



Infrastructure Quality and Agricultural Logistics Performance: Empirical Evidence From Nigeria's Irish Potato Supply Chain

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ABSTRACT

Agricultural logistics infrastructure remains a major determinant of food supply chain efficiency in developing economies. Despite Nigeria's status as one of Africa's leading producers of Irish potatoes, persistent deficiencies in rural road networks, storage facilities, and transportation systems continue to undermine supply chain performance and increase post-harvest losses. This study examines how infrastructure quality affects agricultural logistics performance, drawing on empirical evidence from the Irish potato supply chain in the Mangu and Bokkos Local Government Areas of Plateau State, Nigeria. The study adopts a mixed-methods design, combining quantitative survey data from 92 stakeholders, including farmers, traders, and transporters, with qualitative insights from supply chain actors, and interprets findings through agricultural logistics and supply chain integration theories. The findings show that infrastructure quality significantly influences logistics performance across the Irish potato supply chain. Road infrastructure was rated poor or very poor by up to 75% of stakeholders, particularly transporters, and inadequate storage facilities were the most frequently cited constraint among farmers and traders. The majority of stakeholders reported post-harvest losses of 10% to 20%, with poor storage conditions and deteriorating transport infrastructure identified as the principal causes. Infrastructure deficiencies reduce market accessibility, increase transportation costs, constrain regional distribution, and weaken supply chain resilience. The study recommends integrated investments in rural transport infrastructure, decentralized cold storage facilities, logistics hubs, and public-private partnerships for agricultural transportation. Improving logistics infrastructure has the potential to reduce post-harvest losses, improve farmers' incomes, enhance food security, and strengthen regional agricultural competitiveness.

Keywords: Agricultural logistics; Infrastructure quality; Irish potato supply chain; Nigeria; Post-harvest losses; Supply chain performance

1. Introduction

Agricultural supply chains are fundamental to food security, rural livelihoods, employment generation, and economic transformation, particularly in developing economies where agriculture remains an important source of household income. However, agricultural development depends not only on increasing production but also on the capacity of logistics systems to move products efficiently from production locations to consumers. Agricultural logistics encompasses transportation, storage, handling, packaging, market access, and associated information flows that collectively influence the cost, speed, reliability, and quality of agricultural product movement. For highly perishable commodities, deficiencies in any of these logistics functions can result in physical deterioration, increased transaction costs, reduced market access, and declining economic returns. The Food and Agriculture Organization (FAO, 2024) emphasizes that transforming agri-food systems requires interventions that improve their economic, social, and environmental performance, while the World Bank (2024) similarly highlights the importance of market access and infrastructure investment for inclusive agricultural and economic development.

Post-harvest losses constitute an important dimension of this challenge because the economic value generated through agricultural production can be substantially undermined after harvesting. The problem is particularly pronounced for perishable commodities that are susceptible to mechanical damage, physiological deterioration, moisture loss, and microbial spoilage. Transportation delays, inadequate storage facilities, inappropriate packaging, repeated handling, and poor road conditions can accelerate product deterioration and reduce the quantity and quality reaching final markets.

Nigeria has substantial potential for potato production, with the Jos Plateau constituting an important production zone. Within Plateau State, Mangu and Bokkos are significant locations for Irish potato production and associated agricultural activities. The perishability and physical characteristics of Irish potatoes increase the importance of reliable transportation, suitable storage, careful handling, and effective market connectivity, making infrastructure quality especially consequential for this commodity.

Despite growing empirical attention to agricultural post-harvest and market-access issues in Nigeria, an important gap remains in the literature concerning the integrated influence of infrastructure quality on agricultural logistics performance within Nigeria's Irish potato supply chain. This gap is particularly important in Mangu and Bokkos Local Government Areas of Plateau State, where potato production is concentrated and where the movement of produce from production locations to local, regional, and distant markets depends heavily on road-based transportation and post-harvest infrastructure. Poor road conditions can increase travel time and mechanical damage; inadequate storage can accelerate deterioration and constrain farmers' ability to delay sales; and weak market connectivity can increase transaction costs and limit access to remunerative markets.

Consequently, this study investigates the relationship between infrastructure quality and agricultural logistics performance in Nigeria's Irish potato supply chain, using empirical evidence from Mangu and Bokkos Local Government Areas of Plateau State. Specifically, the study evaluates the quality and adequacy of transportation infrastructure supporting potato distribution, assesses the influence of storage infrastructure on logistics efficiency and post-harvest losses, examines the relationship between infrastructure quality and market accessibility, and identifies policy measures capable of strengthening agricultural logistics performance and supply-chain resilience. By integrating transportation, storage, and market-access dimensions within a single analytical framework, the study seeks to contribute empirical evidence for improving the efficiency, competitiveness, and sustainability of Nigeria's Irish potato supply chain.

2. Literature Review

2.1 Post-Harvest Losses and Logistics Infrastructure in Potato Value Chains

Evidence from potato-producing areas demonstrates the close relationship between logistics infrastructure and post-harvest outcomes. Degebasa (2020) reported that potato losses occur at several stages of the value chain, including harvesting, handling, transportation, storage, distribution, and marketing, with inadequate storage and poor post-harvest management constituting important constraints to reducing losses. Fentie (2020), examining the

potato value chain in Ethiopia, similarly identified perishability, inadequate storage, irrigation constraints, price fluctuations, and weaknesses in value-chain organization as important challenges affecting potato value-chain performance. Kuyu et al. (2019) provide particularly direct empirical evidence from potato supply chains: comparing production areas with different road-access conditions in southwestern Ethiopia, they found that potatoes transported through areas with poorer road access experienced greater mechanical damage and subsequent quality deterioration during storage, showing that transportation infrastructure can have effects that extend beyond the immediate journey to influence subsequent product shelf life and value. Collectively, these studies demonstrate that the performance of potato supply chains depends on a combination of production, transportation, storage, market organization, and post-harvest management rather than production output alone.

2.2 Production, Market Participation, and Infrastructure in the Nigerian Context

Empirical evidence confirms the economic importance of potato production in Plateau State. Bakut (2021) examined Irish potato production among 120 small-scale farmers in Bokkos and Riyom Local Government Areas of Plateau State and found that, despite the profitability of potato production, farmers faced constraints including poor marketing outlets, high input costs, inadequate financing, and weak information networks. These constraints are important from a logistics perspective because production profitability does not necessarily translate into supply-chain efficiency when farmers encounter difficulties in moving produce to appropriate markets.

The importance of market access to agricultural performance is also demonstrated by recent empirical evidence from Nigeria. Manda et al. (2020), using a nationally representative sample of 1,525 cowpea-producing households in northern Nigeria, found that market participation had statistically significant positive effects on household food security and income, and that public infrastructure, including feeder-road construction and maintenance, could facilitate market participation by improving farmers' access to markets and traders. Although the study focused on cowpea rather than Irish potato, its findings demonstrate the broader economic significance of market accessibility and transport infrastructure within Nigerian agricultural supply chains, a relationship that is particularly consequential for potato given that the commodity is bulky and perishable.

2.3 Storage, Transportation, and Post-Harvest Technologies in Nigerian Agriculture

Recent Nigerian evidence demonstrates the importance of transportation and storage conditions in determining post-harvest outcomes. Falola et al. (2023), using data collected from 360 onion farmers and applying descriptive statistics and multiple regression analysis, identified poor storage facilities, transportation-related problems, market distance, and other production and marketing conditions among the factors associated with post-harvest losses, with distance to market and length of post-harvest storage emerging as significant determinants. Evidence from northwestern Nigeria further demonstrates the economic significance of improved storage: Adomi et al. (2023) found that adoption of improved hermetic storage technology among smallholder cowpea farmers improved food security and income outcomes, showing that post-harvest storage interventions can generate benefits beyond physical loss reduction by enabling farmers to preserve produce and manage marketing decisions.

The role of logistics and post-harvest technologies has also received increasing empirical attention in recent Nigerian research. Yami et al. (2025), using a cross-sectional survey of 1,704 tomato farmers in four Local Government Areas of Kano State, examined adoption of reusable plastic crates and other post-harvest packaging innovations. The study found that farmers involved in long-distance sales were more likely to adopt reusable plastic crates, while acquisition costs and limited availability constrained adoption, and that proximity to major output markets, irrigation practices, and membership of farmer associations were also important factors influencing adoption. These findings demonstrate the interdependence between market distance, transportation conditions, packaging technology, and post-harvest loss reduction within Nigerian agricultural value chains.

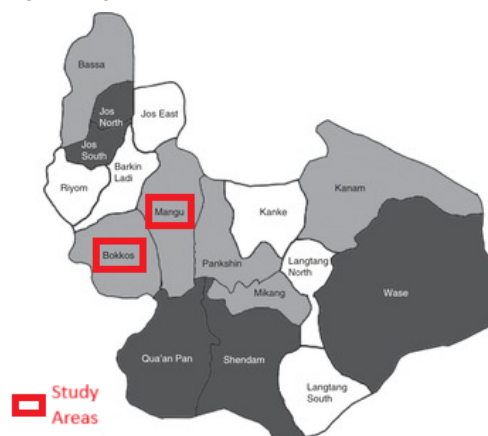
2.4 Gap in the Literature

Despite these empirical contributions, an important gap remains in the literature concerning the integrated influence of infrastructure quality on agricultural logistics performance within Nigeria's Irish potato supply chain. Existing Nigerian studies have examined market participation, production profitability, post-harvest losses, and adoption of post-harvest technologies, but these dimensions have generally been investigated separately: Manda et al. (2020) focused on the relationship between market participation, food security, and income; Bakut (2021) examined the cost and returns of Irish potato production and associated production constraints; Falola et al. (2023) examined the determinants of onion post-harvest losses; Adomi et al. (2023) focused on the welfare implications of improved storage; and Yami et al. (2025) investigated the adoption of post-harvest packaging innovations among tomato farmers. While these studies provide valuable evidence, none of them comprehensively examines how transportation infrastructure, storage facilities, and market accessibility jointly shape logistics performance within a specific Nigerian potato-producing region. This study addresses that gap by integrating transportation, storage, and market-access dimensions within a single analytical framework focused on Nigeria's Irish potato supply chain.

3. Study Area

The study was conducted in Mangu and Bokkos Local Government Areas of Plateau State, Nigeria (Figure 1), with a combined 2006 census population of approximately 480,070 (National Population Commission [NPC], 2006). This historical census figure is retained as a geographical reference point and should not be confused with the study's operational sampling frame. For sampling purposes, the study used an accessible frame of 120 supply-chain actors, comprising 45 farmers, 45 traders, and 30 transporters identified during the preliminary listing of relevant actors in the selected study locations. Thus, the Yamane calculation was applied to $N = 120$, rather than to the general LGA population. These areas represent important Irish potato production clusters in the country and collectively contribute substantially to potato supply. The climatic characteristics of the Jos Plateau, including moderate temperatures, fertile soils, and relatively high elevation, provide favourable conditions for potato cultivation. Consequently, the region serves as a major supplier of Irish potatoes to urban markets across Nigeria and neighbouring West African countries. The target population for the survey therefore comprised stakeholders directly involved in the Irish potato supply chain within the defined accessible sampling frame. Three stakeholder categories were considered: farmers, traders, and transporters. These actors collectively represent the major operational segments of the supply chain from production to final distribution.

Figure 1: Map of Plateau Showing Study Areas



Source: <http://www.plateaustate.gov.ng/page>

4. Methodology

This study adopts a mixed-methods research design integrating quantitative and qualitative approaches to investigate the relationship between infrastructure quality and agricultural logistics performance within the Irish potato supply chain in Plateau State, Nigeria. The mixed-methods approach is particularly appropriate for agricultural logistics studies because it allows both statistical assessment of stakeholder perceptions and contextual understanding of supply chain challenges.

The quantitative component utilizes survey data collected from key stakeholders involved in Irish potato production and distribution, while the qualitative component incorporates insights from interviews and field observations. Combining these approaches improves the validity and reliability of findings by enabling methodological triangulation. Purposive and stratified sampling techniques were employed to ensure adequate representation of major supply chain actors. The sample size, as shown in Table 1, was determined using the Yamane (1967) sample size formula:

$$n = N / [1 + N(e^2)]$$

For $N = 120$ and $e = 0.05$, $n = 120 / [1 + 120(0.05^2)] = 92.31$, which was rounded to 92 respondents, where n is the sample size, N is the population size, and e is the margin of error (0.05).

Table 1: Sample Size

Stakeholder Group	Population	Sample Size
Farmers	45	35
Traders	45	35
Transporters	30	22
Total	120	92

Source: Author's compilation (2026).

The final sample represented approximately 76.7% of the target population, providing adequate coverage of the principal supply chain actors. Primary data were obtained through structured questionnaires administered to farmers, traders, and transporters. The questionnaire was divided into five sections: socioeconomic characteristics, distribution activities, transportation practices, infrastructure challenges, and government support and policy effectiveness. Questions were designed using both closed-ended and Likert-scale formats to facilitate quantitative analysis. Secondary data were obtained from the Plateau Agricultural Development Programme (PADP), the Agricultural Services and Training Centre (ASTC), the National Bureau of Statistics (NBS), the Food and Agriculture Organization (FAO), World Bank databases, and peer-reviewed academic literature.

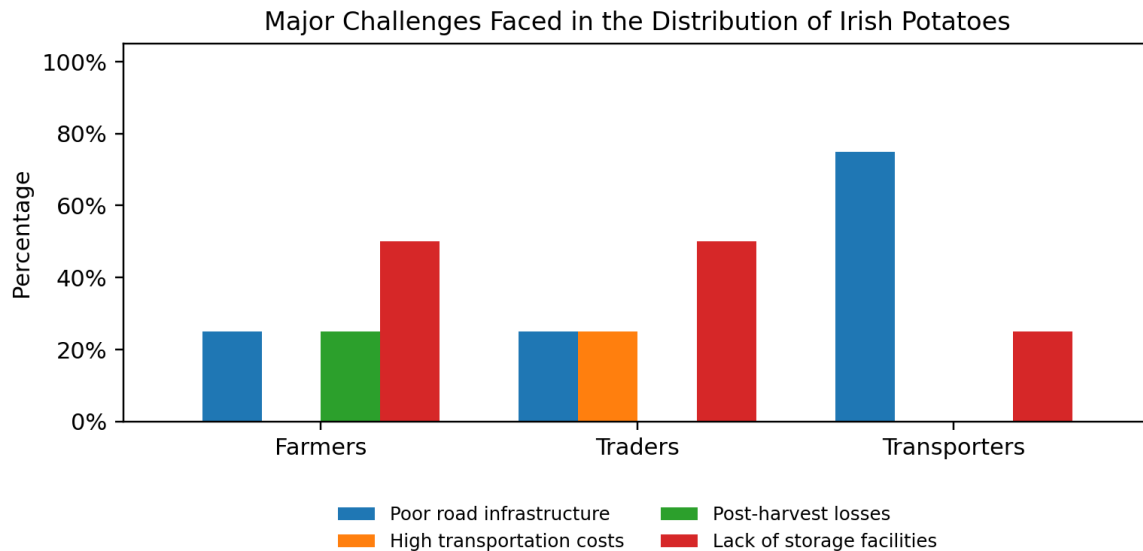
The 92 questionnaires constituting the achieved sample were treated as the usable survey responses; no separate set of 100 respondents is reported in this study. Accordingly, the manuscript consistently uses 92 as the achieved sample and 120 as the operational sampling frame, while 76.7% is reported as the achieved-to-frame proportion rather than as a response rate. Quantitative data were analyzed using descriptive statistical techniques, including frequencies, percentages, and cross-tabulations. The results were interpreted within the framework of agricultural logistics performance. Qualitative responses were analyzed using thematic analysis to identify recurring patterns regarding infrastructure challenges and supply chain constraints. The study surveyed farmers, traders, and transporters operating within the Irish potato supply chain. Farmers and traders each accounted for approximately 40% of respondents, while transporters represented approximately 20%. The gender composition revealed strong male dominance across the supply chain. Approximately 75% of farmers and traders were male, while transport activities were exclusively male-dominated. This finding is consistent with broader agricultural logistics studies in Sub-Saharan Africa, where significant gender disparities typically characterize transport operations. The educational profile of respondents indicates that farmers generally possess higher educational attainment than traders and transporters. A substantial proportion of farmers reported tertiary education qualifications, while traders

were predominantly primary school graduates, and transporters largely possessed secondary school education. Higher educational attainment among farmers may enhance the adoption of improved logistics and post-harvest management practices.

5. Results and Discussion

5.1 Major Infrastructure and Logistics Challenges in Irish Potato Distribution

Figure 2: Major Challenges Faced in the Distribution of Irish Potatoes



The results indicate that infrastructure-related constraints constitute important challenges to the distribution of Irish potatoes in the study area. Figure 2 shows that road infrastructure was rated poor or very poor by 25% of farmers, 25% of traders, and 75% of transporters. Respondents also indicated that road conditions deteriorate considerably during the rainy season, creating additional difficulties in moving harvested potatoes.

Poor road infrastructure is particularly important given the characteristics of the Irish potato supply chain. Potatoes are bulky and susceptible to mechanical damage during loading, transportation and unloading. Consequently, poor road surfaces and unreliable access can increase travel time, vehicle operating costs and handling requirements, while potentially increasing the risk of physical damage to tubers. The finding is consistent with Manda et al. (2020), whose empirical study of more than 1,500 cowpea-producing households in northern Nigeria demonstrated the importance of public infrastructure for agricultural market participation and recommended investment in feeder-road construction and maintenance to improve access to markets.

The finding also has direct relevance to potato supply chains. Kuyu et al. (2019) provide particularly direct empirical evidence from potato supply chains. Comparing production areas with different road-access conditions in southwestern Ethiopia, they found greater mechanical damage and subsequent quality deterioration among potatoes transported from areas with poorer road access. Their results therefore provide a useful mechanism through which inadequate road infrastructure can translate into post-harvest and logistics losses in potato distribution.

The results further show that storage facilities constitute another major constraint, particularly among farmers and traders, for whom Figure 2 shows lack of storage facilities as the most frequently cited challenge (50% for each group). Respondents reported inadequate access to appropriate storage facilities, suggesting limited capacity to preserve potatoes between harvesting and sale. This is important because inadequate storage can shorten marketable shelf life and increase pressure on producers and traders to sell quickly, potentially reducing their bargaining position.

The finding is supported by recent Nigerian empirical evidence. Falola et al. (2023), based on data from 360 Nigerian onion farmers, identified poor storage facilities, poor transportation systems and distance to marketing

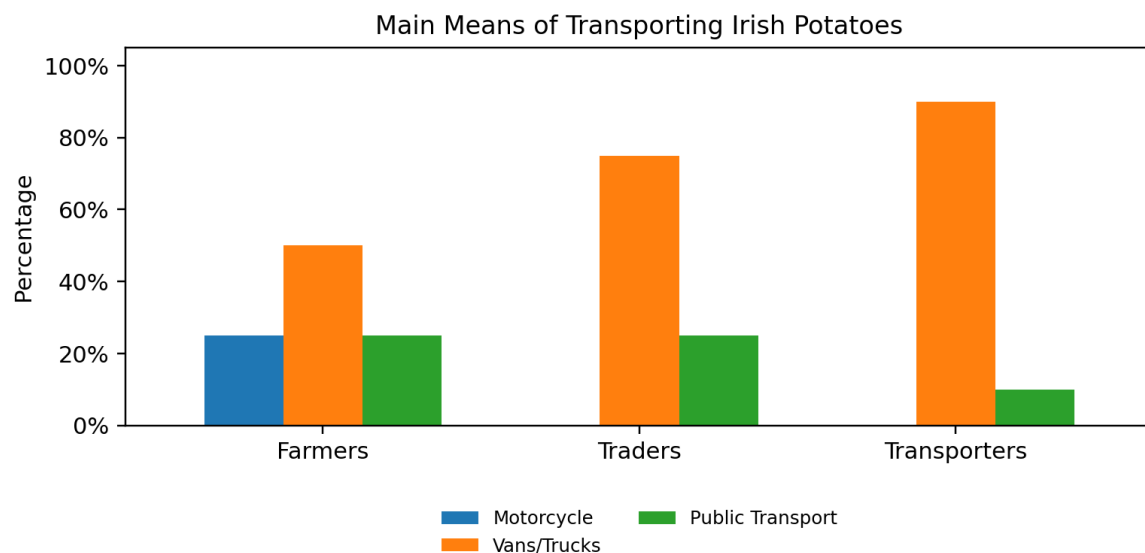
centres among the secondary causes of post-harvest losses. Their regression analysis also found distance to market and length of post-harvest storage to be significant determinants of losses. Although the study concerned onions rather than potatoes, it provides relevant evidence that storage and transport conditions are important components of post-harvest performance in Nigerian agricultural supply chains.

Similarly, Adomi et al. (2023) demonstrated the economic importance of improved storage infrastructure among smallholder cowpea farmers in northwestern Nigeria. Their study found that improved hermetic storage contributed to better food security and income outcomes, illustrating how appropriate post-harvest storage can reduce the consequences of product losses and improve farmers' capacity to manage the timing of sales.

Taken together, the findings suggest that the infrastructure problem in the study area is not restricted to roads. Rather, it involves an interconnected set of transportation and storage constraints that can affect the movement, preservation and marketing of potatoes along the supply chain.

5.2 Transportation Modes and Market Distribution

Figure 3: Main Means of Transporting Irish Potatoes



Road transportation was overwhelmingly the dominant mode used for moving Irish potatoes within the study area. Approximately 75% of traders reported using vans and trucks, while the corresponding proportion among transporters was approximately 90%. Farmers used a combination of trucks, motorcycles, and public transport, with the choice of mode influenced partly by accessibility to production locations.

The dominance of road transportation has important implications for the relationship between infrastructure quality and logistics performance. Because the study area depends predominantly on road-based movement, deficiencies in road infrastructure are likely to affect a large proportion of the potato distribution process. The concentration of transport activity around vans and trucks also means that the operational costs associated with vehicle maintenance, fuel consumption, travel time and road conditions can influence the final cost of potato distribution.

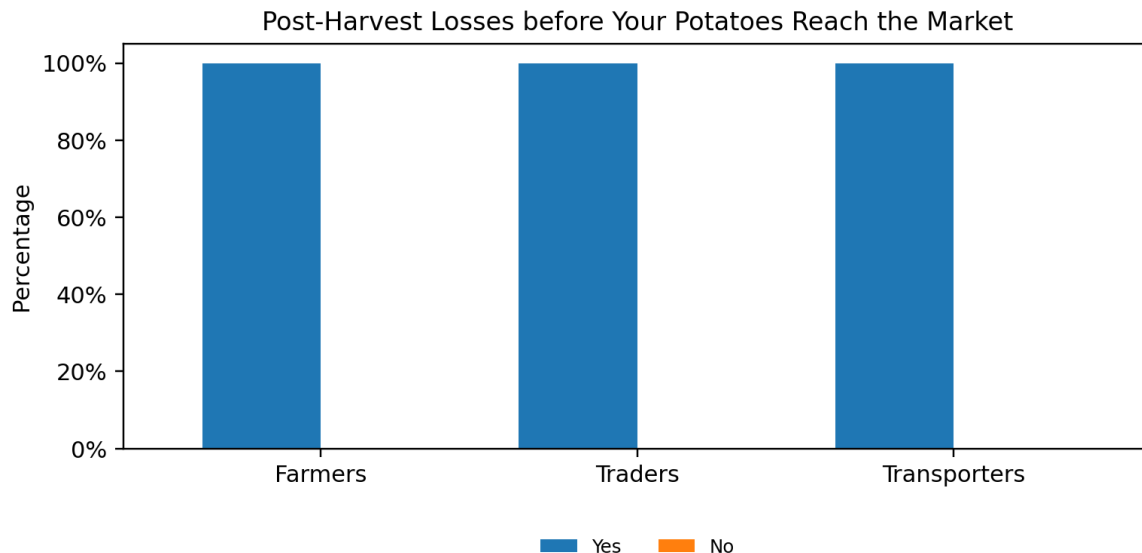
The results further indicate a spatial differentiation in the distribution process. Farmers primarily supplied local markets, while traders and transporters facilitated movement towards more distant regional markets. The major destinations identified by respondents included Abuja, Lagos, Kano, Zaria and Maiduguri. This distribution pattern demonstrates that the performance of the local road network has implications beyond the immediate study communities because farm-level access roads form part of the wider network through which potatoes reach major consumption centres.

The importance of market connectivity is consistent with Manda et al. (2020), who found that participation in agricultural markets generated positive income and food-security effects among Nigerian farm households and

emphasized the role of public infrastructure in facilitating market participation. The implication for the present study is that improving physical connectivity between production communities and market centres may enhance the ability of farmers and traders to participate in more remunerative markets.

5.3 Post-Harvest Losses before Market Arrival

Figure 4: Post-Harvest Losses before Potatoes Reach the Market



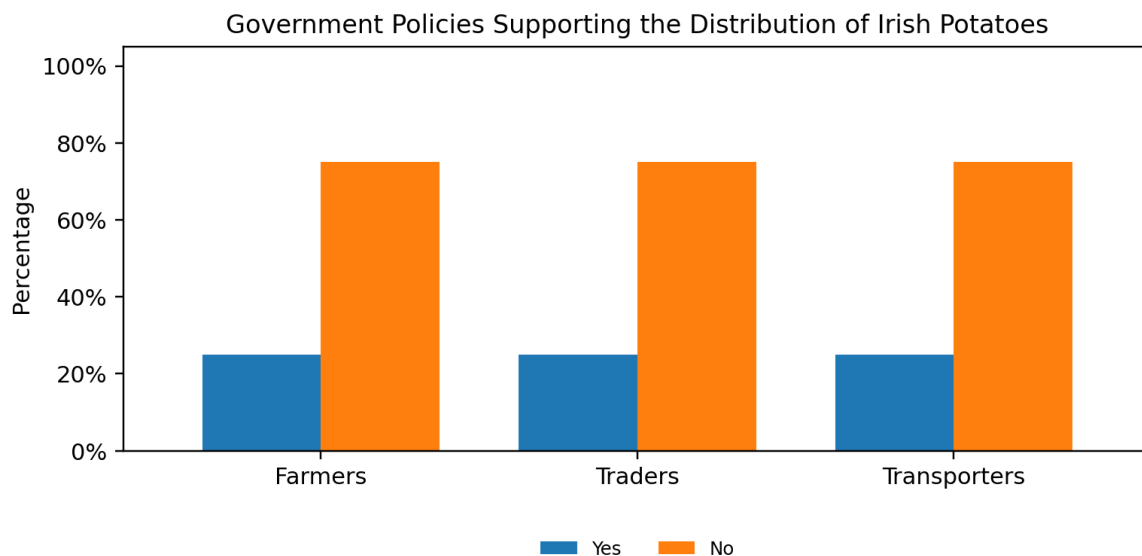
Post-harvest loss emerged as another important concern. The results show that all three stakeholder categories (farmers, traders and transporters) reported experiencing post-harvest losses before potatoes reached their final markets. The majority of respondents estimated losses within the 10–20% range. Respondents attributed these losses principally to inadequate storage, poor road infrastructure, transportation delays and inappropriate handling practices.

The finding provides important evidence that the logistics challenge extends beyond the physical transportation of potatoes. Losses can occur at several points between harvesting and final market delivery, meaning that improvements in production alone may not translate into equivalent improvements in the quantity and quality of potatoes reaching consumers.

The relationship between transportation conditions and potato losses is supported by direct empirical evidence from Kuyu et al. (2019). Their comparison of potato supply chains operating under different road-access conditions found greater mechanical damage where road quality and transportation facilities were poorer. Potatoes transported from the poorer-access area subsequently experienced greater weight and quality losses during storage. Although the study was conducted in Ethiopia, its commodity-specific evidence is particularly relevant to interpreting the present Nigerian findings.

Evidence from Nigeria also supports the importance of post-harvest logistics. Falola et al. (2023) found that poor storage, poor transportation systems and distance to marketing centres were among the factors associated with onion post-harvest losses, while their regression analysis identified distance to market and storage duration as significant determinants. More recently, Yami et al. (2025) demonstrated the importance of post-harvest technologies in Nigeria's tomato value chain, finding that adoption of improved packaging technologies such as reusable plastic crates is relevant to reducing post-harvest losses and is influenced by market-channel characteristics and farmers' access to markets.

5.4 Government Support and Policy Awareness

Figure 5: Government Policies Supporting the Distribution of Irish Potatoes

Approximately 75% of respondents reported limited awareness of government programmes supporting Irish potato distribution, while a majority also perceived existing interventions as ineffective. This finding points to a possible gap between the existence of agricultural interventions and their visibility or accessibility to supply-chain stakeholders.

The result is particularly significant because infrastructure constraints identified in the study, including road access, storage facilities, transportation, and post-harvest management, cannot be addressed effectively through farm-level production interventions alone. Manda et al. (2020), for example, concluded that an enabling policy environment and public infrastructure are important for improving agricultural market participation and recommended investment in feeder-road construction and maintenance.

The relatively low awareness reported by respondents therefore suggests that policy effectiveness should be considered not only in terms of whether programmes exist, but also in terms of stakeholder awareness, accessibility, implementation, coverage and perceived usefulness.

6. Conclusion and Recommendations

The study concludes that infrastructure quality constitutes an important constraint on the performance of the Irish potato supply chain in Mangu and Bokkos Local Government Areas of Plateau State. The empirical findings demonstrate that stakeholders face substantial challenges relating to road conditions, storage facilities, transportation, and post-harvest losses. Road-based transportation dominated potato distribution, with vans and trucks representing the principal transport modes among traders and transporters.

The study therefore demonstrates that increasing agricultural production without simultaneously strengthening the logistics system may not generate corresponding improvements in supply-chain performance. For Irish potato, the problem is particularly important because the commodity must be moved from dispersed production areas to local and distant markets while maintaining acceptable physical quality. Infrastructure investment should consequently be treated as an integral component of agricultural value-chain development rather than as a secondary intervention.

Consequently, the study establishes the prominence of infrastructure and logistics constraints but does not statistically estimate the independent causal effect of road quality, storage capacity or market accessibility on logistics performance. Future research could strengthen the evidence base by combining stakeholder surveys with objective measurements of travel time, transport costs, road condition, storage capacity and measured physical losses.

Based on the findings of this study, the following recommendations are proposed. First, the Plateau State government should prioritize the rehabilitation and maintenance of rural feeder roads connecting Irish potato production communities in Mangu and Bokkos to major markets, which would reduce travel time, transportation costs, vehicle operating expenses, and product damage while enhancing market accessibility. Second, the Plateau State government should endeavour to establish decentralized storage and cold-storage facilities through public-private partnerships and farmer cooperative arrangements; modern storage infrastructure would substantially reduce post-harvest losses, improve product quality, extend shelf life, and increase farmers' bargaining power by reducing pressure for immediate sales. Third, farmers and other stakeholders should develop integrated agricultural logistics hubs within major potato-producing communities to provide coordinated transportation services, storage, aggregation, grading, packaging, and market information, which would improve supply chain coordination, reduce distribution costs, and strengthen regional market integration. Fourth, the Plateau State government should strengthen institutional coordination and stakeholder awareness by improving collaboration among the Federal Ministry of Agriculture and Food Security, the Plateau Agricultural Development Programme (PADP), local governments, farmer cooperatives, and transport unions, including regular dissemination of information on available government support programmes and infrastructure initiatives.

7. Limitations and Direction for Future Research

7.1 Limitations

First, the study relies predominantly on descriptive statistics derived from stakeholder perceptions rather than inferential or econometric techniques capable of estimating the independent causal effect of road quality, storage capacity, or market accessibility on logistics performance. Second, the data on infrastructure conditions and post-harvest losses are self-reported by farmers, traders, and transporters rather than derived from objective, instrument-based measurements of travel time, transport cost, road condition, storage capacity, or physical produce loss, which may introduce recall or perception bias. Third, the study is geographically confined to Mangu and Bokkos Local Government Areas of Plateau State, and while these areas represent major national potato-production clusters, the findings may not be fully generalizable to other potato-producing regions of Nigeria with different infrastructure, market, or institutional conditions. Fourth, the cross-sectional design captures conditions at a single point in time and cannot account for seasonal variation in road conditions, transportation costs, or post-harvest losses, particularly the deterioration in road quality reported during the rainy season. Finally, the sample of 92 respondents, though adequate for descriptive analysis under the Yamane (1967) formula, limits the extent to which more advanced multivariate or subgroup analyses could be performed.

7.2 Directions for Future Research

Building on these limitations, future research could strengthen the evidence in several ways. Studies could combine stakeholder surveys with objective measurements of travel time, transport costs, road condition, storage capacity, and measured physical losses to permit inferential or econometric estimation of the causal effects of infrastructure quality on logistics performance. Longitudinal or seasonal data collection would help capture how infrastructure conditions and post-harvest losses vary across the dry and rainy seasons. Extending the geographic scope of future studies to additional potato-producing regions of Nigeria, or to comparative multi-state or multi-country analyses, would improve the generalizability of findings. Future research could also quantify the economic costs of infrastructure deficiencies, for example through cost-benefit analysis of road rehabilitation, cold-storage investment, or logistics-hub development, to provide policymakers with more precise guidance on the returns to specific infrastructure interventions. Finally, comparative studies examining infrastructure and logistics performance across other perishable crops would help establish whether the patterns identified for Irish potato reflect broader challenges within Nigeria's agricultural logistics systems or are specific to this commodity.

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