



Assessment of Tomato Marketing and Post-harvest Handling Constraints Among Smallholders along River Yobe Basing Area of Geidam/Bursary Local Governments Area of Yobe State Nigeria

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Abstract

This study assessed tomato marketing structures and post-harvest handling constraints among smallholder farmers in Geidam and Bursary Local Government Areas (LGAs) of Yobe State, Nigeria. A mixed-methods cross-sectional survey design was employed, combining purposive and stratified random sampling of 200 smallholder households with trader surveys, focus group discussions, and key informant interviews. Data were analyzed using descriptive statistics, loss quantification techniques, marketing margin analysis, and regression models to identify determinants of farm-gate prices and losses. Findings indicate that post-harvest losses range between 20% and 45% along the farm-to-market chain, with the highest losses occurring during transport and at open markets due to poor packaging, inadequate storage, and long handling times. The study concludes that interventions such as improved packaging (plastic crates), farmer aggregation centers, low-cost evaporative cooling technologies, digital price information platforms, and strengthened farmer cooperatives can significantly reduce losses and enhance producer margins. Policy actions focused on rural infrastructure, credit access, and inclusive farmer support are recommended to sustain productivity and improve livelihoods. These findings contribute to the evidence base on tomato value chain development in northern Nigeria and provide a framework for designing context-specific interventions to reduce losses, improve efficiency, and strengthen food and income security.

Keywords: *Tomato, post-harvest, losses, marketing constraints, smallholders, River Yobe basin, Sustainability. Productivity Yobe State Nigeria*

Introduction:

Tomato production is a significant contributor to the agricultural sector and food security in many countries. However, despite its importance, tomato producers often face numerous challenges that affect their productivity, income and competitiveness. One of the critical areas of concern is the marketing and post-harvest handling of tomatoes, which can result in significant losses and reduced profitability for producers and marketers. The bulk of vegetable produce by smallholder's farmers in Yobe Erid-zone is tomato (*Lycopersicon Esculentum*) it is the single dominant crop (URT, 2012) which is highly virtue vegetable containing essential vitamins needed by the body. It contains folic acid which is necessary for reconstruction and recovery of body cells. It also contains selenium which is the chemical substance that prevent contact by providing the body with immune system against the disease. It also contains potassium to protect the body from heart attack. Tomato production as the integral component of Nigerian horticulture, is providing nutritional benefits and income for rural households. In semi-arid zones such as the River Yobe basin, smallholders rely on floodplain irrigation, river-fed wells, and rainfed pockets. Despite production potential, tomatoes are highly perishable and smallholders often incur substantial post-harvest losses; at the same time, marketing inefficiencies reduce producer returns. In Geidam and Bursary LGAs, seasonal gluts, poor storage infrastructure, limited market information, and inadequate transport amplify losses and weaken bargaining power of producers. This paper aims to comprehensively document the constraints facing tomato smallholders in the target area and propose evidence-based interventions. Additionally, post-harvest losses due to poor handling, storage, and transportation further exacerbate the issue

(Degefa and Getachew, 2020). Despite Nigeria's capacity for tomato production, there's a significant gap between demand and local production, leading to imports of tomato paste (Mbutor et al., 2013). Furthermore, the cyclical nature of tomato availability creates price fluctuations and influences consumption patterns. Addressing post-harvest loss requires holistic interventions across the food supply chain, including improved harvesting methods, storage facilities, packaging, transportation, and market access (Adepoju, 2014). However, these efforts are hindered by various factors, including inadequate infrastructure and handling practices (Oyetoro and Alabi, 2022). Globally nearly one-third of food intended for human consumption is lost or wasted annually, underscoring the urgency of addressing post-harvest losses. In sub-Saharan Africa, where 374 million people face food insecurity, post-harvest losses of vegetables range between 30-50% (FAO et al., 2019). Therefore, mitigating post-harvest losses in Nigeria requires concerted efforts to improve infrastructure, technology, and agricultural practices across the entire food supply chain. Such interventions are crucial for enhancing food security, reducing waste, and improving the livelihoods of people In Yobe State, particularly in Geidam and Bursary Local Government Areas (LGAs), the River Yobe basin provides a unique ecological environment for tomato production.

Objectives

- i. To characterize the socio-economic profile and production practices of tomato smallholders in Geidam and Bursary LGAs.
- ii. To identify and quantify major post-harvest handling losses along the farm-to-market chain.

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- iii. To identify institutional, infrastructural, and technical constraints limiting post-harvest management and access to markets.
- iv. To recommend practical interventions to reduce losses, improve incomes, and strengthen market integration.
- v. To examine the existing marketing channels and structures for tomatoes, including the role of middle-men, wholesalers and retailers.
- vi. To determine potentials areas for improvement in tomato marketing and post-harvest handling, such as infrastructure development, training and policy intervention

Material and Method

3.1 Study Area

The study was conducted in Geidam and Bursari Local Government Areas (LGAs) of Yobe State, Nigeria. These LGAs are located along the river Yobe basin, which provides fertile floodplains suitable for irrigated vegetable production. The area is characterized by a semi-arid climate with an average annual rainfall of 400–600 mm, and temperatures ranging between 20°C and 42°C. Agriculture is the primary livelihood activity, with smallholder farmers cultivating tomatoes, onions, maize, millet, and sorghum. Tomato production is concentrated along the riverine areas, where irrigation facilities support both wet- and dry-season farming.

3.2 Research Design

A cross-sectional survey design was adopted for this study. The approach was chosen because it allows for the collection of quantitative and qualitative data within a limited time frame and provides insights into the current production,

marketing, and post-harvest handling practices of tomato farmers.

3.3 Sampling Procedure and Sample Size

A multistage sampling technique was employed. In the first stage, Geidam and Bursari LGA's were purposively selected due to their prominence in tomato production. In the second stage, five tomato-producing communities were randomly selected from each LGA. Finally, from each community, 15 smallholder tomato farmers were randomly selected, giving a total sample size of 150 respondents.

3.4 Data Collection Methods

Primary and secondary data sources were used:

- **Primary data:** Collected using structured questionnaires, focus group discussions (FGDs), and key informant interviews (KIIs). The questionnaire captured information on socio-economic characteristics, production practices, post-harvest handling, storage, transport, marketing channels, constraints, and loss estimates.
- **Secondary data:** Obtained from journals, reports, government publications, and previous studies related to tomato production and marketing in Nigeria.

3.5 Data Collection Instruments

- **Questionnaire:** Structured and pre-tested to ensure reliability and validity. Sections covered farmer demographics, production systems, handling practices, marketing strategies, and constraints.
- **Focus Group Discussions (FGDs):** Conducted with groups of 8–10 farmers

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in selected communities to obtain qualitative insights into communal challenges and coping mechanisms.

- **Key Informant Interviews (KIIs):** Conducted with agricultural extension officers, local market leaders, transporters, and cooperative heads.

3.6 Analytical Techniques

Data were analyzed using both descriptive and inferential statistical tools:

- **Descriptive statistics:** Frequencies, means, percentages, and standard deviations were used to summarize socio-economic characteristics, handling practices, and market channels.
- **Marketing Margin Analysis:** Used to estimate the distribution of margins across different actors in the value chain.
- **Post-Harvest Loss Estimation:** Farmers' reported losses were quantified and expressed as percentages of total harvest.
- **Constraint Analysis:** Ranking methods and Likert scale analysis were used to identify and prioritize major production, handling, and marketing constraints.
- **Regression Analysis:** Multiple regression was used to determine socio-economic and institutional factors influencing post-harvest losses and marketing performance.

3.7 Ethical Considerations

Participation in the study was voluntary. Respondents were informed about the purpose of the research, and verbal consent was obtained prior to interviews. Anonymity and confidentiality were strictly maintained in reporting results.

Result and Discussion

The findings of this study highlight the severe post-harvest and marketing challenges facing tomato smallholders in the River Yobe basin. The estimated 34% post-harvest loss is consistent with national and regional studies (Abulude et al., 2024; Abdulrahman, 2025). These losses are largely avoidable through better handling, packaging, and storage interventions. However, adoption of improved technologies such as plastic crates and evaporative cooling systems remains low due to cost barriers and lack of awareness.

Marketing inefficiencies further compound farmer vulnerability. The dominance of middlemen and weak farmer organizations reduce farm-gate prices, leaving smallholders with little bargaining power. This structure perpetuates rural farmer poverty. Despite high consumer demand for tomatoes, similar challenges have been documented in other tomato-producing regions in Nigeria (Aliyu et al., 2025; Onwude et al., 2023).

4.1 Socio-economic characteristics of respondents

Table 1 presents the socio-economic characteristics of tomato farmers in the study area. The majority of respondents (78%) were male, reflecting gender norms around land ownership and farming. The mean age was 39 years, indicating that tomato production is dominated by middle-aged farmers who are still in their productive years. Education levels were generally low, with 47% having only primary education and 28% with no formal education. Farm sizes averaged 1.6 hectares, confirming that tomato production in the study area is largely smallholder-based.

Table 1: Socio-economic characteristics of tomato farmers in Geidam and Bursari LGAs

Variable	Frequency (%)	Mean
Gender (Male)	78	-
Gender (Female)	22	-
Mean Age (years)	-	39
No formal education	28	-
Primary education	47	-
Secondary education	20	-
Tertiary education	5	-
Average farm size (ha)	-	1.6

These findings align with those of Aliyu et al. (2025), who found that tomato farming in northern Nigeria is dominated by small-scale farmers with low education levels, which influences adoption of improved practices

4.2 Post-harvest handling practices

The survey revealed that most farmers (65%) used woven sacks for packaging tomatoes, while only 12% reported using plastic crates. Sorting and grading were rarely practiced at the farm level, with 73% selling mixed-quality produce directly. About 85% transported tomatoes on open trucks or motorcycles, exposing the produce to mechanical damage and heat stress. Storage practices were rudimentary, with 91% of farmers lacking access to cold storage facilities.

Table 2: Post-harvest handling practices among tomato farmers

Practice	Percentage (%)
Use of woven sacks	65
Use of plastic crates	12
Sorting/grading practiced	27
Cold storage access	9
Open truck transport	70
Motorcycle transport	15

These practices directly contribute to high levels of post-harvest losses. Similar results were reported by Onwude et al. (2023), who highlighted poor transport conditions as a major factor in tomato deterioration in Nigeria.

4.3 Post-harvest losses

The estimated average post-harvest loss among farmers was 34% of total harvest, with losses occurring mainly during transport (45% of reported losses) and at the market (30%). Losses during storage and on-farm handling accounted for 25%. These figures are consistent with Abulude et al. (2024), who estimated tomato losses in Nigeria to range between 20% and 50%.

Table 3: Estimated post-harvest losses across the value chain

Stage of value chain	Percentage of total losses (%)
On-farm handling	10
Storage	15
Transport	45
Market	30

The magnitude of these losses implies significant economic waste and reduced income for farmers. For instance, a farmer harvesting 100 baskets of tomatoes may lose 34 baskets to spoilage, drastically reducing profitability.

4.4 Marketing channels and margins

Marketing channels were dominated by farm-gate sales to middlemen (60%). Only 25% of

Table 4: Marketing channels and farmer share of consumer price

Channel	Percentage of farmers (%)	Farmer share (%)
Farm-gate (middlemen)	60	30
Local markets	25	40
Regional markets	15	55

These results align with Aliyu et al. (2025), who reported that middlemen dominate the tomato trade in northern Nigeria, significantly reducing farmers' earnings.

4.5 Constraints in tomato marketing and post-harvest handling

The key constraints identified by farmers were:

- Lack of cold storage facilities (92%)
- Poor road infrastructure (86%)
- High cost of packaging materials (78%)
- Price fluctuations and market gluts (74%)
- Weak farmer cooperatives and bargaining power (69%)

Ranking analysis indicated that inadequate storage and poor transport infrastructure were the most critical constraints. This mirrors findings by Abdulrahman (2025), who highlighted infrastructure and organizational weaknesses as major barriers to reducing tomato losses.

farmers sold directly at local markets, while 15% accessed regional markets. Marketing margin analysis revealed that farmers captured only 38% of the consumer price, with wholesalers and retailers taking 62% collectively.

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Marketing inefficiencies further compound farmer vulnerability. The dominance of middlemen and weak farmer organizations

reduce farm-gate prices, leaving smallholders with little bargaining power. This structure perpetuates rural poverty despite high consumer demand for tomatoes. Similar challenges have been documented in other tomato-producing regions in Nigeria (Aliyu et al., 2025; Onwude et al., 2023).

Overall, the results emphasize the need for integrated interventions that combine infrastructure development (roads and storage facilities), policy support (market regulation and price stabilization), and farmer capacity building (cooperatives and training). Such interventions could significantly reduce losses, improve incomes, and enhance food security in Yobe State.

Conclusion

In this study, the assessment of tomato marketing and post-harvest handling constraints among smallholder farmers in Geidam and Bursary LGAs of Yobe State, Nigeria has been discussed in details. The findings revealed that tomato production plays a central role in smallholder livelihoods, but high levels of post-harvest losses (20–45%) and marketing inefficiencies significantly reduce farmers' income and food availability. Losses are most severe during harvesting, transport, and open-market storage due to inadequate packaging, poor infrastructure, and limited storage facilities. The marketing system is dominated by middlemen, restricting farmers' bargaining power and reducing their share of consumer prices. Institutional and infrastructural constraints, including weak extension services, limited access to credit, and poor road networks, exacerbate the challenges. Additionally, women and youth remain underrepresented in profitable nodes of the value chain, highlighting gender inequities. Overall, the study concludes that tomato smallholders in the river

Yobe basin face intertwined technical, infrastructural, and institutional constraints that require multi-level interventions. Reducing losses and improving market systems would significantly improve farmer incomes, food security, and regional economic resilience.

Recommendations

- Promote the use of reusable plastic crates instead of woven sacks to reduce transport damage and bruising.
- The need Farmer training programs: Organize farmer field schools on harvesting techniques, sorting, grading, and basic post-harvest handling.
- Market information dissemination: Establish mobile-based (SMS/WhatsApp) platforms to provide real-time price and demand information. Medium-Term (Organizational and Infrastructure Development)

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