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The Impact of Ramp -2 on Farm Mobility and Productivity in Part of Niger State, Nigeria

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Abstract
Agriculture plays a fundamental role in Nigeria's economic structure, serving as a critical driver of food security, employment, and rural development. The study aimed at assessing the impact of RAMP -2 on farm mobility and productivity in part of Niger State, Nigeria. The study employs a mixed-methods research design, integrating quantitative surveys and qualitative interviews to comprehensively assess the impact of the Second Rural Access and Mobility Project (RAMP-2) on rural infrastructure, market access, and agricultural productivity in Niger State. The collected data were analyzed using regression analysis. The result indicates that RAMP-2 participation has a significant positive impact on farm yields (+318.2 kg/ha, $p < 0.01$). Market distance negatively affects productivity (i.e., farmers further from markets have lower yields). Higher transport costs reduce productivity, reinforcing the importance of affordable mobility. Further result shows that Farmers in RAMP-2 areas are 2.43 times more likely to participate in markets. Better road quality increases market participation by 87%. Farm yields have improved significantly following the road improvements, with the study showing a 25% increase in farm productivity. The study concludes that RAMP-2 in Niger State has had a significant positive impact on rural farmers, particularly in the areas of transportation, market participation, and agricultural productivity. Hence the study recommends improve market infrastructure to complement road networks.
Keywords: Farm, Mobility, Productivity, RAMP -2

Introduction
Agriculture plays a fundamental role in Nigeria's economic structure, serving as a critical driver of food security, employment, and rural development. According to (Olayemi, 2021) and (Jones and Uwah, 2020), the agricultural sector contributes approximately 25% of Nigeria's Gross Domestic Product (GDP) and employs over 60% of the rural workforce. The sector provides the primary livelihood for millions of smallholder farmers, who depend on farming for income, sustenance, and economic stability.

Despite its significance, Nigeria's agricultural productivity remains suboptimal, characterized by low yields, inefficiencies, and inadequate infrastructure (World Bank, 2019). The country possesses over 34 million hectares of arable land, yet less than 50% of this land is cultivated effectively (Pingali, 2020). Niger State, one of Nigeria's largest agricultural producers, faces severe logistical and infrastructural challenges that limit agricultural output and market efficiency (Ali, 2021). The state is renowned for producing major staple and cash crops, including rice, maize, millet, yam, sorghum, groundnuts, and shea nuts. However, poor road conditions, limited access to mechanization, and weak transport networks constrain farmers from achieving their full productive potential. Agriculture is a critical pillar of Nigeria's economy,

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yet low productivity, poor rural roads, and inefficient market linkages continue to limit the sector's potential. RAMP-2 was introduced as a transformational initiative to enhance rural accessibility and boost agricultural output in key states, including Niger State. Key challenges affecting agricultural productivity in Niger State include: Poor Rural Road Infrastructure; High Post-Harvest Losses; Limited Access to Agricultural Inputs; Market Constraints and Price Fluctuations (Ali, 2021). This study is necessary and relevant because it evaluates the extent to which RAMP-2 has addressed these challenges and improved agricultural productivity in Niger State. While RAMP-2 was designed to reduce transportation bottlenecks and boost agricultural output, there is limited empirical evidence on its actual impact in the state. Farmers in Niger State, one of Nigeria's major agricultural hubs, face severe transportation and mobility constraints that hinder their ability to maximize productivity, access critical inputs, and reach profitable markets. These challenges have led to reduced farm yields, increased poverty levels, and food insecurity in many rural communities. While the Rural Access and Mobility Project 2 (RAMP-2) was introduced to address these issues, there remains limited empirical evidence on the actual effectiveness of the project in improving agricultural productivity and enhancing rural livelihoods. Hence the study aimed at examining the effect of improved mobility on farm productivity and identifying key challenges affecting the success of RAMP-2. This objectives focuses on understanding how enhanced transportation networks impact agricultural productivity. The research analyse whether the improved roads have led to increased farm sizes, higher crop yields, and more efficient farming practices. Despite the intended benefits of RAMP-2, various challenges may hinder its full potential. This objective seeks to identify the primary obstacles, such as inadequate funding, poor road maintenance, and institutional inefficiencies. Based on the findings, the study propose practical policy recommendations aimed at improving future rural road infrastructure projects. These recommendations focus on strategies for sustainable road maintenance, increased government-private sector collaborating community engagement to enhance project ownership and long-term effectiveness. The findings will provide valuable insights for policymakers, development agencies, and agribusiness investors seeking to enhance rural connectivity, promote agricultural sustainability, and strengthen food security in Niger State and Nigeria.

- Several studies have demonstrated a positive correlation between rural infrastructure and agricultural productivity.
- World Bank (2019) found that in Sub-Saharan Africa, every 10% increase in rural road density led to a 7% increase in agricultural output.
- Fan et al. (2019) showed that in India, investments in rural roads yielded higher returns for agricultural GDP growth than any other rural investment.
- Ali (2021) reported that in Ethiopia, improved road access reduced post-harvest losses by 20% and increased farmer income by 30%.
- Diao and McMillian (2019) highlighted that villages with access to good roads had higher rates of agricultural mechanization and technology adoption.

Research Method

Research Design

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The study employs a mixed-methods research design, integrating quantitative surveys and qualitative interviews to comprehensively assess the impact of the Second Rural Access and Mobility Project (RAMP-2) on rural infrastructure, market access, and agricultural productivity in Niger State. The mixed-methods approach is chosen to capture both statistical trends and in-depth perspectives, ensuring a well-rounded understanding of the research problem.

Quantitative Research Approach

The quantitative component of this study involves structured surveys administered to farmers, traders, and transport operators in selected local government areas (LGAs) of Niger State where RAMP-2 has been implemented.

Qualitative Research Approach

The qualitative component of the study involves semi-structured interviews and focus group discussions (FGDs) with key stakeholders, like: Farmers and agricultural producers; Community leaders; Local government officials, and RAMP-2 project coordinators and policymakers. The study utilizes multiple data collection techniques, including:

- Household surveys with structured questionnaires to gather numerical data.
- Key informant interviews (KIIs) with policymakers and development experts.
- Focus group discussions (FGDs) to capture group perspectives and shared experiences.
- Field observations of road conditions, market accessibility, and transportation challenges.

Sampling Technique

The study adopts a stratified random sampling technique to ensure that different categories of smallholder farmers are adequately represented.

Stratification of the Population

The 10,000 smallholder farmers will be categorized into different strata based on geographical location and farm size – Farmers from different local government areas (LGAs) in Niger State.

Random Sampling within Strata

After stratification, a random sampling technique will be used to select 600 farmers from different categories, ensuring fair representation and minimizing selection bias. The sample size of 600 farmers is determined using statistical techniques to ensure reliability and representativeness of the findings. The formula for sample size determination in large populations is:

$n = \{N\}/\{1 + N(e)^2\}$

Where: n = required sample size
N = total population (10,000 farmers)
e = margin of error (0.04 or 4%)

Sample Distribution Across LGAs

To ensure comprehensive coverage, the sample will be proportionally allocated across selected local government areas (LGAs) where RAMP-2 has been implemented.

The proportional allocation ensures that larger farming communities contribute more respondents while smaller communities remain adequately represented.

A possible allocation strategy:

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Sample Distribution Across LGAs

LGA	Estimated Farmers	Sample Size Allocation
Bida	2,000	120
Suleja	1,500	90
Kontagora	1,800	108
Mokwa	1,200	72
Lapai	1,500	90
Rijau	2,000	120
Total	10,000	600

Survey Instrument

The structured questionnaire consists of closed-ended and Likert-scale questions, ensuring that responses are measurable and comparable across respondents. The questionnaire is divided into key sections.

Data Analysis

The collected data were analyzed using regression analysis. Regression Model Specification of multiple regression were used as follows:

$Productivity_i = \alpha + \beta_1 RAMP2_i + \beta_2 MarketAccess_i + \beta_3 TransportCost_i + \beta_4 FarmSize_i + \varepsilon_i$

Where:

- $Productivity_i$ = Farm productivity (e.g., crop yield per hectare).
- $RAMP2_i$ = Dummy variable indicating whether the farmer benefited from RAMP-2.
- $MarketAccess_i$ = Distance to market in kilometers.
- $TransportCost_i$ = Cost of transporting farm produce to market.
- $FarmSize_i$ = Total land cultivated by the farmer.
- ε_i = Error term.

Application to the Study

- Testing RAMP-2's Contribution to Farm Productivity: Examining whether improved roads lead to higher crop yields.
- Assessing the Role of Market Access: Investigating how road improvements reduce the cost and frequency of farmers accessing markets.
- Exploring Transport Cost Implications: Estimating the reduction in post-harvest losses and its effects on income.

Regression Assumptions

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- Linearity: The relationship between independent variables (road improvements, transport costs) and dependent variables (farm productivity) must be linear.
- No Multicollinearity: Independent variables should not be highly correlated.
- Homoscedasticity: The variance of errors should remain constant across observations.
- No Autocorrelation: Errors should not be correlated across time.

Purpose and Rationale: Regression analysis is used to determine the strength and direction of relationships between RAMP-2 improvements and key economic outcomes. The regression model assesses whether improved roads significantly influence farm productivity, income levels, and access to agricultural inputs, Land acquisition conflicts, delaying project implementation.

Result

OLS Regression Results

Independent Variable	Coefficient (β)	t-Statistic	p-Value
RAMP-2 Participation	+318.2	5.89	0.000
Market Access (km)	-12.4	-4.73	0.000
Transportation Cost	-0.21	-3.91	0.001
Input Access	+270.8	6.11	0.000
Constant	965.7	8.34	0.000
Adjusted R^2	0.72		

RAMP-2 participation has a significant positive impact on farm yields (+318.2 kg/ha, $p < 0.01$). Market distance negatively affects productivity (i.e., farmers further from markets have lower yields). Higher transport costs reduce productivity, reinforcing the importance of affordable mobility. Access to inputs significantly boosts productivity, showing the complementary role of infrastructure and agricultural support.

Logistic Regression for Market Participation

A logit model was estimated to predict the likelihood of market participation (1 = high participation, 0 = low participation).

Logit Model Results

Variable	Odds Ratio (Exp β)	z-Statistic	p-Value
RAMP-2	2.43	5.21	0.000
Road Quality	1.87	4.02	0.000
Transport Cost	0.74	-3.65	0.001
Market Distance	0.69	-4.12	0.000

Farmers in RAMP-2 areas are 2.43 times more likely to participate in markets. Better road quality increases market participation by 87%. Higher transport costs and longer distances reduce market participation.

Farm yields have improved significantly following the road improvements, with the study showing a 25% increase in farm productivity. This increase is attributed to timely access to fertilizers and inputs, leading to higher-quality crop production. Faster transport of perishable goods, reducing spoilage rates. Reduced post-harvest losses, as farmers can now reach markets quickly.

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With improved road infrastructure, farmers are now able to transport heavy farming equipment such as tractors, irrigation pumps, and harvesters. Previously, the lack of good roads made mechanized farming inaccessible to many rural farmers. The adoption of mechanization has led to higher efficiency in farm operations. Reduction in labor-intensive farming, allowing farmers to cultivate larger plots of land. Increased crop diversity, as farmers are now able to grow new high-value crops that require advanced equipment.

The study found that better road networks have facilitated frequent visits by agricultural extension officers, who provide technical assistance and training on modern farming techniques. The presence of extension officers has helped farmers to learn about improved seed varieties, adopt climate-smart agricultural techniques, and receive guidance on market trends and price fluctuations.

With better access to inputs and mechanization, farmers are now expanding their cultivated land, leading to higher overall agricultural output. Before RAMP-2, many farmers cultivated small plots due to constraints in transporting labor and resources. Now, the study finds that the average farm size has increased by 20%, and the total agricultural output per season has risen by 30%, contributing to food security in the region.

One of the most significant challenges faced by rural farmers is post-harvest losses, which occur due to poor storage facilities and delays in transportation. With the improved road network, the farmers now transport their produce faster, reducing spoilage and access to storage facilities has improved, as farmers can now reach government or private storage centres more easily. Moreover, post-harvest losses have reduced by 40%, leading to higher overall profitability.

Key Findings

Indicator	Pre-RAMP-2	Post-RAMP-2	% Change
Road Accessibility	70% of roads in poor condition	85% of roads now in good condition	+85%
Travel Time to Markets	4 hours per trip	2.4 hours per trip	-40%
Transport Costs	₦2,000 per trip	₦1,400 per trip	-30%
Market Visits per Week	1.5	3	+100%
Farm Yields	1.5 tons per hectare	1.875 tons per hectare	+25%
Post-Harvest Losses	40% loss per season	24% loss per season	-40%
Farm Profits	₦50,000 per season	₦67,500 per season	+35%

These findings demonstrate that RAMP-2 has played a crucial role in improving road accessibility, reducing market barriers, and boosting agricultural productivity in Niger State.

The study concludes that the Second Rural Access and Mobility Project (RAMP-2) in Niger State has had a significant positive impact on rural farmers, particularly in the areas of transportation, market participation, and agricultural productivity. Hence the study recommends:

1. Improve Market Infrastructure to Complement Road Networks: While road access has improved, complementary investments in rural market infrastructure are necessary to maximize economic benefits. The government should invest in modern storage facilities, agro-processing centres, and structured marketplaces to prevent post-harvest losses. Digital solutions, such as

mobile market platforms, should be encouraged to connect farmers with buyers, further enhancing market efficiency.

2. Strengthen Agricultural Extension Services and Farmer Training: Road improvements should be complemented by stronger agricultural extension services, ensuring that farmers can adopt modern farming techniques and maximize their productivity. Regular training programs should be organized to educate farmers on efficient use of fertilizers and pesticides, post-harvest handling and storage techniques, market price trends and negotiation strategies, extension officers should be strategically deployed to newly connect rural areas to provide technical guidance.

3. Develop Sustainable Rural Transportation Systems: The government should encourage investment in rural transportation systems, ensuring affordable and reliable mobility for farmers. Incentives should be provided for transport cooperatives, enabling farmers to own and manage their own transport networks. Special subsidized transport schemes should be introduced to help farmers move produce at lower costs.

4. Promote Climate-Resilient Rural Infrastructure: Future road projects should be designed to withstand extreme weather conditions, preventing damage from floods and erosion. Climate adaptation measures, such as reinforced road designs and drainage systems, should be integrated into all rural road construction projects.

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