Unpacking the Drivers of Market Orientation: Evidence from Smallholder Rice Farming Households in Southeast Nigeria

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ABSTRACT

Background: A fundamental departure from subsistence to commercial agriculture is crucial for ensuring lasting household-level food security and poverty reduction. The absence of farm-level analysis of the market orientation decisions constitutes a bottleneck to commercialising smallholder rice farmers.

Objectives: The study evaluated the determinants of smallholder rice farmers' market orientation and the extent of market orientation among smallholder rice farming households.

Methodology: The study adopted a survey design. A multistage sampling technique was used to select 288 smallholder rice farmers. Primary data was collected from the respondents using a semi-structured questionnaire. The market orientation index and Heckman's two-stage model were used to realise the objectives.

Results: A moderate market orientation index of 0.52 was established among the small-scale rice farmers. In addition, the results of the determinants of market orientation showed that the socioeconomic and institutional drivers of market orientation were education, distance to an established market, size of the rice farm, agricultural extension service, and land fragmentation. The extent of market orientation was driven by education, labour, fertiliser access, distance to the asphalt road, size of the rice farm, and market information.

Conclusion: Small-scale rice farmers in Southeast Nigeria are moderately market-oriented, and the educational status of the household head principally drives the decision to be market-oriented and the extent of orientation.

Unique Contribution: The study identified the key factors that drive or inhibit smallholder rice farmers' market orientation in Southeast Nigeria. This will help government agencies and policymakers to enact precise policies that will effectively drive smallholder commercialisation.

Key Recommendation: Agricultural extension services should be strengthened to include market-oriented training and information dissemination to provide farmers with timely information on market dynamics and opportunities.

Keywords: Smallholders, Rice, Market orientation, Heckman's Model

Introduction

Agriculture remains a potent tool to stimulate economic growth, poverty reduction and the advancement of food security status in Sub-Saharan Africa (SSA) (Hoang, 2020). However, with smallholder dominance coupled with the new environment characterized by rising populations, urbanization, and climate change there is an urgent need for agricultural transformation from a high subsistence level to a highly market-oriented level in the sub-region (Abdullah et al., 2019). Smallholders are farmers with a low asset base and operate less than two hectares of farmland; smallholder commercialisation involves the adoption of a market-oriented model and aligning production decisions based on the prevailing market signals as well as selling significant farm produce in the output market. Adenegan et al. (2013) defined market orientation as the organization-wide generation of market intelligence on current and future customer needs and organization-wide responsiveness to it. In agriculture, it is defined as the degree of allocation of resources such as land, labour and capital to produce agricultural goods meant for sale (Gebremedhin & Jaleta, 2010). Olwande et al (2015) noted that for the goal of smallholder commercialisation to be achieved, the shift from a consumption-oriented approach to a market-orientation model must be anchored on the principle of profit maximization. Profit can be maximised in a market-oriented model through continuous interaction with both the input and output market and running the farm as a business enterprise (Nwafor, 2020; Okoye et al., 2019). Thus, Martey et al. (2017) opined that smallholder farmers' commercialization premised on market orientation is crucial in designing policies aimed at curbing poverty and enhancing the welfare of farmers in SSA and other developing countries across the world (Martey et al., 2017). However, Ebata et al. (2017) observed that due to the inaccessibility and inefficient input and output markets, this noble objective has not been optimally realized and thus constituted barriers to smallholder rice farmers' market-orientation decisions. Consequently, a low market orientation of cereal crops such as rice has been reported in most developing countries (Abate et al., 2020; Mpombo, 2018). Available literatures such as Abate et al. (2020), Nwafor (2020) and Mpombo (2018) linked the marginally low market orientation index of smallholder farmers to limited use of purchased inputs, and allocation of farmland to less markable crops mainly for consumption instead of high-valued crops meant for the market.

The global demand for rice is a market signal and opportunity for smallholder rice farmers to assign more farm resources towards the production of rice and to be actively involved in the rice market. Therefore, the allocation of farm resources to the production of high-market-valued crops will likely lead to increased market participation. Martey et al. (2017), re-echoed this stance by affirming that smallholder commercialization will be realized when the tripartite issues of productivity, market orientation and market participation are properly resolved. With the expectation of increased household welfare and poverty alleviation, many governments and policymakers especially in developing countries have continuously advocated and promoted market-oriented agriculture (Ntakyo & van den Berg, 2019). In addition, Diriba (2020) asserted that the commercial transformation of subsistence farming is crucial in ensuring sustainable household food security and doubles as a vital pathway to economic growth and development. Therefore, market orientation production of high-value crops such as rice has the potential to increase farm income and enhance the food security status of smallholder farmers (Aromolaran et al., 2020).

In Nigeria, the federal government has through many schemes, programmes and policies, promoted smallholder agricultural commercialization. Top on the list of these interventions is the Agricultural Transformation Agenda (ATA), with the core mandate of treating agriculture as a business, and not a developmental project (FMARD, 2011). Furthermore, agricultural import bans and tariffs, hybrid and improved seed, and subsidized fertilizer prices were some other government policies targeted towards achieving food sufficiency, boosting smallholder production levels and the general welfare of farmers. Abdullah et al. (2019) added that enhancement of the functioning of input and output markets, improvement of service provision and infrastructural development, and increased productivity were the philosophy behind these policies and interventions. Mani et al. (2019) further pointed out that ensuring active engagement with the market, both as input buyers and output sellers by the resource-poor or subsistence farmers was among the goals of these policies. However, despite these interventions and efforts, the expectations of the government and policymakers on smallholder commercialization in Nigeria remained unattainable. Anthony et al. (2021) and Olayemi et al. (2021) attributed the failure to effectively commercialize smallholder farmers who dominate rice farming in Nigeria to a shortage of input supply, price fluctuation and poor access to market and low market orientation. Ogundari (2016) also linked this failure to poor farm-level analysis of smallholder rice farmers' market orientation decisions.

Several studies such as Adepoju (2018), Falola et al. (2022) and Kabiti et al. (2016) have investigated smallholder commercialization using the crop commercialization index, but only a few (Aromolaran et al., 2020; Hagos et al., 2020) employed the concept of market orientation. Moreover, most of the literature in Nigeria, especially in the Southeast, is largely on root and tuber crops, such as Ukeje et al. (2017) and Okoye et al. (2019). To the knowledge of the researchers, the degree of market orientation by smallholder rice farmers, especially in Southeast Nigeria, has not been explored. Thus, this work tends to fill the gap. Also, the majority of the available studies on smallholder market orientation in the study area were based on narrow samples drawn from a single state in Southeast Nigeria. Such studies not only failed to capture variability across states but, more significantly, restricted the generalization of the findings at the regional level (Abafita et al., 2016). Furthermore, while the available literature has provided some empirical evidence on the possible drivers of market orientation among smallholders, there exists significant variation in the analytical methods applied. The majority of available studies, for example, Mekie et al. (2019) used ordinary least square regression, while Abate et al. (2020) employed the Tobit model to examine the drivers of smallholder farmers' market orientation among smallholder farmers. However, these models were limited as they did not address the issue of sample selection bias. In this study, Heckman's two-stage model was utilized to address sample selection bias, which arises from the fact that the extent of market orientation is only observed for market-oriented farming households. The study aims to estimate the market orientation index among smallholder rice farming households and evaluate the drivers of smallholder rice farmers' market orientation and extent of market orientation. With the gradual transformation of agriculture towards commercialization in developing countries, the identification of the critical factors that can transition smallholder rice farmers to market-oriented producers is essential (Ezeibe et al., 2020), in enhancing their means of livelihood and welfare.

Materials and Methods

The study was conducted in Southeast Nigeria, comprising five states: Abia, Anambra, Ebonyi, Enugu, and Imo. The Southeast is situated between Latitude 4° 30' and 7° 00' North and Longitude 5° 30' and 9° 30' East. The land area of about 28,987km² (2,898,700 Ha) (National Bureau of Statistics, 2010) with an estimated population of 24,067,008 million people (Worldometer, 2021), and spread across 95 local government areas (LGAs) with 19 agricultural zones. The predominant soil type in the area is sandy loam, and the climate is characterized by rainy and dry seasons (Okere, 2020). Smallholder agriculture dominates the major economic activities, especially in rural areas. Rice ranks among the valuable staple foods grown and marketed in the study area, especially the popular Abakiliki and Adani rice. It is mainly grown at the subsistence level, though a few farmers operate at the commercial level.

In selecting respondents for this study, a multistage sampling method was deployed. In stage one, Anambra, Ebonyi and Enugu states were purposively selected based on the high volume number of rice farmers (Mba et al. 2021). In stage two, three agricultural zones were selected purposively from each of the three states selected based on the preponderance of rice farming in the areas. In stage three, three LGAs (Anambra state: Ayamelum, Ogbaru, and Awka North; Ebonyi State: Ezza North, Ivo, and Izzi and Enugu State: Aninri, Isi-Uzo, and Uzo-Uwani) where rice is mostly produced in the study area were purposively selected from each state. Stage four involved a purposive selection of three communities from each of the nine LGAs selected based on a large number of rice farming households. The final stage was a proportionate random selection of smallholder rice farming households across the 27 communities selected due to the unequal numbers of smallholder farmers (Olumba, et al., 2021). Eighty-four (84) respondents were randomly selected in Anambra state as follows: eight smallholder rice farmers each were selected from Ebenebe, Amanuke, and Achalla communities in Awka North LGA; 10 each from Omor, Umumbo, and Ifite-Ogwari communities in Anyamelum LGA; and 10 each from Atani, Umunakwo, and Ogbakugba communities in Ogbaru LGA. In Ebonyi State, 108 respondents were selected as follows: 12 smallholder rice farmers were selected randomly from Okposi, Orizor, and Ameka communities in Ezza North LGA, 10 each from Akaeze, Amagu, and Ogwor communities in Ivo LGA and 14 each from Igbeagu, Ohuruekpe and Edukpachi communities in Izzi LGA. In Enugu state, 96 respondents were randomly selected as follows: eight smallholder rice farmers each were randomly selected from Nenwe, Oduma and Okpanku communities in Aninri LGA; 10 each from Mbu, Umualor, and Eha Amufu communities in Isi-Uzo LGA and 14 each from Adani, Ogurugu, and Igga communities in Uzo-Uwani LGA. In all, a total of 288 smallholder rice farmers were sampled and used for analysis in the study. The list of rice farming households, obtained from ADP offices in the three states, served as the sampling frame. Primary data, collected with the aid of a semi-structured questionnaire were used in the study. The questionnaire was validated by three experts from the department of Agricultural Economics, University of Nigeria, Nsukka. The reliability of the questionnaire was ascertained by trial testing 30 copies on smallholder rice farmers in the study area. The internal consistency was achieved using the Cronbach alpha reliability technique in which a reliability coefficient of 0.82 was obtained. The market orientation index and Heckman's two-stage model were used to realise the objectives.

Market Orientation Index

The market orientation index for the smallholder households was computed as follows:

$$MOI_i = \frac{\sum_{j=1}^{J} CMI_j \, L_{ji}}{L_i^T}; \; L_i^T > 0, \; and \; 0 < MOI_i \leq 1 \tag{1}$$

Where: MOI_i is the market orientation index of household *i*; *CMI* is the crop-specific marketability index,; L_{ji} is farm size for rice *j* by ith farm household *i*, while L_i^T is the overall crop farm owned by *ith* household in 2022 crop production year. MOI*i* ranges from 0 to 1; values closer to 1 indicate market-oriented households; those closer to 0, are not market-orineted while values around the midpoint is said to be moderately market oriented.

$$CMI_j = \frac{\sum_{i=1}^{N} X_{ji}}{\sum_{i=1}^{N} Y_{ji}}; \; Y_{ji} > X_{ji} \tag{2}$$

$$0 \leq CMI_{ji} \leq 1$$

Where: CMI_{ji} is crop-specific marketability index; X_{ji} represents the quantity of rice *j* sold by household *i;* while Y_{ji} represents the total qauntity of rice *j* produced by household *i;* and *N* represents the total number of sampled households. CMI value ranges from 0 to 1. is aggregated across all the sample households in the study area, with values ranging from 0 to 1, while crops meant for the market have value closer, crops for consumption are closer to 0 the (Osmani & Hossain, 2016).

Heckman's Two-Stage Model

The Heckman two-stage model was employed to identify the drivers of market orientation decisions and the intensity orientation among smallholder rice farmers. The Heckman model is a statistical technique that addresses sample selection bias in econometric analysis. This bias occurs when the process of selecting individuals or observations for a sample is related to the outcome variable being studied, leading to biased parameter estimates. The Heckman model includes two equations: a selection equation, expressed using the probit model and an outcome equation, using ordinary least square regression. The selection equation predicts the chances of being included in the sample, while the outcome equation evaluates the relationship between the dependent and independent variables. In the first stage, a probit model was employed to determine whether smallholder rice farmers exhibited market orientation or not. In the second stage, the extent of market orientation was concurrently estimated using ordinary least squares regression. In addition to estimating the probability of market orientation, the probit model equally generated the Inverse Mills Ratio (IMR) which accounted for sample selection in the study and ensured that the estimates were unbiased. The ordinary least square estimation was done with the inclusion of the IMR as an additional regressor.

The probit model was expressed as:

$$Pr\ (Y = 1/X) = \phi\ (\beta_0 + \beta_1 X) \tag{3}$$

ϕ is the cumulative distribution function of a standard normal variable

The implicit form was specified thus:

$$Y_i{}^* = X_i \beta + \mu_i \qquad (4)$$

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

Y_i^* = observed dichotomous dependent variable, it has value of 1 if the rice farmer is market-oriented, and 0, if otherwise.

Y_i = underlying latent variable that indexes market orientation.

X_i = row vectors of the independent variables that affect the likelihood of a rice farmer being market-oriented.

β = vectors of estimated parameters.

U_i = error term, with an assumption of standard normal distribution.

The selection equation (first step) of Heckman's two-stage model was, therefore, specified explicitly as follows:

$$Pr \ (Y = 1/X) = \beta_0 + \beta_1 X_1 + \ldots + \beta_n X_n + U_i \qquad (5)$$

Where:

Y= (Market-oriented =1, otherwise 0)

β_0 = Constant

$\beta_1 - \beta_n$ = Coefficients of the variables of estimates

X_1 = Age (Years)

X_2 = Education (Years)

X_3 = Labour (family labour = 1; otherwise = 0)

X_4 = Fertilizer (Access to fertilizer use = 1; otherwise = 0)

X_5 = Credit Access (Yes =1, No = 0)

X_6 = Cost of rice seed (₦)

X_7 = Distance to established market (Kilometres)

X_8 = Size of rice farm(hectare)

X_9 = Distance to Asphalt Road (Kilometres)

X_{10} = Extension Services (Extension contact in the last 1 year = 1; otherwise = 0)

X_{11} = Access to market information

X_{12} = Land Fragmentation

μ_i = stochastic error term.

The outcome equation (second step) estimated the extent or level of market orientation. The equation was estimated using OLS as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots + \beta_n X_n + \mu_i \qquad (6)$$

Where:

Y= Extent or level of Market Orientation

β_0 = Constant

$\beta_1 - \beta_n$ = Coefficient of the variables of estimates

X_1 = Age (Years)

X_2 = Education (Years)

X_3 = Labour (family labour = 1; otherwise = 0)

X_4 = Fertilizer (Access to fertilizer use = 1; otherwise = 0)
X_5 = Credit Access (Yes =1, No = 0)
X_6 = Cost of rice seed (₦)
X_7 = Distance to established market (Kilometres)
X_8 = Distance to Asphalt Road (Kilometres)
X_9 = Size of rice farm (hectare)
X_{10} = Transportation cost (₦)
X_{11} = Extension Services (Extension contact in the last 1 year = 1; otherwise = 0)
X_{12} = Market information (Access =1, otherwise 0)
X_{13} = Income from rice (₦)
X_{14}= Output/Yield (Kg)
X_{15} = Land Market Access (Access to land market =1, otherwise 0)
X_{16} =IMR
μ_i = stochastic term

Results and Discussion

Market Orientation Index of Smallholder Rice Farming Households

The result in Table 1 shows that the total rice produced by the respondents in the 2022 farming season was 233,615 kg while only 170,342 kg was sold. The total farm size of the respondents was 481.10 hectares, while the farm size allocated to rice production was 339.80 hectares only. The results show a mean market orientation index of 0.52 among smallholder rice farmers in the study area. The findings suggest a moderate level of market orientation among smallholder rice farmers in Southeast Nigeria. In other words, the respondents are fairly market-oriented with an average market orientation index of 0.52; this indicates the allocation of 52% of cultivable land to the production of highly valued crops such as rice.

Table 1: Market Orientation Index of Smallholder Rice Farmers

Indicators (Kg)	Total	Min.	Max.	Mean	Std. Dev.	Index
Size of Land Size (Ha)	481.10	0.50	2.00	1.67	0.47	
Land Size Allocated to Rice (Ha)	339.80	0.25	2.00	1.180	0.57	
Quantity of Rice Produced (Kg)	233615.00	150.00	2500.00	811.16	455.86	
Quantity of Rice Sold (Kg)	170342.00	0.00	2100.00	591.47	437.01	
Market Orientation Index						**0.52**

Field Survey, 2023

The moderate level of market orientation could be attributed to a relative use of purchased inputs among the farmers. The index also indicates that the smallholder rice farmers are neither highly market-oriented (score closer to 1) nor entirely focused on subsistence farming practices (score closer to 0), rather they strike a balance between production for personal consumption and

production for the market; although the proportion for market exceeded that of consumption by only two per cent. This suggests that the smallholder rice farmers in the study are gradually transitioning from subsistence-oriented farming to market-oriented production. The result also implies that smallholder farmers are 52 per cent responsive to market signals, market demands and market opportunities in the allocation of productive resources in the production of marketable products like rice in the study area. The results corroborate a study by Nwafor (2020) and Osmani and Hossain (2016) which found a moderate market-orientation index of 0.55 and 0.59 among smallholder farmers in South Africa and Bangladesh respectively. However, the result is at variance with Mpombo (2018) which reported a low market orientation index of 0.13 among smallholder rice farmers in Tanzania. The study also disagrees with Abate et al. (2020) and Mekie et al. (2019) which indicated low market orientation indices of 0.10 and 0.29 among smallholder wheat and barley smallholder farmers, respectively in Ethiopia.

Determinants of Market Orientation among Smallholder Rice Farmers

The results of Heckman's two-stage model on the factors influencing market orientation and the extent of the orientation of the small-scale rice farmers in Southeast Nigeria were presented in Tables 2 and 3 respectively. The significant value of the inverse mill's ratio suggests that sample selection bias was adequately handled by the Heckman model. The sign of the inverse mill's ratio was positive and implies a positive selection bias, meaning that the unobservable factors that affect the selection process are also positively correlated with the outcome variable; thus, individuals who self-select into the sample have higher values of the outcome variable. The Heckman result also showed that the Wald Chi-square value of 296.74 was highly significant at a 1% (p<0.01) level of probability, implying that the explanatory variables jointly explain the likelihood of the smallholder rice farmers being market-oriented. The result also implies that at least one estimate of the probit regression is not equal to zero; hence, correctly influencing market orientation among smallholder rice farmers in Southeast, Nigeria. The first stage of the Heckman model examined the socio-economic and institutional drivers of market orientation.

The coefficient of education of the household head was positive and significant at 5% (p<0.05). The result implies that as the educational level of smallholder rice farmers increases, the likelihood of being market-oriented increases. The marginal effects result of 0.0692 indicates that the likelihood of a smallholder rice farmer being market-oriented increases by 6.92% for every one-unit increment in the education of the household head. house head education. The result suggests that with more education, a smallholder rice farmer will more likely to make informed decisions about the market conditions. The result is in tandem with studies by Okoye *et al.* (2019) and Martey et al. (2017) that education had a positive impact on smallholder farmers' likelihood of being market-oriented and also improved their farm income and welfare.

Table 2: Heckman Model for the Determinants of Market Orientation (Selection Equation)

	Coefficient	Std. Err.	Z	P>z	dy/dx
Age	-0.0048	0.0142	-0.34	0.734	-0.0005
Education	0.0692**	0.0321	2.15	0.031	0.0111
Labour	-0.3574	0.3487	-1.03	0.305	-0.0720
Fertiliser Access	0.1164	1.1037	0.11	0.916	0.0222
Credit Access	-0.4077	0.4936	-0.83	0.409	-0.0668
Cost of rice seed	-2.94e-06	4.73e-06	-0.62	0.535	-5.15e-07
Distance to Market	-0.0577***	0.0116	-4.97	0.000	-0.0119
Size of Rice farm	3.1948***	0.6199	5.16	0.000	0.4785
Distance to Asphalted Road	0.0092	0.0920	0.10	0.920	0.0037
Extension Access	1.0557***	0.2998	3.52	0.000	0.1555
Access to Market Information	0.3765	0.3283	1.15	0.252	0.0628
Land fragmentation	-0.6441**	0.2933	-2.20	0.028	-0.0980
Constant	-2.7777	1.6470	-1.69	0.092	
Mills lambda (Λ)	0.1218***	0.0443637	2.75	0.006	
Rho (p)	0.9253				
Sigma (σ)	0.1316				
Wald Chi^2 (15) (χ^2) = 296.74					
Prob > Chi^2 (χ^2) = 0.0000					

***Source:** Field Survey, 2023   *** & ** indicate 1% & 5% significance levels respectively*

The result of distance to an established market was negative and significant at 1% (p<0.01). The result shows that with increased distance to the market, the market orientation of the household head decreases. This suggests that with increasing distance from the farm or household to the market, the likelihood of a smallholder rice farmer becoming market-oriented declines; thus, the farmer will focus more on self-production for consumption, instead of production for the market. The result of marginal effects of -0.0119 implies that for every unit increase in distance to an established market, the likelihood of a smallholder rice farmer being market-oriented decreases by 1.2%. The result agrees with Okoye et al. (2019) that distance to the market was negative and significantly influenced the market orientation among smallholder farmers. The size of the rice farm was positive and significant at 1% (p<0.01). The result suggests that the more farmland available for the smallholder farmers, the more the farmers are likely to allocate to the production of more marketable produce like rice in the study area; thus, increased farm size enhances market orientation decisions. The result of marginal effects of 0.4785 implies that for every unit increase

in the size of the rice farm, the likelihood of a smallholder rice farmer being market-oriented increases by 47.9%. The result re-emphasizes the significance of land as one of the critical factors of agricultural production especially in the Southeast, Nigeria where agricultural land is very limited and competes greatly with other uses. The result is consistent with Aromolaran et al. (2020) who identified the size of farmland as a major driver of market orientation decisions among smallholders in Nigeria.

The coefficient of the extension access was positive and significant at 1% (p<0.01). The result implies that with increased contact with agricultural extension services, the likelihood of a smallholder rice farmer becoming market-oriented increases. The result affirms the positive effect of extension services on the welfare of farmers especially in developing countries. Furthermore, the result of marginal effects of 0.1555 implies that for every unit increase in agricultural extension visits to a smallholder rice farmer, the likelihood of the farmer being market-oriented increases by 15.6%. The result aligns with Abate et al. (2020) and Mekie et al. (2019) that access to extension services is a major driver of market orientation among smallholder cereal farmers. The coefficient of land fragmentation was found to be negative and significant at 5% (p<0.05). The result implies that the more a smallholder farmer's land is fragmented into smaller portions, the less likely the farmer will be market-oriented. The result of marginal effects of -0.0980 suggests that for every unit increase in land fragmentation, the probability of a smallholder rice farmer being market-oriented decreases by 9.8%. This can be attributed to the fact that fragmented farmlands lead to inefficient use of resources, making it difficult to adopt and use some modern agricultural innovations and technologies efficiently. This results in reduced productivity and high cost of production; thus, discouraging the smallholder farmers from responding to market signals and opportunities. This result is similar to that of Martey et al. (2017) which established a negative relationship between land fragmentation and market orientation decisions among smallholder farmers.

Determinants of Extent of Market Orientation among Smallholder Rice Farmers
The results of factors influencing the extent of market orientation among smallholder farmers in the study are presented in Table 2. The factors were estimated using OLS, which is the second stage or outcome equation of a Heckman model. The model output showed that six out of the fifteen explanatory variables included in the model were found to be significant at various levels of significance. The coefficient of education of the household head (0.0045) was positive and significant at 5% (p<0.05). The result implies that the more years spent in school by the household heads, the more market-oriented they become; and thus, the more resources are allocated to the production of more marketable produce. The result is a testament to the transformative role education plays among smallholder farmers. The result is similar to Abate et al. (2021), Dlamini (2019) and Gebre et al. (2021) that educated smallholder farmers are more likely to understand market dynamics, pricing, and opportunities and thus produce more marketable goods for the market. The coefficient of family labour (0.0612) was positive and significant at 10% (p<0.10). The result implies that the higher the number of available family labour, the more market-oriented a smallholder rice farming household tends to become. This is not surprising considering that labour is one of the critical factors of production in rice farming, therefore, a substantial family labour is cost-effective, as it reduces the need for external labour costs. Also, with the involvement of family members in rice production, more of the income generated will be retained within the

family; thus, contributing to economic stability in the household and transformation to commercial farming. The result is in tandem with Abdullah et al. (2019) and Kondo (2018) which credited family labour as one of the most important determinants of the intensity of market orientation among smallholder farmers.

The coefficient of fertilizer access was also (0.88138) positive and significant at 1% (p<0.01). The result suggests that the more a smallholder rice farmer has access to inorganic fertilizer, the more market-oriented the farmer becomes. This could be associated with the fact that lack of access to fertilizer has been one of the major hindrances to smallholder commercialization in most developing countries (Lenis et al., 2017). Fertilizer is an essential farm input; it improves soil fertility and crop output levels. Thus, with access to fertilizers by smallholder rice farmers, their rice output will increase spontaneously, leading to more response to market signals. For example, the ban on rice importation in Nigeria. The result agrees with Andaregie et al. (2021) and Nwafor (2020) that smallholder farmers who have access to fertilizers are more inclined to produce crops that are in demand by the market and may be better positioned to quickly respond to market signals and changing consumer preferences.

Distance to the asphalted road (0.0134) was negative and significant at 5% (p<0.05). This suggests that the closer a smallholder rice farm or household is to an asphalted road (good and motorable road), the more market-oriented the household becomes. This is attributed to the bad road networks, especially in the rural areas, which hinder and discourage smallholder agricultural commercialization due to increased transaction costs. It limits smallholders' access to efficient and competitive markets where they can sell their products at better prices and improved profit. The results are consistent with Martey et al. (2017) that distance to a tarmac road influenced the smallholder maize farmers' market orientation in Northern Ghana.

The size of the rice farm (0.1887) was positive and significant at 1% (p<0.01). The result suggests that the more the size of rice farmland, the more smallholder rice farmers allocate productive inputs to the production of more marketable products and channel their production decisions based on the market demands and preferences. The result is not surprising as smallholder farmers with relatively larger farm sizes are better positioned to improve production techniques, post-harvest handling, value-added activities and better negotiations with the market. Smallholder rice farmers with relatively larger farm sizes can also enjoy economies of scale, as they produce more efficiently and at lower costs per unit of output. Consequently, the farmers allocate a significant portion of their production to the market, as they can produce in greater quantities. The result is similar to Aromolaran et al. (2020), Nwafor (2020), and Osmani and Hossain (2016) that farmers with large farm sizes are more market-oriented and tend to have more means of transporting their products to more distant and competitive markets; thereby enhancing profits and, in turn, improving their household welfare.

Table 3: Heckman Model for Determinants of Extent of Market Orientation (Outcome Equation)

	Coefficient	Std. Err.	z	P>z
Ages	-0.001832	0.0011472	-1.60	0.110
Education	0.0044619**	0.0023137	1.93	0.054
Labour	0.0611591*	0.0339483	1.80	0.072
Fertiliser Access	0.881389***	0.0777028	11.34	0.000
Credit Access	-0.0113136	0.0288823	-0.39	0.695
Cost of Rice seed	-3.07e-07	4.14e-07	-0.74	0.458
Distance to Market	0.0019755	0.0014647	1.35	0.177
Distance to Asphalt Road	-0.0133725**	0.0059452	-2.25	0.024
Size of Rice farm	0.1886574***	0.0295389	6.39	0.000
Transport cost	-5.84e-07	2.08e-06	-0.28	0.779
Extension Access	-0.0068389	0.0214201	-0.32	0.750
Market Information	0.0683586**	0.0324656	2.11	0.035
Farm Income	1.09e-07	1.23e-07	0.89	0.375
Output yield	-8.02e-06	0.0000711	-0.11	0.910
Land Market Access	0.0218687	0.0206729	1.06	0.290
Constant	1.251227	0.1247216	10.03	0.000
Wald Chi2 (15) (χ^2) = 296.74				
Prob > Chi2 (χ^2) = 0.0000				

Source: Field Survey, 2023   ****, **& * Significant at 1 %, 5% & 10% probability levels respectively*

The result is not surprising as smallholder farmers with relatively larger farm sizes are better positioned to improve production techniques, post-harvest handling, value-added activities and better negotiations with the market. Smallholder rice farmers with relatively larger farm sizes can also enjoy economies of scale, as they produce more efficiently and at lower costs per unit of output. Consequently, the farmers allocate a significant portion of their production to the market, as they can produce in greater quantities. The result is similar to Aromolaran et al. (2020), Nwafor (2020), and Osmani and Hossain (2016) that farmers with large farm sizes are more market-oriented and tend to have more means of transporting their products to more distant and competitive markets; thereby enhancing profits and, in turn, improving their household welfare.

Finally, the coefficient of access to market information (0.06834) was positive and significant at 5% (p<0.05). The result implies that the more market information available to a smallholder rice farmer, the more market-oriented the farmer becomes. Specifically, for any additional unit increase in market information, the smallholder rice farmer becomes more market-oriented by 0.0684 units. Access to market information provides smallholder farmers with knowledge and insights on the current market dynamics and the prevailing government policies with which the farmer can make informed decisions on what crop to produce and where to sell. Thus, market insights ultimately lead to increased profitability, reduced market-related risks, and improved livelihoods among smallholder rice farming households. The result agrees with studies by Ayalew et al. (2021), Mafimisebi and Ikuerowo (2018) and Mekie et al. (2019) that access to market information empowers smallholders to timely make more informed and more market-oriented decisions while aligning their production with market needs.

Conclusion and Recommendations

Agricultural transformation anchored on smallholders' commercialization is one of the effective ways of boosting rural incomes, food security and employment, especially in rural areas. Smallholders' commercialization efforts in Southeast Nigeria have not been fully optimized. Despite several economic and institutional challenges, smallholder rice farmers in the study area are gradually shifting from subsistence-oriented farming to moderately market-oriented production. Optimum market orientation among smallholder rice farmers is achievable; however, improvement in the education of the household head, improving access and availability of inorganic fertilizer, improved road infrastructure and accessibility of relevant and timely market information can drive and enhance optimum market orientation. Therefore, any policy to improve the active participation of smallholder rice farmers must be targeted towards the improvement of these key factors. The study recommends that agricultural extension services should be strengthened to include market-oriented training and information dissemination to provide farmers with timely information on market dynamics, opportunities, and demands. The major limitation of the study was the general insecurity in the study area. To address this, the researcher hired trained enumerators or research assistants who were familiar with the terrain of each of the selected communities.

Conflict of interest
The authors hereby declare that no conflict of interest exists.

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