			

Source: Field Survey, 2025

5. CONCLUSION

This study examined the effects of post-harvest losses on the marketing efficiency of tomato sellers in the state of Ekiti in Nigeria. The findings of the study show that the post-harvest loss rate among tomato marketers in Ekiti State is 18.7% of the purchased quantities, mainly because of delays in transportation, inadequate refrigeration facilities, and credit issues. Efficiency in marketing is extremely low at 0.42, and there is a clear negative correlation between post-harvest losses and marketing efficiency. Using modified crates and refrigeration facilities greatly improves efficiency.

Although the post-harvest loss of 18.7% recorded in the study is lower than the national estimates of 30–50% reported for Nigeria (FAO, 2022), the result is in line with the findings of (Adebayo *et al.*, 2023; Egbetokun & Ojo, 2024; Mintah *et al*., 2022; Mwangi & Ngigi, 2023) who in their various studies in Nigeria and other Sub-Saharan African identified transportation constraints,

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inadequate storage facilities, and poor packaging practices as the main drivers of tomato losses along the marketing chain. The observed variation may be attributed to differences in transport infrastructure, market organization, trader experience, access to cold storage, and the adoption of improved post-harvest technologies across locations.

6. RECOMMENDATION

The reduction of post-harvest losses among tomato traders in the study area will require a collaborative approach involving government, financial institutions, extension services and trader associations. The Ekiti State government should invest in rural road infrastructure and the provision of affordable solar-powered cold storage facilities at major markets to reduce spoilage. EKADEP and agricultural extension services should organise regular training for traders on improved post-harvest handling, packaging, storage and transportation practices to improve their technical capacity. The Bank of Agriculture (BOA) and NIRSAL should provide credit facilities at affordable rates to enable traders to invest in modern storage, packaging and transportation technologies. Equally associations of tomato traders should promote cooperative marketing, common storage facilities and use of standard packaging material. The implementation of these measures would result in reduced post-harvest losses, improved marketing efficiency and profitability, strengthened food security and improved sustainability of the tomato value chain in Ekiti State

7. LIMITATIONS THE STUDY

One of the major limitations of the study is recall bias. The respondents rely solely on memory recall to estimate their losses. In addition, while the research was carried out on major tomato markets in the Ekiti state, the results apply only to the four LGAs capture within Ekiti State and might not reflect the situation in other tomato markets outside the selected LGAs. Also, the cross-sectional design limits causal inference and does not allow for seasonal variation.

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