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Research Article

Determinants of Farm Size Distribution among Rice-Farming Households in Northwest Nigeria

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Abstract
This study examined the determinants of farm size distribution among rice-farming households in Northwest Nigeria. Multistage sampling procedure was employed to select 387 rice-farming households, with the first stage involving purposive selection of Kano, Kebbi, and Jigawa States, while the last stage involved cluster sampling of rice-farming households. Primary data were collected using a structured questionnaire. Data were analysed using descriptive statistics, the Gini Coefficient, and Ordered Logit regression. Results showed that farm size distribution was dominated by small-scale holdings, with 69.0% of households operating small farms of 0.1-1.99 ha, 23.0% operating medium farms of 2.00-4.99 ha, and 8.0% operating large farms of 5.00 ha and above. The mean farm size was 1.45 ha, while the Gini coefficient of 0.24 indicated relatively low inequality in farm-size distribution. The Ordered Logit model revealed that sex ($\beta = 1.05$; $p<0.01$), household size ($\beta = 0.29$; $p<0.05$), and land tenure security ($\beta = 0.65$; $p<0.01$) significantly and positively influenced the likelihood of belonging to higher farm-size categories. The study concluded that farm size distribution among rice-farming households in Northwest Nigeria is significantly influenced by household characteristics and land tenure security. The study recommended strengthening land tenure security, improving farmers' access to productive resources, and promoting policies that support efficient land utilisation and sustainable expansion of farm holdings among rice-farming households in Northwest Nigeria.
Keywords: Farm Size Distribution; Rice-farming Households; Northwest Nigeria

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1. INTRODUCTION

Farm size distribution refers to the pattern in which agricultural landholdings are distributed among farming households according to the size of farms they operate (Lowder et al., 2016; Jayne et al., 2022). It is an important indicator of agricultural structure, reflecting the prevalence of small-, medium-, and large-scale farms and providing insights into land concentration, fragmentation, resource allocation, and economies of scale. In predominantly smallholder systems such as Nigeria, farm-size distribution is particularly important because farmers operate under heterogeneous conditions of land access and productive resources (Kamal et al., 2022; Akpo et al., 2024). Farm size can influence farmers' capacity to adopt improved technologies, utilise mechanisation, achieve economies of scale, and undertake productive investments, making its distribution an important structural feature of agricultural production.

Land tenure arrangements are central to the distribution of farm sizes because the security of land rights influences farmers' decisions to acquire, retain, lease, or consolidate agricultural holdings. Secure tenure can strengthen incentives for land improvement, investment, and farm expansion, whereas insecure rights may constrain such decisions. Evidence suggests that land tenure security can promote agricultural investment, productivity growth, and expansion of farming activities(Rupert and

Sherlock, 2025). Conversely, inheritance practices can contribute to land fragmentation when agricultural holdings are repeatedly subdivided among family members (Ajani,et al., 2025). Population growth and competing demands for agricultural land may further intensify pressure on available land. Household characteristics, including sex and household size, can also affect farm size through differences in access to land, family labour, productive resources, and decision-making opportunities (Daudu et al., 2026). Consequently, farm-size distribution reflects the interaction of institutional, demographic, and household-level factors rather than land availability alone.

The issue is particularly relevant to rice production, where adequate land and complementary productive resources are essential for sustaining production at different scales. Rice-farming households in Nigeria operate under diverse socioeconomic and institutional conditions, resulting in substantial variation in cultivated farm sizes. Northwest Nigeria is especially important because it constitutes one of the country's major rice-producing regions (Hassan & Karaatmaca, 2025).However, differences in tenure arrangements, household characteristics, land availability, and access to productive resources may result in substantial variation in the scale of rice-farming operations across households.

Previous studies have examined farm size in relation to agricultural productivity, efficiency, land fragmentation, and rural livelihoods(Gollin, 2018). Comparatively limited attention has been given to the determinants of farm-size distribution among rice-farming households, particularly in Northwest Nigeria. Much of the existing literature treats farm size as an explanatory variable or focuses on the productivity implications of different farm sizes, with less emphasis on the socioeconomic and institutional factors explaining why households operate small, medium, or large farms. This represents an important empirical gap, given the structural importance of farm-size distribution to agricultural resource allocation and development.

Understanding these determinants is essential for designing land-use policies, tenure interventions, and agricultural programmes that recognise differences in the scale of farming operations. Against this background, this study investigates the determinants of farm-size distribution among rice-farming households in Northwest Nigeria. Specifically, it examines the distribution of households across small-, medium-, and large-scale farm-size categories and identifies the socioeconomic and institutional factors influencing their likelihood of occupying higher farm-size categories. Given the ordinal nature of the farm-size categories, an Ordered Logit model was employed to estimate the factors associated with farmers' position within the distribution and provide empirical evidence for policies addressing structural constraints to agricultural landholding.

2. MATERIALS ANS METHODS

Study Area

The study was conducted in Northwest Nigeria, comprising Kano, Katsina, Kaduna, Kebbi, Jigawa, Sokoto, and Zamfara States. The region lies between latitudes 10°N and 13°N and longitudes 4°E and 9°E, covering approximately 216,956 km², which represents about 24% of Nigeria's total land area (Amfani, 2018, and National Bureau of Statistics (NBS), 2021). The climate is characterised by distinct wet and dry seasons, with annual rainfall ranging from 600 to 1,200 mm and temperatures reaching about 40°C during the dry season (Steve Hatfield-Dodds, 2007). Agriculture is the dominant economic activity, with rice, maize, sorghum, millet, and cowpea being the major food crops, alongside livestock production (Abel & Chukwuka, 2024). The region is one of Nigeria's principal rice-producing zones but continues to face challenges such as limited access to

agricultural finance, poverty, and insecurity, which have implications for agricultural production and farmers' access to credit.

Sampling Procedure and Data Collection

The sample size was determined using Cochran (1977) formula for an unknown population at a 95% confidence level and a 5% margin of error, which yielded a minimum sample size of 387 rice farming households. Multistage sampling procedure was used to select the households, with the first stage involving a purposive selection of Kano, Kebbi, and Jigawa States. Finally, simple random sampling was used to select 43 rice-farming households from each community, giving a total sample of 387 respondents table 1.

Table 1: Questionnaire Distribution (n = 387)

State	Selected ADP Zone	Community	Sample Size
Kano	Kano South	Kura	43
		Bunkure	43
		Garyn Malam	43
Total			**129**
Kebbi	Argungu	Bunza	43
		ZaggaBagudo	43
		DakingariSuru	43
Total			**129**
Jigawa	Hadejia	Guri	43
		Kafin Hausa	43
		Jahun	43
Total			**129**
Grand Total			**387**

Source: Field Survey, data 2025

Demographic characteristics such as age, gender, education, and farm size were obtained using a structured questionnaire. To obtain information on access to agricultural credit, Focus Group Discussions (FGDs) were held with rice farmers. Information about the institutional factors was obtained through Key Information Interviews (KIIs)

Analytical Technique

Farm size distribution among rice-farming households was operationalised using the total cultivated land area of each household, measured in hectares (ha).

The Gini Coefficient was employed to provide graphical measures of inequality in farm-size distribution. The Gini Coefficient was estimated using the standard Lorenz-based formulation as follows:

$$G = 1 - \sum_{i-1}^{n}(Y_i + Y_i - 1)(\chi_i - \chi_i - 1) \quad \ldots\ldots (1)$$

Where:
G = Gini Coefficient
χ_i = Cumulative Proportion of rice farming households
Y_i = Cumulative Proportion of farm size holdings
n = Number of farm size categories (Small 0.1 – 1.99ha, medium 2.00 – 4,99ha, large ≥ 5.00ha)

It ranges from 0 to 1, where a value of 0 represents perfect equality and a value approaching 1 indicates increasing concentration of cultivated land among fewer households (Farris, 2010).

The Ordered Logit model was employed to analyse the factors influencing farm-size distribution because the dependent variable comprises inherently ordered categories: small-scale (0.10–1.99 ha), medium-scale (2.00–4.99 ha), and large-scale (≥5.00 ha). The model was considered appropriate because it preserves the ranking information contained in the dependent variable and has been widely applied to empirical studies involving ordered outcomes(Jambo and Mukanyau, 2025). The observed ordinal outcome is determined as:The dependent variable for farm size distribution was defined as:

F_1 = Small farm size (0.1 – 1.999ha)
F_2 = Medium farm size (2.00 – 4.999ha)
F_3 = Large farm size (≥ 5.00ha)

The latent variable of the ordered logit model was specified as;
$.F_i^* = \beta_0 + \beta_1 b_1 + \beta_2 b_2 + \beta_3 b_3 + \beta_4 b_4 + \beta_5 b_5 + \beta_6 b_6 + \beta_7 b_7 + \beta_8 b_8 + \beta_9 b_9 + \beta_{10} b_{10} + \beta_{11} b_{11} + \beta_{12} b_{12} + \beta_{12} b_{13} + \epsilon i$ …………………………………………………………………………………. (2)

The observed farm size categories were expressed as;
Fi = 1, if $F_i \le \mu_1$
2, if $\mu_1 < Fi \le \mu_2$
3, If $F_i > \mu_3$
Where;

F_i = latent variable representing the probability of a household operating in a large farm size category.
F_i = Observed farm size category
F_i = 1 represents a small farm size
F_i = 2 represents a medium farm size
F_i = 3 represents a large farm size
μ_1 and μ_2 = threshold (cut-points) parameter to be estimated
β_0 = Constant
$\beta_1 - \beta_{13}$ = Coefficients of explanatory variables
ϵi = stochastic error term assumed to follow a logistic distribution
The explanatory variable included in the model was defined as follows;
b_1 = Age of household head (years)
b_2 = Sex (male = 1, female = 0)
b_3 = Access to agricultural credit (yes = 1, no = 0)
b_4 = Contact to extension agent (yes = 1, no =0)
b_5 = Cooperative membership (yes = 1, no = 0)
b_6 = Educational level (none = 0, primary = 1, secondary = 2, tertiary = 3)
b_7 = Household size (number of household members)
b_8 = Off-farm income (₦)
b_9 = Farming experience (years)
b_{10} = Distance to market (km)
b_{11} = Total rice output harvested per year (kg)
b_{12} = Collateral requirement (yes =1, no =0)
b_{13} = Land tenure security (secured title = 1, otherwise = 0)

The cumulative probability function for the Ordered Logit model is specified as follows:
$P(Fi \le j) = \frac{1}{1+e^{-Zi-Xi\beta}}$………………………………………………………………………. (3)
Where;
J = 1, 2……………...J-1
Apriori expectation was that b_1 to $b_{11} > 0$, b_{12} to $b_{13} < 0$.

3. RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The socioeconomic characteristics show that most respondents were within the economically active age group. About 30.5% were aged 51 years and above, while 27.4% and 25.3% were within the 21-30 and 31-40 age brackets, respectively. The mean age index of 3.40 (SD = 1.272) indicates a predominantly economically active farming population, consistent with Sadiq et al., (2022), who reported that rice farmers in Nigeria largely fall within the productive age range.

Educational attainment indicates that 38.2% of respondents had secondary education, 37.7% had primary education, 18.6% had no formal education, and 5.5% had tertiary education. The mean educational index of 1.30 (SD = 0.833) suggests that most farmers had basic formal education. This finding is consistent with Muhammad et al. (2025), who reported that Nigerian smallholder rice farmers predominantly possess primary or secondary education.

Household size was relatively large, with 45.5% of respondents having 6–10 members and 27.9% having 11–15 members, while 15.5% and 11.1% had 0–5 and 16–20 members, respectively. The mean household-size index was 2.35. The predominance of medium-to-large households suggests considerable availability of family labour, which remains important in rural agrarian economies where mechanisation is limited. This finding agrees with Olaitan et al. (2025), who reported that rice-farming households in Nigeria are predominantly characterised by medium-to-large household sizes.

Farming experience was relatively high, as 41.9% of respondents had at least 16 years of experience, 31.8% had 6–10 years, 17.3% had 11–15 years, and 9.0% had less than five years. The mean experience index of 2.92 (SD = 1.046) indicates substantial accumulated production knowledge and managerial experience among respondents. Such experience can enhance production decisions, input utilisation, and adaptive capacity. This is consistent with Amadi et al. (2026), who found that farming experience improved total factor productivity among Nigerian rice farmers through enhanced production efficiency and input utilisation.

Rice output was concentrated in the medium and high categories: 23.3% of respondents produced below 1,000 kg, 42.1% produced 1,000–4,999 kg, and 34.6% produced at least 5,000 kg. The mean output index of 2.11 (SD = 0.759) indicates a concentration in the medium- and high-output categories. This pattern suggests that a substantial proportion of rice farmers operate beyond purely subsistence production, potentially reflecting access to productive resources such as land, labour, improved seed, fertilizer, mechanisation, and credit. The finding is supported by Vihi et al. (2024), who established that improved seed, fertilizer, and pesticides significantly influence rice productivity among Nigerian farmers.

Access to extension services was relatively high, with 88.1% of respondents reporting contact with extension agents compared with 11.9% without contact. This contrasts with Effiong et al. (2023), who reported that 77.5% of cassava farmers in Anambra State lacked extension contact, and Solomon (2018), who found that 85.83% of smallholder farmers in Bayelsa State had no access to extension services. The relatively high extension coverage observed in the study area may enhance farmers' access to technical information and improved production practices.

Cooperative membership was also high, with 81.4% of respondents belonging to cooperative societies compared with 18.6% who did not. This indicates the importance of collective action and social capital within the rice-farming system. Cooperatives can facilitate access to credit, inputs, training, and markets, thereby reducing some of the transaction and information constraints faced by smallholders. The finding is consistent with Kehinde et al. (2025), who reported that cooperative participation improves income stability and reduces poverty among Nigerian smallholder farmers.

Regarding collateral requirements, only 5.7% of respondents reported that collateral was required to obtain agricultural credit, whereas 94.3% accessed credit without collateral requirements. The low incidence of collateral requirements may reflect the importance of informal and cooperative-based lending arrangements, where physical collateral is often substituted with social trust, group guarantees, or membership obligations. This is particularly relevant to smallholders who may lack formal land titles and other pledge able assets. The finding supports Simons-Cappa et al. (2026), who observed that informal lending institutions contribute to rural financial inclusion through flexible collateral conditions. Table 2 shows the socioeconomic characteristics of respondents.

Table 2: Socioeconomic Characteristics of Respondents

Variable	Frequency	%	Mean ($\bar{x}$)	Std. Dev
Age(years)			3.40	1.272
Below 20	14	3.6		
21-30	106	27.4		
31-40	98	25.3		
41-50	51	13.2		
Above 51	118	30.5		
Sex				
Male	275	71.1		
Female	112	28.9		
Education Level				
No Formal Education	72	18.6		
Primary Education	146	37.7		
Secondary Education	148	38.2		
Tertiary Education	21	5.5		
Household Size			2.35	0.872
1 - 5	60	15.5		
6 - 10	176	45.5		
11- 15	108	27.9		
16 – 20	43	11.1		
Farming Experience (Years)			2.92	1.046
Below 5	35	9.0		
6 – 10	123	31.8		
11 – 15	67	17.3		
≥16	162	41.9		
Total Rice Output(kg)			2.11	0.759
Below 1,000	90	23.3		
1,000 – 4,999	163	42.1		
≥5,000	134	34.6		
Access to Extension				
Extension Contact	341	88.1		
Non-Contact	46	11.9		
Cooperative Membership				
Cooperative Member	315	81.4		

Non-member	72	18.6
Off-farm Income(₦)		
No off-farm income	116	30.0
Below 100,000	153	39.5
Above 100,00	118	30.5
Agricultural Credit Access		
Access	337	87.1
Non-access	50	12.9
Collateral Requirement		
Use Collateral	22	5.7
No Collateral	365	94.3

Source: Field Survey, 2025

Farm Size Distribution and Inequalities

Table 3 presents the distribution of rice-farming households across farm-size categories, descriptive statistics, and the Gini coefficient for assessing inequality in cultivated landholdings. The results show that 68.99% of households operated small-scale farms (0.10–1.99 ha), while 23.00% and 8.01% operated medium-scale (2.00–4.99 ha) and large-scale (≥5.00 ha) farms, respectively. The mean farm size of 1.45 ha confirms the predominantly smallholder nature of rice production in the study area. This finding is consistent with evidence that smallholders dominate agricultural production in Nigeria and other developing economies, particularly where population pressure and land fragmentation constrain farm expansion (Chiaka et al., 2022; Apanovich and Nyairo, 2025; Hao et al., 2025).

The standard deviation of 0.8330 indicates moderate variation in farm size, while the positive skewness of 2.3326 indicates a right-skewed distribution, reflecting the presence of a relatively small number of households operating substantially larger farms. The kurtosis value of 8.7911 further indicates a leptokurtic distribution with relatively heavy tails, suggesting the presence of extreme observations in the upper end of the farm-size distribution. Such patterns, characterised by a large proportion of households operating small plots alongside a smaller proportion with relatively larger holdings, have also been reported among smallholder farming households in Nigeria and other Sub-Saharan African countries (Kuivanen et al., 2016; FAO, 2022).

The Gini Coefficient (0.2392)confirms some degree of inequality in farm-size distribution. Indicating concentration of cultivated land among a small proportion of households. Thus, although differences in cultivated land exist across households, farm holdings are comparatively evenly distributed within the study population. The finding is consistent with Chikaire et al. (2011) and Abubakar (2021), who reported low to moderate landholding inequality among Nigerian smallholder farmers, and with Gollin (2018) and Lowder et al. (2025), who observed that landholding disparities in developing-country farming systems are generally moderate rather than highly concentrated.

Table 3: Farm Size Distribution and Inequality (n = 387)

Farm Size Category	**Frequency**	**Percentages (%)**
Small (0.1 – 1.99ha)	267	68.99
Medium (2.00 – 4.99ha)	89	23.00
Large (≥ 5.00ha)	31	8.01
Total	387	100
Descriptive Statistics	**Value**	
Mean Farm Size (ha)	1.4522	
Standard Deviation	0.8330	

Skewness	2.3326
Kurtosis	8.7911
Inequality Measure	
Measure	**Value**
Gini Coefficient	0.23921

Source: Field Survey, 2025

The Determinants of Farm Size Distribution

Table 4 presents the Ordered Logit estimates of the factors influencing farm-size distribution among rice-farming households in Northwest Nigeria. The dependent variable was categorised as small-scale (0.10–1.99 ha), medium-scale (2.00–4.99 ha), and large-scale (≥5.00 ha). The model was statistically significant (LR $\chi^2 = 65.65$; $p < 0.01$), indicating that the explanatory variables jointly influenced households' position within the farm-size distribution. The Pseudo R^2 of 0.0723 indicates that the model explained 7.23% of the variation in farm-size distribution, which is acceptable for a cross-sectional discrete-choice model.

Sex had a positive and highly significant effect on farm-size distribution ($\beta = 1.045$; $p < 0.01$), indicating that male farmers were more likely to operate larger farms than their female counterparts. This may reflect gender disparities in access to land, labour, agricultural finance, and farm expansion opportunities, particularly under customary land tenure arrangements that often favour men in land acquisition and ownership. The finding is consistent with Adegbuyiro and Owoeye 2026), who reported significant gender disparities in access to agricultural resources among Nigerian farmers.

Access to agricultural credit had a positive and weakly significant effect ($\beta = 0.584$; $p < 0.10$), suggesting that farmers with access to credit were more likely to occupy higher farm-size categories. Credit access can relax financial constraints and facilitate land acquisition, labour hiring, input purchase, and farm expansion. This finding supports evidence from rice-farming systems in Nigeria that access to credit improves farm productivity and investment capacity (Haryanto et al., 2023;Saidu et al., 2026).

Educational level exerted a positive and weakly significant effect ($\beta = 0.218$; $p < 0.10$), indicating that farmers with higher educational attainment were more likely to operate larger farms. Education can enhance managerial capacity, access to agricultural information, adoption of improved technologies, record keeping, and the ability to identify profitable investment opportunities. This finding is consistent with Padhy and Kumar (2015), who reported that education facilitates farmers' adoption of improved agricultural practices and agricultural commercialisation.

Household size had a positive and statistically significant effect at the 5% level ($\beta = 0.285$; $p < 0.05$), implying that households with larger family sizes were more likely to operate larger farm holdings. Larger households provide greater availability of family labour, which can reduce hired-labour costs and facilitate cultivation of larger areas, particularly where mechanisation remains limited. This finding is consistent with Hao et al., (2025b), who reported that household labour availability significantly influences farm size and production decisions in smallholder farming system.

Total rice output exhibited a negative and weakly significant effect on farm-size distribution ($\beta = -0.180$; $p < 0.10$). This suggests that higher output did not necessarily translate into larger farm holdings. The finding may reflect intensification, whereby farmers obtain higher output from relatively smaller holdings through improved technologies, inputs, and management practices. Thus, productivity growth may occur

through intensification rather than expansion of cultivated land, particularly where land constraints exist (Tadele, 2017).

Collateral requirement had a negative and weakly significant effect on farm-size distribution ($\beta = -0.963$; $p < 0.10$), implying that collateral constraints reduced the likelihood of farmers operating within higher farm-size categories. Smallholder farmers often lack formal assets acceptable to lenders, thereby restricting access to credit for land acquisition and farm investment. The finding supports the credit rationing theory, which emphasises the role of lending conditions in constraining agricultural investment among smallholders (Balana and Oyeyemi, 2022).

Land tenure security had a positive and highly significant effect on farm-size distribution ($\beta = 0.653$; $p < 0.01$), indicating that farmers with secure tenure arrangements were more likely to operate larger farms. Secure land rights reduce uncertainty and strengthen incentives for long-term investment, land acquisition, and farm expansion. This finding aligns with (Kehinde et al., 2021), who reported that land tenure security enhances agricultural investment, productivity, and farm expansion among Nigerian farmers.

Age, extension contact, cooperative membership, off-farm income, farming experience, and distance to market did not significantly influence farm-size distribution. Although some of these variables exhibited positive or negative coefficients, their effects were statistically insignificant, suggesting that they did not independently explain differences in farm-size categories during the study period.

Overall, the results indicate that farm-size distribution among rice-farming households was significantly influenced by sex, access to agricultural credit, educational attainment, household size, rice output, collateral requirements, and land tenure security. In particular, the positive effect of land tenure security highlights the importance of secure property rights in facilitating farm expansion, while the negative effect of collateral requirements underscores the role of financial constraints in limiting farmers' capacity to operate larger holdings.

Table 4: Determinants of Farm Size Distribution - Ordered Logit Regression Results
(Dependent Variable: Farm Size Distribution Category (Small = 1, Medium = 2, Large = 3)

Variable	Coefficient (β)	St. Error	z-Value	p-Value	95% Confidence Interval
Age	-0.005	0.081	-0.06	0.955	-0.164 – 0.155
Sex	1.045***	0.260	4.03	0.000	0.537 – 1.554
Credit Access	0.584*	0.308	1.89	0.058	-0.020 – 1.188
Ext Contact	-0.029	0.325	-0.09	0.929	-0.666 – 0.608
Coop Membership	-0.168	0.284	-0.555	-0.724	-0.724 – 0.388
Edu Level	0.218*	0.124	1.76	0.078	-0.025 – 0.461
Household Size	0.285**	0.132	2.15	0.031	0.026 – 0.545
Off-farm Income	0.095	0.093	1.02	0.307	-0.087 – 0.278
Farm Exp	-0.183	0.121	-1.51	0.132	-0.421 – 0.055
Distance to Mkt	-0.127	0.103	-1.24	0.216	-0.328 – 0.074
Total Rice Output	-0.180*	0.092	-1.95	0.051	-0.360 – 0.001
Collateral Requir	-0.963*	0.535	-1.80	0.072	-2.011 – 0.086
Land Tenure System	0.653***	0.231	2.82	0.005	0.199 – 1.107
Model Diagnostics					
Statistic	**Value**				
Number of Observations	387				

LR χ^2 (13)		65.65***	
Log Likelihood		-420.9120	
Pseudo R^2		0.0723	
Threshold Parameters (Cut Points)			
Cut Point	**Coefficient**	**St. Error**	**95% Confidence Interval**
Cut 1	1.711	0.803	0.136 – 3.285
Cut 2	3.635	0.824	2.019 – 5.251

Note: *** P < 0.001, ** P < 0.05, * P < 0.10

Note: Cut points represent the threshold value separating the ordered farm size categories in the ordered logit model

Source: Field Survey, 2025.

4. CONCLUSION AND RECOMMENDATIONS

The study concludes that rice farming in Northwest Nigeria is predominantly smallholder-based, with most households operating small farms, although farm-size inequality remains relatively low (Gini = 0.23921). Farm-size distribution is significantly influenced by sex, access to agricultural credit, education, household size, rice output, collateral requirements, and land tenure security. In particular, male farmers, households with greater labour availability, educated farmers, those with access to credit, and farmers with secure land tenure were more likely to operate larger farms. In contrast, collateral requirements and higher rice output reduced the likelihood of occupying larger farm-size categories. The findings, therefore, indicate that farm-size distribution is shaped not only by land availability but also by financial, demographic, and institutional conditions.

Based on the findings, the study recommends improving land tenures security and access to agricultural credit, particularly through alternative collateral arrangements that reduce financing constraints for smallholder farmers. Gender-responsive land and agricultural policies should also improve women's access to land and productive resources. Finally, agricultural interventions should promote productivity-enhancing intensification, enabling farmers to increase rice output through improved technologies and input use without relying solely on expansion of cultivated land.

Reference

1. Abel, E., & Chukwuka, A. (2024). Livestock Industry in Nigeria : Challenges, Current State, and Path to Transformation.2020, 247–249.
2. Abubakar, I. R. (2021). Predictors of Inequalities in Land Ownership among Nigerian Households: Implications for Sustainable Development. Land Use Policy, 101. https://doi.org/10.1016/j.landusepol.2020.105194
3. Adegbuyiro, O. B., & Owoeye, R. S. (2026). Assessment of Gender Disparities on Access to Agricultural Resources in Ekiti State, Nigeria. 15(1), 16–23.
4. Ajani, U. Y, Olayinka, B. O, Ojetola, O. O, & Ogunjimi, B. R. (2025). Land Fragmentation in Nigeria: Balancing the Drawbacks for Sustainable Real Estate Development. Journal of African Sustainable Development, 7(2), 1–19. https://doi.org/10.70382/bejasd.v7i2.003
5. Akpo, C. Y., Pocol, C. B., Moldovan, M. G., & Houensou, D. A. (2024). Land Access Modes and Agricultural Productivity in Benin. Agriculture (Switzerland), 14(10), 1–19. https://doi.org/10.3390/agriculture14101744

6. Amadi, M. U., Aluwong, J. S., Bayei, J. D., & Shaba, M. G. (2026). Factors Influencing the Total Factor Productivity among Upland Rice Farmers in Niger State and the Federal Capital Territory, Nigeria.Nijerya'nın Nijer Eyaleti ve Federal Başkentindeki Pirinç Çiftçileri Arasında Toplam Faktör V. 9(4), 1045–1057.
7. Amfani, A. (2018). Revisiting the Linguistic Situation in the North West Geopolitical Zone of Nigeria. III, 392–398.
8. Apanovich, N., & Nyairo, R. (2025). Dominant Smallholder Farming System Typologies in Southcentral Uganda and their Food Security Status. Agriculture and Food Security, 14(1). https://doi.org/10.1186/s40066-025-00534-3
9. Balana, B. B., & Oyeyemi, M. A. (2022). Agricultural Credit Constraints in Smallholder Farming in Developing Countries: Evidence from Nigeria. World Development Sustainability, 1(November 2021), 100012. https://doi.org/10.1016/j.wds.2022.100012
10. Chiaka, J. C., Zhen, L., Yunfeng, H., Xiao, Y., Muhirwa, F., & Lang, T. (2022). Smallholder Farmers' Contribution to Food Production in Nigeria. Frontiers in Nutrition, 9(July). https://doi.org/10.3389/fnut.2022.916678
11. Chikaire, J., Atala, T. K., G.^Akpoko, J., Nnadi, F. N., & Jamilu, A. A. (2011). Landholding Inequality among Smallholder Farmers in Imo State, Nigeria: Implications for Agricultural Development and Rural Livelihood. Nature & Science, 9(11), 12–20. http://content.ebscohost.com.library3.webster.edu/ContentServer.asp?Cochran, W. G. (1977). Estimation of Population Ratio in Post-Stratified Sampling Using Variable Transformation.
12. Daudu, A. K., Aderinoye-Abdulwahab, S. A., Karakara, A. A., Kareem, O. W., Dolapo, T. A., Azeez, K. K., & Egbewole, H. O. (2026). Gender Differences in Access to Risk Management Tools and their Effects on Farm Productivity in Nigeria. Discover Sustainability, 7(1). https://doi.org/10.1007/s43621-026-03313-7
13. FAO. (2022). World Food and Agriculture. In The Lancet (Vol. 274, Issue 7102). https://doi.org/10.1016/S0140-6736(59)91820-3
14. Farris, F. A. (2010). The GiniIndex and Measures of Inequality. American Mathematical Monthly, 117(10), 851–864. https://doi.org/10.4169/000298910X523344
15. Gollin, D. (2018). IFAD Research Series 34 - Farm size and productivity: Lessons from recent literature.
16. Hao, W., Hu, X., Wu, G., Zhang, Z., Cai, M., Zhou, H., & Liu, X. (2025). The Impact of Plot Size and Farm Size on Crop Production: Evidence from Mechanization and Labour Input Perspectives. Energy Nexus, 19(1), 100530. https://doi.org/10.1016/j.nexus.2025.100530
17. Haryanto, T., Wardana, W. W., Jamil, I. R., Brintanti, A. R. D., & Ibrahim, K. H. (2023). Impact of Credit Access on Farm Performance: Does source of credit matter? Heliyon, 9(9), e19720. https://doi.org/10.1016/j.heliyon.2023.e19720
18. Hassan, N. U., & Karaatmaca, A. G. (2025). Assessment of Mechanized Rice Farming in Northwestern

Nigeria : Socio-Economic Insights and Predictive Modeling.

19. Jambo, N., & Mukanyau, R. (2025). An Ordered Logistic Regression Analysis of the Factors Associated With Smallholder Farmers' Decision to Fully Embrace Conservation Agriculture in Zimbabwe. Sustainable Environment, 11(1), 1–12. https://doi.org/10.1080/27658511.2025.2521948
20. Jayne, T. S., Wineman, A., Chamberlin, J., Muyanga, M., & Yeboah, F. K. (2022). Changing Farm Size Distributions and Agricultural Transformation in Sub-Saharan Africa. Annual Review of Resource Economics, 14, 109–130. https://doi.org/10.1146/annurev-resource-111220-025657
21. Kamal, A., Amoke, B., Lawal, L., Waheed, O., & Kehinde, L. (2022). Impact of Land Access and Ownership on Farm Production: Empirical Evidence from Gender Analysis in Southwestern Nigeria. African Journal on Land Policy and Geospatial Sciences, 5(1), 2657–2664.
22. Kehinde, A. D., Adesiyan, T. F., Hassan, S. O., & Familusi, I. G. (2025). Leveraging on Membership in Agricultural Cooperatives to Alleviate Abject Poverty among Smallholder Farming Households in Nigeria. Sustainable Futures, 9(November 2024). https://doi.org/10.1016/j.sftr.2024.100399
23. Kehinde, M. O., Shittu, A. M., Adewuyi, S. A., Osunsina, I. O. O., & Adeyonu, A. G. (2021). Land Tenure and Property Rights and Household Food Security among Rice Farmers in Northern Nigeria. Heliyon, 7(2), e06110. https://doi.org/10.1016/j.heliyon.2021.e06110
24. Kuivanen, K. S., Alvarez, S., Michalscheck, M., Adjei-Nsiah, S., Descheemaeker, K., Mellon-Bedi, S., & Groot, J. C. J. (2016). Characterising the diversity of smallholder farming systems and their Constraints and Opportunities for Innovation: A Case Study from the Northern Region, Ghana. NJAS - Wageningen Journal of Life Sciences, 78, 153–166. https://doi.org/10.1016/j.njas.2016.04.003
25. Lowder, S. K., Bhalla, G., & Davis, B. (2025).Global Food Security, 45(4), 100854. https://doi.org/10.1016/j.gfs.2025.100854
26. Lowder, S. K., Skoet, J., & Raney, T. (2016). The Number, Size, and Distribution of Farms, Smallholder Farms, and Family Farms Worldwide. World Development, 87, 16–29. https://doi.org/10.1016/j.worlddev.2015.10.041
27. Muhammad, A., Mohammed, A. M., Muktar, B. G., Bala, A. H., Aliyu, Y. M. & Makinta, U. (2025). Nigerian Journal of Agriculture and Agricultural Technology (NJAAT). Nigerian Journal of Agriculture and Agricultural Technology, 5(1), 265–272. https://njaat.com.ng/index.php/njaat/article/view/992/746
28. National Bureau of Statistics. (2021). Nigerian Gross Domestic Product Report (Q4 & Full Year 2020). Nigerian Gross Domestic Product Report, February, 1–152.
29. Olaitan, M. A., Oyediji, B. I., Bamidele, J., & Alabuja, F. O. (2025). Economics of Rice Production and its Effect on Household Food Security Status in Abaji Area Council of Abuja, Nigeria. 10.
30. Padhy, C., & Kumar, B. (2015). Effect of Agricultural Education on Farmers'Efficiency : A Review. International Journal of Engineering Technology, Management and Applied Sciences, 3(2), 247–258. https://doi.org/10.3390/pathogens

31. Rupert Grint, Sherlock Holmes, F. N. (2025). Impact of Land Tenure Security on Agricultural Production. Author : Rupert Grint, Sherlock Holmes, Florence Nightingale.
32. Sadiq, M. S., Singh, I. P., & Makarfi, M. A. (2022). Labour-use Efficiency of Rice Farmers in Nigeria's North-central Region. Siembra, 9(2), e3969. https://doi.org/10.29166/siembra.v9i2.3969
33. Saidu, Z. F., Ahmad, A. K., Daba, S. A., Studies, P., & Polytechnic, K. S. (2026). Impact of Agricultural Financing on Economic Performance and Food Security : Evidence from Nigeria.12(1), 20–34. https://doi.org/10.56201/ijbfr.vol.12.no1.2026.pg20.34
34. Simons-Cappa, D. D., Huaranga-Rivera, H. V., Sánchez-Castro, A., Ruiz-Camus, C. E., Cabezas-Ramírez, T. V., Juárez-Rivero, A. A., &Vega-Chávez, R. A. (2026). Informal Financial Credit and Sustainable Livelihoods: Determinants and Delinquency Patterns Among Microentrepreneurs in the Peruvian Amazon. Sustainability (Switzerland), 18(9), 1–29. https://doi.org/10.3390/su18094249
35. Steve Hatfield-Dodds, R. N. and D. C. (2007). Actors Influencing Price of Agricultural Products and Stability Count. AgEcon Search,18
36. Tadele, Z. (2017). Raising Crop Productivity in Africa Through Intensification. Agronomy, 7(1), 1–30. https://doi.org/10.3390/agronomy7010022
37. Vihi, S. K., Jesse, B., Tanko, P. K., Selzing, P. M., & Sulaiman, J. K. (2024). Adoption of Improved Production Technologies Among Rice Farmers in Wase Local Government Area of Plateau State, Nigeria. Agricultural Socio-Economics Journal, 24(1), 23–37. https://doi.org/10.21776/ub.agrise.2024.024.1.3

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