

Impact of Farmland Fragmentation on Cassava Production among Smallholder Farmers in Anambra State

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ABSTRACT

Background and Objective: Farmland fragmentation is a common feature of smallholder agriculture in Sub-Saharan Africa, largely driven by population pressure and inheritance practices. In Nigeria, fragmented landholdings pose structural challenges to efficient cassava production, which remains a key source of food security and rural livelihood. This study examined the effect of fragmented farming land on cassava production among smallholder farmers in Anambra State, Nigeria, with specific reference to Ayamelum Local Government Area. **Materials and Methods:** A multi-stage sampling technique was employed to select 100 cassava farmers. Data were collected using a structured questionnaire and analysed using descriptive statistics (such as frequency, percentage and mean) and multiple regression analysis at 0.01, 0.05, 0.10). **Results:** The results revealed that cassava farming is male-dominated, with most farmers being middle-aged, moderately educated, and engaged in diversified livelihood activities. Fragmented cassava farmland ownership was largely characterized by rented and inherited land, reflecting land scarcity and traditional inheritance systems. The regression results indicated a strong and statistically significant relationship between fragmented farmland and cassava production, with land cost, land affordability, production risk, and proximity of farmland to farmers' residences significantly influencing cassava output. The model explained over 70% of the variation in cassava production, and the null hypothesis that fragmented farmland has no effect on cassava production was rejected. **Conclusion:** The study concludes that farmland fragmentation significantly affects cassava production among smallholder farmers and recommends land consolidation, improved land tenure security, and supportive agricultural policies to enhance cassava productivity in the study area.

KEYWORDS

Cassava production, farmland fragmentation, smallholder farmers, land tenure, agricultural productivity

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INTRODUCTION

Cassava (*Manihot esculenta*) occupies a central position in Nigeria's agricultural and economic landscape. Owing to its resilience and adaptability, cassava serves as a major source of dietary carbohydrates and plays a vital role in food security, especially in Southern Nigeria. Nigeria is the world's largest producer



of cassava, with an estimated annual output of 60.8 million metric tonnes in 2022¹ (Despite its importance, cassava production in Nigeria remains constrained by structural inefficiencies such as low mechanization, limited access to modern inputs, and inefficient land use patterns. Land fragmentation, in particular, undermines productivity gains by increasing costs, limiting economies of scale, and restricting the adoption of improved technologies.

In the Global South, agricultural production is predominantly characterized by smallholder, household-based farming systems rather than large-scale commercial enterprises². These smallholder systems play a critical role in ensuring food security and rural livelihoods. However, land fragmentation poses a major constraint to agricultural development in Sub-Saharan Africa by limiting farm size, undermining rural incomes, reducing production intensity, constraining diversification, and agricultural development^{3,4}. Socio-cultural and institutional factors, particularly customary land tenure systems and inheritance practices, have been identified as key drivers of continuous land subdivision. Rapid urbanization and weak land-use planning further exacerbate the fragmentation problem.

In Nigeria, a large proportion of the population resides in rural areas and depends primarily on arable crop farming for income and employment. Within this context, land fragmentation has become a critical challenge in rural land management, particularly among smallholder farmers⁵. Although land fragmentation may offer limited benefits, such as risk diversification, it is more commonly associated with negative outcomes including production inefficiencies, increased labour requirements, higher transportation costs, and losses arising from inefficient input application on small, scattered plots.

Land fragmentation also referred to as land parcellization, pulverization, or scattering is commonly defined as a situation in which a single farm household operates multiple spatially dispersed and non-contiguous plots of land as one production unit^{4,6,7}. In Sub-Saharan Africa⁸, land fragmentation as a condition in which households cultivate more than one distinct parcel of land, often acquired through inheritance.

Micro-level empirical studies in Nigeria consistently show that land fragmentation negatively affects agricultural productivity and efficiency⁹. Land fragmentation significantly reduced productivity among farm households in Abia State. Similarly¹⁰, landholdings in Tivland, Benue State, were small, non-contiguous, and widely dispersed, with adverse implications for agricultural development¹¹. Land fragmentation hurt the output, farm size, and economic efficiency. Cassava production is particularly sensitive to land fragmentation due to its land-intensive nature⁵. Fragmentation index and distance between farm plots and farmsteads significantly contributed to technical inefficiency among cassava farmers in South-West Nigeria. Similarly, studies indicate that small and fragmented cassava plots limit mechanization, discourage investment in modern inputs, and reduce profitability, despite rising domestic and industrial demand for cassava-based products^{12,13}.

This study, therefore, seeks to fill this gap by empirically examining the effect of fragmented farmland on cassava production among smallholder farmers in Anambra State.

Therefore, the objectives of this study were to:

- Describe the socioeconomic characteristics of the cassava smallholder farmers
- Examine the type of fragmented farmland ownership among the cassava smallholder farmers
- Determine the factors contributing to fragmented cassava farmland

MATERIALS AND METHODS

Research hypothesis:

- H_0 : Fragmented farmland does not affect the cassava production among the smallholder farmers
- H_1 : Fragmented farmland affects the cassava production among the smallholder farmers

Study area and duration: The study was conducted in Ayamelum Local Government Area (LGA) of Anambra State, Nigeria, with a focus on the effect of fragmented farmland on the production of cassava among smallholder farmers in 2025. Ayamelum LGA is one of the 21 local government areas in Anambra State, located in the South-Eastern Region of Nigeria. Anambra State shares boundaries with Delta State to the West, Imo State to the South, Enugu State to the East, and Kogi State to the North. The state has an estimated population of about 9 million people¹⁴ and is predominantly inhabited by the Igbo ethnic group. Geographically, Anambra State lies between longitudes 6°35 E and 7°21 E and latitudes 5°38 N and 6°47 N.

Ayamelum LGA covers an estimated land area of 207.6 square miles and has a population of approximately 225,400 people. The area possesses considerable agricultural and economic potential, offering opportunities for revenue generation and employment for the local population.

Sampling techniques: Given the large population of farmers in Ayamelum Local Government Area, a multi-stage sampling technique was adopted to select respondents for the study. A well-structured questionnaire was used to gather information from the respondents. The sample size formula was employed¹⁵,

$$n_0 = \frac{z^2 pq}{e^2}$$

Where:

n_0 = initial sample size = 384

z = z-value (1.96 for 95% confidence level) = 1.96 (95% confidence level)

p = Estimated population proportion = 0.5 (maximum variability assumption)

q = $1 - p = 1 - 0.5 = 0.5$

e = Margin of error = 0.05 (5% margin of error)

While, the Cochran formula suggests a minimum sample size of 384 respondents, this study adopts a reduced sample size of 100 respondents due to:

- Budget constraints
- Time limitations within the project timeline
- Exploratory nature of the study, focusing on econometric modelling rather than large-scale representativeness
- Homogeneity of the study population, which allows for meaningful inference even with a smaller sample

The sampling procedure involved two stages. In the first stage, purposive sampling was used to select Ifite Ogwari based on their significant involvement in cassava production activities. In the second stage, simple random sampling was employed to select 100 farmers from the selected communities, ensuring equal representation and minimizing selection bias. This approach allowed for a fair and systematic selection of respondents while capturing diverse categories of farmers within the study area. The final sample size comprised 100 farmers, including both registered and unregistered farmers.

Ethical statement: Ethical considerations were strictly observed throughout the study. Before data collection, respondents were informed about the purpose and objectives of the research. Participation in the study was entirely voluntary, and informed consent was obtained from all selected farmers before administering the questionnaire. Respondents were assured that the information provided would be treated with strict confidentiality and used solely for academic and research purposes. The sampling and data collection procedures were conducted fairly and respectfully to ensure that no participant was subjected to harm, coercion, or discrimination during the research process.

Data analysis: Data were analyzed using descriptive and inferential statistics with the aid of SPSS software. Descriptive statistics were used to examine the socioeconomic characteristics of the respondents and to identify the different types of land ownership in the study area. Multiple regression analysis was applied to determine the factors contributing to land fragmentation in the study area.

The standard significance levels are:

- 1% significance level ($\alpha = 0.01$)
- 5% significance level ($\alpha = 0.05$)
- 10% significance level ($\alpha = 0.10$)

RESULTS AND DISCUSSION

Table 1 presents the socioeconomic characteristics of the respondents, which provide important context for understanding labour dynamics, migration decisions, and agricultural productivity outcomes in the study area.

Table 1 presents the socioeconomic characteristics of the respondents involved in the study. The result revealed that the majority of the respondents were male, accounting for 77.0%, while females constituted 23.0% of the sample. This implies that cassava production and related activities in the study area are predominantly carried out by men.

The age distribution showed that 39.0% of the respondents were within the age range of 41-50 years, followed by 28.0% within 31-40 years, while 19.0% and 14.0% fell within 21-30 years and 51-60 years respectively. The mean age of the respondents was 40.3 years, indicating that most farmers were within their economically active and productive age group.

Regarding educational qualification, 36.0% of the respondents had secondary education, 28.0% had primary education, 22.0% had no formal education, while 14.0% attained tertiary education. This suggests that a considerable proportion of the respondents possessed basic educational knowledge which could positively influence adoption of improved farming practices and decision-making.

The household size distribution indicated that 79.0% of the respondents had household sizes between 0-3 persons, 18.0% had 4-6 persons, while only 3.0% had 7-9 persons. The mean household size was 2.3 persons, suggesting relatively small household units among the respondents.

In terms of occupation, trading constituted the major occupation of the respondents with 48.0%, followed by farming with 33.0%, while 19.0% were civil servants. This implies that many respondents combined farming with other income-generating activities, particularly trading.

The marital status distribution showed that 59.0% of the respondents were married, 31.0% were single, while widows/widowers accounted for 10.0%. No respondent reported being divorced. The high proportion of married respondents may indicate the availability of family labor and shared household responsibilities in farming activities.

Table 1: Socioeconomic characteristics of the respondents

Variables	Frequency (100%)	Percentage (100%)	Mean
Gender			
Male	77	77.0	
Female	23	23.0	
Age (Years)			
21-30	19	19.0	40.3
31-40	28	28.0	
41-50	39	39.0	
51-60	14	14.0	
Educational qualification			
No formal	22	22.0	
Primary	28	28.0	
Secondary	36	36.0	
Tertiary	14	14.0	
Household size			
0-3	79	79.0	2.3
4-6	18	18.0	
7-9	3	3.0	
Occupation			
Farming	33	33.0	
Trading	48	48.0	
Civil servant	19	19.0	
Marital status			
Single	31	31.0	
Married	59	59.0	
Widow/widower	10	10.0	
Divorced			
Monthly income (₦)			
1.0-50,000	37	37	65315.19
51,000-100,000	46	46	
101,000-150,000	17	17	
151,000-200,000			

Field survey, 2025

The income distribution revealed that 46.0% of the respondents earned between ₦51,000 and ₦100,000 monthly, while 37.0% earned between ₦1 and ₦50,000, and 17.0% earned between ₦101,000 and ₦150,000. None of the respondents earned between ₦151,000 and ₦200,000. The mean monthly income was ₦65,315.19, indicating a moderate income level among the respondents.

Types of fragmented farmland ownership among cassava smallholder farmers: The results on the types of fragmented cassava farmland ownership among smallholder farmers reveal a mixed land tenure system dominated by rented and inherited plots shown in Table 2.

Table 2 presents the types of fragmented farmland ownership among cassava smallholder farmers in the study area. The result revealed that a majority of the respondents, representing 62.0%, acquired farmland through renting, while 38.0% did not rent farmland. This suggests that land rental is a common means through which cassava farmers access fragmented farmland for production activities.

The table further showed that 27.0% of the respondents cultivated family land, whereas the majority, accounting for 78.0%, did not rely on family land ownership. This indicates that family land was less commonly used among the sampled farmers compared to other forms of land acquisition.

In terms of purchased land, only 19.0% of the respondents owned farmland through outright purchase, while 81.0% did not. This low proportion may be attributed to the high cost of land acquisition and limited financial capacity of smallholder farmers.

Table 2: Types of fragmented farmland ownership among cassava smallholder farmers

Variables	Frequency (%)	Percentage (%)
Rent		
Yes	62	62
No	38	38
Family land		
Yes	27	27
No	73	73
Purchased		
Yes	19	19
No	81	81
Inherited		
Yes	54	54
No	46	46

Field survey, 2025

Table 3: Factors contributing to fragmented cassava farmland and test of hypothesis

Model	Unstandardized coefficients		Standardized coefficients		Sig.
	B	Std. error	beta	T	
(Constant)	5.615	0.876		6.412	0.000
Cost of land	-2.082	0.167	-0.772	-12.430	0.000
Low rental rate	0.956	0.252	0.257	3.795	0.000
Risk associated with farming	-2.560	0.419	-0.378	-6.109	0.000
Closeness to residence	1.836	0.275	0.599	6.684	0.000
Low crop production	0.279	0.231	0.087	1.205	0.231
R Square	0.734				
Adjusted R Square	0.720				
F	51.810				

Field survey, 2025 (1% = 0.01, 5% = 0.05, 10% = 0.10)

The findings also revealed that 54.0% of the respondents inherited farmland, while 46.0% did not inherit land. This implies that inheritance remains an important traditional means of farmland ownership among cassava smallholder farmers in the study area.

Overall, the result indicates that rented and inherited lands constitute the major forms of fragmented farmland ownership among cassava farmers, while purchased and family lands are less common. This pattern of land ownership may influence farm size, tenure security, and agricultural productivity.

Factors contributing to fragmented cassava farmland and test of hypothesis: The model summary indicates a strong relationship between the dependent variable (cassava production) and the explanatory variables representing factors associated with farmland fragmentation in Table 3.

Table 3 presents the factors contributing to fragmented cassava farmland among smallholder farmers as well as the test of hypothesis using multiple regression analysis. The result showed that the model was statistically significant with an F-value of 51.810, indicating that the explanatory variables jointly influenced fragmented cassava farmland ownership among the respondents. The coefficient of determination ($R^2 = 0.734$) revealed that about 73.4% of the variation in fragmented farmland was explained by the variables included in the model, while the adjusted R^2 of 0.720 indicates a good fit of the regression model.

The regression result further showed that the cost of land had a negative and statistically significant effect on fragmented cassava farmland ($\beta = -2.082$, $p < 0.05$). This implies that increasing land costs significantly influence farmers' decisions regarding fragmented land acquisition and utilization. Similarly, risk associated with farming also had a negative and significant effect ($\beta = -2.560$, $p < 0.05$), suggesting that higher farming risks discourage concentration of farmland and contribute to fragmentation.

Low rental rate was found to have a positive and significant influence on fragmented farmland ($\beta = 0.956$, $p < 0.05$). This indicates that affordable rental arrangements encourage farmers to cultivate multiple fragmented plots. In the same vein, closeness to residence positively and significantly influenced fragmented farmland ownership ($\beta = 1.836$, $p < 0.05$), implying that farmers prefer farmland located close to their homes for ease of supervision, monitoring, and reduced transportation costs.

However, low crop production did not significantly influence fragmented cassava farmland, as indicated by its probability value ($\beta = 0.279$, $p > 0.05$). This suggests that low crop output was not a major determinant of farmland fragmentation among the respondents in the study area.

The gender distribution shows that farming and related livelihood activities are male-dominated, with 77% of respondents being male and only 23% female. The result supports the finding of Balogun and Akinyemi⁵ that 69.3% of the cassava farmers were male-headed households. This pattern reflects the prevailing socio-cultural norms in rural Nigeria where men are more involved in land ownership, farm decision-making, and physically demanding agricultural tasks. The low female participation may also indicate gender-based constraints in access to productive resources and labour, which has implications for migration decisions and productivity outcomes.

The age distribution reveals that the majority of respondents (67%) fall within the economically active age bracket of 31-50 years, with a mean age of 40.3 years. The result corresponds with⁵ that majority of the cassava farmers were within the age group of 41-50 years in their study area. This suggests that most respondents are in their productive years and are likely to be directly involved in both farming and off-farm labour activities. Individuals within this age group are more prone to internal labour migration in search of better income opportunities, which can reduce the availability of farm labour and potentially affect agricultural productivity. The relatively lower proportion of younger respondents (21-30 years) may reflect youth migration to urban centres, reinforcing concerns about ageing farming populations and labour shortages in rural agriculture.

Educational attainment among respondents is generally low, as only 14% attained tertiary education, while the majority possess secondary education (36%) or below. The result corresponds with⁵ who found that 50.8% of the farmers were educated. A significant proportion (22%) had no formal education. Low educational attainment may limit access to formal employment opportunities, thereby increasing reliance on agriculture and informal trading. At the same time, limited education can constrain the adoption of improved agricultural technologies and reduce productivity, making migration a coping or livelihood diversification strategy rather than a productivity-enhancing choice.

Household size is relatively small, with 79% of respondents having between 0-3 household members and a mean household size of 2.3. Smaller household sizes may imply limited availability of family labour for farming activities, increasing dependence on hired labour or encouraging household members to migrate to urban areas for wage employment. This situation can exacerbate labour constraints during peak farming periods, negatively affecting farm output and efficiency.

In terms of occupation, trading dominates (48%), followed by farming (33%) and civil service (19%). The dominance of trading suggests significant livelihood diversification among respondents, likely driven by income instability in agriculture. Engagement in non-farm activities may reduce time allocated to farming but can also provide financial resources to cushion the effects of labour migration and farm productivity losses. This occupational structure highlights the growing importance of non-farm income sources in rural economies.

Marital status indicates that the majority of respondents are married (59%), suggesting household responsibilities that may influence migration decisions. Married individuals may migrate temporarily to support household welfare through remittances, while single respondents (31%) may migrate permanently in search of better opportunities. The result is in agreement with¹⁶ whose study found that majority of the respondents were married in their study area. These differing migration patterns have varying implications for agricultural labour availability and productivity.

Income distribution shows that most respondents earn between ₦51,000 and ₦100,000 monthly (46%), with a mean income of ₦65,315.19. This moderate income level suggests limited financial capacity to invest in improved inputs or mechanization. Consequently, labour migration may serve as a strategy to supplement household income through remittances, potentially mitigating the negative effects of labour loss on agricultural productivity.

Overall, the socioeconomic characteristics indicate a predominantly male, middle-aged, low-to-moderately educated rural population with diversified livelihoods and limited household labour. These features are critical in explaining internal labour migration behaviour and its implications for agricultural productivity in the study area.

As shown in Table 2, 62% of the respondents cultivate cassava on rented land, indicating that land rental markets play a significant role in providing access to farmland for smallholder farmers. This high reliance on rented land suggests increasing pressure on land availability and reflects the fragmentation of landholdings in the study area. Fragmented and rented plots are often small and scattered, which may limit farmers' ability to adopt long-term soil management practices and mechanization, thereby affecting cassava productivity.

Inherited land also constitutes a major source of farmland, with 54% of respondents cultivating cassava on inherited plots. This finding is consistent with the traditional land tenure system in rural Nigeria, where land is passed down through generations. The findings support¹⁶ their study that the mode of land acquisition was inherited by the respondents. However, inheritance-based land ownership often leads to fragmentation as land is subdivided among heirs over time. Such fragmentation can reduce farm size, increase operational costs, and constrain efficient farm management, particularly for labour-intensive crops such as cassava.

Family land accounts for a smaller proportion of farmland access, with only 27% of respondents reporting its use. The declining role of communal or extended family land may be attributed to population growth, competing land uses, and changing socio-economic structures within rural communities. Limited access to family land may compel farmers to rent additional plots, further increasing fragmentation.

Purchased land is the least common form of land ownership, reported by only 19% of respondents. The low incidence of land purchase reflects limited financial capacity among smallholder farmers and the high cost of land acquisition. Secure land ownership through purchase typically encourages long-term investment in soil fertility improvement and farm infrastructure; thus, its limited occurrence may negatively affect sustainable cassava production.

Overall, the dominance of rented and inherited land underscores the prevalence of fragmented landholdings among smallholder cassava farmers. The above result is consistent with the finding¹⁶. This fragmented land ownership structure has important implications for labour allocation, migration decisions, and productivity. Farmers operating on fragmented and insecure land tenure arrangements may be less willing to invest in improved cassava varieties and modern production technologies, while labour migration may further compound productivity challenges due to reduced on-farm labour availability.

The correlation coefficient ($R^2 = 0.857$) suggests a high degree of association between fragmented farmland factors and cassava production. The coefficient of determination ($R^2 = 0.734$) implies that approximately 73.4% of the variation in cassava production among smallholder farmers is explained by the included predictors, namely cost of land, land cheapness, risk, closeness to residence, and low production. After adjusting for the number of predictors, the adjusted R^2 remains high at 0.720, confirming the robustness and reliability of the model.

The relatively low standard error of the estimate (0.706) further suggests that the model provides a good fit and that the predicted values of cassava production closely approximate the observed values.

Overall significance of the model: The ANOVA results show that the regression model is statistically significant at the 1% level ($F = 51.810$, $p < 0.001$). This indicates that the explanatory variables jointly have a significant effect on cassava production. Hence, the null hypothesis that fragmented farmland does not affect cassava production is statistically untenable when the factors are considered collectively.

The cost of land has a negative and highly significant effect on cassava production ($\beta = -0.772$, $p < 0.001$). This suggests that higher land costs compel farmers to cultivate smaller, scattered plots rather than consolidated holdings, thereby increasing fragmentation and reducing production efficiency. High land costs may limit access to contiguous farmland and discourage long-term productivity-enhancing investments. The study finding is comparable^{16,17} who asserted that in their study area, various factors are responsible for farm fragmentation.

Conversely, low land rental cost shows a positive and statistically significant relationship with cassava production ($\beta = 0.257$, $p < 0.001$). This implies that access to relatively affordable land enables farmers to expand or maintain their cassava plots, even if fragmented, which can help sustain production levels. Affordable land may reduce financial pressure and allow farmers to allocate more resources to inputs and farm operations.

The variable risk associated with farming exhibits a negative and significant effect on cassava production ($\beta = -0.378$, $p < 0.001$). This reflects the tendency of farmers to spread risk by cultivating multiple small and spatially separated plots as a coping strategy against land disputes, theft, or crop failure. While this strategy reduces exposure to total loss, it increases fragmentation and raises operational costs, thereby negatively affecting overall production.

Closeness of farmland to the farmer's residence has a positive and statistically significant effect on cassava production ($\beta = 0.599$, $p < 0.001$). This suggests that farmers prefer fragmented plots located close to their homes to reduce transportation costs, improve supervision, and enhance labour efficiency. Proximity to residence may mitigate some negative effects of fragmentation by improving farm management and labour utilization.

In contrast, low production is not statistically significant ($\beta = 0.087$, $p = 0.231$). This implies that low output is more likely an outcome of farmland fragmentation rather than a driving factor. As such, it does not independently contribute to explaining the causes of fragmentation in the study area.

Test of hypothesis: The hypothesis tested in this study states:

- **H₀:** Fragmented farmland does not have an effect on cassava production among smallholder farmers
- **H₁:** Fragmented farmland has an effect on cassava production among smallholder farmers

Given the statistical significance of the regression model ($p < 0.001$) and the significant coefficients of key fragmentation-related variables, the null hypothesis (H_0) is rejected, while the alternative hypothesis (H_1) is accepted. This confirms that fragmented farmland has a significant effect on cassava production among smallholder farmers in the study area. This result corresponds with studies^{14,17} who found a strong positive relationship between land size, land ownership and productivity.

The findings highlight that economic factors (land cost and affordability), risk considerations, and spatial factors (proximity to residence) are major drivers of farmland fragmentation and significantly influence cassava production. Addressing land market inefficiencies, improving land tenure security, and promoting land consolidation policies could help reduce fragmentation and enhance cassava productivity among smallholder farmers.

Based on the findings of the study, it is recommended that the government and relevant land authorities promote land consolidation and aggregation schemes to enable farmers to cultivate larger, contiguous cassava plots, thereby reducing inefficiencies associated with fragmented landholdings and improving productivity. Efforts should also be made to strengthen land tenure security, particularly for farmers operating on rented and inherited land, as secure land rights encourage long-term investments in soil fertility, improved cassava varieties, and farm infrastructure. In addition, transparent and affordable land rental markets should be developed through appropriate regulatory frameworks to minimize the burden of high land costs on production efficiency. Measures to reduce risks, such as community-based dispute resolution mechanisms, improved farm security, and access to agricultural insurance, should also be enhanced to discourage land fragmentation. Furthermore, support for mechanization and access to improved agricultural inputs should be provided, as mechanization can help overcome labour inefficiencies linked to fragmented plots. Agricultural extension services should deliver targeted training on efficient farm management practices under fragmented conditions, including proper spacing, soil management, and labour organization. Lastly, increased investment in rural infrastructure and youth-oriented agricultural programmes is essential to reduce rural-urban migration and ensure the availability of productive labour for cassava farming.

CONCLUSION

In conclusion, this study established that farmland fragmentation is a significant determinant of cassava production among smallholder farmers in Ayamelum Local Government Area of Anambra State. The predominance of male, middle-aged farmers with modest educational attainment and limited household labour underscores structural constraints within the production system. The widespread reliance on rented and inherited land has intensified fragmentation, weakened tenure security, and reduced incentives for long-term investment in productivity-enhancing practices.

Empirical evidence from the multiple regression analysis confirmed that fragmented landholdings, high land costs, and production risks significantly reduce cassava output, while access to affordable and proximate farmland enhances productivity by lowering operational inefficiencies. With over 70% of the variation in output explained by the model, the findings demonstrate strong analytical robustness. Consequently, the null hypothesis was rejected, and the study concludes that farmland fragmentation exerts a statistically significant and economically meaningful effect on cassava production in the study area. Addressing land tenure insecurity, high land costs, and structural fragmentation is therefore critical for improving cassava productivity and strengthening rural livelihoods.

SIGNIFICANCE STATEMENT

This study provides empirical evidence on how farmland fragmentation influences cassava production among smallholder farmers in Ayamelum Local Government Area, Anambra State, Nigeria. It demonstrates that land cost, tenure arrangements, production risk, and proximity of farmland significantly shape

production outcomes. The findings highlight the constraints imposed by fragmented and insecure landholdings on agricultural efficiency and productivity. This evidence is useful for policymakers in designing land consolidation strategies, strengthening land tenure security, and improving rural land markets to enhance cassava productivity and smallholder livelihoods.

This study provides empirical evidence on the effects of farmland fragmentation on cassava production among smallholder farmers in Anambra State, Nigeria. It highlights how fragmented landholdings influence productivity, input use, and farm efficiency, addressing structural constraints such as inheritance-driven land subdivision. The findings offer evidence-based insights to guide land reform policies, consolidation strategies, and extension interventions aimed at improving cassava productivity and smallholder performance.

ACKNOWLEDGMENT

This study appreciates the smallholder cassava farmers in Ayamelum Local Government Area for their support in the course of this research.

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