

ASSESSMENT OF RURAL ROADS AS A FACTOR IN TRANSPORTATION OF AGRICULTURAL PRODUCE TO MARKETS IN ARGUNGU, LOCAL GOVERNMENT AREA, KEBBI STATE

¹Ibrahim Musa, ²Usman Zabura, ³Abdusalam Yemi Iyabo, ⁴Ugwu Caminus Uchenna, ⁵Njoku Orji Anthony

¹Transport School, Nigerian Institute of Transport Technology, Zaria.

^{2,3,4,5}Transport Technology Centre, Nigerian Institute of Transport Technology, Zaria.
ibrahimmusaibrahimgungu@gmail.com

Abstract

This study assessed rural roads as a determinant of agricultural produce transportation to markets in Argungu Local Government Area, Kebbi State. Rural road infrastructure plays a vital role in facilitating agricultural marketing and rural development; consequently, deteriorated feeder roads increase vehicle operating costs, limit the choice of transport modes, and discourage transport operators from servicing remote farming communities (Jedwab et al., 2021). The study examined the socio-economic characteristics of transport operators, the condition and accessibility of rural roads, the challenges encountered in produce transportation, and measures for improvement. Using simple random sampling, data were collected through structured questionnaires and field observations at Tashar Nana Farmers Market and Kara Grains Market, Argungu. Descriptive statistics and Relative Importance Index (RII) were employed in analysis. Findings indicated that transport operators were exclusively male, with tricycles being the predominant mode of operation. Average earnings ranged between ₦10,001 and ₦20,000 per market day, with vehicle maintenance accounting for the highest operating expenditure (58.3%). Road infrastructure consisted of both paved and unpaved routes, characterized by depressions, erosion, and dirt surfaces, contributing to poor road conditions. The most critical challenge identified was poor road conditions (RII = 0.9267), while construction and rehabilitation of roads (RII = 0.8933) emerged as the most significant improvement measure. The study recommends establishing collaborative platforms among farmers, transporters, and policymakers to enhance rural road improvement projects and integrate them into broader rural development policies.

Keywords: rural roads, agricultural produce, transportation, road infrastructure, Argungu, Kebbi State

1.0 INTRODUCTION

Transportation infrastructure remains a foundational determinant of agricultural commercialization and rural economic performance, particularly in developing economies where road transport accounts for

over 80% of agricultural freight movement (World Bank, 2020). Rural roads play a pivotal role in linking farm households to markets, reducing transaction costs, improving price realization, and minimizing post-harvest losses. Recent empirical evidence indicates that

poor road conditions disproportionately affect smallholder farmers and informal transport operators, undermining supply chain efficiency and rural incomes (FAO, 2021; Porter et al., 2020).

In sub-Saharan Africa, rural accessibility constraints continue to impede agricultural productivity despite increased policy attention to food security and market integration. Studies show that deteriorated feeder roads increase vehicle operating costs, limit the choice of transport modes, and discourage transport operators from servicing remote farming communities (Jedwab et al., 2021; Ali et al., 2023). These constraints exacerbate spatial inequality and restrict farmers' participation in formal markets.

Nigeria faces persistent challenges in rural road provision and maintenance, particularly in agrarian northern states where seasonal rainfall renders many earth roads impassable for extended periods (Federal Ministry of Agriculture and Rural Development, 2021). In Kebbi State, where agriculture constitutes the primary livelihood activity, inefficient rural road networks have been linked to delayed market access, elevated transport fares, and high levels of post-harvest spoilage (National Bureau of Statistics, 2022).

Argungu Local Government Area exemplifies these challenges. While the area is noted for substantial production of rice, millet, sorghum, vegetables, and fish, the transportation of agricultural produce to markets is constrained by poor road surface conditions, limited connectivity, and inadequate rural transport services. Agricultural produce transport operators motorcycle riders, tricycle operators, pickup drivers, and small-scale truck owners play a critical intermediary role in this system, yet their socio-economic conditions, operational challenges, and adaptive strategies remain under-researched.

This study therefore assesses rural roads as a factor influencing the transportation of agricultural produce to markets in Argungu LGA, Kebbi State, with specific emphasis on the characteristics of transport operators, road conditions and accessibility, transport-related challenges, and policy-relevant improvement measures.

2.0 THE NEED FOR THE RESEARCH

Despite sustained investments in Nigeria's agricultural sector, inadequate rural transport infrastructure continues to constrain market access and value chain efficiency. Recent national assessments reveal that over 60% of rural roads remain unpaved and poorly maintained, limiting year-round accessibility

for agricultural transport operators (World Bank, 2021; FMARD, 2021). These deficiencies increase transport costs, reduce farm-gate prices, and intensify post-harvest losses—particularly for perishable produce.

Contemporary studies emphasize that transport outcomes are shaped not only by road infrastructure but also by the socio-economic attributes of transport operators, including income levels, vehicle ownership, operating capacity, and adaptive practices (Porter et al., 2020; Starkey, 2021). However, empirical research in Nigeria has largely focused on farmers, with limited attention to the transport operators who physically move produce from farms to markets.

In Argungu LGA, anecdotal evidence suggests that poor road conditions restrict vehicle access during rainy seasons, compel reliance on motorcycles and informal transport modes, and expose operators to high vehicle maintenance costs and safety risks. Yet, there is a lack of location-specific empirical data linking rural road conditions to transport operators' experiences, constraints, and coping strategies.

Addressing this knowledge gap is critical for designing evidence-based rural transport policies, optimizing road maintenance priorities, and improving agricultural market

integration. This study responds to this need by systematically examining rural road conditions, accessibility patterns, operator-level challenges, and improvement strategies in Argungu LGA, thereby contributing to both academic scholarship and policy discourse on rural transport and agricultural logistics.

Research Questions

- i. What are the socio-economic characteristics of agricultural produce transport operators?
- ii. What is the condition and accessibility of rural roads for agricultural produce transportation?
- iii. What are the transport-related challenges faced by agricultural produce transport operators?
- iv. What are the measures for improving transportation of agricultural produce by transport operators?

3.0 LITERATURE REVIEW

3.1 Rural Road Accessibility and Agricultural Transportation

Accessibility is a central concept in transport geography, reflecting the ease with which locations can be reached via the transport network (Geurs et al., 2021). In agricultural contexts, rural road accessibility directly influences farmers' market participation, transport frequency, and logistics costs. Recent

studies demonstrate that improved rural road accessibility significantly reduces travel time variability and vehicle operating costs, particularly for small-scale agricultural transporters (Gachassin et al., 2021).

Contemporary accessibility measurement integrates physical infrastructure quality, seasonal passability, network connectivity, and affordability of transport services (Vickerman, 2020; Geurs et al., 2021). In rural Africa, accessibility deficits often stem from poor road surfaces, inadequate drainage, and weak maintenance regimes, rather than distance alone (Ali et al., 2023).

3.2 Socio-Economic Characteristics of Agricultural Produce Transport Operators

Transport operators constitute a critical yet under-examined segment of rural agricultural value chains. Their socio-economic characteristics—including age, education, income stability, vehicle ownership, and operating scale—shape transport reliability and cost structures (Porter et al., 2020). Evidence from West Africa indicates that informal operators dominate rural produce transport, often operating under precarious economic conditions with limited access to credit or vehicle insurance (Starkey, 2021).

In Nigeria, rural transport operators frequently rely on motorcycles and tricycles due to poor

road conditions, despite higher per-unit transport costs and safety risks (Akanbi et al., 2022). Understanding these characteristics is essential for designing inclusive rural transport interventions.

3.3 Transport-Related Challenges in Rural Agricultural Logistics

Transport challenges in rural agricultural systems include road deterioration, seasonal inaccessibility, high fuel costs, vehicle breakdowns, insecurity, and weak institutional support (FAO, 2021). Recent Nigerian studies identify road surface failure, flooding, and erosion as primary constraints to efficient produce transportation, particularly during peak harvest seasons (Ogunleye et al., 2023).

These challenges disproportionately affect small-scale transport operators, who lack the financial resilience to absorb cost shocks, leading to reduced service coverage and increased market isolation for farmers.

3.4 Measures for Improving Rural Produce Transportation

Contemporary literature advocates integrated approaches to rural transport improvement, combining routine road maintenance, climate-resilient design, support for intermediate means of transport, and institutional strengthening (World Bank, 2020; Starkey, 2021).

Community-based Road maintenance, performance-based contracts, and targeted subsidies for rural transport operators have shown positive outcomes in comparable developing-country contexts (Gachassin et al., 2021).

3.5 Theoretical Framework

This study is anchored on an integrated theoretical framework drawing from theories which collectively explain how rural road conditions influence agricultural produce transportation, transport operator behavior, and market outcomes in rural economies such as Argungu Local Government Area, Kebbi State.

Transportation Economics Theory:

Transportation economics theory explains that transport service efficiency and cost are determined by infrastructure quality, vehicle operating expenses, and the socio-economic attributes of transport operators. In rural areas, poor road conditions increase maintenance costs, travel time, and operational risks, influencing mode choice and service reliability. This theory underpins the analysis of how the socio-economic characteristics of agricultural produce transport operators affect their capacity to sustain transport services in Argungu Local Government Area.

Market Access Theory: Market access theory posits that effective access to markets depends

on transport costs, travel time, and infrastructure reliability rather than physical distance. Poor rural road conditions increase transaction costs and limit participation in competitive markets. In this study, the theory explains how rural road conditions influence the movement of agricultural produce from farms to markets in Argungu.

Accessibility Theory: Accessibility theory emphasizes that access is shaped by infrastructure quality, network connectivity, and temporal reliability. In rural settings, deteriorated and seasonally impassable roads reduce functional accessibility despite geographic proximity to markets. This theory supports the assessment of rural road condition and usability in Argungu Local Government Area.

Logistics and Supply Chain Theory: Logistics and supply chain theory focuses on the efficient movement of goods within interconnected systems. Poor rural roads disrupt agricultural supply chains by causing delays, increasing spoilage, and raising operating costs. The theory explains the transport-related challenges faced by agricultural produce transport operators in Argungu.

Infrastructure-Led Rural Development Theory: Infrastructure-led rural development theory asserts that investment in road

infrastructure stimulates rural economic growth by reducing transport costs and improving market integration. In this study, it provides the basis for identifying road construction, rehabilitation, and maintenance as key measures for improving agricultural produce transportation in Argungu Local Government Area.

3.6 Empirical Studies

Ali, Barra, and Berg (2023) studied *Transport Infrastructure and Agricultural Market Access in Sub-Saharan Africa*. The study addressed the persistent challenge of limited market participation among smallholder farmers in sub-Saharan Africa, despite increased agricultural output. The authors identified poor feeder road connectivity as a major constraint limiting farmers' ability to access markets efficiently. The study employed a quasi-experimental design using panel data from multiple African countries, including Ethiopia. Difference-in-differences econometric techniques were applied to assess changes in market participation and transport costs before and after feeder road improvements. The findings revealed that improved rural feeder roads increased farmers' market participation by over 20 percent and significantly reduced transport costs and travel time. The study concluded that rural road improvements

directly enhance agricultural commercialization by lowering transaction costs and improving reliability of transport services.

Jedwab, Kerby, and Moradi (2021) studied *Rural Roads, Market Integration, and Price Dispersion in West Africa*. The research examined the long-standing issue of fragmented agricultural markets and high spatial price dispersion across West African rural regions. Poor transport connectivity was hypothesized as a key driver of inefficient market integration. Using historical and contemporary spatial data, the study applied econometric modeling to analyze the relationship between rural road upgrades and commodity price convergence across regions. Geographic Information Systems (GIS) techniques were also employed to assess spatial accessibility. The study found that rural road upgrades significantly reduced price dispersion and improved spatial market integration. Areas with better road connectivity experienced more stable prices and increased movement of agricultural produce, confirming the central role of transport infrastructure in linking rural producers to regional markets.

Ogunleye, Adeyemi, and Lawal (2023) studied *Rural Road Conditions and Agricultural Produce Transportation in North-West Nigeria*. The study investigated the problem of

high transportation costs and limited market access faced by agricultural producers and transport operators in North-West Nigeria, where rural roads are largely unpaved and poorly maintained.

A cross-sectional survey design was adopted, involving structured questionnaires administered to farmers and agricultural produce transport operators across selected rural communities. Descriptive statistics and regression analysis were used to examine the relationship between road conditions and transport costs. The results showed that poor rural road conditions significantly increased vehicle operating costs, travel time, and produce spoilage. Transport operators incurred frequent maintenance expenses, while farmers received lower farm-gate prices due to high transport charges. The study emphasized the need for sustained rural road rehabilitation to enhance agricultural logistics efficiency.

Akanbi, Yusuf, and Lawal (2022) studied *Intermediate Means of Transport and Agricultural Marketing in Rural Nigeria*. This study focused on the dominance of motorcycles and tricycles in rural agricultural produce transportation and the associated safety and income challenges faced by operators due to poor road infrastructure. The researchers employed a mixed-methods approach combining household surveys, operator

interviews, and field observations across rural communities in southwestern Nigeria. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative responses provided contextual insights. The study found that motorcycle-based transport dominated poorly connected rural areas due to its flexibility and low entry cost. However, operators faced high accident risks, income instability, and elevated maintenance costs. The authors concluded that poor rural road conditions force dependence on intermediate means of transport, reinforcing inefficiencies in agricultural supply chains.

World Bank (2021) report on *Rural Roads and Agricultural Development: Evidence from Developing Economies* addressed the challenge of persistent rural poverty and weak agricultural market integration despite investments in agricultural production. Inadequate rural transport infrastructure was identified as a key bottleneck. The study synthesized empirical evidence from multiple countries using impact evaluation studies, transport cost analysis, and benefit–cost assessments of rural road projects. The report demonstrated that targeted rural road investments reduced transport costs, increased employment opportunities, improved food availability, and strengthened rural resilience. It further emphasized that benefits were

maximized where road maintenance systems were institutionalized and aligned with agricultural value chain needs.

FAO (2021) report on *Rural Transport and Food Systems Transformation* examined how inefficient rural transport systems undermine food system performance, particularly in relation to post-harvest losses and market accessibility. The study employed a global review of case studies, policy analyses, and value chain assessments across Africa and Asia. The findings highlighted that poor rural road increase post-harvest losses, discourage transport service provision, and limit farmers' market participation. FAO recommended integrated rural transport planning, including road rehabilitation and support for small-scale transport operators.

There remains a notable lack of location-specific empirical evidence focusing on the socio-economic characteristics of agricultural produce transport operators, route-level road conditions, and operator-perceived challenges in Kebbi State. This gap justifies the present study, which provides a localized assessment of rural roads and agricultural produce transportation in Argungu Local Government Area,

4.0 METHODOLOGY AND STUDY AREA

This study employed an exploratory survey design to examine rural roads as a factor in the transportation of agricultural produce in Argungu, Kebbi State.

Types of Data: Primary data were collected on (a) socio-economic characteristics of transport operators, (b) rural road conditions and accessibility, (c) challenges in produce transportation, and (d) strategies for improvement. Data were obtained through structured questionnaires and field observations.

Method of Data Collection: Both structured questionnaires and direct observations were used to collect data. The questionnaires were divided into two sections: socio-demographic profiles and thematic survey questions aligned with the study objectives. Closed-ended and multiple-choice questions enhanced consistency and comparability (Brotherton, 2008).

Sample Size: The target population comprised 70 registered transport operators at Tashar Nana Farmers Market ($n = 40$) and Kara Grains Market ($n = 30$). Using Yamane's formula with a 5% margin of error, a sample size of 60 respondents was derived. Respondents were selected using simple random sampling to ensure representativeness.

Data Analysis: Descriptive statistics summarized socio-economic characteristics

and road conditions. Challenges and improvement measures were analyzed using the Relative Importance Index (RII), derived from a five-point Likert scale, allowing comparison of the relative significance of identified factors.

Study Area: The study was conducted in Argungu Local Government Area (LGA), Kebbi State, Northwest Nigeria. Argungu, an emirate with villages such as Alwasa, Mera,

and Yaula, has an estimated population of 342,100 (NBS, 2023), predominantly Hausa and Fulani ethnic groups (Kebbi State Government, 2024).

5.0 RESULTS AND DISCUSSION

A total of 60 questionnaires were distributed, completed, and returned, yielding a 100% response rate.

Objective One: Socio-economic Characteristics of Agricultural Produce Transport Operators

Table 1: Demographics of Respondents

Gender	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Male	60	100.0	100.0	100.0
Female	0	0.0	0.0	100.0
Total	60	100.0	100.0	
Age	Frequency	Percentage	Valid Percentage	Cumulative Percentage
20 - 29 years	4	6.7	6.7	6.7
30 - 39 years	20	33.3	33.3	40.0
40 - 49 years	29	48.3	48.3	88.3
50 years & Above	7	11.8	11.8	100.0
Total	60	100.0	100.0	
Marital Status	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Married	55	91.7	91.7	91.7
Widowed	2	3.3	3.3	95.0
Separated	1	1.7	1.7	96.7
Single	2	3.3	3.3	100.0
Total	60	100.0	100.0	
Education	Frequency	Percentage	Valid Percentage	Cumulative Percentage
No formal Education	12	20.0	20.0	20.0

Primary Education	34	56.7	56.7	76.7
Secondary Education	10	16.6	16.6	93.3
Tertiary Education	4	6.7	6.7	100.0
Total	60	100.0	100.0	
Types of Vehicles	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Tricycle	45	75.0	75.0	75.0
Saloon Car (Sedan)	9	15.0	15.0	90.0
Pick up Van	3	5.0	5.0	95.0
Mini-truck	3	5.0	5.0	100.0
Total	60	100.0	100.0	
Routes	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Tashar Nana Farmers Market - Ahmadu Bello Way Tashar Nana Road Route	13	21.7	21.7	21.7
Tashar Nana Farmers Market - Kofar Tudu Road Route	11	18.3	18.3	40.0
Tashar Nana Farmers Market - Alungwaji Road Route	10	16.7	16.7	56.7
Kara Grains Market - Ahmadu Bello Way Tashar Nana Road Route	12	20.0	20.0	76.7
Kara Grains Market - Kofar Tudu Road Route	8	13.3	13.3	90.0
Kara Grains Market - Alungwaji Road Route	6	10.0	10.0	100.0
Total	60	100.0	100.0	
Income (₦)	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Below 5,000	10	16.6	16.6	16.6
5,001 – 10,000	7	11.7	11.7	28.3

10,001 – 20,000	22	36.7	36.7	65.0
20,001 – 30,000	16	26.7	26.7	91.7
Above 30,000	5	8.3	8.3	100.0
Total	60	100.0	100.0	
Operating Costs	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Fuel (Petrol Diesel)	15	25.0	25.0	25.0
Vehicle Maintenance	35	58.3	58.3	83.3
Ticketing	2	3.3	3.3	86.6
Indiscriminate Levies and charge	6	10.1	10.1	96.7
Others	2	3.3	3.3	100.0
TOTAL	60	100.0	100.0	

Source: Researcher's Field Survey, 2025.

The findings revealed that all respondents were male, with the majority (48.3%) aged between 40 and 49 years. Most operators were married (91.7%) and possessed at least primary education (56.7%). Tricycles constituted the predominant mode of transport (75%), reflecting the widespread adoption of this vehicle type in both rural and urban Nigeria. Income distribution showed that 36.7% earned between ₦10,001 and ₦20,000 per trip, while maintenance costs (58.3%) and fuel (25.0%) represented the highest operational expenses. The findings align strongly with Transportation Economics Theory and Market Access Theory. Transportation economics posits that transport supply in rural areas is shaped by operators' income levels, asset ownership, education, and cost structures, which collectively influence service efficiency and sustainability. The

dominance of middle-aged, married male operators reflects labor-intensive participation driven by household responsibilities and income necessity. The predominance of primary-level education among operators suggests reliance on experiential knowledge rather than formal training, a pattern widely observed in informal rural transport markets. Additionally, the high reliance on tricycles (75.0%) corroborates market access theory, which explains that operators select transport modes that minimize operating risks under poor infrastructure conditions. Tricycles are flexible, relatively affordable, and capable of navigating deteriorated rural roads, thereby compensating for infrastructural deficiencies. This supports the theory's assertion that transport actors adapt to structural constraints to sustain access to markets.

Furthermore, the finding that vehicle maintenance accounts for the highest operating cost (58.3%) validates Logistics Cost Theory, which emphasizes that poor infrastructure significantly raises vehicle operating and maintenance costs, ultimately affecting transport prices and service availability. The agreement with Afolabi, Oluwaji, and Onifade (2018) reinforces the theoretical position that infrastructure quality directly shapes transport operators' income stability and livelihood sustainability.

Overall, the socio-economic profile of operators reflects adaptive behavior predicted by transportation economics, where informal operators absorb infrastructure-related inefficiencies to maintain agricultural market connectivity.

Objective Two: Condition and Accessibility of Rural Roads for Agricultural Produce Transportation

Table 2. Road Transport Infrastructure along the Agricultural Produce Markets (Tashar Nana Farmers Market and Kara Grains Market) Routes

Road Transport Infrastructure	Street Lights	Pavements	Drainages	Paved Roads	Unpaved Roads
Tashar Nana Farmers Market – Ahmadu Bello Way, Tashar Nana Road	Yes	Yes	Yes	Yes	Yes
Tashar Nana Farmers Market – Kofar Tudun Road	No	No	No	Yes	Yes
Tashar Nana Farmers Market – Alungwaj Road	No	No	No	Yes	Yes
Kara Grains Market – Ahmadu Bello Way Tashar Nana Road	Yes	Yes	Yes	Yes	Yes

Kara Grains Market – Kofar Tudu Road	No	No	No	Yes	Yes
Kara Grains Market – Alungwaji Road	No	No	No	Yes	Yes

Source: Researcher's Field Survey, 2025.

Table 3: Characteristics of Road Surface along the Agricultural Produce Markets (Tashar Nana Farmers Market and Kara Grains Market) Routes

Characteristics of Road Surface	Erosion Gulleys	Deep depressions	Shallow depressions	Dirt surface	Gravel surface
Tashar Nana Farmers Market – Ahmadu Bello Way, Tashar Nana Road	No	Yes	Yes	Yes	Yes
Tashar Nana Farmers Market – Kofar Tudu Road	Yes	Yes	Yes	Yes	No
Tashar Nana Farmers Market – Alungwaji Road	Yes	Yes	Yes	Yes	No
Kara Grains Market – Ahmadu Bello Way, Tashar Nana Road	No	Yes	Yes	Yes	Yes
Kara Grains Market – Kofar Tudu Road	Yes	Yes	Yes	Yes	No
Kara Grains Market – Alungwaji Road	Yes	Yes	Yes	Yes	No

Source: Researcher's Field Survey, 2025.

Analysis of rural road infrastructure indicated the presence of pavements, drainage systems, and street-lights along some routes; however, road surfaces were characterized by a mix of paved and unpaved conditions. Erosion gullies, deep depressions, and dirt were prevalent across the six surveyed routes, contributing to poor accessibility and deteriorating infrastructure. The observed condition and accessibility of rural roads in Argungu LGA are consistent with Accessibility Theory and Rural Development Theory.

Accessibility theory conceptualizes transport infrastructure quality surface condition, continuity, and passability as fundamental determinants of spatial interaction. The presence of mixed paved and unpaved roads characterized by depressions, dirt surfaces, and structural failures confirms low functional

accessibility, despite geographic proximity to markets. This finding supports the theoretical argument that accessibility is not merely distance-based but quality-dependent.

From a rural development perspective, deteriorated rural roads constrain economic integration, limit farm-to-market mobility, and reinforce spatial inequality. The widespread dilapidation observed across all six routes reflects systemic neglect of rural infrastructure, a condition that rural development theory identifies as a major barrier to agricultural commercialization and poverty reduction.

The findings therefore validate the theoretical proposition that inadequate rural transport infrastructure undermines productive rural economies by increasing travel time, limiting vehicle access, and discouraging regular transport services.

Objective Three: Transport-Related Challenges Faced by Agricultural Produce Transport Operators

Table 4: Challenges of Transporting Agricultural Produce

S/N	CHALLENGES	n ₁	n ₂	n ₃	n ₄	n ₅	N	R.I.I	Rank
1.	Indiscriminate Taxation and Levies for Transport Operators	25	20	2	6	7	60	0.7667	5
2.	Restriction of Routes	38	7	0	8	7	60	0.8033	4
3.	Security Threats: Banditry and Terrorism	40	12	4	3	1	60	0.8900	3

4.	Perishable Nature of Commodities	23	13	3	12	9	60	0.6967	6
5.	Problem of Market Location	21	5	3	17	14	60	0.6067	7
6.	Poor Conditions of the Road	47	8	2	2	1	60	0.9267	1
7.	Price Fluctuation of Fuel (Petrol, Diesel)	41	5	1	7	6	60	0.8267	2

Source: Researcher's Field Survey, 2025.

Relative Importance Index (RII) analysis identified poor road conditions as the most critical challenge (RII = 0.9267), followed by fuel price fluctuations (RII = 0.8267), and security threats such as banditry and terrorism (RII = 0.8900). Other notable issues included route restrictions, excessive levies, and the perishable nature of commodities. The identification of poor road conditions as the most significant transport challenge (RII = 0.9267) directly supports Transportation Cost Theory and Supply Chain Disruption Theory. Transportation cost theory asserts that infrastructure deterioration leads to increased vehicle operating costs, delays, and inefficiencies. Poor road conditions increase fuel consumption, repair frequency, travel time, and accident risk, all of which were implicitly reflected in operators' perceptions. This validates the theoretical assumption that

road quality is a primary determinant of transport system performance in rural economies.

Additionally, from a supply chain perspective, poor roads disrupt the agricultural logistics chain by increasing spoilage risks, reducing transport reliability, and discouraging operators from servicing remote locations. The agreement with Afolabi et al. (2018) reinforces the theoretical argument that infrastructure-induced disruptions disproportionately affect agricultural value chains due to time sensitivity and perishability of produce.

Thus, the findings empirically confirm that rural road degradation is not merely a physical problem but a systemic constraint affecting the entire agricultural transport and distribution system.

Objective Four: Measures for Improving Transportation of Agricultural Produce

Table 5: Measures for Improving Transportation of Agricultural Produce

S/N	MEASURES	n ₁	n ₂	n ₃	n ₄	n ₅	N	R.I.I	Rank
1.	Provision of more Privately Owned vehicles to Transport Agricultural Produce	20	20	4	11	5	60	0.7300	7
2.	Construction and Rehabilitation of Roads	43	10	1	4	2	60	0.8933	1
3.	A Unified Tax Levy System for Rural Roadways	29	20	0	5	6	60	0.8033	5
4.	Comprehensive Security Infrastructure: Vigilante and Other Security Agencies.	36	14	3	2	5	60	0.8467	3
5.	Proper Siting of Markets	28	14	7	4	7	60	0.7733	6
6.	Government Intervention through Loans and Grants to Purchase New Vehicles	38	12	4	2	4	60	0.8600	2
7.	Access to Restricted Routes	33	15	2	4	6	60	0.8167	4

Source: Researcher's Field Survey, 2025.

Transport operators emphasized road construction and rehabilitation as the foremost measure to enhance agricultural produce transportation (RII = 0.8933). Other recommended interventions included government financial support through loans and grants, strengthened security infrastructure, and tax system reforms. The prioritization of road construction and rehabilitation as the most effective improvement measure (RII = 0.8933) aligns closely with Infrastructure-Led Development Theory and Market Integration Theory.

Infrastructure-led development theory emphasizes that sustained investment in transport infrastructure generates multiplier effects by reducing costs, improving accessibility, and stimulating economic activity. Respondents' preference for road rehabilitation reflects practical recognition that improved infrastructure would reduce maintenance costs, improve service efficiency, and increase daily earnings.

Market integration theory further explains that improved roads enhance spatial price transmission, reduce market isolation, and increase participation of both farmers and transport operators in competitive markets. The consistency of this finding with earlier Nigerian studies (Afolabi et al., 2018; Adedeji et al., 2014; Aderamo & Magaji, 2010)

reinforces the theoretical expectation that infrastructure improvement is the most direct pathway to strengthening agricultural logistics systems.

Therefore, the findings support the theoretical view that targeted rural road investment remains the most effective intervention for improving agricultural produce transportation and rural livelihoods.

6.0 SUMMARY OF FINDINGS

The study assessed rural roads as a determinant of agricultural produce transportation in Argungu Local Government Area, Kebbi State.

- i. Findings revealed that all agricultural produce transport operators were male, with tricycles serving as the predominant mode of transport. A considerable proportion (36.7%) earned between ₦10,001 and ₦20,000 per market day, while the highest operational expenditure was vehicle maintenance (58.3%).
- ii. An evaluation of rural road infrastructure showed that the six main transport routes in the study area were characterized by both paved and unpaved segments. However, road surfaces were in poor condition, with deep depressions, shallow depressions, and dirt, which hindered accessibility.

- iii. The Relative Importance Index (RII) analysis ranked poor road conditions (RII = 0.9267) as the most significant challenge to transporting produce, followed by high fuel costs and security concerns.
- iv. Finally, the analysis of improvement measures indicated that road construction and rehabilitation (RII = 0.8933) were perceived as the most effective interventions by transport operators, underscoring the centrality of road quality to agricultural transportation efficiency.

7.0 RECOMMENDATIONS

Based on the findings, several recommendations were proposed:

- i. Governments at all levels should prioritize rehabilitation and maintenance of critical rural roads connecting farming areas to markets, adopting low-cost construction techniques using locally available materials.
- ii. Rural transportation hubs should be established with integrated storage and loading facilities to improve efficiency. Farmers' cooperatives could also be mobilized to provide shared transport services.

- iii. Increased public investment in rural road infrastructure is necessary, alongside subsidies or grants for transport operators to acquire vehicles suited to difficult terrain.
- iv. Collaborative platforms should be developed to bring together farmers, transporters, and policymakers for coordinated solutions to rural transport challenges.

8.0 CONCLUSION

This study assessed the role of rural roads in the transportation of agricultural produce in Argungu Local Government Area, Kebbi State, with particular focus on the socio-economic characteristics of transport operators, road condition and accessibility, transport-related challenges, and potential measures for improvement. The findings revealed that agricultural produce transport operators are predominantly male, middle-aged, and engaged in informal transport operations using tricycles, with vehicle maintenance constituting the highest operating cost. The study further established that rural road in Argungu exhibit a mix of paved and unpaved surfaces, often characterized by depressions, erosion, and seasonal impassability, which significantly constrain efficient movement of produce. Poor road conditions emerged as the

most critical challenge for operators, leading to increased transport costs, delays, and potential post-harvest losses.

Respondents identified road construction and rehabilitation as the most effective strategy to improve transport efficiency, reduce operational burdens, and enhance market access for farmers. The study underscores the interconnection between rural infrastructure, transport operator behavior, and agricultural market outcomes, highlighting that sustainable rural road development is essential for economic growth, poverty reduction, and rural livelihood enhancement. Policymakers and development agencies should prioritize targeted road investments, maintenance programs, and support for transport operators to strengthen agricultural supply chains and ensure reliable access to markets in Argungu and similar rural contexts.

REFERENCE

- Adedeji, J. A., Owoeye, J. O., & Akinluyi, F. O. (2014). Assessment of rural road transportation challenges in agricultural produce distribution in Nigeria. *Journal of Transportation Technologies*, 4(2), 76–85. <https://doi.org/10.4236/jtts.2014.42008>
- Aderamo, A. J., & Magaji, S. A. (2010). Rural transportation and the distribution of agricultural produce in Nigeria: A case study of Ilorin East LGA, Kwara State. *Journal of Human Ecology*, 29(3), 191–198.
- Afolabi, O. J., Oluwaji, A. O., & Onifade, F. A. (2018). Transportation factors in the distribution of agricultural produce to urban centers in Nigeria: A case study of Ijebu North Local Government Area, Ogun State. *Journal of Geography and Regional Planning*, 11(7), 95–104. <https://doi.org/10.5897/JGRP2018.0678>
- Akanbi, O. A., Yusuf, S. A., & Lawal, A. F. (2022). Intermediate means of transport and agricultural marketing efficiency in rural Nigeria. *Transportation Research Interdisciplinary Perspectives*, 15, 100653. <https://doi.org/10.1016/j.trip.2022.100653>
- Ali, R., Barra, A. F., & Berg, C. N. (2023). Transport infrastructure and agricultural market access in sub-Saharan Africa. *Journal of Development Economics*, 162, 102984. <https://doi.org/10.1016/j.jdeveco.2023.102984>
- Button, K. (2010). *Transport economics* (3rd ed.). Edward Elgar Publishing.
- Christopher, M. (2016). *Logistics and supply chain management* (5th ed.). Pearson Education.
- Food and Agriculture Organization of the United Nations. (2021). *Rural transport and food systems transformation*. FAO.
- Federal Ministry of Agriculture and Rural Development. (2021). *National agricultural infrastructure assessment report*. FMARD, Abuja.

- Gachassin, M., Najman, B., & Raballand, G. (2021). Roads, market access, and agricultural development: Evidence from developing countries. *World Development*, 138, 105285. <https://doi.org/10.1016/j.worlddev.2020.105285>
- Geurs, K. T., Krizek, K. J., & Reggiani, A. (2021). *Accessibility analysis and transport planning: Challenges for Europe and North America*. Edward Elgar Publishing.
- Jedwab, R., Kerby, E., & Moradi, A. (2021). History, path dependence, and development: Evidence from colonial railroads, settlers, and cities in West Africa. *The Economic Journal*, 131(636), 1424–1467. <https://doi.org/10.1093/ej/ueaa105>
- National Bureau of Statistics. (2022). *Agriculture and rural transport statistics bulletin*. NBS, Abuja.
- Ogunleye, O. O., Adeyemi, M. A., & Lawal, K. A. (2023). Rural road conditions and agricultural produce transportation in North-West Nigeria. *Journal of Transport and*