WHAT DRIVES THE MARKET PARTICIPATION DYNAMICS OF SMALL-SCALE RICE FARMERS IN SOUTHEAST NIGERIA?

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ABSTRACT
Smallholders' difficulty in gaining a significant market share can be attributed to poor market orientation and participation decisions. This highlights the importance of understanding market dynamics, including key push and pull factors, which are essential for successful commercialization, the advancement of rural livelihoods, and the strengthening of the local economy. This study explored the market participation dynamics of rice farming households, estimated the market participation index, and identified the key drivers influencing rice market participation. A mixed-methods design was adopted in the study. Primary data were collected from 288 randomly selected smallholder rice farmers using a semi-structured questionnaire, supplemented by a focus group discussion. The collected data were analyzed using a market participation index and Heckman's two-stage model. The market participation result of 73% indicated that the farmers were semi-commercialized. Agricultural extension access (1.543), farm size (2.450), rice yield (0.005), market orientation (8.074), the cost of rice seed (-0.001), and distance to market (-0.074) influenced the decision to engage in the market. Similarly, the intensity of market participation was influenced positively by education (2.359), access to extension (30.378), rice yield (0.759), farm income (0.002), and market orientation (86204.8), while the price of output (-0.006) and ownership of transport facilities (39.551) had a negative effect. Access to agricultural extension services ranks among the critical factors driving

smallholder rice commercialization in Nigeria. Therefore, to accelerate smallholder commercialization, boost household welfare, and develop the rural economy, there is an urgent need to strengthen agricultural extension services through the integration of market-oriented training, which will enhance the capacity of small-scale farmers to make informed, timely, and strategic market decisions.

Keywords: Market access, Heckman model, small-scale farmers, push-pull factors
JEL Codes: Q12, Q13 and Q18

1. INTRODUCTION

In recent times, the commercialization of smallholders has emerged as a vital policy strategy for enhancing the quality of life in developing countries (Aromolaran et al., 2020; Ma et al., 2024). Central to this transformation is market access, which is crucial for achieving smallholder commercialisation (Otekunrin et al., 2019), serving as a fundamental policy instrument to integrate smallholder farmers, who are largely subsistence, into the market and thereby unlock economic benefits. Boosting the rural economy requires a transformative shift from the prevalent semi-subsistence, low-input, and low-productivity farming systems in developing countries, particularly in sub–Saharan Africa (Olwande et al., 2015; Akanbi et al., 2020; Anthony et al., 2021; Ukwuaba et al., 2024). Smallholder farmers' participation in the market, especially in developing countries, has the potential to accelerate the realisation of the United Nations Sustainable Development Goal of reducing poverty. In support of this position, Arua et al. (2025), Mutea et al. (2025), and Onyenekwe et al. (2025) emphasize, in separate studies, the importance of commercializing subsistence farming for achieving sustainable household food security, economic growth, and development. A critical pathway to realizing this commercialization is through enhanced market participation, which involves promoting the sale of produce for economic benefits, particularly for subsistence or semi-subsistence farmers (Abate et al., 2021). Andaregie et al. (2021) and Wassihun et al. (2022) observed that integrating smallholder farmers into output markets has been shown to boost income and reduce poverty significantly. This shift toward commercialization not only enhances livelihoods but also fosters the development of specialized production systems among smallholders (Mutea et al., 2025). According to Wassihun et al. (2022), such specialization promotes higher productivity through learning by doing and creates stronger incentives for efficiency. Consequently, active participation in high-value crop markets, such as rice, is widely perceived as a pathway to increased rural household income and reduced income risks (Aromolaran et al., 2020). Beyond individual household benefits, such participation also holds broader socioeconomic potential, serving as a strategic tool for reducing income inequality in developing countries (Ihemezie, 2025).

However, Meemken and Bellemare (2020) noted that, despite these benefits, rural smallholder farmers often have a low market share due to limited involvement in these markets. In Nigeria, Yusuf (2020), Owusu and Iscan (2021), Oni and Ojekunle (2023), and Ezeudu & Iscan (2024) linked the low market involvement of smallholder farmers to several structural and institutional barriers, including poor access to credit, inadequate rural infrastructure, and limited extension services. Southeastern Nigeria presents additional challenges, including high input costs, a lack of modern storage facilities, and inefficient transportation networks, all of which restrict farmers' ability to scale production and consistently engage with output markets (Opata et al, 2020; Udeuhele, 2022). Gender disparities exacerbate the issue, with women farmers frequently excluded from land ownership and decision-making processes (Olumba & Alimba, 2022; Onah et al., 2025). These limitations reinforce subsistence-level farming and hinder the transition to commercial agriculture, especially for a highly strategic crop like rice.

Rice (*Oryza sativa*) is one of the widely consumed staples in Nigeria. Its national preference and increased demand serve as a clarion call for smallholders to become more market-oriented and actively participate in the market (Sekiya et al., 2020). The market-oriented and participatory approach involves allocating more farm resources to rice production, increasing investment in quality inputs and improved rice seeds, and selling the output in a competitive market (Mbombo, 2022). In recognition of this need and the cost implications for resource-poor rice farmers, the Nigerian government launched various interventions, including the Agricultural Transformation Agenda, the Anchor Borrowers program, and input subsidy schemes, to advance smallholder market participation in the rice market. Similarly, government policies, such as rice import bans and land border closures, were aimed at protecting smallholder rice farmers from foreign competition and increasing their market access. Hoq et al. (2021) emphasised that these policies and initiatives are vital in increasing rice productivity and strengthening the market and its infrastructure. However, despite these efforts, the desired results are yet to be achieved. Smallholders are still constrained by a limited supply of inputs, plagued by price volatility, and low market access, as evidenced by their low participation rates. (Anthony *et al.,* 2021; Dillon et al., 2025).

Studies such as Opata et al. (2020), Hoq et al. (2021), Shamsul et al. (2021), Saweda et al. (2023), and Ukwuaba et al. (2024) have linked market participation to improved household welfare. However, many smallholder rice farmers in Nigeria remain hesitant to engage actively in the market. This reluctance stems from a complex interplay of socio-economic and institutional factors that have not received sufficient scholarly attention, particularly in Southeastern Nigeria, a region with high rice production potential but persistently low commercialization among smallholders. Although identifying and understanding these complex and dynamic factors is essential for strengthening smallholder commercialization policies, they remain underexplored in Southeast Nigeria. Mafimisebi and Ikuerowo (2018) assessed the drivers of market participation among smallholder rice farmers in Nigeria. However, their study had two key limitations: it excluded the southeast region, which produces a significantly larger quantity of rice, and employed Ordinary Least Squares (OLS) regression, which does not account for sample selection bias. This gap in region-specific, methodologically robust research limits the effectiveness of agricultural policies and interventions. Therefore, this study addresses these limitations by applying the Heckman model and focusing on Southeast Nigeria, thereby offering a more comprehensive and context-sensitive understanding of smallholder commercialization. In doing so, it aims to inform targeted policies that strengthen push factors and mitigate pull factors affecting market participation. This study aims to bridge existing knowledge gaps by examining the complex and dynamic factors that influence smallholder commercialization in Nigeria. Particularly, it aims to deepen understanding of the policies that can effectively accelerate this transformation. To achieve this, the study specifically evaluated the degree of market participation index, identified the key factors driving market participation decisions, and the intensity of market participation. Accurate identification and proper understanding of these factors will be crucial in achieving the goal of the government's smallholder commercialisation effort, which aims to improve farmers' welfare and overall economic growth**.**

The rest of this paper is organized as follows. Section 2 reviews the relevant literature, providing the theoretical and empirical basis for the study. Section 3 describes the methodological framework used in the analysis. In section 4, we present and discuss the findings related to the research objectives. Lastly, section 5 presents the conclusion and policy recommendations aimed at enhancing the commercialization of smallholder agriculture.

2 LITERATURE REVIEW

2.1 Theoretical Literature

The household production and structural change theories provided the theoretical framework for this work. The household production theory was a popular concept introduced by the renowned American economist Gary Becker. The theory centers on household decisions about production, consumption, and time management within families. It describes a household as a rational entity responsible for making both production and consumption choices related to goods and services. To maximize utility, households strive to use their income and time efficiently, organizing the acquisition and utilization of goods and services for both consumption and production. It is also described as the production of goods and services by household members for their own use, utilizing their capital and labour (Mpombo, 2022). In relation to this study, the theory is essential for understanding how a typical household makes production decisions based on resource endowments, institutional support, and government policies. Specifically, the household production theory aligns with the empirical variable of household asset endowment, which includes access to land, labour, and capital. Households with greater asset endowment are more likely to produce surplus and engage in output markets, as they possess the capacity to respond to market signals and scale production beyond subsistence. In addition, institutional support variables, such as access to credit, extension services, and input subsidies, serve as enabling factors that influence household production decisions. The theory suggests that when these supports are present, households are more likely to allocate resources toward market-oriented production, thereby increasing their likelihood of participating in the output market.

Households, being rational and seeking to maximize utility, may allocate more of their productive assets toward producing surplus that can be marketed, depending on favourable government policies and market demand, in addition to their consumption. However, real-world household decisions are often shaped by imperfect information and socio-cultural influences. Limited access to market data, cognitive constraints, and prevailing norms, such as gender roles, community expectations, and traditional farming practices, can lead households to make choices that deviate from purely rational behaviour. For example, a household may prioritize subsistence crops over market-oriented production due to cultural preferences or risk aversion, even when market signals suggest otherwise. These factors affect how resources are allocated, often independently of economic efficiency.

The structural change theory examines how underdeveloped economies transition from a heavy reliance on traditional subsistence farming to a more modern, urbanized, and industrially diverse economy, characterized by the presence of manufacturing and service sectors (Agbenyo, 2020). Agricultural production alone will not drive economic growth; it must be connected to the market (Horvey et al., 2024). Markets enable households to specialize according to their comparative advantage, resulting in trade-related improvements in welfare. Markets are widely recognized as drivers of economic growth. In the 1980s, structural transformation introduced a market-led agricultural development model (Gabardo et al., 2017), which was accompanied by the widespread promotion of market liberalization policies in SSA and other low-income regions. Structural change theory explains why smallholder households engage in agricultural production and, by extension, participate in the market. According to this theory, smallholder farmers are motivated to join the market to access a diverse range of consumption options. By participating, smallholder farmers can gain welfare benefits by adopting a market-oriented approach, focusing on producing goods in which they have a comparative advantage, and engaging in crops with positive market signals. Empirically, this is captured through variables such as distance to market, transportation cost, rice price, and farming experience. These variables reflect the household's response to broader structural

forces. As smallholders begin to specialize and commercialize, they contribute to rural economic transformation, aligning with the theory's emphasis on market-led growth. Thus, market participation in this study serves as a proxy for structural transformation at the household level, linking theoretical expectations with observable outcomes. Therefore, Market-oriented production and participation can enhance the livelihoods of smallholder rice farmers by increasing welfare, including higher consumption spending and a better overall standard of living.

2.2 Empirical Literature

Regarding market participation, there are mixed reports on the market participation index among smallholder farmers. Some indicate a moderate level, while others report a very low index. However, none report a high level, suggesting that limited market access remains a major issue in many developing countries. For example, Ochieng and Hepelwa (2018) estimated the mean crop market participation to be 66%, categorizing farmers as moderately commercialized. Similarly, Mekie et al. (2019) reported a moderate participation level of 57% among smallholders, while Ayele et al. (2021) found a participation rate of 48.33%, describing the farmers as semi-commercialized. Conversely, Mpombo (2022) reported an average market participation level of 57% among smallholder rice farmers, indicating most operate at a subsistence level and only participate when outputs are surplus. Low participation is attributed to high transaction costs caused by poor infrastructure and weak institutions. Abate et al. (2021) reported a mean participation level of 10.26 among smallholder wheat farmers. 26%, below the regional average of 19%, classifying Ethiopian wheat farmers as non-commercialized due to their inability to supply beyond their consumption needs and limited market knowledge. Key socio-economic and institutional factors influencing smallholder market participation include gender and age of the household head, farm size, production quantity, land and transport ownership, cooperative membership, credit received, distance to paved roads and markets, and output prices. For example, Manda et al. (2021) identified social capital, land ownership, education, adoption of improved technologies, and transportation assets as drivers. Ayalew et al. (2021) found that access to market information, education, previous year's prices, extension services, farm size, yield, and credit had a positive impact on participation, whereas proximity to markets and family size had a negative impact. Molla et al. (2022) indicated that production quantity, price level, and tertiary education had a positive influence on participation, while distance from main roads and markets had a negative effect on wheat market supply. Gebre et al. (2021) noted that the education level, gender, sorghum farm size, output quantity, off-farm income, and access to credit of household heads significantly impacted market participation.

However, findings across countries such as Ethiopia, Tanzania, and Ghana reveal contextual differences compared to Nigeria. For instance, while Ethiopian farmers are often classified as non-commercialized due to limited surplus and market knowledge (Abate et al., 2021), Nigerian smallholders may face similar constraints but also contend with unique institutional and infrastructural challenges, such as fluctuating policy environments and regional insecurity, which further hinder participation. Moreover, although extension services are generally associated with increased market participation, there are contexts where this relationship does not hold. In some regions of Ghana, for example, increased access to extension services did not significantly improve participation due to poor service quality, lack of follow-up, and limited relevance to market-oriented production (Asante et al., 2020). This suggests that the effectiveness of extension services depends not just on access but also on content, delivery, and farmer trust. There are also notable inconsistencies in the literature regarding the role of transport, credit, and market information. While some studies highlight transport ownership and proximity to roads as critical enablers (Manda et al., 2021; Molla et al., 2022), others report

minimal impact, possibly due to poor road conditions or lack of reliable transport services. Similarly, credit access is often cited as a driver of participation, yet in some cases, farmers with credit still fail to engage due to high input costs or market volatility. Market information, though widely acknowledged as beneficial, may not translate into participation if farmers lack the capacity to act on it or if the information is outdated or inaccurate.

METHODOLOGY

3.1 Study area

The study was conducted in Southeastern Nigeria, which comprises five states - Imo, Enugu, Abia, Ebonyi, and Anambra. Smallholder agriculture is the predominant economic activity, with fertile and well-drained soil supporting the growth of various crops, including rice. Abakiliki and Adani rice are among the popular rice varieties cultivated and marketed in the southeast of Nigeria (Mba et al., 2021).

3.2 Sampling procedure

The study selected 288 smallholder rice farmers through a multi-stage sampling procedure. Owing to the high volume of rice farming, Enugu, Anambra, and Ebonyi states were selected in the first stage. (Mba et al., 2021). Stage two involved the purposive selection of three agricultural zones from the three previously selected states, based on the volume of rice production in each zone. For the third stage, a purposive approach was employed to select three Local Government Areas with a high volume of rice production from each of the selected states. Three communities with the highest concentration of rice-farming households, based on data from the Agricultural Development Programme in the three states, were selected in the fourth stage from the previously identified Local Government Areas. To address the disparity in the number of small-scale farmers in each community, and to ensure adequate representation of each selected rice farming community in the sample (Olumba et al., 2021). Thus, a proportionate random method was employed to select the smallholder rice farming households in the final stage from the list of registered rice farmers in the selected communities. Therefore, a total of 288 respondents, comprising 84, 108, and 96 smallholder rice farmers from Anambra, Ebonyi and Enugu states, respectively, were sampled. The sample size was calculated based on the population mean, considering the continuous nature of the market participation index. We assumed a 95% confidence level, using a standard deviation of 0.5 and a 6% margin of error (to ensure the sample size is sufficient even in the worst-case scenario), which is common during planning. It was estimated as:

$$n = \left(\frac{Z.\sigma}{d}\right)^2$$

Where Z is the Z-score for the desired confidence level (1.96 for 95%), σ is the estimated standard deviation of the market participation index, and d is the margin of error. This method yields a minimum sample of approximately 267. The final sample of 288 respondents in Table 1 thus meets this statistical threshold for robust inference.

3.3 Data collection and analysis

Between January and May 2023, primary data were obtained using questionnaires. Focus group discussions and interviews complemented the data collected through questionnaires.
Data was collected on relevant production and market factors from smallholder rice farmers who practice rain-fed agriculture and produce only one cycle per annum. The market participation index and the Heckman model were used to analyze the collected data.

Table 1*:* Summary of the sampling procedure

State	Agricultural Zones	LGAs	Communities	Selected farmers per community	Selected farmers per LGA
Anambra					
	Awka	Awka North	3	08	24
	Anambra	Anyamelum	3	10	30
	Onitsha	Ogbaru	3	10	30
Ebonyi					
	Ebonyi Central	Ezza North	3	12	36
	Ebonyi South	Ivo	3	10	30
	Ebonyi North	Izzi	3	14	42
Enugu					
	Awgu	Aninri	3	08	24
	Enugu	Isi -Uzo	3	10	30
	Nsukka	Uzo-Uwani	3	14	42
Total	9	9	27		288

In line with Gebremedhin and Jaleta (2012), the market participation index was expressed mathematically as follows in equation 1.

$$\frac{\sum_{k=1}^{k} P_k \; S_{ik}}{\sum_{k=1}^{k} P_k \; Q_{ik}} \quad x \quad 100 \qquad (1)$$

Where S_{ik} is the quantity of output *k* sold by household *i* in kilogramme, estimated at an average community-level price (P_k), Q_{ik} is the total quantity of output *k* produced by household *i* in kilogramme. The index ranges from 0 to 100 or 0 to 1; the higher the market participation index is, the more commercially oriented the farmers are, and vice versa. Following Alawode and Makinde (2022), with minor modifications, smallholder household crop commercialization was classified into three levels: low (<50%), medium or semi-commercial (50-74%), and high (≥75%).

To ensure a robust analysis of both the decision to participate in the market and the intensity of participation, the Heckman two-stage model was adopted. This model is particularly suitable for correcting sample selection bias, which arises when the sample of farmers participating in the market is non-random and potentially influenced by both observable and unobservable factors. By modeling both the participation decision and the intensity of participation, the Heckman approach provides consistent and unbiased estimates. Furthermore, to satisfy the exclusion restriction required for identification in the Heckman model, cooperative membership and farm labour were included in the selection equation (Probit model) but excluded from the outcome equation (OLS model). These variables are assumed to influence the decision to participate in the market but not the quantity of rice sold, thereby ensuring proper identification of the Inverse Mills Ratio and correction for sample selection bias.

First Stage: Probit Model (Market Participation Decision)

The first stage of the Heckman model involves estimating a Probit regression to identify the drivers of the market participation decision. That is, the probit model was used to estimate whether rice farmers sold any rice or not. The probit model was expressed implicitly as:

$Y_i^* = X_i \beta + \mu_i$ (2)

$Y_i = \begin{pmatrix} 1 \; if \; Y_i^* \geq 0 \\ 0 \; if \; Y_i^* < 0 \end{pmatrix}$

Y_i* = observed to be a dichotomous dependent variable, with a value of 1 indicating if the rice farmer sold any rice in the market and 0 if otherwise.

Y_i = The latent variable underpinning the index.

X_i = row vectors representing the explanatory variables

β = vectors of parameters

U_i = error term

Explicitly, the probit model was expressed thus:

$\Pr (Y = 1/X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \ldots + \beta_n X_n + \mu_i$ (3)

Where:

Y = (Market participation =1, 0, otherwise)

β_0 = Constant

β_1 - β_n = Variable's coefficient

X_1 = Age (Years)

X_2 = Level of Education (Years)

X_3 = Farm Labour (Family labour = 1; otherwise = 0)

X_4 = Access to Fertiliser (Yes = 1; No = 0)

X_5 = Extension Services (1, if extension service was received in the last 12 months; otherwise = 0)

X_6 = Credit Access (Yes =1, No = 0)

X_7 = Distance to asphalted road (Kilometres)

X_8 = Cost of seed (₦)

X_9 = Distance to competitive market (Kilometres)

X_{10} = Size of rice farmland (hectare)

X_{11} = Access to Market information (Yes = 1, No = 0)

X_{12} = Transportation cost (₦)

X_{13} = Total Rice yield (Kg)

X_{14} = Ownership of transport facility (Ownership =1, otherwise 0)

X_{15} = Membership of cooperative (Membership =1, otherwise 0)

X_{16} = Market orientation Index

ui= Error term

The Probit model was estimated using maximum likelihood estimation (MLE), a method suitable for binary outcome variables. This approach ensures that the estimated coefficients reflect the marginal effects of each explanatory variable on the probability of market participation.

Second Stage: OLS Model (Intensity of Market Participation)

The second stage of the Heckman model uses Ordinary Least Squares (OLS) regression to estimate the intensity of market participation, measured by the quantity of rice sold in kilogrammes. The model was specified as:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \mu_i$ (5)

Where:

Y = Intensity of market participation (Quantity of rice sold in Kg)

β_0 = Constant
$\beta 1$-βn = Variable's coefficient
X_1 = Age (Years)
X_2 = Education (Years)
X_3 = Access to Fertiliser (Access = 1; otherwise = 0)
X_4 = Extension Services (Extension contact within the last 12 months = 1; otherwise = 0)
X_5 = Credit Access (Yes =1, No = 0)
X_6 = Market distance (Kilometres)
X_7 = Size of rice farmland (hectare)
X_8 = Distance to Asphalted Road (Kilometres)
X_9 = Total Rice yield (Kg)
X_{10} = Transportation cost (₦)
X_{11} = Market Information (Access = 1, Otherwise = 0)
X_{12} = Price of Rice Output (₦)
X_{13} = Income from rice
X_{14} = Ownership of transport facility (Ownership =1, Otherwise, 0)
X_{15} = Market Orientation Index
X_{16} = IMR
Ui = Error term

The inclusion of the IMR, derived from the first-stage Probit model, corrects for potential selection bias in the second-stage regression. This ensures that the estimates of the intensity model are not biased due to the non-random selection of market participants. All variables were tested for multicollinearity using the Variance Inflation Factor (VIF), and those with VIF values above five were excluded. Model diagnostics were conducted to assess goodness-of-fit, heteroskedasticity, and normality of residuals. The analysis was implemented using STATA version 17, which provides built-in procedures for estimating Heckman selection models.

4. RESULTS AND DISCUSSION

4.1 Market participation index of the smallholder rice farmers

The result in Table 2 indicates that out of the 233,615.00 kg of rice produced, 170,342 kg were marketed. The result further reflects the level of their commercialisation. It indicates a market participation index of 73% or 0.73. It implies that the farmers were semi-commercialized, as the index was above the subsistence level (<50% or 0.5) but less than a highly commercialized level (≥75% or 0.75).

Table 2: Market participation level of the respondents

Indicators (Kg)	Total	Mean	Std. Dev.	
Quantity of rice produced.	233615.00	811.16	455.86	
Quantity of rice sold	170342.00	591.47	437.01	
Market Participation Index				73% (0.73)

Source: Field Survey, 2023

The result suggests that smallholder rice farmers were semi-commercialized, as the quantity sold was far greater than that consumed and/or gifted to friends, neighbours, and relatives. This can be attributed to the increased market-oriented production and the allocation of a larger land area to rice production. This suggests the farmers were driven by their moderate market orientation and knowledge, rather than solely by surplus rice production. Therefore, the high

transactional costs stemming from poor infrastructure and weak institutions were not significant enough to hinder smallholders' access to the output market. The result is consistent with Ogundele (2020), who reported a moderate market participation index of 0.52 among smallholder cereal farmers in southwestern Nigeria. The result also aligns with previous studies

Table 3: Heckman's Model Estimates of the Drivers of Market Participation Decision

Variables	Coefficient	Std. Err.	z	P>z	Marginal effect (dy/dx)
Age	0.00467	0.02303	0.20	0.839	0.00007
Education	0.04308	0.04661	0.92	0.355	0.00048
Labour	0.87310	0.57015	1.53	0.126	0.00688
Fertiliser Access	0.13551	1.20039	0.11	0.910	0.00129
Extension Access	1.54256***	0.47528	3.25	0.001	0.02219
Credit Access	-0.40813	0.55091	-0.74	0.459	-0.00619
Distance to Asphalted Road	0.00472	0.13858	0.03	0.973	0.00011
Cost of Rice seed	-0.00002***	0.0000078	-3.07	0.002	0.0000003
Distance to Market	-0.07447***	0.01736	-4.29	0.000	-0.00093
Rice Farm Size	2.45028***	0.92825	2.64	0.008	0.03044
Market Information	0.46491	0.47598	0.98	0.329	0.00767
Transport Cost	-0.00011**	0.00006	-1.98	0.048	0.0000013
Rice Yield	0.00536***	0.00142	3.77	0.000	0.00007
Transport Facility Ownership	-0.81463	0.51178	-1.59	0.111	-0.00900
Cooperative Membership	0.05925	0.47559	0.12	0.901	0.00095
Market Orientation Index	8.07355***	2.22122	3.63	0.000	0.08104
Constant	7.31747	6.07673	1.20	0.229	
mills lambda (ʎ)	6.75236	23.40621	0.29	0.773	
Rho (ρ)	0.11144				
Sigma (σ)	60.59191				
Wald Chi2 (15) (χ^2) = 6344.37					
Prob > Chi2 (χ^2) = 0.0000					

**** (p<0.01), ** (p<0.05)*

Source: Field Survey, 2023.

by Kondo (2018), Ochieng and Hepelwa (2018), and Ghimire (2020), which reported moderate commercialisation or semi-commercialisation among smallholder farmers in the northern region of Ghana. The study, however, contradicts Mpombo's (2022) findings, which indicated a low market participation of 27% by Tanzanian rice farmers.

4.2 Drivers of market participation decision

The results of the socio-economic and institutional elements driving the decisions to participate in the rice market are presented in Table 3. The results show a significant IMR (lambda) for market participation intensity, indicating that a sample selection bias did not occur. The positive IMR sign suggests a positive selection bias, implying that higher values of the outcome variable are typically found in those who self-select into the sample. Furthermore, access to agricultural extension services, the cost of rice seeds, market distance, farm size, transport costs, rice output, and the level of market orientation were found to be instrumental in determining decisions to take part in the output market.

Access to agricultural extension was significant ($p<0.01$). It suggests that increasing access to agricultural extension information among smallholder rice farmers increases their propensity

to participate in the market by 2.22%. Extension services provide relevant market information and training to improve agricultural practices and productivity, thereby enhancing their participation in the rice market. Agricultural extension services also provide timely data on market trends and opportunities, enabling farmers to make informed decisions about production and marketing strategies. This finding reinforces the role of institutional support in bridging the gap between subsistence and commercial agriculture. Extension services not only disseminate technical knowledge but also serve as conduits for market intelligence, which is critical for smallholder farmers navigating volatile market conditions. This aligns with a study by Ayele et al. (2021) in Ethiopia, who suggest that with empirical market information from extension personnel, smallholder farmers make more informed decisions about the market, thereby optimizing their returns and reducing the risk of losses due to market fluctuations.

The cost of rice seed was significant ($p<0.01$) with a negative coefficient. This suggests that as the cost of rice seed increases, the likelihood of getting involved in the market decreases. Smallholder farmers are often financially constrained; the high cost of rice seeds constitutes a barrier to entry into the market due to limited financial resources. Therefore, smallholder rice farmers, especially those without access to credit, may be disinterested in the market if the cost of seed is unaffordable. This result highlights the importance of input affordability in market participation. High seed costs not only deter market entry but may also compromise yield potential if farmers resort to using inferior or recycled seed varieties. The study is similar to Kondo (2018), who found that the high cost of seeds and/or lack of access to improved seed varieties are crucial in market participation decisions in the Northern province of Ghana. It also aligns with Abdullah et al. (2019), which highlights the significant impact of high seed costs and limited access to improved seed varieties on market participation decisions.

Similarly, the coefficient of distance to the established market was negative at a 1% probability level. Thus, indicating that an increase in market distance significantly reduces the likelihood of market participation. Empirically, a unit increase in distance to market decreases market participation by 0.093%. This is likely because longer distances increase transportation costs, which reduce profit margins and discourage market participation. This finding underscores the critical role of infrastructure and proximity in shaping commercialization. Poor road networks and long travel times can erode the economic viability of market participation, particularly for smallholder farmers. The result aligns with those of Hoq et al. (2021), who reported similar results in Bangladesh. Farm size was another key factor in shaping the market decision. The results indicate that an increase in farm size is associated with a higher likelihood of participating in the rice market. In particular, as the farm size increases, the likelihood of engaging in the market increases by 3.0444%. This is largely due to the propensity to produce more as a result of increased farm size, as well as access to timely market information. The study aligns with the work of Mango et al. (2018), Abdullah et al. (2019), and Opata et al. (2020). The transport cost was significant ($p < 0.01$) and revealed a negative correlation between the participation decision in the rice market and transportation costs. The results suggest that as transportation costs decrease, the likelihood of participating in the market is likely to increase. This result underscores the role of physical infrastructure and logistics in shaping market access. High transportation costs, often driven by poor road conditions and a lack of affordable transport options, erode profit margins and discourage farmers from engaging with distant or competitive markets. Poor road infrastructure, such as inadequate road networks, leads to increased transaction costs, which may likely deter farmers from making informed market decisions. The result aligns with Mango et al. (2018), who suggest that the high cost of transportation, exacerbated by poor rural road infrastructure, negatively impacts households' decisions to participate in the output market in Zimbabwe.

The coefficient of the total rice yield was positive ($p<0.01$). This suggests a direct and strong relationship between the rice yield produced by smallholder rice farmers and the decision to participate in the rice market. The result implies that as the quantity of rice produced increases, the likelihood of a smallholder rice farmer participating in the output market increases. Higher yields not only ensure surplus beyond subsistence needs but also provide the economic incentive to engage with markets. Farmers with greater output are more likely to seek buyers, negotiate prices, and invest in post-harvest handling to meet market standards. Thus, higher yields accelerate this decision, as supported by various studies, including Ayele et al. (2021) and Molla et al. (2022), which show that higher yields spur and accelerate smallholder farmers' output market participation decisions. The market orientation index was significant ($p<0.01$). The result implies that a direct, strong, and reliable relationship exists between the market orientation index and market participation decisions. Market-oriented farmers are more likely to adopt practices that align with buyer expectations, such as timely harvesting, proper packaging, and quality control. Their proactive engagement with market signals positions them as competitive participants in the agricultural value chain. The result aligns with Abafita et al. (2016) and Aydin (2021), who found that market orientation has a positive influence on market participation decisions.

4.3 Factors influencing the intensity of market participation

The results in Table 4 indicate that the education of the household head, access to agricultural extension services, rice output, availability of market information, price of output, cost of rice seed, rice income, ownership of transport facilities, and market orientation index were significant variables that determined the intensity of smallholders' market participation.

The years spent in school (education) were positive and significant ($p<0.01$). It suggests that a direct relationship exists between the years spent in school and the intensity of market participation. It reveals that exposure to formal education can transform a subsistence farmer into at least a semi-commercialised farmer through greater involvement in the market. Education empowers farmers with the knowledge and skills necessary to use efficient and productive agricultural practices, leading to increased rice yields and quality, and making their produce more marketable. Moreover, education enhances farmers' ability to interpret market signals, negotiate prices, and diversify their marketing channels. Educated farmers are more likely to adopt innovations and respond proactively to changing consumer preferences, thereby increasing their competitiveness in the market. Additionally, educated smallholder rice farmers can easily access vital information about market trends, pricing, and demand through various channels, such as the Internet and agricultural extension services, and are better equipped to navigate the market. The result aligns with Medina et al. (2020) and Molla et al. (2022), who found that education is a powerful tool for increasing market participation by sharpening knowledge and skills, enabling individuals to make informed decisions, access resources, and adapt to changing market demands. The total rice yield was significantly ($p<0.01$) at the probability level. It implies that a direct and strong relationship exists between the yield of rice produced and the intensity of market participation. This suggests that with increasing rice output by smallholder rice farmers, more quantity will be made available for the market. Higher yields not only ensure surplus production but also create opportunities for farmers to engage in bulk sales, attract buyers, and negotiate better prices. Improved yield often reflects better agronomic practices, which are themselves linked to commercialization. The result is understandable as higher rice yields motivate farmers to participate more actively in the market and, in turn, generate more income for other household needs.

Table 4: Heckman's model for drivers of intensity of market participation

Variables	Coefficient	Std. Err.	z	P>z
Age	-0.12484	0.56241	-0.22	0.824
Education	2.35868**	1.07508	2.19	0.028
Fertiliser Access	-17.37656	36.28316	-0.48	0.632
Extension Access	30.37764***	10.06211	3.02	0.003
Credit Access	10.74425	13.53278	0.79	0.427
Distance to Market	0.849136	0.61943	1.37	0.170
Size of Rice Farm Land	-9.07637	10.36038	-0.88	0.381
Distance to Asphalted Road	3.203894	2.57051	1.25	0.213
Rice Yield	0.75884***	0.03588	21.15	0.000
Transport Cost	-0.00002	0.00105	-0.02	0.983
Access to Market Information	31.65886*	16.93516	1.87	0.062
Price of Output	-0.00640**	0.00268	-2.39	0.017
Income from Rice	0.00022***	0.00007	2.99	0.003
Ownership of Transport Facility	-39.55050***	11.81691	-3.35	0.001
Market Orientation Index	86204.8***	20923.49	4.12	0.000
Constant	205.30730	103.0737	1.99	0.046
mills lambda (ʎ)	6.752358	23.40621	0.29	0.073
Rho (ρ)	0.11144			
Sigma (σ)	60.591914			
Wald Chi2 (15) (χ^2) = 6344.37				
Prob > Chi2 (χ^2) = 0.0000				

**** (p<0.01), **(p<0.05) & *(p<0.1)*

Source: Field Survey, 2023.

The result aligns with studies in Ethiopia, Tanzania, and other regions, such as Ayele et al. (2018), Mpombo (2022), Gebre et al. (2021), and Molla et al. (2022), which have found that higher yields, combined with market information, encourage smallholders to sell more of their produce. Market information accessibility was significant at a 10% ($p<0.1$) risk level. This suggests a direct relationship between access to market information and the intensity of market participation. The result suggests that as more market information becomes available, farmers become more active in interacting with and selling their output in the market. Access to timely and accurate market information reduces uncertainty, enabling farmers to make informed, strategic decisions regarding pricing, sales timing, and market outlet choices. It also facilitates better planning and resource allocation, which are essential for scaling up production. This information enables smallholder farmers to cultivate crops in higher demand, which offers better prices in the market, thereby increasing their profitability and contributing to poverty reduction and an improved standard of living. The result aligns with Manda et al. (2021), who found that increased output supply by smallholder farmers is linked to improved market information accessibility.

Farm income was positively and significantly ($p<0.01$) related to market participation intensity, suggesting that higher rice sales income is associated with increased market participation. The study indicates that the higher the income generated from rice sales, the greater the intensity of market participation. Income from market participation serves as both a reward and a reinvestment mechanism. It enables farmers to expand their operations, adopt improved technologies, and enhance post-harvest handling, all of which contribute to deeper market engagement. The income, as realised, can be instrumental in farm expansion and the transformation of smallholder rice farmers into highly commercialised farmers through active participation in the market. Furthermore, increased income can enhance household resilience,

reduce vulnerability to shocks, contribute to broader rural development outcomes, and improve the standard of living among smallholder rice farmers, aligning with Sustainable Development Goal 1. The result affirms the studies by Kyaw et al. (2018), Camera et al. (2023), Kumar et al. (2025), and Dey and Singh (2025), which identified income generated from the output market as a key determinant of the intensity of market participation.

The ownership of the transport facility was significant and negative at a 1% risk level. The result suggests that an indirect relationship exists between ownership of the transport facility and the intensity of market participation. The ownership of transport facilities is expected to make the output market more accessible by facilitating the movement of farm produce. In rural areas with poor infrastructure, transport assets owned by smallholder farmers are often repurposed for non-agricultural uses, such as commercial transport services or personal mobility. Rather than facilitating the movement of farm produce to market, these vehicles often serve as a source of off-farm income to supplement household earnings. Compounding this issue, inadequate road networks lead to frequent wear and tear, increased maintenance demands, and higher fuel consumption due to slow travel speeds, all of which escalate transportation costs and diminish the utility of these assets for market access. This finding contrasts with that of Kondo (2018) in Ghana and Manda et al. (2021) in Tanzania, who reported a positive and direct association between the ownership of transport facilities and the intensity of market participation.

The market orientation index was significant ($p<0.01$), indicating a strong relationship between the index and the level of market participation. This means that as the market orientation index increases, the amount of rice available for the market also increases. Specifically, a one-unit rise in market orientation results in an 86204.8-unit increase in market participation intensity. Market-oriented farmers are more likely to align their production decisions with consumer preferences, price signals, and seasonal demand. This strategic alignment enhances their competitiveness and increases the volume of produce channelled to the market. This leads to higher market participation, increased farm income, and overall economic well-being for farmers. They also tend to invest in post-harvest technologies and branding strategies, such as milling, destoning, and packaging that improve product appeal and marketability. Their responsiveness to market dynamics positions them as key actors in the commercialization process. They also consider seasonal variations in their production planning and are quick to supply rice when demand peaks. Therefore, market orientation has a significant influence on the level of market participation among smallholder rice farmers in Southeast Nigeria. Ultimately, market orientation strongly correlates with higher market participation. These findings suggest that promoting a market-oriented approach among farmers can enhance smallholder commercialization and improve the welfare of resource-poor farmers. The results align with those of Abate et al. (2021) in Ethiopia and Mpombo (2022) in Tanzania, who found that the level of market orientation was positively and significantly related to the intensity of market participation among smallholder farmers.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

Smallholder commercialisation remains a critical strategy in empowering rural communities and boosting their income; hence, the study examined the status and drivers of smallholder rice commercialisation in the southeast. Smallholders' commercialisation efforts in Southeastern Nigeria have not been fully optimised; however, progress has been made, as the study showed that rice farmers have transitioned from a subsistence level to a semi-commercialised status. The availability and accessibility of agricultural extension services, the

quantity of rice produced, access to market information, farm income, and market orientation were crucial in encouraging smallholder rice farmers to participate in the rice market. However, distance to established markets and transportation costs largely discouraged market participation decisions. The intensity of market participation was found to be enhanced by education, access to extension, rice yield, farm income, and market orientation. Particularly, increased market orientation correlated with market participation and thus translated to higher market participation. Therefore, improving these crucial factors must be the focus of any program intended to increase smallholder rice farmers' active engagement and achieve complete commercialisation.

To effectively support smallholder farmers and address the challenges identified in this study, a comprehensive intervention strategy is necessary. One key recommendation is the introduction of targeted input subsidies and seed credit schemes to ease the financial burden of acquiring high-quality seeds and fertilizers. This should be championed by the Federal Ministry of Agriculture and Rural Development (FMARD), in collaboration with the Bank of Agriculture (BOA), to ensure that smallholder farmers have access to affordable and improved inputs through structured and transparent channels.

Equally important is the need to strengthen farmers' market orientation through modernized extension services that leverage ICT tools to deliver timely agronomic and market information. The Agricultural Development Programmes (ADPs) in each state, under the coordination of FMARD, should be restructured and equipped with digital platforms to disseminate market intelligence, weather forecasts, and price updates. The National Agricultural Extension and Research Liaison Services (NAERLS) should also be tasked with developing farmer-friendly mobile applications and radio outreach programmes to improve market literacy.

Infrastructure development also plays a critical role in accelerating smallholder commercialisation; therefore, the study also recommends government and private sector investment in rural infrastructure, such as roads and market access points, to reduce transportation costs and improve market connectivity for smallholder farmers. The Federal Ministry of Works and Housing, in partnership with State Ministries of Works and Local Government Councils, should prioritize the rehabilitation and construction of feeder roads in rice-producing communities. Additionally, the Rural Access and Agricultural Marketing Project (RAAMP), funded by the World Bank, should be expanded to cover more local government areas in Southeastern Nigeria.

Improving transportation infrastructure reduces the distance to established and/or competitive markets, significantly enhancing market participation and leading to higher incomes for smallholder farmers. To ensure sustainability, the National Assembly Committees on Agriculture and Rural Development should advocate for increased budgetary allocations toward rural infrastructure and agricultural extension services in the annual appropriation bill.

Finally, the Federal Ministry of Finance, Budget, and National Planning should integrate smallholder commercialization into national development frameworks such as the Medium-Term National Development Plan (MTNDP), ensuring that commercialization strategies are aligned with broader poverty reduction and food security goals.

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Conflict of interest

No conflicts of interest are associated with this work.

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