

EFFECT OF MARKET ACCESS AND TECHNOLOGICAL ADOPTION ON PERFORMANCE OF AGRIBUSINESS IN KADUNA STATE: ROLE OF COMMUNITY TIES

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Abstract

This study examines the effect of market access and technological adoption on the performance of agribusinesses in Kaduna State, Nigeria, while assessing the moderating influence of community ties on these relationships. A quantitative research designed was adopted, and data were collected through a survey of 334 agribusiness owners and smallholder farmers drawn from Giwa, Zaria, and Sabon Gari Local Government Area. The study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze the hypothesized relationships among variables. The findings indicate that both market access and technological adoption have significant positive effects on agribusiness performance. The study concludes that while market access and innovation are vital for agribusiness success, strong community network further strengthen market-related outcomes. It recommends improving rural infrastructure, promoting inclusive technology adaptation, and strengthening farmer's cooperatives to support sustainable agribusiness development.

Keywords: Effect of market access, Kaduna state, performance of agribusiness, role of community ties, technological adoption

Introduction

Agriculture is central to Nigeria's economy, playing a crucial role as around two-thirds of the workforce is engaged in agriculture, mainly cultivating staple crops like rice, maize, and cassava. Smallholder farmers, operating on small plots of land normally on 0.5–2 hectares of farmland, dominate agricultural activities, particularly in growing rice and maize, which are vital for food security. Agriculture's importance extends beyond economic contributions, influencing employment and ensuring the nation's food security (Ume, Enete, Onyekuru, & Opata, 2020). Agriculture is of paramount importance to the Nigerian economy, according to Adeyemi, Sennuga, Bamidele, Alabuja, and Omole, (2023) serving as a critical sector that significantly contributes to economic growth, employment generation, food security, foreign exchange earnings, rural development, and economic diversification. With about 24% of Nigeria's Gross Domestic Product (GDP) attributed to agriculture in 2020, the sector remains the largest employer of labor, engaging millions of farmers and agricultural workers across various activities (World Bank, 2021).

From 2020 to 2024, agriculture's contribution to Nigeria's GDP experienced a decline. In 2020, the agricultural domain stimulated 24% GDP. By 2023, this had dropped to around 22%, with further decreases projected for 2024 (Pricewater Cooper, PwC, 2023). This decline is primarily attributed to problems like poor infrastructure, restricted access to market, and lack of community network and persistent insecurity, which have reduced productivity in the sector (PwC, 2023). This reduction in agricultural output has had a significant effect on SMEs involved in agribusiness. With agriculture being a vital economic pillar in Nigeria, the sector's challenges, such as limited market access, slow technological adoption, and reduced government support services, have hindered the growth of agricultural SMEs. These factors have constrained SMEs' ability to scale up operations, access broader markets, and adopt modern farming techniques (National Bureau of Statistics, NBS, 2023).

The performance of SMEs in agribusiness is intricately linked to agricultural productivity. When agricultural productivity declines, these SMEs face numerous challenges, including reduced revenues, increased operational costs, and restricted access to credit (Abdul-Azeez, Ihechere, & Idemudia, 2024). This, in turn, impacts their ability to invest in modern technology and expand into larger markets, both of which are crucial for scaling operations and improving profitability (Waluyo, 2024). Improved market access is one of the key solutions to enhancing the performance of agribusiness SMEs. Digital platforms, for example, have been effective in helping smallholder farmers access new markets, reduce reliance on middlemen, and improve profit margins. In Nigeria, platforms like FarmCrowdy enable farmers to connect directly with investors and access larger markets, improving their financial stability and operational scalability. The use of mobile banking and fintech services also allows these farmers to receive payments and access credit more efficiently (Waluyo, 2024).

Technological adoption also plays a critical role in agribusiness performance. Modern technologies such as advanced farming equipment, precision agriculture, and digital platforms can greatly improve productivity and streamline operations. Despite the transformative potential, adoption in Kaduna State remains uneven, primarily due to financial constraints, limited technical expertise, and inadequate access to training and resources (NEARLS, 2023). These challenges limit the ability of agribusinesses to enhance efficiency and remain competitive, ultimately impeding their growth and development.

Community ties play a potentially critical yet underexplored role in moderating the relationship between market access, technological adoption, and agribusiness performance in Kaduna State. Given the strong influence of social networks and communal relationships on business operations in the region (Bourdieu, 1986; Putnam, 2000), these ties can facilitate knowledge sharing, foster collaboration, and provide both emotional and practical support. However, limited research has examined how community ties may enhance or constrain the effectiveness of market access and technology adoption in improving agribusiness outcomes (Coleman, 1988; Lin, 2001). Understanding this moderating role is essential for developing more holistic strategies that not only address infrastructural and technological gaps but also leverage communal support to boost agribusiness growth and sustainability.

Agribusiness performance in Nigeria is significantly constrained by infrastructural deficits, limited access to finance, inadequate storage, post-harvest losses, and climate-related risks (Ene, Onyele & Orji, 2022; Issahaku & Abdulai, 2020). These challenges hinder smallholder farmers' productivity, resulting in low yields, reduced income, and suboptimal agribusiness

outcomes (Bold et al., 2022; Slayi, Zhou & Jaja, 2023). Poor post-harvest handling and outdated farming practices further weaken market competitiveness, while quality inconsistencies and pest vulnerabilities reduce product value (Abiddin et al., 2023; Mditshwa et al., 2017). Nonetheless, opportunities for growth lie in rising local and global demand for processed agricultural products, government support initiatives like the Anchor Borrowers' Program same with implementation of agri-tech solutions can enhance efficiency (CBN, 2021; Oluigbo-Moses, 2023). Mitigating these challenges by improving support services, technological integration, and market access is essential for boosting agribusiness performance, enabling farmers to scale operations, increase incomes, and drive broader economic development.

Despite the sector's significance, there is limited scholarly attention regarding the interactions between market dynamics, technological advancements, support structures, and the overall performance of agribusinesses, particularly within the unique context of community ties. Previous studies (e.g., Raimi, Shokunbi, & Olowo, 2022; Mungadi, Argungu, & Mahmud, 2022; Amolegbe, & Adewumi, 2022) often focus on individual factors without considering the moderating influence of local social networks. This research aims to fill the identified gap in the literature by investigating the complex relationship among market access, technological adoption, support services, and agribusiness performance, with a specific focus on the moderating role of community ties. Social networks and community ties are deeply intertwined; as social networks often form the basis of community ties within agricultural settings. Social networks represent the web of relationships and interactions among individuals, organizations, and institutions, while community ties refer to the bonds and mutual support that arise from these relationships within a specific geographic or cultural context.

In agribusiness, community ties play a crucial moderating role by influencing how farmers access markets, adopt technology, and benefit from support services. Strong social networks enhance the flow of information, collaboration, and resource sharing, thereby boosting agribusiness performance. However, the relationships between market access, technological adoption, support services, and performance are not always straightforward. Studies show that market access impacts vary depending on infrastructure, competition, and market conditions (Bonuedi, 2021; Davis & Weinstein, 2003), while technological adoption outcomes depend on how well the technology fits local needs and the capacity to utilize it effectively (Boothby, Dufour & Tang, 2010). Similarly, support services often influence performance indirectly, contingent upon other contextual factors (Alzahrani et al., 2023; Mungadi, Argungu & Mahmud, 2022). These inconsistencies underscore the need to consider community ties as a key moderating factor that shapes the effectiveness of these variables, offering a more holistic understanding of what drives agribusiness success.

Addressing this limitation, the study contributes to a more comprehensive understanding of the factors shaping the success of agribusinesses. Hence the study examines the moderating role of community ties on the effect of market access, technological adoption on agribusiness performance of farmer in Kaduna state.

H₀₁: There is no significant effect of market access on the performance agribusinesses in Kaduna State.

H02: There is no significant effect of technological adoption on the performance of agribusiness in Kaduna State.

H03. Community ties does not moderate the relationships between market access and the performance of agribusiness in Kaduna State.

H04. Community ties does not moderate the relationships between technological adoption and the performance of agribusiness in Kaduna State.

Literature Review

Performance of agribusinesses is closely associated to their ability to access markets, which enables them to reach consumers, negotiate better prices, and reduce post-harvest losses. According to Ogunsanmi (2013), market access is an important determinant of agribusiness success in Nigeria, specifically to a smallholder farmers who depend heavily on intermediary buyers due to infrastructural challenges. Ibeme (2017) further emphasized that inadequate transport networks, poor road conditions, and lack of reliable market information hinder farmers' ability to engage effectively in commercial activities. In contexts like Kaduna State, where agricultural production is significant, limited market access reduces profitability and impedes scalability. However, market access alone may not translate into improved performance without complementary factors such as social capital and community engagement.

Technological adoption also has an important part in enhancing agribusiness performance. The integration of modern agricultural technologies—such as improved seeds, precision farming tools, mobile applications for market information, and mechanized equipment—has the potential to increase productivity and efficiency (Boothby, Dufour & Tang, 2010; Oluigbo-Moses, 2023). Yet, the uptake of such technologies is often slow in rural Nigeria, due to financial constraints, lack of awareness, and limited training opportunities (NEARLS, 2023). Bold et al. (2022) assert that smallholder farmers in developing countries struggle with low productivity largely because of poor access to quality inputs and technological tools. Additionally, Slayi, Zhou, and Jaja (2023) point out that inadequate knowledge transfer further inhibits the effective use of these technologies, resulting in mixed outcomes for agribusinesses depending on the local context.

Community ties—defined as the strength of social networks, trust, and mutual cooperation among members of a farming community—have been increasingly recognized as a moderating variable that can enhance or diminish the effects of market access and technology adoption. Social capital theory (Bourdieu, 1986; Coleman, 1988; Putnam, 2000) provides a theoretical basis for this argument, positing that relationships within communities foster the exchange of resources, information, and support. In agrarian societies, strong community networks can facilitate collective bargaining, information dissemination, and shared use of technology, thereby enhancing overall performance (Lin, 2001). Conversely, weak community ties may result in fragmentation, reduced trust, and underutilization of external opportunities.

Despite these insights, the moderating role of community ties in shaping agribusiness performance remains underexplored, especially in the Nigerian context. Research by Bonuedi (2021) and Davis and Weinstein (2003) confirms that market access and infrastructure alone are insufficient without considering the social systems in which agribusinesses operate.

Integrating the role of community ties into existing models thus fills a critical gap and offers a more nuanced understanding of agribusiness performance determinants in regions like Kaduna State.

Market Access and Agribusiness Performance

Market access remains a fundamental driver of agribusiness performance, as it determines the ability of farmers to sell their produce, reach new customers, and obtain favorable prices. According to Ogunsanmi (2013), poor road infrastructure, insufficient market information, and the dominance of middlemen have continued to impede effective market participation among Nigerian farmers. Ibeme (2017) further notes that in many rural parts of Kaduna State, infrastructural decay limits farmers' ability to transport goods to profitable markets. While market access is often linked to improved agribusiness outcomes, Davis and Weinstein (2003) emphasize that its effectiveness is context-specific, depending on factors such as market competition, location, and available infrastructure.

Technological Adoption and Agribusiness Performance

Technological advancement in agriculture offers tools for increasing yield, efficiency, and profitability. Precision farming, mobile-based extension services, and mechanization have been shown to improve performance when effectively implemented (Boothby, Dufour & Tang, 2010). However, in Kaduna State, the adoption of such innovations remains uneven. Bold et al. (2022) highlight that decreasing smallholder farmers productivity stems from poor access to modern technologies, high costs, and limited technical capacity. NEARLS (2023) adds that large number of farmers experience in access to training and demonstration centers that promote practical technology use. As Slayi, Zhou, and Jaja (2023) argue, without adequate knowledge transfer, even the best technologies may fail to yield desired outcomes.

Community Ties as a Moderating Factor

Community ties—representing shared norms, trust, and social networks—can influence how agribusinesses utilize market access and adopt technologies. Theories of social capital (Bourdieu, 1986; Coleman, 1988; Putnam, 2000) suggest that strong community ties can enhance cooperation, information exchange, and mutual support among farmers. In Kaduna State, where communal living is prevalent, such networks can serve as channels for disseminating market information, pooling resources for equipment, or collectively accessing distant markets. Lin (2001) emphasizes that social networks not only serve instrumental roles in resource access but also influence behavioral outcomes. Despite their potential, few empirical studies in Nigeria have explored community ties as a moderator, creating a research gap this study aims to address.

Theoretical Framework

This study is anchored in Social Capital Theory, as developed by Bourdieu (1986), Coleman (1988), and Putnam (2000), which posits that social networks, norms of reciprocity, and trust within communities have positively increased access to resources and enhanced collective outcomes. In the context of agribusiness, social capital—manifested through community ties—can play a pivotal role in enabling farmers to share information, access inputs, organize collective marketing, and adopt new technologies. Community networks often facilitate informal learning, reduce transaction costs, and foster collaboration, especially in rural

economies where formal institutions may be weak or inaccessible. Thus, community ties serve not only as support systems but also as catalysts that enhance the effectiveness of market access and technological interventions in agribusiness operations.

Additionally, the framework draws from the Resource-Based View (RBV) of the firm, which asserts that sustainable competitive advantage stems from the strategic use of valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). Market access and technological adoption are viewed as strategic external and internal resources, respectively, that enhance agribusiness performance when effectively leveraged. However, the capacity to utilize these resources efficiently may depend on contextual factors such as community ties, which act as complementary enablers. By integrating Social Capital Theory with RBV, this study provides a holistic understanding of how structural factors (e.g., infrastructure and technology) interact with relational assets (e.g., trust and cooperation) to influence agribusiness outcomes in Kaduna State.

Materials and Method

This study adopts a quantitative research approach using a descriptive survey design in investigating moderating role of community ties on the relationship between market access, technological adoption, and the performance of agribusinesses in Kaduna State, Nigeria. The survey design is appropriate for capturing data from a broad population and identifying patterns among key variables without manipulating the research environment. The target population comprises registered agribusiness owners and smallholder farmers operating in selected agricultural zones of Kaduna State total 3,670. A multi-stage sampling technique is employed: first, purposive sampling is used to select three agriculturally active Local Government Areas (LGAs) Giwa, Zaria and Sobongari, followed by stratified random sampling to ensure representation across different agribusiness types (crop, livestock, and mixed farming). Data is collected through a structured questionnaire designed to measure market access, technological adoption, community ties, and agribusiness performance using a 5-point Likert scale.

To ensure validity and reliability, the questionnaire is subjected to expert review and pilot testing before administration. Cronbach's Alpha is used to test internal consistency of the instrument, with a threshold of 0.70 for acceptable reliability. Data collected is analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) technique, which is suitable for assessing complex relationships and moderating effects among latent variables. Specifically, PLS-SEM helps determine the direct effects of market access and technological adoption on agribusiness performance, and the moderating influence of community ties on these relationships. Hypotheses are tested at a 5% level of significance. This methodological approach provides empirical insight into how social structures interact with economic and technological factors to shape agribusiness outcomes in the study area.

Results and Discussion

The study surveyed a total of 334 agribusiness owners and smallholder farmers across three agriculturally active Local Government Areas (LGAs) in Kaduna State: Giwa, Zaria, and Sabon Gari. Of the respondents, 124 (37.1%) were from Giwa, 112 (33.5%) from Zaria, and 98 (29.4%) from Sabon Gari. The majority of respondents were male (62.9%), while females accounted for 37.1%, reflecting the gender distribution common in agricultural activities

within the region. accordingly 28.1% of the respondents were between 21–30 years age, 41.6% were between 31–40 years, and 30.3% were above 40 years. Regarding educational background, 17.4% had no formal education, 35.9% had primary or secondary education, and 46.7% possessed tertiary qualifications. Most respondents (64.1%) were involved in crop production, 23.4% in livestock, and 12.5% in mixed farming. This demographic profile reflects a diverse and active agribusiness community in Kaduna State, suitable for assessing the influence of market access, technological adoption, and community ties on agribusiness performance.

Assessment of the Path Model

The path model provides a structured framework for analyzing the relationships between independent variables (market access and technological adoption), the moderator (community ties), and the dependent variable (agribusiness performance). It allows for the simultaneous assessment of both direct and interaction effects, making it suitable for exploring complex, real-world dynamics. The inclusion of interaction terms (e.g., *MACT* and *TACT*) enables the model to test for moderation, which is essential in understanding how community ties influence the strength or direction of the main effects. This approach is justified as it provides a holistic view of agribusiness performance, capturing both individual and contextual influences within a single analytical framework.

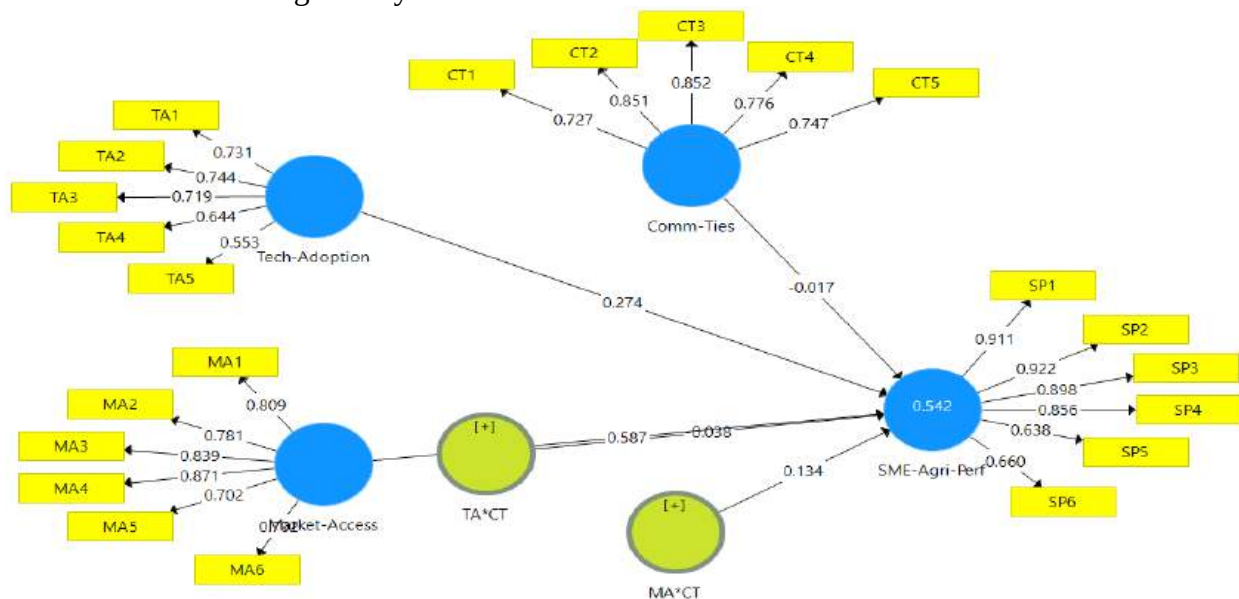


Figure 1 Path model

Results and Discussion

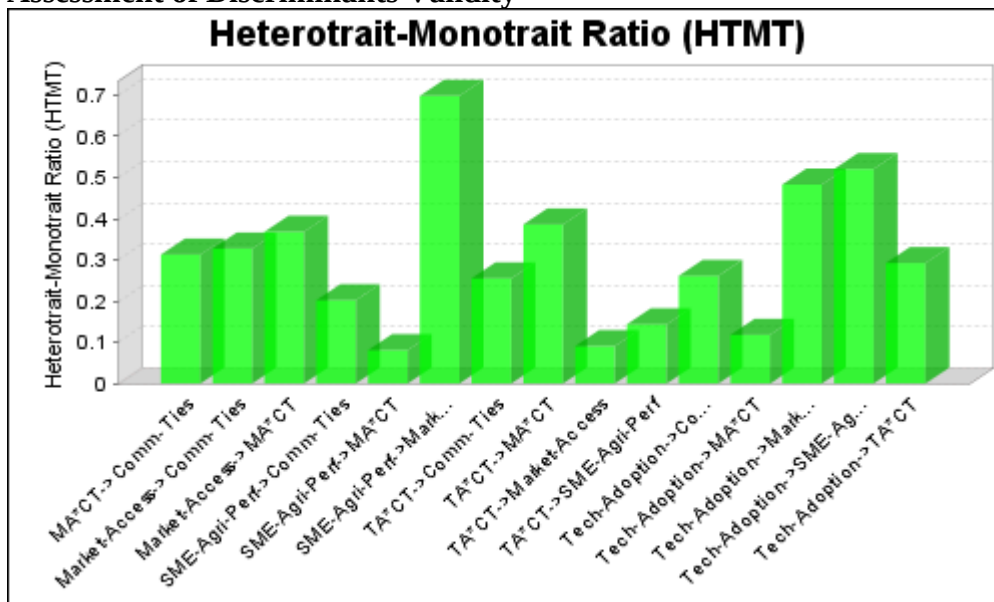
Table 1 Loadings and Internal Consistency

Items	Loadings	CR	AVE
CT1	0.727	0.893	0.628
CT2	0.851		
CT3	0.852		
CT4	0.776		
CT5	0.747		
MA1	0.809	0.906	0.619
MA2	0.781		

MA3	0.839		
MA4	0.871		
MA5	0.702		
MA6	0.702		
SP1	0.911	0.925	0.677
SP2	0.922		
SP3	0.898		
SP4	0.856		
SP5	0.638		
SP6	0.660		
TA1	0.731	0.811	0.503
TA2	0.744		
TA3	0.719		
TA4	0.644		
TA5	0.553		

The results from Table 1 demonstrate that the measurement model meets acceptable thresholds for reliability and convergent validity. All constructs—Community Ties (CT), Market Access (MA), Technological Adoption (TA), and SME Agribusiness Performance (SP)—exhibit composite reliability (CR) values above the recommended 0.70 threshold (ranging from 0.811 to 0.925), indicating strong internal consistency among items. The average variance extracted (AVE) values for each construct are also above the minimum threshold of 0.50, except for some individual item loadings in TA and SP (e.g., TA5 = 0.553, SP5 = 0.638), that are low but still within acceptable limits for exploratory studies. These findings suggest that the measurement items adequately capture the underlying constructs, justifying their use in the structural model for further analysis.

Assessment of Discriminants Validity



The Heterotrait-Monotrait Ratio (HTMT) graph above assesses discriminant validity among the constructs in the study model. All HTMT values are well below the conservative threshold of 0.85, indicating that the constructs—such as market access, community ties, technological adoption, and SME agribusiness performance—are sufficiently distinct from one another. The highest HTMT value appears to be slightly above 0.70, which still remains

within the acceptable range, further reinforcing that there is no issue of multicollinearity or construct redundancy. This confirms that the latent variables measure different concepts, thereby validating the structural model's discriminant validity and ensuring the robustness of the path analysis results.

Assessment of Structural Model

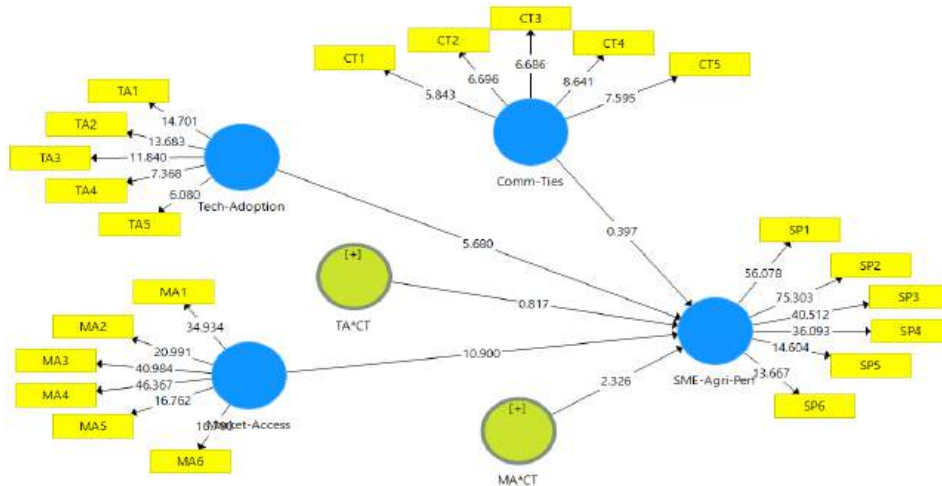


Figure 2 Structural Model
Table 2 Test of Hypotheses

Relationship	Beta	Mean	STDEV	T Stat	P Values	Decision
Market-Access -> SME-Agri-Perf	0.587	0.583	0.054	10.9	0.000	Reject
Tech-Adoption -> SME-Agri-Perf	0.274	0.283	0.048	5.68	0.000	Reject
MA*CT -> SME-Agri-Perf	0.134	0.128	0.058	2.326	0.020	Reject
TA*CT -> SME-Agri-Perf	0.038	0.042	0.047	0.817	0.414	Fail to Reject

R2=0.542

The results presented in Table 2 reveal insightful findings regarding the effect of market access, technological adoption, and community ties on the performance of agribusinesses in Kaduna State. The first hypothesis (H01), which posited that there is no significant effect of market access on agribusiness performance, is rejected ($\beta = 0.587$, $T = 10.9$, $p = 0.000$). This indicates a strong, statistically significant positive relationship, suggesting that improved access to markets substantially enhances agribusiness performance. This aligns with previous studies (Ogunsanmi, 2013; Bonuedi, 2021) that emphasize the importance of reliable infrastructure, market linkages, and information flow in agricultural success.

Similarly, the second hypothesis (H02) is rejected ($\beta = 0.274$, $T = 5.68$, $p = 0.000$), confirming a significant positive effect of technological adoption on agribusiness performance. This suggests that integrating modern farming tools, digital platforms, and improved inputs positively contributes to productivity and competitiveness, corroborating findings by Boothby et al. (2010) and Oluigbo-Moses (2023). The third hypothesis (H03), which examines the moderating role of community ties on the relationship between market access and performance, is also rejected ($\beta = 0.134$, $T = 2.326$, $p = 0.020$), indicating that community ties significantly strengthen the positive effect of market access on agribusiness performance. This finding supports social capital theory (Coleman, 1988; Lin, 2001),

affirming that communal relationships can facilitate trust, collective action, and shared knowledge that enhance market participation.

However, the fourth hypothesis (H04), which tests the moderating effect of community ties on the relationship between technological adoption and agribusiness performance, is not supported ($\beta = 0.038$, $T = 0.817$, $p = 0.414$), suggesting that community ties do not significantly influence this relationship. This could imply that technology adoption may be more dependent on individual capacity, access to resources, or formal support systems rather than social networks. These results highlight the need for differentiated strategies when promoting market access and technology use, considering the varying influence of community engagement on each pathway.

Assessment of IPMA



Figure 3 IPMA

The Importance-Performance Map highlights the relative significance (total effects) and performance levels of key constructs—community ties, market access, and technological adoption—on SME agribusiness performance. Market access (red dot) emerges as both the most important and best-performing predictor, with the highest total effect and a performance score near 90, indicating it should remain a strategic priority. Technological adoption (green triangle) shows moderate importance and high performance, suggesting it contributes positively but with room for further enhancement. In contrast, community ties (blue square) demonstrate high performance but very low importance in terms of direct effect, implying that while well-developed socially, their influence on performance is indirect or context-specific. These insights suggest that improving market access should be the primary focus, while continued investment in technology and a strategic reevaluation of community engagement can further optimize agribusiness outcomes.

Conclusion and Recommendation

Conclusion

This study examined impact of market access and technological adoption on the performance of agribusinesses in Kaduna State, Nigeria, while assessing the moderating role of community ties. The findings revealed that both market access and technological adoption significantly enhance agribusiness performance. Moreover, community ties positively moderate the relationship between market access and performance, indicating that strong social networks amplify the benefits of market connectivity. However, community ties did not significantly moderate the relationship between technological adoption and performance, suggesting that technology-driven improvements may be more dependent on individual capacity and institutional support than social influence. These insights highlight the complex but critical role of both structural and relational factors in driving agribusiness success.

Recommendations

1. Government and development agencies should prioritize investment in rural road networks, storage facilities, and transport systems to improve market access and reduce post-harvest losses.
2. Extension services and agri-tech programs should be expanded to ensure farmers receive practical training and support, especially in using technologies suited to local farming conditions.
3. Policymakers and NGOs should engage local community structures such as cooperatives and farmer associations to facilitate group marketing, knowledge sharing, and joint access to inputs and markets.
4. Collaboration between the government, private sector, and community organizations can foster innovation, funding, and infrastructure development to strengthen agribusiness ecosystems.

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