

## DIGITAL MARKETPLACE FOR RURAL DEVELOPMENT IN SOUTHERN KADUNA: A MULTI-STAKEHOLDER STATISTICAL AND POLICY ANALYSIS

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### Abstract

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Periodic markets in rural Nigeria are often constrained by poor market access, weak logistics systems, limited price transparency, and excessive intermediary influence, all of which reduce farmer profitability and hinder rural development. In Southern Kaduna, where periodic markets dominate the agricultural economy, the absence of coordinated digital market systems has further intensified these challenges. This study examined the feasibility of a digital marketplace for improving rural agricultural market efficiency in Southern Kaduna using a multi-stakeholder statistical and policy analysis approach. Primary data were collected through structured questionnaires administered to 107 respondents comprising farmers, buyers, suppliers, distribution partners, community leaders, and regulators selected through a multistage sampling procedure. Descriptive statistics, chi-square analysis, and multiple regression techniques were employed to analyze the data. The findings revealed that 96.3% of respondents experience market access difficulties, while logistics inefficiency emerged as the most critical determinant of market performance ( $\beta = 0.47$ ). The chi-square results further showed statistically significant constraints in market access ( $\chi^2 = 91.56, p < 0.05$ ), logistics efficiency ( $\chi^2 = 69.50, p < 0.05$ ), and intermediary influence ( $\chi^2 = 34.82, p < 0.05$ ). The study also found a high level of mobile device usage among stakeholders, indicating readiness for digital marketplace adoption despite limited smartphone penetration. Anchored on digital platform theory, the study concludes that low-bandwidth digital marketplace systems can improve coordination, reduce transaction costs, enhance price transparency, and strengthen rural market integration. The study recommends the development of inclusive digital platforms alongside investments in rural infrastructure and digital literacy programs.

**Keywords:** Digital Marketplace, Rural Development, Market Efficiency, Southern Kaduna.

### Introduction

Rural markets in Nigeria are characterized by fragmentation, weak infrastructure, and limited access to information. In regions such as Southern Kaduna, periodic markets dominate trade systems, yet they are often inefficient in facilitating optimal exchange between producers and consumers. These inefficiencies result in reduced incomes for farmers, increased transaction costs, and significant post-harvest losses (Reardon et al., 2019).

Market access remains a fundamental challenge, particularly for smallholder farmers, who often rely on intermediaries to reach buyers. While intermediaries can play important roles in aggregation and distribution, they frequently introduce distortions in price formation and reduce the share of income accruing to producers (Barrett, 2020). Additionally, poor logistics systems, including inadequate road infrastructure and high transportation costs, further constrain market efficiency (World Bank, 2022).

The emergence of digital technologies offers new opportunities to address these challenges. Digital marketplaces can enhance information flow, improve price transparency, and facilitate direct linkages between market actors (Aker, 2018). However, the success of such platforms depends on a clear understanding of existing market constraints and stakeholder dynamics.

Recent empirical evidence highlights that digital innovations can significantly improve agricultural outcomes, including market access and food security, but adoption is influenced by factors such as education, gender, and access to resources (IFPRI, 2023). Furthermore, studies on e-logistics platforms in Nigeria reveal that while digital tools enhance farm sales, disparities in access persist across different social groups (Daudu et al., 2025).

Despite these advances, there remains a significant gap in localized studies that integrate multiple stakeholders and apply robust statistical analysis to evaluate digital marketplace feasibility. This is particularly true for Southern Kaduna, where periodic markets dominate and empirical evidence remains limited. This study is further anchored in digital platform theory, which explains how multi-sided digital systems improve coordination, reduce transaction costs, and enhance market efficiency.

### Statement of the Problem

Rural agricultural markets in Southern Kaduna face several interconnected challenges: limited access to profitable markets, lack of price transparency, inefficient logistics systems, and over-reliance on intermediaries. These challenges reduce farmer profitability and hinder rural development (Ezeudu & Obimbua, 2024).

Digital solutions have been proposed; there is insufficient empirical evidence to support their design and implementation in this specific context. While digital platforms greatly improve profitability elsewhere (Tsan et al., 2021), in Nigeria such solutions have primarily captured urban markets, with major examples such as Jumia, Konga, and Jiji, along with social [media](#) platforms like Instagram and WhatsApp Business. The likelihood of generating sizable profits was decreased because these platforms failed to capture rural periodic marketplaces and spaces (World Bank, 2023). This study evaluates this lacuna to bridge the gap.

### Objectives of the Study

- i. To assess market access challenges among stakeholders.
- ii. To evaluate price transparency in rural markets.
- iii. To analyze logistics efficiency and transaction costs.
- iv. To examine the role of intermediaries.
- v. To determine the feasibility of a digital marketplace.

### Research Hypothesis

- **H<sub>01</sub>:** Farmers have reliable access to markets
- **H<sub>02</sub>:** Price information is transparent
- **H<sub>03</sub>:** Logistics systems are efficient
- **H<sub>04</sub>:** Intermediaries do not significantly affect profits

## Literature Review

The role of market access in rural development has been widely documented. Improved access to markets enables farmers to increase productivity and income by connecting them to larger and more competitive markets (Abay et al., 2022). However, in many developing regions, market access is constrained by infrastructural and institutional limitations.

Price transparency is another critical factor influencing market efficiency. Information lop-sidedness often leads to inefficient pricing, where farmers lack knowledge of prevailing market prices and are therefore unable to negotiate effectively (Aker, 2018). Digital information systems have been shown to reduce such asymmetries and improve market outcomes.

Logistics and transportation also play a significant role in shaping agricultural markets. Poor logistics systems increase transaction costs and reduce competitiveness (World Bank, 2022). In the same way, the role of middlemen has been widely discussed. Although they play important roles like collecting products and helping with distribution, they sometimes take advantage of limited information among producers and buyers to gain unfairly high profits (Fafchamps & Minten, 2019).

Recent studies emphasize the transformative role of digital platforms in agricultural markets. Digital marketplaces enhance value-chain integration by reducing transaction costs and improving coordination among stakeholders (Sadiq et al., 2025). However, adoption challenges remain due to digital literacy gaps and infrastructural constraints (FAO, 2022). This study fills these gaps by providing localized, statistically robust evidence specific to Southern Kaduna.

## Theoretical Framework

The study is anchored on Digital Platform Theory, developed by Parker, Van Alstyne, and Choudary (2016). The theory explains how digital infrastructures create value by facilitating interactions among multiple groups of users within a shared ecosystem. It conceptualizes digital platforms as multi-sided markets that enable direct exchange between producers, consumers, and other stakeholders while reducing transaction costs and improving coordination efficiency.

Central to the theory are the concepts of network effects, information symmetry, and platform-enabled coordination. The theory argues that the value of a platform increases as more users participate, thereby improving market connectivity and efficiency. In rural markets, Digital Platform Theory provides a useful framework for understanding how digital marketplaces can enhance market access, improve price transparency, streamline logistics, and reduce intermediary inefficiencies, making it highly relevant for addressing structural constraints in regions such as Southern Kaduna.

## Methodology

This study adopted a cross-sectional survey research design to examine the feasibility of a digital marketplace for enhancing rural agricultural market efficiency in Southern Kaduna, Nigeria. The survey design was considered appropriate because it enabled the collection of quantitative data from multiple stakeholder groups within the agricultural market system at a single point in time.

## Target Population

For this study, the estimated accessible population of stakeholders across the selected periodic markets in Jema'a and Kaura Local Government Areas was 145 individuals involved in market activities, including buyers/payers, farmers, suppliers, distribution partners, community leaders, and regulators. These groups were selected across two local government periodic markets in Jema'a and Kaura to enable market validation of the digital markets solution to periodic markets. The key actors play critical roles in the functioning of rural agricultural markets and possess relevant knowledge regarding market access, logistics, pricing systems, and digital market readiness.

## Sampling Procedure and Sampling Technique

The sample size for the study was determined using the Taro Yamane (1967) formula for finite populations. The formula is expressed as:  $n = \frac{N}{1 + N(e)^2}$

Where:  $n$  = sample size;  $N$  = total population;  $e$  = sampling error 5% (0.05)

Using a 5% margin of error, the sample size was calculated as follows:  $n = \frac{145}{1 + 145(0.05)^2}$

$n = 106.4$ . The calculated sample size was 106.4 respondents, which was rounded up to 107 respondents to improve representativeness and ensure adequate coverage of all stakeholder categories within the agricultural value chain.

A multistage sampling technique was used for the study. First, purposive sampling was used to identify key periodic markets and stakeholder categories relevant to the objectives of the study. Thereafter, a stratified sampling technique was employed to ensure adequate representation of all stakeholder groups within the agricultural value chain. Finally, respondents were selected using simple random sampling within each stakeholder category to reduce sampling bias and ensure fairness in participation.

A total sample size of 107 respondents was used for the study, distributed across the stakeholder groups as follows: buyers or payers (35), farmers/end users (17), suppliers (18), distribution channel partners (12), community leaders/influencers (13), and regulators/policy actors (12).

**Table 1: Distribution of Respondents (N = 107)**

Category	Frequency	Percentage (%)
Buyers or Payers	35	32.7
End Users (Farmers)	17	15.9
Suppliers	18	16.8
Distribution Channel Partners	12	11.2
Community Leaders/Influencers	13	12.1
Regulators/Policy Actors	12	11.2
<b>Total</b>	<b>107</b>	<b>100.0</b>

**Source: Field Survey, 2026**

Table 1 illustrates six stakeholder groups: buyers/payers, end users (farmers), suppliers, distribution partners, community leaders, and regulators, which guarantee comprehensive insights into the agricultural market system.



**Method of Data Collection**

Primary data were collected through the administration of structured questionnaires. The questionnaire was designed to capture information on market access challenges, price transparency, logistics efficiency, intermediary influence, infrastructure constraints, and digital readiness among stakeholders. The instrument contained both closed-ended and structured response questions to facilitate quantitative analysis.

The questionnaires were administered directly to respondents through field surveys with the assistance of trained research assistants where necessary. This approach ensured clarity of responses and improved response accuracy. Secondary data were also obtained from journal articles, policy documents, books, and institutional reports to support the theoretical and empirical discussions of the study.

**Method of Data Analysis**

Data collected from the field were analyzed using descriptive and inferential statistical techniques. Descriptive statistics such as frequencies and percentages, pie chart and doughnut were used to summarize respondents’ views and market characteristics. Chi-square analysis was employed to test the study hypotheses and determine the statistical significance of market-related constraints, while multiple regression analysis was used to examine the influence of market access, price transparency, logistics efficiency, and intermediary activities on market efficiency. The chi-square statistic is calculated by comparing observed and expected frequencies using the formula.

$$\chi^2 = \sum (O - E)^2 / E \dots\dots\dots (1)$$

**The Regression Analysis Model is given as:**

$$ME = \beta_0 + \beta_1MA + \beta_2PT + \beta_3LE + \beta_4IM + \epsilon \dots\dots\dots (2)$$

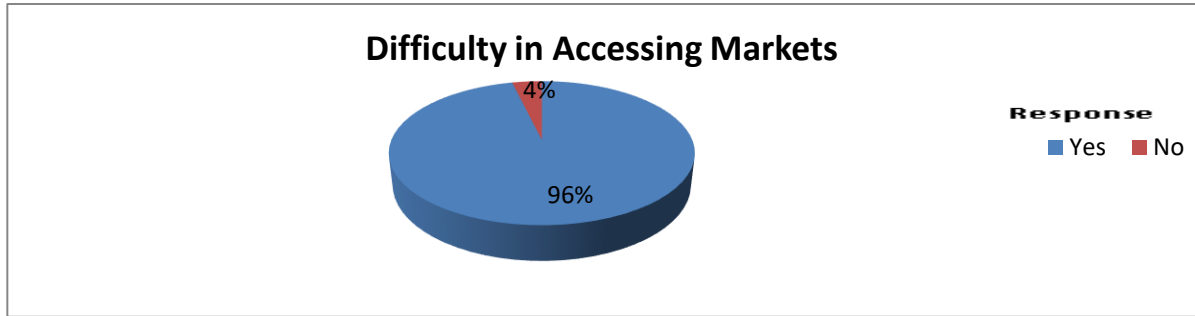
Where:

- ME = Market Efficiency (Dependent Variable)
- MA = Market Access difficulty
- PT = Price Transparency issues
- LE = Logistics Efficiency (time + cost)
- IM = Intermediary influence

**Results and Discussions**

**Market Access Constraints**

Figure 1 revealed that 96.3% of respondents experience difficulty accessing markets, indicating that market access challenges are widespread and deeply rooted within the rural economy of Southern Kaduna. This finding suggests that farmers and other stakeholders operate within highly fragmented market systems characterized by poor transportation networks, weak connectivity, and limited integration with broader commercial markets. The implication is that rural producers are largely confined to local periodic markets where competition is limited and bargaining power remains weak.



**Figure 1: Difficulty in Accessing Markets**  
**Source: Field Survey, 2026**

The finding agrees with the work of Abay, Berhane, Minten, and Taffesse (2022), who observed that poor market access significantly reduces agricultural productivity and rural incomes across developing economies. Similarly, Ezeudu and Obimbua (2024) found that weak rural transportation systems in Nigeria continue to isolate farmers from profitable markets, thereby increasing poverty and limiting commercialization. In the context of Southern Kaduna, the persistence of access barriers indicates that agricultural production alone cannot guarantee rural development without effective market integration mechanisms.

The results presented in Table 2 further support this view, as 55% of the respondents indicated that they experienced market challenges on a weekly basis, while 21% reported facing them monthly. This indicates that market access problems are not temporary disruptions but persistent structural constraints embedded within the rural marketing system. Frequent exposure to these challenges increases transportation costs, delays transactions, and reduces the ability of farmers to respond quickly to market opportunities. This finding is consistent with the observations of Reardon et al. (2019), who argued that poor market coordination and infrastructural deficiencies create continuous inefficiencies within agricultural value chains in sub-Saharan Africa.

**Table 2: Frequency of Market Challenges**

Periods	Frequency	Percentage (%)
Weekly	59	55.0
Monthly	22	21.0
Seasonal/Rare	26	24.0
Total	107	100

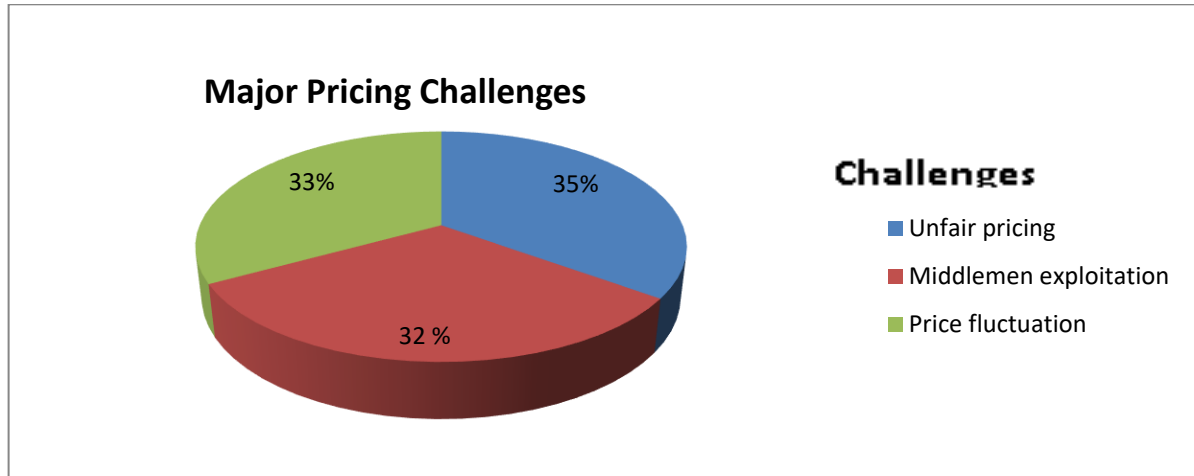
**Source: Field Survey, 2026**

Critically, the persistence of market access difficulties suggests that rural producers are trapped within localized economic systems that restrict competition and reduce market efficiency. This supports the argument of Digital Platform Theory that network connectivity and market integration are essential for improving economic outcomes in fragmented systems.

**Price Transparency Challenges**

Figure 2 showed that unfair pricing (35%), intermediary exploitation (32%), and price fluctuations (33%) were almost equally distributed among respondents. This balanced distribution demonstrates

that price inefficiency in Southern Kaduna is multidimensional rather than being caused by a single dominant factor.



**Figure 2: Major Pricing Challenges**  
Source: Field Survey, 2026

The finding agrees with Aker (2018), who argued that information irregularity remains a major source of market inefficiency in rural agricultural systems. Farmers who lack access to real-time market information are unable to negotiate effectively, making them vulnerable to price manipulation and exploitation by intermediaries. Similarly, Fafchamps and Minten (2019) observed that inadequate pricing information weakens farmer bargaining power and contributes to unstable rural market systems.

**Logistics and Cost Implications**

The findings presented in Table 3 revealed that 71% of respondents spend between two and five hours completing market transactions, while 18% spend more than five hours. This concentration in the higher time categories indicates severe inefficiencies within transportation and coordination systems.

**Table 3: Time Lost in Transactions**

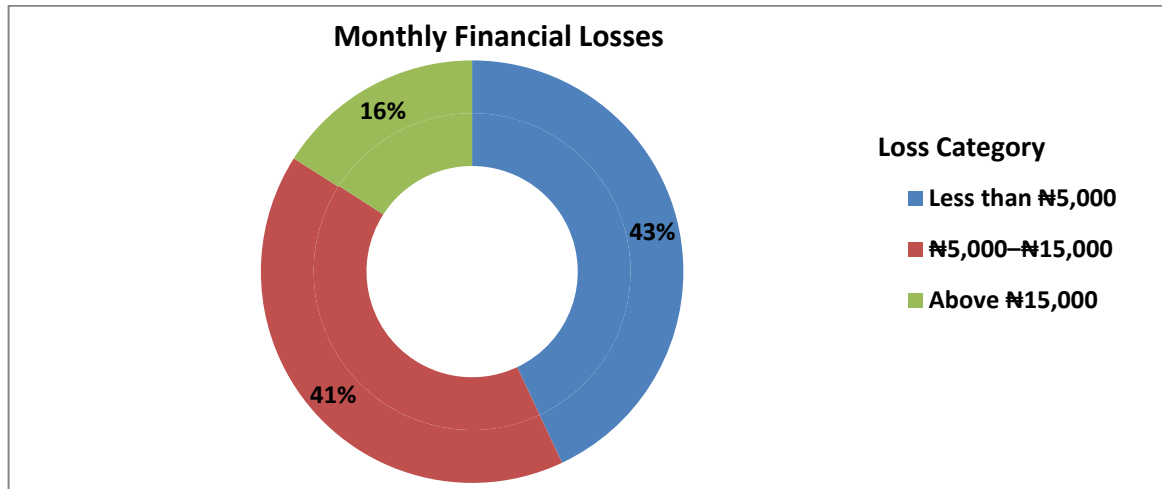
Time Category	Frequency	Percentage (%)
Less than 2 hours	12	11
2–5 hours	76	71.0
More than 5 hours	19	18.0
Total	107	100

**Source: Field Survey, 2026**

The findings are consistent with World Bank (2022), which identified poor logistics systems as one of the greatest constraints to agricultural commercialization in developing economies. In a similar study, Daudu, Oladipo, and Yusuf (2025) found that poor logistics coordination greatly affects the efficiency of agricultural markets in Nigeria by causing delays and increasing operational costs.

Figure 3 revealed that a substantial proportion of respondents experience serious financial losses arising from inefficiencies within the rural market system. The findings showed that 43% of

respondents lose less than ₦5,000 monthly, 41% lose between ₦5,000 and ₦15,000, while 16% incur losses above ₦15,000 every month. The distribution indicates that more than half of the respondents suffer moderate to severe financial losses, reflecting the high economic burden associated with poor market coordination, transportation delays, and inefficient logistics systems.



**Figure 3: Monthly Financial Losses**

Source: Field Survey, 2026

The findings agree with Barrett (2020), who argued that weak food supply chains and poor market coordination significantly reduce producer profitability in developing economies. Similarly, World Bank (2022) observed that transportation inefficiencies and high transaction costs continue to constrain rural agricultural commercialization across sub-Saharan Africa. Daudu et al. (2025) also reported that inadequate logistics coordination in Nigeria contributes directly to income losses among agricultural stakeholders, particularly smallholder farmers operating within fragmented rural markets. Persistent losses of this magnitude constrain farmers’ ability to reinvest and expand production, thereby limiting long-term economic growth.

**Post-Harvest Losses**

Table 4 showed that 48% of respondent’s experiences produce wastage between 5% and 15%, while 16% experience losses above 15%. These findings indicate that post-harvest losses are widespread within the agricultural system of Southern Kaduna.

**Table 4: Produce Wastage**

Wastage Level	Frequency	Percentage (%)
Less than 5%	39	36.0
5–15%	51	48.0
Above 15%	17	16.0
Total	107	100

Source: Field Survey, 2026

The findings agree with FAO (2022), which reported that inadequate storage systems, delayed transportation, and weak market coordination are primary causes of post-harvest losses in rural agricultural economies. Similarly, Barrett (2020) observed that poor supply chain coordination contributes significantly to food wastage and reduced farmer income across developing countries.

Realistically, post-harvest losses represent both economic inefficiency and developmental setbacks because they reduce effective supply, lower profitability, and weaken food security. The findings suggest that improving logistics and market coordination could substantially reduce wastage and improve agricultural productivity.

### Digital Readiness

Table 5 revealed that 52% of respondents use basic mobile phones, while only 24% use smartphones. This indicates that advanced digital penetration remains relatively low in the study area. These findings align with IFPRI (2023), which noted that digital adoption in rural Africa is often constrained by technological limitations rather than behavioral resistance. Similarly, FAO (2022) emphasized that low-bandwidth and mobile-compatible digital systems are more effective in rural communities where smartphone penetration remains limited.

**Table 5: Mobile Device Ownership**

Device Type	Frequency	Percentage (%)
Basic phone	56	52.0
Smartphone	26	24.0
Both	19	18.0
None	6	6.0
Total	107	100

**Source: Field Survey, 2026**

The findings further indicate that Southern Kaduna possesses significant behavioral readiness for digital marketplace adoption despite technological limitations. The frequent use of mobile devices demonstrates that stakeholders are already integrated into communication systems and may adopt digital marketplaces if such systems are simple, affordable, and compatible with basic phones. This finding strongly supports Digital Platform Theory, which argues that digital platforms generate value by increasing participation and connectivity among users. The implication is that inclusive digital systems designed for low-bandwidth environments could significantly improve market coordination and participation in rural areas.

Table 6 revealed that 60% of respondents use mobile devices daily, 32% use them weekly, while only 8% use them occasionally. The findings indicate a high level of engagement with mobile communication technologies among stakeholders within the rural agricultural market system. Despite the relatively low level of smartphone ownership identified in Table 5, the frequency of mobile usage demonstrates that digital communication has already become integrated into the daily activities of most respondents.

**Table 6: Frequency of Mobile Usage**

Response	Frequency	Percentage (%)
Daily	64	60.0
Weekly	34	32.0
Occasionally	9	8.0
Total	107	100

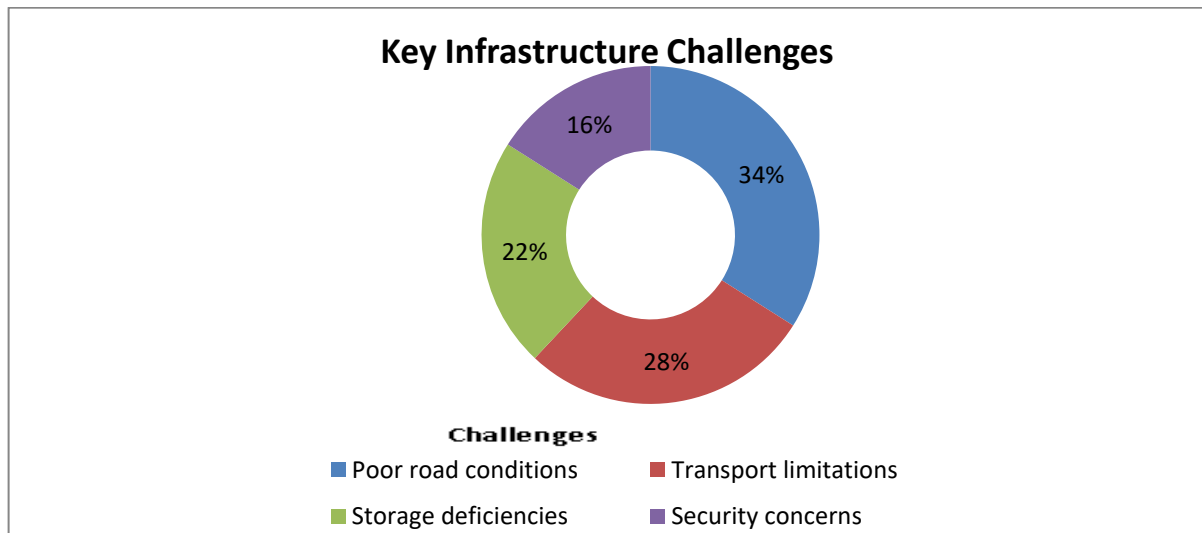
**Source: Field Survey, 2026**

The findings agree with IFPRI (2023), which reported that mobile communication technologies have increasingly become central to agricultural information exchange and market coordination in rural

Africa. Similarly, FAO (2022) emphasized that frequent mobile usage among rural farmers provides a critical entry point for digital agricultural transformation, particularly where internet penetration and smartphone ownership remain limited. Daudu et al. (2025) also found that consistent mobile engagement among Nigerian farmers positively influences the adoption of digital logistics and e-market systems. Despite limited smartphone access, users are already integrated into mobile-based systems, creating a foundation for digital marketplace adoption.

### Infrastructure Constraints

Figure 4 identified poor road conditions (34%) and transportation limitations (28%) as the major infrastructural constraints affecting market efficiency. Storage deficiencies (22%) and security concerns (16%) were also identified as important barriers. The findings agree with World Bank (2022), which highlighted infrastructure deficits as critical obstacles to rural agricultural development in Africa. Similarly, Ezeudu and Obimbua (2024) observed that poor infrastructure increases transaction costs and weakens rural market integration in Nigeria.



**Figure 4: Key Infrastructure Challenges**

Source: Field Survey, 2026

Rural market inefficiencies are strongly linked to infrastructural underdevelopment, as found in the study. Poor roads increase travel time and transportation costs, while storage deficiencies contribute to produce wastage and reduced profitability. The interaction between transportation, storage, and security challenges demonstrates that infrastructural problems are interconnected and collectively weaken market performance.

### Hypothesis Testing

#### Chi-square Test Results

Table 7 presents the chi-square analysis of respondents' access to markets. The number of respondents who reported difficulty in accessing markets (103) was much higher than the expected frequency of 53.5, whereas only 4 respondents reported no difficulty, which was far below the expected value. The calculated chi-square value  $\chi^2=91.56$  was considerably higher than the critical

value of 3.84 at 1 degree of freedom and a 0.05 level of significance. This shows that there is a statistically significant difference between the observed and expected frequencies.

**Table 7: Market Access Chi-Square Test**

Response	Observed	Expected	(O-E) <sup>2</sup> /E
Yes	103	53.5	45.78
No	4	53.5	45.78
Total			91.56

( $\chi^2 = 91.56$ ,  $df = 1$ ,  $p < 0.05$ )

Source: Field Survey, 2026

This large deviation suggests that market access constraints are not randomly distributed but are systematically experienced by the majority of stakeholders. In practical terms, this implies that structural barriers such as poor road networks, distance to markets, and lack of transportation are deeply embedded within the rural market system. The magnitude of the chi-square value also indicates a strong effect size, suggesting that market access is a dominant constraint influencing agricultural market performance. This finding provides empirical support for rejecting the null hypothesis ( $H_0$ ) and confirms that farmers do not have reliable access to markets.

The chi-square analysis in Table 8 revealed that the observed frequencies across the pricing categories closely matched expected frequencies, resulting in a statistically insignificant chi-square value ( $\chi^2 \approx 0.07$ ,  $p > 0.05$ ). Although statistically insignificant, the practical implication of this result is highly important because it demonstrates that all respondents experience pricing challenges almost equally. This indicates that pricing inefficiency is systemic and pervasive throughout the market structure.

**Table 8: Price Transparency Chi-Square Test**

Category	Observed	Expected	(O-E) <sup>2</sup> /E
Unfair price	37	35.67	0.05
Fluctuation	35	35.67	0.01
Middlemen	35	35.67	0.01
Total			0.07

( $\chi^2 \approx 0.07$ ,  $df = 2$ ,  $p > 0.05$ )

Source: Field Survey, 2026

The absence of significant variation among pricing challenges suggests that rural agricultural markets in Southern Kaduna suffer from a generalized lack of transparency. This implies that no single pricing issue can be addressed in isolation because unfair pricing, volatility, and intermediary control are interconnected dimensions of a broader structural problem. The finding aligns with IFPRI (2023), which noted that digital agricultural systems improve rural market efficiency primarily through enhanced information sharing and real-time pricing mechanisms.

The chi-square analysis in Table 9 showed that logistics inefficiency was statistically significant ( $\chi^2 = 69.50$ ,  $p < 0.05$ ). This demonstrates that delays and inefficiencies are systematically experienced across the market system rather than occurring randomly. The dominance of the 2–5 hour transaction category indicates that most stakeholders face substantial operational delays during market activities.

**Table 9: Logistics Efficiency Chi-Square Test**

Category	Observed	Expected	(O-E) <sup>2</sup> /E
≤1hr	11	35.67	17.06
2–5hrs	76	35.67	45.57
>5hrs	20	35.67	6.87
Total			69.50

( $\chi^2 = 69.50$ ,  $df = 2$ ,  $p < 0.05$ )

Source: Field Survey, 2026

This finding supports the argument of Sadiq, Singh, and Ahmad (2025), who maintained that logistics remains the central determinant of agricultural market efficiency in digitally transforming economies. The result also validates Digital Platform Theory, which emphasizes coordination efficiency and transaction cost reduction as major functions of digital platforms.

The chi-square result in Table 10 revealed that intermediary influence was statistically significant ( $\chi^2 = 34.82$ ,  $p < 0.05$ ), with most respondents indicating that intermediaries impose additional costs within the market system. This finding supports the work of Fafchamps and Minten (2019), who argued that intermediaries often exploit information irregularity and market fragmentation to capture disproportionate value within agricultural supply chains. However, the finding also reflects the argument of Parker, Van Alstyne, and Choudary (2016) that intermediaries are not necessarily eliminated in digital systems but are transformed into more transparent and value-adding actors.

**Table 10: Intermediaries Influence Chi-Square Test**

Response	Observed	Expected	(O-E) <sup>2</sup> /E
Yes	84	53.5	17.41
No	23	53.5	17.41
Total			34.82

( $\chi^2 = 34.82$ ,  $df = 1$ ,  $p < 0.05$ )

Source: Field Survey, 2026

Vitaly, the findings indicate that intermediaries currently possess significant market power because they control information, transportation, and market access channels. This creates unequal power relations within the market system, reducing the profit margins of producers and consumers alike.

The regression analysis in Table 11 revealed that the explanatory variables jointly accounted for approximately 71% of the variation in market efficiency ( $R^2 = 0.71$ ). Logistics efficiency emerged as the strongest determinant of market performance ( $\beta = 0.47$ ), followed by market access ( $\beta = 0.41$ ), price transparency ( $\beta = 0.33$ ), and intermediary influence ( $\beta = 0.29$ ).

The findings agree with Sadiq et al. (2025), who emphasized that logistics and coordination systems are the strongest determinants of digital agricultural market performance. Similarly, Daudu et al. (2025) observed that improved logistics coordination significantly enhances agricultural commercialization and rural incomes in Nigeria.

**Table 11: Regression Results testing the assumption variables**

Variable	Coefficient	Std Error	t-value	p-value
Constant	1.05	0.28	3.75	0.0
Market Access	0.41	0.1	4.1	0.0
Price Transparency	0.33	0.08	4.12	0.0
Logistics	0.47	0.09	5.22	0.0
Intermediaries	0.29	0.07	4.14	0.0

**Source: Field Survey, 2026**

The dominance of logistics as the strongest predictor confirms that transportation and coordination systems are the foundation of efficient agricultural markets. Without efficient logistics, improvements in pricing systems or digital adoption may produce only limited benefits. The findings therefore demonstrate that rural market transformation requires integrated interventions that simultaneously address transportation, information systems, market access, and institutional coordination.

The results also strongly validate Digital Platform Theory by showing that digital marketplaces can address the major drivers of inefficiency through improved coordination, reduced transaction costs, enhanced information flow, and stronger market connectivity. The findings therefore provide empirical evidence that digital marketplaces can transform fragmented periodic markets into more efficient and inclusive economic systems capable of supporting sustainable rural development.

### Policy Implications

The following policy implications were provided.

- i. Development of low-cost digital platforms
- ii. Investment in rural infrastructure
- iii. Promotion of digital literacy programs
- iv. Strengthening institutional support

### Conclusion

This study concludes that rural agricultural markets in Southern Kaduna are characterized by deeply rooted structural inefficiencies manifested through poor market access, weak price transparency, logistics delays, infrastructural deficiencies, post-harvest losses, and excessive intermediary influence, all of which collectively undermine market efficiency, farmer profitability, and sustainable rural development. The findings revealed that logistics remains the most critical determinant of market performance, while persistent transportation delays, financial losses, and market fragmentation continue to constrain agricultural commercialization within the region. Despite these challenges, the study established a significant level of digital readiness among stakeholders, particularly through the frequent use of mobile communication devices, indicating strong potential for the adoption of low-bandwidth digital marketplace systems. Based on Digital Platform Theory, the study revealed that digital marketplaces can greatly improve coordination efficiency, lower transaction costs, promote better access to information, strengthen market linkages, and transform intermediaries into more transparent and value-driven actors within the agricultural value chain. The study therefore argues that sustainable rural transformation in Southern Kaduna depends on transitioning from fragmented traditional market systems to digitally integrated and coordinated

market structures supported by investments in rural infrastructure, logistics, storage facilities, digital literacy, and institutional support mechanisms. In the long run, the study provides strong empirical and policy support for the establishment of an inclusive digital marketplace platform that can enhance the efficiency of rural markets, improve farmers' incomes, minimize post-harvest losses, and encourage sustainable economic transformation in Southern Kaduna and other similar rural areas in Nigeria.

### **Contributions to Knowledge**

This study makes several important contributions to knowledge in the fields of rural development, agricultural economics, and digital transformation.

First, it provides localized empirical evidence on the functioning of rural agricultural markets in Southern Kaduna, a context that has received limited attention in existing literature. By adopting a multi-stakeholder approach, the study captures diverse perspectives across the value chain, offering a more comprehensive understanding of market dynamics than studies focused solely on farmers.

Second, the study advances existing research by integrating statistical rigor with theoretical insight, combining chi-square and regression analyses with Digital Platform Theory. This dual approach not only quantifies the extent of market inefficiencies but also explains the underlying mechanisms through which digital platforms can address them.

Third, the study extends digital platform theory into the rural agricultural context of developing economies, showing how its core principles-network effects, transaction cost reduction, and information symmetry-apply to periodic market systems. This contextual application enriches the theory by demonstrating its relevance beyond urban and industrial markets.

Finally, the research offers practical and policy-oriented insights by proposing a low-bandwidth, inclusive digital marketplace model tailored to the realities of rural communities. This bridges the gap between theory and practice, making the findings directly applicable to policymakers, development practitioners, and technology designers.

### **Recommendations**

The following recommendations were made:

1. Develop a low-bandwidth digital marketplace platform.
2. Introduce real-time price information systems.
3. Strengthen logistics coordination mechanisms.
4. Provide continuous user training and support.
5. Establish trust systems (ratings, verification, endorsements).

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