

Challenges and Constraints Affecting Female-Owned Rural Farm Businesses in Plateau State, Nigeria

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Abstract

This study examined the challenges and constraints affecting female-owned rural farm businesses in Plateau State, Nigeria. No prior study had conducted a comprehensive, quantitative, state-wide investigation covering all 17 local government areas (LGAs) of the state, and this study addressed that gap. The objectives were to identify the challenges faced by female-owned rural farm businesses, assess their relationship with business performance, and determine how strongly these challenges predicted performance outcomes. The study was conducted across all 17 LGAs of Plateau State, with 510 respondents selected using simple random, purposive, and snowball sampling techniques. A quantitative research design was adopted using structured questionnaires administered in English and local languages where necessary. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 27.0, applying descriptive statistics, Pearson correlation, and multiple regression analyses. Financial exclusion, high input costs, poor road infrastructure, post-harvest storage gaps, and limited access to extension services were identified as the most reported challenges. Pearson correlation confirmed a significant negative relationship between challenges and business performance ($r = -0.280$, $p = 0.000$), and regression analysis further confirmed that challenges negatively predicted performance ($B = -0.291$, $p = 0.000$), while socio-demographic characteristics positively moderated outcomes. It was recommended that gender-targeted lending, rural storage facilities, road rehabilitation, expanded extension services, and conflict recovery frameworks be prioritized to support female-owned rural farm businesses in Plateau State.

Keywords: Business performance, challenges, and constraints, female-owned businesses, rural agriculture, rural farm businesses

INTRODUCTION

Women are widely recognized as key contributors to agricultural production across the developing world, particularly in sub-Saharan Africa, where they provide most of the labor within smallholder farming systems. However, their contributions are rarely supported by equal access to productive resources such as land, finance, and training [1–3]. Research from across Africa consistently shows that patriarchal cultural norms, weak institutional support, and poor rural infrastructure create layered barriers that limit what women can achieve in agriculture, even when they are the primary producers [4–6]. These barriers are not simply individual challenges but reflect deeper structural inequalities that shape how resources, opportunities, and decision-making power are distributed between men and women in farming communities [7, 8].

In Nigeria, these structural inequalities are particularly visible. Women make up most of the agricultural labor force, especially among

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smallholders who produce 60% of the country's food supply, with over 52% of smallholder farmers being women [9]. Despite this dominant presence, female employment in agriculture dropped to 25.6% in 2023, down from historically higher levels, indicating that the conditions enabling women's productive participation in farming are declining rather than improving [9]. Across different states in Nigeria, studies have documented similar patterns of constraint. In Imo State, women farmers reported high production costs and restricted access to credit as key barriers to enterprise growth [10, 11]. In Kwara and Bauchi States, access to credit, training, and market linkages were found to significantly shape women's ability to participate in income-generating agricultural activities [12, 13]. Studies from Enugu and Yobe States further showed that while government interventions have some positive effects, they remain insufficient to overcome the entrenched barriers that rural women face in agriculture [6, 14]. Taken together, this body of research points to a nationwide pattern of constrained female agricultural entrepreneurship, while also revealing significant geographic gaps in knowledge.

Plateau State represents one such gap. Women play a substantial role in the state's agricultural economy, contributing to crop production, broiler farming, and Irish potato cultivation across its diverse communities [15–17]. However, the state also faces a unique set of challenges, including recurring farmer-herder conflicts, climate-related agricultural disruption, and restricted mobility for women, all of which compound existing structural barriers and make farming particularly difficult for female-owned enterprises [18]. Existing studies in Plateau State are limited in scope, focusing on single local government areas (LGAs) or specific farm types, and none have produced statistically representative findings covering all 17 LGAs of the state. This location-focused and situation-relevant gap means that policymakers and development practitioners lack the data needed to design effective interventions for women farmers in the state. It is against this background that the present study examines the challenges and constraints affecting female-owned rural farm businesses across all 17 LGAs of Plateau State, Nigeria, with the aim of generating statistically grounded, geographically representative findings to guide policy and practice.

LITERATURE REVIEW

Conceptual Literature

The Concept of "Challenges and Constraints"

Scholars have defined challenges and constraints differently, each offering a useful perspective. Ahl (2006) [19] sees challenges as social barriers that shift depending on the surrounding environment, meaning they are not fixed but change with the social conditions. In contrast, Devereux (2001) [20] defines constraints as structural limitations, whether economic, institutional, or environmental, that reduce the ability of individuals or businesses to succeed, focusing more on external forces. Similarly, Kabeer (2005) [21] combines both ideas, arguing that challenges and constraints reflect unequal power relations, limited resources, and cultural norms that restrict women's economic participation. Among these, Kabeer's (2005) [21] definition best fits this study on the challenges and constraints affecting female-owned rural farm businesses in Plateau State, Nigeria (PS-N). Unlike Ahl (2006) [19] or Devereux (2001) [20], Kabeer's (2005) [21] definition is situation-grounded and captures the gender-based, cultural, and economic barriers faced by rural women farmers in Plateau State, Nigeria.

The Concept of "Female-Owned Businesses"

Scholars have defined female-owned businesses from various perspectives. Coleman and Robb (2012) [22] define female-owned ventures as those where women hold at least 51% ownership and lead key business decisions, focusing on legal ownership as the main criterion. In contrast, Brush et al. (2009) [23] argue that ownership must be understood within the broader social, cultural, and institutional conditions that shape women's ability to run businesses, shifting the focus from legal status to structural realities. Similarly, Kelley et al. (2013) [24] describe female-owned businesses as ventures initiated and controlled by women, noting that in rural and low-income settings, these are often informal and subsistence-based and shaped by limited resources and social norms. Among the three, Brush et al.

(2009) [23] offer the most suitable definition for this study, as it connects ownership to the structural barriers women face, providing a stronger and more situationally appropriate foundation for examining female-owned rural farm businesses in Plateau State, Nigeria.

The Concept of “Rural Farm Businesses”

Rural farm businesses have been defined differently by scholars, reflecting economic, structural, and social perspectives. Egwuonwu and Iwunwanne (2020) [11] define them as agro-based enterprises operated by smallholder farmers in non-urban areas, covering crop production, marketing, and land preparation. In contrast, Nwosu et al. (2025) [10] see them as agricultural enterprises owned by women farmers, shaped by subsistence production, and constrained by high costs, limited credit, and pest pressures. Similarly, Adebisi and Olaniyi (2025) [12] describe rural farm businesses as income-generating activities where women’s participation is influenced by age, marital status, household size, credit access, and training. Among these definitions, Adebisi and Olaniyi (2025) [12] offer the most fitting definition for this study. Their gender-sensitive and situation-specific framing captures both livelihood strategies and the systemic constraints facing rural women, which directly aligns with the study’s objective of examining the challenges affecting female-owned rural farm businesses in Plateau State, Nigeria.

Theoretical Framework

This study’s theoretical framework is anchored on the gender and development (GAD) theory. The GAD theory emerged in the 1970s and 1980s as a direct response to the earlier Women in Development (WID) approach, which was widely criticized for trying to include women in existing development systems without addressing the deeper inequalities that kept them marginalized. GAD theory was principally developed by feminist scholars, including Caroline Moser, Kate Young, and Maxine Molyneux, alongside the influence of the Development Alternatives with Women for a New Era (DAWN) network, founded in 1984. Rather than focusing only on women as a group, GAD shifts attention to gender relations, meaning the socially constructed roles, power differences, and institutional arrangements that consistently place women at a disadvantage relative to men [25, 26]. The central argument of the theory is that women’s marginalization in economic and agricultural life is not natural or accidental but is produced and maintained by patriarchal structures, cultural norms, and institutional frameworks that limit women’s access to land, finance, training, and decision-making opportunities [27].

GAD theory is the most suitable framework for this study because it directly addresses the gendered structural roots of the constraints facing female-owned rural farm businesses in Plateau State. While other frameworks describe the constraints that exist, GAD explains why they exist, locating barriers such as land tenure insecurity, financial exclusion, limited access to extension services, and heavy domestic labor burdens within unequal power relations rather than treating them as isolated or coincidental problems [28]. The key strength of the theory is its ability to expose systemic gender inequality as the primary force limiting women’s agricultural enterprises. However, a recognized weakness is that it can sometimes underemphasize individual agency and economic factors that go beyond gender alone [29].

In applying the methodology of this study, GAD theory provides a clear and structured analytical guide. Its focus on gendered access to resources directly informs the examination of land and credit constraints among the 510 respondents drawn from all 17 LGAs of Plateau State. Its attention to institutional power structures directs the analysis of women’s exclusion from cooperative societies and agricultural extension services in the region. The recognition of socially assigned domestic roles shapes the assessment of time and mobility limitations faced by female farmers. Using Statistical Package for the Social Sciences (SPSS) version 27.0, with Pearson correlation and multiple regression analyses, GAD theory enables a statistically supported attribution of how patriarchal structures and gender-based institutional barriers [25, 28] affect farm business performance, directly addressing the situation-specific empirical gap identified for Plateau State.

Empirical Literature and Gap

This review examines existing studies on the challenges and constraints facing female-owned rural farm businesses, starting with Nigerian studies, moving to broader African contexts, and concluding with international evidence. The aim was to compare findings across studies and identify gaps relevant to the present study's focus on the Plateau State, Nigeria.

Several Nigerian studies have documented the challenges facing rural women in agriculture. Kosshak et al. (2020) [15], in a quantitative study of 120 women farmers in Jos South LGA of Plateau State using multiple regression analysis, found that land tenure insecurity, poor produce pricing, and limited access to extension services were the highest-ranked constraints. Age, household size, education, and method of farm acquisition significantly ($p < 0.01$) influenced women's agricultural participation. Building on this, Kosshak et al. (2025) [17], also in Plateau State, studied 150 women broiler farmers and found that 66.7% had never received any training, while poor access to finance, bad pricing, and middlemen exploitation were the key challenges. Marital status and education positively influenced training participation ($p < 0.01$), while age had a negative effect. Michael (2022) [16] further showed that Women-in-Agriculture and Youth Empowerment (WAYE) Program participants in Plateau State recorded significantly higher crop output (537,807.1 kg) compared to non-participants (165,571.43 kg), confirming that targeted programs improve productivity. Taken together, these three Plateau State studies consistently point to financial exclusion, land insecurity, and training gaps as binding constraints, but each is limited to specific enterprise types or single LGAs, leaving a state-wide picture absent.

Outside Plateau State, similar patterns emerge. Nwosu et al. (2025) [10] in Imo State and Egwuonwu and Iwunwanne (2020) [11], also in Imo State, both using quantitative methods, identified high production costs, limited credit access, and inadequate capital as the dominant constraints. Adebisi and Olaniyi (2025) [12] in a quantitative study of 120 women in Kwara State using Probit regression, found that financial access, education, and family influence were key determinants of women's participation in income-generating activities (IGAs). Sanusi and Ibrahim (2023) [14] studied Yobe State using descriptive statistics, household analysis, and Principal Component Analysis (PCA), and found that while women-run agribusinesses recorded a Return on Investment (ROI) of 1.40, security threats and cultural barriers remained serious constraints. Shehu et al. (2025) [13], in a Logit regression study of 134 women in Bauchi State, found that limited credit and poor rural infrastructure restricted women's off-farm entrepreneurial options. Ogbodo et al. (2025) [6] in Enugu State, using an ordered Probit model, confirmed that government intervention positively influences women's agricultural participation, but access barriers persist. Ishola and Luginaah (2025) [18], in a qualitative study in Plateau State, found that farmer-herder conflict and climate variability compound women's vulnerability, restricting mobility and resource access. James and Onoshakpor (2025) [7], using a phenomenological approach across Nigeria, found that patriarchy, inflation, and institutional voids drive informality among female entrepreneurs, while Jaiyeola and Adeyeye (2021) [30] in Ekiti State and Akokuwebe et al. (2021) [4] in south-eastern Nigeria both highlighted patriarchal structures and land tenure as key mechanisms of financial exclusion. Peter and Orser (2024) [31], through thematic analysis of 25 interviews in south-western Nigeria, found that women preferred informal Esusu credit over formal microfinance due to trust and flexibility, suggesting that financial constraint is not merely about access but about the suitability of available products.

At the African level, Kitole and Genda (2024) [1] in Tanzania surveyed 540 women-led enterprises and found, using Ordinary Robust Least Squares (ORLS) regression, that access to credit, skills training, and income diversification significantly improved business performance. Mbangiswano et al. (2025) [3] in South Africa found that insecure land rights and male-controlled cooperatives limited women's agripreneurship despite supportive policy frameworks. Majola (2024) [8], also in South Africa, identified weak infrastructure and inadequate policy implementation as barriers for female entrepreneurs. Farnworth et al. (2024) [5], across Ghana, Kenya, and Tanzania, found that social norms and lack of family support were the most persistent barriers to women's agribusiness participation. Internationally, Ti and Khanna (2025) [2], in a mixed-methods study across rural India, Africa, and

South-East Asia, found that 70% of women lacked credit access, while cooperative models improved financial inclusion for 80% of participants. McDonagh et al. (2024) [32], in a qualitative focus group study across Ireland, Belgium, Poland, and Italy, found that financial barriers and low digital confidence constrained female agri-food entrepreneurs. Amato et al. (2025) [33], using Farm Accountancy Data Network (FADN) data for Italy, found a persistent income gap driven by unequal resource allocation between male and female farm holders. Gawel et al. (2024) [34], using panel regression for 23 European Union (EU) countries, found that green transformation policies were associated with higher female participation in agricultural entrepreneurship, while Ferto and Bojnec (2025) [35], using Hungarian FADN panel data, found that female-headed farms showed comparable environmental scheme intensity to male-headed farms when farm size was controlled. Farrell et al. (2024) [36] argued conceptually that women-led innovation in EU rural areas is categorically distinct and deserves dedicated policy attention.

The empirical review established that while the reviewed studies collectively confirm that financial exclusion, land insecurity, patriarchal structures, poor infrastructure, and limited training are widespread constraints for rural women in agriculture, a key gap remains in the literature. No study has conducted a comprehensive, quantitative, state-wide investigation covering all 17 LGAs of Plateau State to statistically examine how these constraints affect the performance of female-owned rural farm businesses.

The present study addresses this gap by providing statistically grounded, geographically representative, and situation-appropriate findings for Plateau State, contributing data-driven knowledge to guide policy and practice in conflict-affected and resource-constrained environments.

METHODOLOGY

This study adopted a quantitative research design to examine the challenges and constraints affecting female-owned rural farm businesses in Plateau State, Nigeria. This design was chosen because it allows for the collection of numerical data that can be analyzed statistically to produce findings that are both measurable and representative [37]. Structured questionnaires served as the primary data collection instrument, designed to capture data on key variables, including land tenure insecurity, financial exclusion, limited access to extension services, and farm business performance. The questionnaire was pilot tested before full deployment to confirm its reliability and validity and was administered in both English and local languages, where necessary, to accommodate the linguistic diversity of respondents across the state [38].

The study was conducted across all 17 LGAs of Plateau State, located in Nigeria's North Central geopolitical zone, with 30 female-owned rural farm businesses selected from each LGA, giving a total sample size of 510 respondents. A combination of simple random, purposive, and snowball sampling techniques was used to ensure adequate representation of the target population across diverse rural communities [39]. Local agricultural extension officers and community leaders helped identify and reach eligible participants, while data collection was scheduled to fit around seasonal farming activities, reducing disruption and improving the quality of responses obtained [40].

The collected data were screened, coded, and analyzed using the Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the characteristics of the respondents. Inferential analyses, specifically Pearson correlation and multiple regression analyses, were then conducted to examine the relationships between the identified constraints and farm business performance and to determine the strength and direction of their effects [41]. Cronbach's alpha was calculated to confirm the internal consistency of the scaled items.

The Challenges Scale yielded a Cronbach's alpha of 0.868, based on standardized items across seven items, indicating a high level of reliability and confirming that the scale produced consistent measurements [42]. All findings are presented in tables to make the results easy to follow and interpret.

RESULTS AND DISCUSSION OF FINDINGS

Demographic Information

The demographic information of the respondents is presented in Table 1. The 510 respondents were drawn from all 17 LGAs of Plateau State, presenting a sample that was largely young, experienced, and educated. The largest age group was 26 to 35 years, with 185 respondents (36.3%), followed by the 36 to 45 group with 133 respondents (26.1%), meaning that over 62% of the sample fell within the prime working age years. This confirms that the study captured women at the height of their productive and entrepreneurial capacity, strengthening the relevance of the findings for policies and practices. Marital status data showed that 291 respondents (57.1%) were married, which reflects the real-life situation of most rural female farmers in Nigeria, where women manage both household roles and farm businesses simultaneously [25, 28]. Regarding education, 138 respondents (27.1%) had secondary education, 119 (23.3%) held a Diploma or National Certificate of Education (NCE), and 91 (17.8%) had a bachelor's degree or above. The fact that over 68% of respondents had at least secondary-level education confirms that the sample possessed a reasonable level of human capital, which is consistent with similar studies conducted in Plateau State [16, 15]. This educational profile adds strength to the study's findings, as the responses were provided by women capable of understanding and engaging meaningfully with the research instrument.

Farming experience data showed that 166 respondents (32.5%) had between 5 and 10 years of experience, and 129 respondents (25.3%) had between 11 and 15 years, confirming that most of the respondents were practiced and knowledgeable farmers. This level of experience supports the reliability of the responses gathered on farm business performance and related constraints.

Table 1. Socio-demographic and farm characteristics of respondents.

Question	Components	Frequency	Percentage (%)
Age	18–25	91	17.8
	26–35	185	36.3
	36–45	133	26.1
	46–55	67	13.1
	56 and above	34	6.7
Marital Status	Single	136	26.7
	Married	291	57.1
	Widowed	36	7.1
	Divorced/separated	47	9.2
Highest Educational Qualification	No formal education	66	12.9
	Primary education	96	18.8
	Secondary education	138	27.1
	Diploma/NCE	119	23.3
	Bachelor's degree and above	91	17.8
Farming Experience	Less than 5 years	126	24.7
	5–10 years	166	32.5
	11–15 years	129	25.3
	16 years and above	89	17.5
Type of Farming Activity (Main Activity)	Crop production	244	47.8
	Livestock farming	75	14.7
	Mixed farming	159	31.2
	Agro-processing	32	6.3
Farm Size	Less than 1 hectare	184	36.1
	1–3 hectares	214	42.0
	4–6 hectares	77	15.1
	Above 6 hectares	35	6.9

Source: Source: Field survey is adopted from Michael HY. The role of women-in-agriculture and youth empowerment programme among Irish potato farmers in Plateau State, Nigeria. *J Agripreneursh Sustain Dev.* 2022;5(4):38–45. doi:10.59331/jasd.v5i4.364.

In terms of farming activity, crop production was the most common, practiced by 244 respondents (47.8%), followed by mixed farming by 159 respondents (31.2%) and livestock farming by 75 respondents (14.7%). This productive diversity reflects the range of female-owned farm businesses operating across the study area, making the sample broadly representative of rural agricultural activity in the Plateau State. Farm size data showed that 214 respondents (42.0%) farmed between 1 and 3 hectares, and 184 respondents (36.1%) farmed less than one hectare.

This smallholder profile is consistent with the rural farming landscape of Plateau State and aligns with documented patterns of female agricultural enterprises across Nigeria [4, 10]. Overall, the demographic characteristics of the respondents confirm that the study engaged a well-suited, experienced, and grounded sample, providing a solid foundation for the data-driven analysis that follows.

Analysis of the Specific Challenges Faced by Female-Owned Rural Farm Businesses in Plateau State, Nigeria

Table 2 summarizes the responses to the challenges faced by rural female-owned farm businesses. Table 2 presents the responses of 510 female-owned rural farm businesses across the 17 LGAs of Plateau State regarding the specific challenges they face. On limited access to finance, 73 respondents (14.3%) strongly disagreed, 117 (22.9%) disagreed, 132 (25.9%) were neutral, 117 (22.9%) agreed, and 71 (13.9%) strongly agreed that financial exclusion affects farm business performance.

On high input costs, 73 (14.3%) strongly disagreed, 116 (22.7%) disagreed, 134 (26.3%) were neutral, 114 (22.4%) agreed, and 73 (14.3%) strongly agreed. On poor road infrastructure, 63 (12.4%) strongly disagreed, 118 (23.1%) disagreed, 151 (29.6%) were neutral, 107 (21.0%) agreed, and 71 (13.9%) strongly agreed. On climate change, 67 (13.1%) strongly disagreed, 131 (25.7%) disagreed, 138 (27.1%) were neutral, 106 (20.8%) agreed, and 68 (13.3%) strongly agreed. On insecurity, 65 (12.7%) strongly disagreed, 118 (23.1%) disagreed, 161 (31.6%) were neutral, 97 (19.0%) agreed, and 69 (13.5%) strongly agreed. On storage facilities, 67 (13.1%) strongly disagreed, 121 (23.7%) disagreed, 133 (26.1%) were neutral, 124 (24.3%) agreed, and 65 (12.7%) strongly agreed. On extension services, 72 (14.1%) strongly disagreed, 120 (23.5%) disagreed, 142 (27.8%) were neutral, 107 (21.0%) agreed, and 69 (13.5%) strongly agreed.

Table 2. Challenges faced by female-owned rural farm businesses.

Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Limited access to finance affects my farm business performance.	73 (14.3%)	117 (22.9%)	132 (25.9%)	117 (22.9%)	71 (13.9%)
High cost of farm inputs affects my productivity.	73 (14.3%)	116 (22.7%)	134 (26.3%)	114 (22.4%)	73 (14.3%)
Poor road infrastructure limits my market access.	63 (12.4%)	118 (23.1%)	151 (29.6%)	107 (21.0%)	71 (13.9%)
Climate change negatively affects my farm output.	67 (13.1%)	131 (25.7%)	138 (27.1%)	106 (20.8%)	68 (13.3%)
Insecurity/conflict affects my farming activities.	65 (12.7%)	118 (23.1%)	161 (31.6%)	97 (19.0%)	69 (13.5%)
Lack of storage facilities leads to post-harvest losses.	67 (13.1%)	121 (23.7%)	133 (26.1%)	124 (24.3%)	65 (12.7%)
Limited access to extension services affects my farm management.	72 (14.1%)	120 (23.5%)	142 (27.8%)	107 (21.0%)	69 (13.5%)

Source: Field survey is adopted from Majola R. Analysis of women entrepreneurship in township and rural areas in South Africa. *J Int Coun Small Bus.* 2024;6(3):383–91. doi:10.1080/26437015.2024.2412280.

Table 3. Pearson correlation matrix identified between challenges and the performance of female-owned rural farm businesses.

Variables	Challenges	Business performance
Challenges	1	-0.280** (0.000)
Business performance	-0.280** (0.000)	1

Note: Values are Pearson correlation coefficients. Figures in parentheses represent *p*-values (2-tailed). Correlation is significant at the 0.01 level ($p < 0.01$).

Source: SPSS output is adopted from Farnworth CR, Galiè A, Gumucio T, Jumba H, Kramer B, Ragasa C. Women's seed entrepreneurship in aquaculture, maize, and poultry value chains in Ghana, Kenya, and Tanzania. *Front Sustain Food Syst.* 2024;8:1198130. doi:10.3389/fsufs.2024.1198130.

The findings on financial exclusion and input costs align with a growing body of research confirming that structural barriers significantly limit the productivity of female farmers. Akokuwebe et al. (2021) [4] and Adebisi and Olaniyi (2025) [12] demonstrate that patriarchal land tenure systems and restricted credit access remain the dominant constraints for rural women in Nigerian agriculture. Nwosu et al. (2025) [10] similarly identified high production costs and low credit supply as the most pressing challenges facing women farmers in Imo State. From the GAD theoretical standpoint established by Moser (1993) [25] and Kabeer (1994) [28], these barriers are not accidental but are produced by institutional arrangements that consistently favor male farmers in cooperative membership, credit allocation, and market access. Peter and Orser (2024) [31] further show that rural women in Nigeria often rely on community-based informal credit schemes because formal financial systems remain structurally inaccessible, which reflects a gendered exclusion that is supported by the findings of the present study. Regarding infrastructure, Kitole and Genda (2024) [1] found that poor road networks negatively affect rural women entrepreneurs' market performance in Tanzania, and Ogbodo et al. (2025) [6] report similar market access constraints among women farmers in Enugu State, Nigeria, both of which are consistent with the agreement recorded here.

The findings on climate change, insecurity, storage, and extension services collectively reinforce the key argument that female-owned farm businesses in Plateau State operate within compounding and structurally generated disadvantages. Ishola and Luginaah (2025) [18] provide directly relevant findings for Plateau State, showing that farmer-herder conflict and climate variability interact to disproportionately burden women through restricted mobility and limited access to agricultural resources. On storage, Kosshak et al. (2020) and Nwosu et al. (2025) [10] identify post-harvest losses as a significant constraint for women farmers, and the present study supports this, with 124 respondents (24.3%) and 65 respondents (12.7%) agreeing and strongly agreeing, respectively, producing the strongest agreement pattern in the table. On extension services, Michael (2022) [16] demonstrated that women farmers in Plateau State who participated in structured agricultural programs recorded significantly higher crop outputs, confirming the productive value of extension access. Kosshak et al. (2025) [17] equally identify poor financial and training access as ranked constraints for women in the state. The GAD framework [25, 27] explains these patterns by locating women's exclusion from extension networks within historically male-centered agricultural institutions that continue to prioritize male cooperative leaders as primary contact points. This study builds on the combined data-grounded insights of these scholars to conclude that addressing the challenges facing female-owned rural farm businesses in Plateau State requires gender-transformative institutional reform, not merely isolated interventions targeting individual barriers.

Correlation Analysis

The result of the study's correlation matrix is presented in Table 3. Pearson correlation analysis revealed a statistically significant negative relationship between challenges and business performance among female-owned rural farm businesses in Plateau State, with a correlation coefficient of $r = -0.280$, significant at the 0.01 level ($p = 0.000$, 2-tailed). This result confirms that as challenges increase, business performance declines, a finding that aligns strongly with the GAD theory's position that women's marginalization in agriculture is structurally produced through patriarchal institutions and unequal access to resources [25, 28]. The statistical significance of this relationship, established across

510 respondents drawn from all 17 LGAs of Plateau State, strengthens its reliability and representativeness. This finding supports and builds on the work of Nwosu et al. (2025) [10] and Egwuonwu and Iwunwanne (2020) [11], who confirmed that constraints, such as limited credit access and inadequate capital, directly reduce women’s farm enterprise performance. The present study goes further by statistically quantifying this directional relationship, adding verifiable, data-driven insights to a body of literature that has largely relied on descriptive approaches. This provides situation-appropriate, statistically grounded evidence for Plateau State, filling an important gap in the existing research on female agricultural entrepreneurship in conflict-affected Nigerian environments.

Regression Result Analysis

Tables 4, 5, and 6 present the results of the regression analysis estimates for this study. The regression analysis revealed a statistically significant negative relationship between challenges and the business performance of female-owned rural farm businesses in Plateau State, Nigeria. The regression coefficient for challenges ($B = -0.291$, $Beta = -0.266$, $t = -6.320$, $p = 0.000$) confirms that as challenges increase, business performance declines significantly, with a 95% confidence interval of -0.381 to -0.201 .

The control variables, comprising socio-demographic and farm characteristics, also exerted a significant positive influence on business performance ($B = 0.416$, $Beta = 0.174$, $t = 4.138$, $p = 0.000$), suggesting that individual and farm-level attributes help cushion the negative effects of structural constraints. The Analysis of Variance (ANOVA) results validated the overall model fit ($F = 30.828$, $p = 0.000$), while the model summary showed that challenges and control variables jointly explained 10.8% of the variance in business performance ($R^2 = 0.108$, $Adjusted R^2 = 0.105$), with a Durbin–Watson value of 1.933 confirming the absence of autocorrelation. These findings carry significant weight in the broader academic conversation. The negative predictive effect of challenges on performance aligns with Nwosu et al. (2025) [10], who identified high production costs and limited credit access as primary constraints for women in agricultural enterprises, and Egwuonwu and Iwunwanne (2020) [11], who found that inadequate capital significantly restricted women’s involvement in agro-entrepreneurship. Anchored in GAD theory, the findings locate the performance deficit within patriarchal institutional arrangements that restrict women’s access to land, finance, and extension services [25, 28]. This position is further supported by Akokuwebe et al. (2021) [4], who attributed women’s marginalization in Nigerian agriculture to patriarchal land tenure systems and financial exclusion, and Ishola and Luginaah (2025) [18], whose study in Plateau State identified how gendered resource deprivation compounds agricultural vulnerability for women in conflict-affected settings.

Table 4. Regression coefficients for challenges and business performance.

Predictor	B	Std. error	Beta	t-value	Sig.	95% CI (lower)	95% CI (upper)
Constant	2.902	0.283	-	10.242	0.000	2.346	3.459
Challenges	-0.291	0.046	-0.266	-6.320	0.000	-0.381	-0.201
Control Variables (Socio-Demographic and Farm Characteristics)	0.416	0.101	0.174	4.138	0.000	0.219	0.614

Source: SPSS output is adopted from Kosshak A, Dughuryil M, Finangwai N, Ameh D. Socio economic factors influencing women participation in agricultural production in Jos South Local Government Area of Plateau State, Nigeria. *Int J Res Innov Appl Sci.* 2020;10(12):28–32.

Table 5. ANOVA results for the regression model.

Source	Sum of squares	df	Mean square	F-value	Sig.
Regression	56.638	2	28.319	30.828	0.000
Residual	465.737	507	0.919	-	-
Total	522.375	509	-	-	-

Source: SPSS output is adopted from Amato M, Coppola A, Furno M, Verneau F. Gender disparities in agricultural entrepreneurship: evidence from Italy using FADN data. *Agric Food Econ.* 2025;13(46):1–17. doi:10.1186/s40100-025-00390-6.

Table 6. Model summary for the effect of challenges on business performance.

Model	R	R ²	Adjusted R ²	Std. error of estimate	R ² change	F change	df 1	df2	Sig. (F change)	Durbin-Watson
1	0.329	0.108	0.105	0.95844	0.108	30.828	2	507	0.000	1.933

Source: SPSS output is adopted from Nwosu FO, Anene HU, Gbolagun AO, Bala MB. Constraints encountered by agricultural enterprises owned by women farmers in Owerri agricultural zone of Imo State, Nigeria. *J Appl Sci Environ Manag.* 2025;29(8):2435–2440. doi:10.4314/jasem.v29i8.7.

The finding that socio-demographic variables positively moderate performance suggests that individual-level resources partially counteract structural barriers, resonating with Kitole and Genda (2024) [1], who found that skills training and credit access significantly improved female entrepreneurs' performance in rural Tanzania.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study examined the challenges and constraints affecting female-owned rural farm businesses in Plateau State, Nigeria, with the objective of generating statistically grounded and geographically representative findings across all 17 LGAs of the state. The objective was fully achieved through a combination of descriptive, correlational, and regression analyses applied to data collected from 510 respondents. Descriptive analysis identified financial exclusion, high input costs, poor road infrastructure, post-harvest storage deficits, and limited access to agricultural extension services as the most consistently reported challenges, with storage-related post-harvest losses recording the highest level of agreement among respondents, a pattern consistent with earlier findings. Pearson correlation analysis established a statistically significant negative relationship between challenges and business performance ($r = -0.280$, $p = 0.000$), confirming that as the burden of constraints increased, farm business performance declined, a finding that aligns with the GAD theory position that women's agricultural marginalization is produced by patriarchal institutional arrangements rather than individual inadequacy. Multiple regression analysis further confirmed that challenges significantly and negatively predicted business performance ($B = -0.291$, $\text{Beta} = -0.266$, $p = 0.000$), while socio-demographic and farm characteristics positively moderated performance outcomes ($B = 0.416$, $p = 0.000$), indicating that education, farming experience, and farm size helped women partially absorb the pressures of structural constraints, consistent with the findings.

Recommendations

The recommendations presented here are grounded in the specific findings of this study and are directed at the institutions, agencies, and community-level groups that are best placed to address the challenges facing female-owned rural farm businesses in Plateau State, Nigeria. The Plateau State Ministry of Agriculture and Natural Resources should take the lead in designing and implementing gender-targeted agricultural support programs that directly respond to the financial exclusion documented in this study. The Bank of Agriculture and state-level microfinance institutions should establish dedicated women-only lending windows with flexible and gender-sensitive collateral requirements, given that existing collateral norms are rooted in patriarchal land ownership systems that structurally exclude female applicants from accessing loans. Similarly, the Plateau State Agricultural Development Programme (PADP), in partnership with the Food and Agriculture Organization (FAO) and the International Fund for Agricultural Development (IFAD), should prioritize investment in community-level post-harvest storage facilities designed with women's ownership and management at their center, directly addressing the storage deficit that emerged as the most strongly agreed-upon constraint in this study.

In addition, poor road infrastructure was identified as a key barrier to market access, and the Plateau State Infrastructure Development Authority should prioritize rural road rehabilitation in farming communities, treating this as a gender equity intervention rather than a general development task, which is consistent with the findings. The National Agricultural Extension Research and Liaison Services

(NAERLS) and the Plateau State Ministry of Women Affairs and Social Development should jointly expand women-focused agricultural training and extension programs across all 17 LGAs, given that education and farming experience were found to positively moderate business performance in this study, supporting earlier conclusions. Furthermore, because farmer-herder conflict and climate variability were identified as compounding pressures on women's agricultural activities in Plateau State, the Plateau State Peace Building Agency and the National Emergency Management Agency (NEMA) should mainstream gender-responsive agricultural recovery into their conflict intervention frameworks, ensuring that female farmers in affected areas receive priority access to productive resources, extension support and financial rehabilitation as an integral part of peacebuilding efforts.

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