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# Transportation Infrastructure as a Determinant of Agricultural Marketing Outcomes among Farmers in Ekiti State, Nigeria

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## Abstract

This study investigates how transportation infrastructure affects marketing outcomes of agricultural produce in Ekiti State, Nigeria. Transportation infrastructure the most crucial being the condition, accessibility, and reliability of rural roads helps to determine the extent to which farmers are actively able to transport their produce from farm sites to markets, thereby influencing price realization, market participation, and marketing performance. A multi-stage sampling procedure was employed, whereby from each of the twelve sampled communities across three local government areas, ten respondents were selected and data obtained through structured interviews. Descriptive statistics and multiple regressions were used to assess the extent of transport-based variables that determined marketing outcomes among smallholder farmers. The study concludes that road conditions, road maintenance, and means of transport availability enhance access to market and marketing efficiency, while poor road conditions and high transport costs adversely affect farmers' income and competitiveness in the markets. The conclusion therefore is that inadequate transportation infrastructure remains a primary constraint in the effective agricultural marketing of Ekiti State. The recommendation is for increased public investment in rural road networks and agricultural logistics services to mitigate transport-related losses while also minimizing transaction costs and enhancing market integration for the farmers.

**Keywords:** Transportation Infrastructure; Agricultural Marketing; Road Quality; Market Accessibility; Transport Costs; Smallholder Farmers; Ekiti State; Rural Development; Agricultural Logistics; Market Outcomes

## 1. Introduction

The agricultural sector contributes significantly to Nigeria's GDP while engaging a larger share of its labour force (Nadabo, 2023). As one of the pillars of rural livelihood, the sector remains crucial to economic growth and poverty alleviation (Oladipo & Ayegbusi, 2016). Nevertheless, Nigeria's agricultural value chain suffers systemic inefficiencies, many of which arise from infrastructural deficits predominantly with regards to transportation infrastructure that is seen as the backbone for market integration and commodity flow (Utuk, Eduno & Okon, 2024). In Ekiti State, agriculture would have become a key sector given its favourable agro-ecological conditions and arable land; however, poor transport networks impede the movement of produce from farm gates to consumption sites, thus limiting market access, reducing farm income, and inhibiting growth within the sector (Zakaree, Ijaiya, Attah & Abdulmumin, 2022).

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Transportation is a fundamental aspect of the agricultural supply chain that ultimately determines access to markets, transaction costs, and price transmission efficiency (Ajiboye et al., 2024). The quality and efficiency of transport infrastructure directly affect agricultural marketing outcomes by determining producer surplus, market integration, and spatial arbitrage opportunities (Yusuf, Araoye & Ademola, 2024). In Ekiti State, road transport is the primary mode of conveyance for agricultural commodities and in providing low transaction costs and better market linkages (Oluwasusi & Adeyemo, 2021). About 90% of agricultural freight in Nigeria is shipped by road networks, and this highlights the importance of the road sector to agribusiness logistics (Udoinyang, 2024).

Still, on investment in road infrastructure, the continued decline of feeder roads, and rising vehicle operating costs act against the marketing efficiency, marketing margins, and greater competitiveness of farmers (Sonde, 2023). After the post-COVID-19 recovery of agricultural markets, a call for resilient and cheap logistics arose, given that the pandemic previously revealed the frailty of supply chains, while also increasing the pressing need to strengthen the backbone of transportation infrastructure (Aboyeji & Aguda, 2024). Transport inefficiencies, while being a key influence in post-harvest losses, also represent the primary barrier against alleviating market linkages (Ezeudu & Obimbua, 2024).

Despite Nigeria's agricultural sector being highly potent in unlocking general economic growth and food security, existing challenges facing commodity distribution and access to markets are inequitably downgrading the value chain performance (Zakaree, Ijaiya, Attah & Abdulmumin, 2022). The presence of poor road infrastructure high transaction costs, distortions in price, and post-harvest losses in Ekiti State serve to further weaken agricultural marketing systems (Oluwasusi & Adeyemo, 2021). High transportation costs would reduce allocative efficiency, increase marketing risks with little or no gain for producer welfare, thereby giving the rural economy an even harder blow on their capacity for economic growth (Oladipo & Ayegbusi, 2016). It is pertinent to state that inefficient logistics exacerbate price volatility and act as a disincentive to market participation, thereby exacerbating losses and further reducing marketing efficiency (Ajiboye et al., 2024).

Transportation infrastructure has been studied in a general sense; however, what is often lacking are actual empirical routes on the costs structure, spatial delimiting, and mutual logistic inefficiencies bounding road transport in Ekiti State (Olagunju, 2022). Given the fast-changing dynamics of the relationship between infrastructure development and the spatial distribution of agricultural production, recent empirical findings are needed to inform needed policy reforms and targeted investments (Utuk, Eduno & Okon, 2024).

The study, therefore, shall examine how transportation infrastructure, particularly rural road networks, affect the market integration, price efficiency, and overall marketing outcomes of farmers in Ekiti State. Through analysis of transportation cost functions, supply chain bottlenecks, and potential efficiency gains, the study aims at advancing recommendations of a policy nature based on the established evidence between stakeholders, value chain actors, and firms engaged in agribusiness. The work contributes to the empirical folds of transportation economics and agricultural marketing in Nigeria through deep analysis of the parameters of marketing efficiency in Ekiti State. Hence it becomes important to explore the role of transportation infrastructure as a determinant of agricultural marketing outcomes among farmers in the state (Nadabo, 2023; Yusuf, Araoye & Ademola, 2024). The study objectives are to:

- Describe the socio-economic characteristics of the respondents;
- Determine the condition of road transportation infrastructure affecting the marketing of agricultural produce;
- Examine the factors that contributed to inadequate road transportation for agricultural marketing in ekiti state;
- Identify the constraints to effective road transportation of agricultural produce in ekiti state.

## 2. Materials and Methods

The study was carried out in Ekiti State, Nigeria, with the study population consisting of farmers who grow arable crops in the study area. Three (3) local government areas: Irepodun/Ifelodun, Oye, and Ise-Orun were purposively sampled in stage one of the multi-stage sampling procedure because they have inadequate rural road networks in Ekiti State. In stage two, a total of twelve (12) communities were selected at random from the chosen local government, four (4) of which were known to have a poor road transportation network. Ultimately, out of the twelve (12) communities, ten (10) respondents were randomly selected making a total of one hundred and twenty (120) respondents. Descriptive statistics like frequencies, percentages, and means were utilized to examine the data that was gathered from the respondents, and inferential statistics were also employed. The regression model is specified mathematically as:

$$MAP = f(RQ, RT, RM, MT) \quad \text{.....1.}$$

Econometrically, the regression Analysis is specified as:

$$MAP = \alpha_0 + \beta_1 \text{RQ} + \beta_2 \text{RT} + \beta_3 RM + \beta_4 MT + \varrho_t$$

Where: *MAP* = Marketing of Agricultural Produce*; RQ*= Road Quality; *RT*= Road Traffic; *RM*= Road Maintenance; *MT*= Mode of Transportation; $\varrho_t$ = error *term;*$\alpha_0$ = Control ; $\beta_1 - \beta_4$

## 3. Results and Discussion

### 3.1. Socio-economic characteristics of respondents

Table 1 shows that the average age of farmers in the Ekiti state is 42 years, almost half (34.1%) of them fall between 41 and 50 years old. Only 3.3% were above 60 years old. This indicates that the respondents were within the economically active and productive age group and were relatively young, thus eligible to market agricultural products. It is further indicative that to a large extent, the younger cohort is quick to engage in any marketing initiatives in the research area. This result supports that of Oladeji et al. (2024), who found a relatively greater chance in the case of younger people than older people being able, industrious, and tough, and what is more, being capable of meeting the demands posed by marketing activities. Only 28.4% of farmers were women, while 71.6% were men. Therefore, more males than females approach agricultural produce. In contrast, what can be found in Sub-Saharan Africa is where about half of the active farming activities are women. The result shows a higher proportion of males compared to females, which demonstrates that in terms of crop production, the study area has a higher number of male-dominated farmers (Nnaji, Ratna, & Renwick, 2022). Women farmers are potentially fewer than men because they have less access to resources and decision-making capacity (Hassan & Acheneje, 2021; Oladeji et al., 2024).

This is similar to the results showing that 16.6% of respondents were not married, but the majority (72.5%) were married, with 2.5% divorced and 8.4% widowed. It also implies that they are not deterred from marketing agricultural goods because of marriage. Seventy-two percent of farmers made more than half of their income from farming, and about 63.4% of farmland cultivators had a degree, but secondary school leavers were second with just 26.6%; 7.5% had primary education; and 2.5% had no formal education. Most respondents have at least some education for marketing and consumer support of agricultural products. Education, according to Adolphus et al. (n.d.), allows farmers to acquire, interpret, and make meanings out of information, so they can use the knowledge more effectively and find relevant answers to production, market, and funding problems. The same message was contained in Table 1, which recorded occupational engagement in primary farming. The bulk of the respondents, constituting 35.5%, also participated in off-farm trading, while close to half (i.e., 47.5%) spent most of their time in agricultural production. This implies that the majority of respondents were mainly producers, as many among them probably participate within the downstream segment of the agricultural value chain through the sale of farm outputs.

The survey indicates an average farming experience of 8.4 years, while 80.8% have less than 10 years' experience in farming. The findings show that respondents display a medium-term engagement in marketing agricultural produce, an expression of a moderate degree of market-orientation and risk-management capacity to transportation constraints. This agrees with Udoinyang (2025), who mentioned farm revenue, production experience, market inefficiencies, and locational advantage as the most important factors determining the marketing channels that farmers selected for their commodities.

By and large, a household consisted of an average of 4.6 persons, with 70.8 percent adopting between 4 and 6 members in the households: this could have implications for labor availability and consumption patterns in farm households. Also, a good portion (44.1%) of the farmers accessed land through inheritance, while 30.0 and 21.6% depended on rental and outright purchase, respectively. This will ensure a significant decrease in the fixed cost of production as inherited land is in stark contrast to rented land, where one incurs annual rental obligations increasing operational costs and adversely impacting net farm income.

Regarding transport logistics and market efficiency, 100% of respondents relied on road infrastructure for product distribution, while 97.5% classified road transport as inefficient. This further highlights that 6 persons are less than the critical number that 'falls' into inefficiencies and excess costs of transaction and post-harvest losses, resulting in profit margins and market competitiveness being far lower. This was the finding of Udoinyang (2025) and Hassan & Acheneje (2021) in verification that lowering transportation costs would also increase demand in rural areas and make more money available to them. A 10% increase in the conditions of roads has brought about a 12% increment in output in agricultural production and a 2.2% improvement in total family income. Such shows how road quality significantly influences productivity and earnings.

**Table 1** Distribution of respondents based on their selected socio-economic characteristics

| Selected socio-economic characteristics | Frequency (n=120) | Percentage | Mean |
|---|---|---|---|
| Age (Years) | | | |
| ≤ 30 | 26 | 21.6 | |
| 31-40 | 27 | 22.5 | |
| 41-50 | 41 | 34.1 | 41.9 |
| 51-60 | 22 | 18.3 | |
| > 60 | 4 | 3.5 | |
| Gender | | | |
| Male | 86 | 71.6 | |
| Female | 34 | 28.4 | |
| Marital status | | | |
| Married | 87 | 72.5 | |
| Single | 20 | 16.6 | |
| Divorced | 3 | 2.5 | |
| Widowed | 10 | 8.4 | |
| Educational level | | | |
| No formal education | 3 | 2.5 | |
| Primary education | 9 | 7.5 | |
| Secondary education | 32 | 26.6 | |
| Tertiary education | 76 | 63.4 | |
| Primary occupation | | | |
| Farming | 57 | 47.5 | |
| Trading | 42 | 35.5 | |
| Artisan | 8 | 6.6 | |
| Transporter | 13 | 10.4 | |
| Farming experience (Years) | | | |
| ≤ 10 | 97 | 80.8 | |
| 11-20 | 12 | 10.0 | 8.4 |
| 21-30 | 6 | 5.0 | |
| > 30 | 5 | 4.2 | |
| Household size | | | |
| 1-3 | 24 | 20.0 | |
| 4-6 | 85 | 70.8 | 4.6 |
| > 6 | 11 | 9.2 | |
| Means of land acquisition | | | |
| Inheritance | 53 | 44.1 | |

| | | | |
|---|---|---|---|
| Purchase | 26 | 21.6 | |
| rent/lease | 36 | 30.0 | |
| Communal | 5 | 4.3 | |
| Mode of transportation | | | |
| Road | 120 | 100 | |
| Efficiency of road transportation | | | |
| Efficient | 3 | 2.5 | |
| Not efficient | 117 | 97.5 | |

Source: Field Survey (2023)

### 3.2. Factors that contributed to inadequate road transportation in the marketing of agricultural produce

With an F-statistic of 14.90 and a p-value of 0.000, Table 2's analysis demonstrates the linear model's goodness of fit. Additionally, the $R^2$ value of 0.625 indicates that only road quality, road provision and maintenance, age, yearly income, and mode of transportation could account for 62.5% of variations in the marketing of agricultural produce. The remaining 37.5% of variations were caused by variables outside the regression model that also had an impact on the marketing of agricultural produce in the study area. This indicates that, out of the 7 independent variables, 5 have a considerable impact on the selling of agricultural output. At the 10 percent significance level, road quality has a positive effect on the marketing of agricultural produce. This suggests that in the research area, there is a significant relationship between the sale of agricultural produce and the quality of the roads. This implies that agricultural produce may be marketed and sold more successfully the better the roads are. Similarly, the provision and maintenance of transportation infrastructure exert a significant positive impact at the 1% level, indicating that enhanced road conditions and upkeep facilitate the efficient marketing of agricultural commodities. The choice of transportation mode is also economically significant at the 1% level, emphasizing its critical role in the cost-effective distribution of agricultural goods. At the 5% significance level, age shows a positive correlation, suggesting that an individual's ability to engage in agricultural marketing improves with age.

**Table 2** Regression analysis for factors that contributed to inadequate road transportation in the marketing of agricultural produce

| **Variable** | **Parameters** | **Coefficient** | **Std err** | **T-ratio** |
|---|---|---|---|---|
| Road quality | $X_1$ | 0.6780* | 0.3865 | 1.75 |
| Road traffic | $X_2$ | -0.2391 | 0.3110 | -0.77 |
| Road provision and maintenance | $X_3$ | 0.3071*** | 0.1089 | 2.82 |
| Mode of transportation | $X_4$ | 0.5835*** | 0.1747 | 3.34 |
| Age | $X_5$ | 0.0325** | 0.0145 | 2.23 |
| Annual income | $X_6$ | -0.6861** | 0.3458 | -1.98 |
| Household size | $X_7$ | 0.3014 | 0.3155 | 0.96 |
| Constant | $X_0$ | 22.323 | 0.3143 | 71.01 |
| Diagnostics statistics | | | | |
| $R^2$=0.625 | | | | |
| F statistic=14.90 | | | | |
| N=120 | | | | |

*Significance at 10%, **Significant at 5%, *** Significance at 1%; Source: Field Survey (2023)

Conversely, the negative relationship at the 5% significance level between annual income and agricultural product marketing implies that as income increases, the incentives or participation in marketing agricultural goods decrease. This can be the result of changing consumer buying habits or preferences as income rises. In a separate research,

Abdulraheem et al. (2021) reaffirmed the impact of good roads on farmers' incomes and the selling of their agricultural products. The majority of farmers found that poor road conditions decreased their revenue per capita when selling their output.

### 3.3. Constraints to effective road transportation of Agricultural produce

The several constraints to efficient road transportation of agricultural products in the research area as shown in Table 3. Inadequate logistic services were the majority's (99.1%) main constraints. Produce transportation from the site of production to the place of purchase is a component of logistics services. The marketing of agricultural goods is impacted by poor road mobility, which makes it difficult for logistic services to reach remote rural areas far from the market. Farmers and producers can benefit from greater access to markets, higher pricing for their produce, and more efficient produce transportation and storage through the construction of new highways and logistical services. With 49.1%, the existence of intermediaries placed 5th in this criterion. By buying commodities from farmers and reselling them to retailers or wholesalers, middlemen are sometimes referred to as mediators. The fact that intermediaries frequently pocket a sizable portion of the proceeds from the sale of agricultural goods is one of the main problems with them.Farmers may have less money as a result of other costs like transportation. Minimizing the influence of intermediaries or enhancing their efficiency is crucial for optimizing the value chain in the road transportation of agricultural commodities. Another significant constraint, identified by 64.1% of respondents, is the high cost of transportation, wKey determinants of transportation costs in agricultural markets include fuel expenses, vehicle depreciation, and travel distance. Additionally, substandard infrastructure—particularly deteriorated road networks—intensifies logistical inefficiencies, thereby increasing transaction costs associated with the distribution of agricultural produce.

This observation aligns with Shekhar et al. (2023), who identified post-harvest losses as a consequence of factors such as poor handling practices, pest infestation, inadequate storage infrastructure, and weak transportation systems, all of which hinder the performance of agricultural marketing channels.

**Table 3** Constraints to effective road transportation of Agricultural produce

| Constraints | Frequency | Percentage | Rank |
|---|---|---|---|
| Inadequate logistic services | 133 | 99.1 | 1st |
| Lack of service | 95 | 79.1 | 3rd |
| Cost of transportation | 77 | 64.1 | 4th |
| Poor market infrastructure | 96 | 80 | 2nd |
| Presence of a middleman | 59 | 49.1 | 5th |
| Others | 59 | 49.1 | 5th |

*Multiple responses; Source: Field Survey (2023)

## 4. Conclusion

These findings clearly indicate that transport infrastructure is a major determinant of agricultural marketing outcomes among farmers in Ekiti State. The efficiency of marketing of agricultural produce was greatly influenced by road quality, provision and maintenance of roads, age of farmers, and mode of transportation. Improved road networks, their regular renovation for maintenance, and appropriate transport means were found to make markets more accessible, lower transaction costs, and lead to higher profitability of agricultural produce. Age and income were also revealed as pertinent factors; this showed that experience and financial capacity of farmers interact with transportation infrastructure to determine marketing performance. Other relevant variables such as road traffic and household size were found not statistically significant, but their relevance in appreciating a broader range of logistical and supply chain issues can be found in agricultural marketing.

Based on the above, the study puts forth the following recommendations:

- Improve Road Infrastructure: Expand the rural road network horizon while maintaining the local roads regularly so that transportation costs would be cheaper, expanded market access, and delivery time improved for agricultural commodities.

- Promote Sustainable Means of Transport: Encouragement of cost-effective and environment-friendly means such as bicycles, motorbikes, and public transport to improve the transportation of produce while reducing the carbon footprint of the sector.
- Invest in Logistics and Storage Facilities: Cold storage units, collection centers, and other kinds of specialized logistics infrastructures will be established to reduce post-harvest losses, assure quality, and increase values of agricultural commodities.
- Capacity Enhancement of Farmers and Market Accessibility: Through efficient transport planning, packaging, adding value, and up-to-date access to market information, farmers will be trained to improve the marketability of their produce and profit margins guaranteed, thus supporting rural economic development.
- Strengthening Policy and Institutional Support: Investment in rural transport systems should be prioritized by policymakers and allow for the establishment of frameworks to support coordination between transport providers, agribusiness firms, and farmers for sustainable and cost-efficient agricultural marketing.

## Compliance with ethical standards

*Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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