



## **DETERMINANTS OF MARKET PARTICIPATION AMONG ARABLE CROP FARMERS IN KWARA STATE, NIGERIA: EVIDENCE FROM MAIZE AND SORGHUM FARMERS**

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### **ABSTRACT**

The study examined the level and determinants of market participation among arable crop farmers in Kwara State, Nigeria, with a focus on maize and sorghum production. A multi-stage sampling technique was used in selecting 91 respondents for the study. Data were collected through structured questionnaires administered to maize and sorghum farmers using face-to-face interviews and analysed using both descriptive and inferential statistics. The results revealed maize farmers recorded a mean commercialization index of 54.21, with 47.2% falling within the 51–60% market participation category. Similarly, sorghum farmers had a mean index of 52.58, with 39.5% within the same commercialization range. The Probit regression results indicated that maize market participation was significantly influenced by age ( $p < 0.05$ ), household size ( $p < 0.05$ ), level of education ( $p < 0.05$ ), access to credit ( $p < 0.01$ ), and farm size ( $p < 0.05$ ). For sorghum farmers, significant determinants included access to credit ( $p < 0.05$ ), farm size ( $p < 0.01$ ), association membership ( $p < 0.05$ ), access to extension services ( $p < 0.05$ ), and distance to market ( $p < 0.05$ ). The study concludes that market participation among arable crop farmers in Kwara State is moderately commercialized. Maize participation was mainly influenced by age, household size, education, access to credit, and farm size, while sorghum participation was driven by credit access, farm size, association membership, extension services, and distance to market. The study therefore recommends improved access to credit, stronger extension support, enhanced cooperative participation, and better rural market infrastructure to promote commercialization.

**Keywords:** Market, Participation, Agricultural, Commercialization, Index, Sorghum.

### **INTRODUCTION**

Agriculture is one of the pillars of the Nigeria economy, which plays a crucial role in job creation, food security, and livelihood (PwC Nigeria, 2020). In the agricultural sector, the arable crop farming is strategic in ensuring availability of the staple foods including maize, rice, cassava, yam and vegetables (Food and Agriculture Organisation of the United Nations). Although Nigeria is endowed with large arable land resources and good agro-ecological factors, the degree of market participation by the smallholder farmers is not optimal (Balana & Oyeyemi, 2022). Market participation, which is considered to be the involvement of farmers in selling and buying agricultural products (Otekurin *et al.*, 2019), is one of the most commonly recognised mechanisms of rural income improvement, food security improvement, and sustainable commercialization of agriculture (Mkuna & Wale, 2022). In developing economies, smallholder farmers form the basis of the agricultural sector, generating 60 to 80 percent of the food and 40 to 60 percent of rural household earnings (Ayisi *et al.*, 2022). Nonetheless, the rate of productivity has been quite low among smallholders, with a significant number of them having a farm size below two hectares (Lipton, 2023). Agricultural development policy in countries where poverty reduction and rural transformation are the priority of the policies relies on strengthening the integration of smallholder markets, especially in countries where agricultural development is prioritised over policymaking (Shilobolemi *et al.*, 2024). Commercialization in this respect does not only concern the increase in production, but the increase in the capacity of the farmers to compete effectively and profitably in the output markets.

The lack of rural infrastructure, especially the lack of a proper road system and ineffective storage facilities, increases transaction costs and leads to post-harvest losses (Adelusi *et al.*, 2024; Ariong *et al.*, 2023). The lack of proper transport infrastructure also erodes the bargaining power of the farmers and their availability to lucrative markets in the cities (Makyao, 2025). Another impeding factor is



information asymmetry. Farmers are often dependent on the services of an intermediary who takes advantage of the limited access available to quality price information by buying produce at low farmgate prices, and retailing it at a massive profit margin (Nugroho, 2021). There are technological interventions, such as mobile-based market information systems, that have been put forward as the means to lessen the information gaps and enhance price transparency (Sudha *et al.*, 2024). On the same note, commercialization behaviour is greatly influenced by production capacity. The larger the size of the output in the farms, the higher the chances that a farmer will produce more of the product than is needed by the household and thus it has a greater incentive to engage in markets (Atere, 2023), and with smaller sizes of farms and higher household consumption needs often stay subsistence-oriented (Phelps, 2024). Availability of financial services is a key element in ensuring that there is access to markets. Access to credit will lead farmers to develop better inputs, scale up production, and improve the quality of produce (Kambali & Panakaje, 2022). On the other hand, credit limits the scale of production and restricts various farmers to small scale or informal market trades. The spatial considerations like market distance and transportation infrastructure are also a critical determinant of participation levels; the closer to markets, the lower the transaction costs and the higher the chances of commercialization (Scott and Richardson, 2021). Experienced outcomes indicate the existence of a beneficial linkage between market access and marketed surplus (Ma *et al.*, 2024), and long-distance and bad roads deter entry (Chibaro *et al.*, 2025).

Storage capacity also affects the marketing behaviour. Access to proper storage enables farmers to sell only when the prices are good, and thus, increase profits (Akello *et al.*, 2022). Conversely, the absence of storage leads to distress sales and revenue loss (Bisht & Singh, 2024). Also, stable prices and predictable market outlets will motivate farmers to sell larger portions of production to markets (Tack and Yu, 2021). Collective marketing is increased by social capital, especially cooperative membership, minimises transaction costs, and enhances bargaining power (Nyasulu, 2021; Bellanger *et al.*, 2025). Market participation is explained by Farm Household Theory, which suggests farmers balance subsistence needs with market opportunities, Transaction Cost Theory, where high transaction costs and market barriers discourage participation (Nugroho, 2021), and Market Structure Theory, which emphasises efficient price signals in encouraging commercial market engagement (Ucha & Ameh, 2021; Rashied, 2024; Ma & Gong, 2024). Even though many agricultural projects have aimed to improve commercialization in Nigeria, there is empirical paucity of understanding of crop-specific determinants of commercialization in the market in Kwara State. The literature tends to focus more on production results without adequately analysing the structural limitations that define the choice of participation decisions (Shiru, 2023). The fundamental obstacles to successful market integration (such as post-harvest losses, very poor institutional support, volatile prices, and the use of intermediaries) persist (Karikari *et al.*, 2023; Msosa, 2022; Olutumise, 2022; Montincone *et al.*, 2024).

With these gaps, there is need to have a context-specific and multi-crop analysis of cereal market participation in Kwara State. This paper thus focuses on the socio-economic attributes, level, the driving factors, and the limitations of the market participation of maize, rice, soybean, and sorghum farmers. Therefore, the study seeks to examine the following objective;

- i. Assess the level of market participation among maize and sorghum farmers in Kwara State, Nigeria.
- ii. Examine the socio-economic and institutional factors influencing market participation among maize farmers in the study area.
- iii. Assess the socio-economic, institutional, and market-related factors influencing market participation among sorghum farmers in the study area.

## **METHODOLOGY**

### **Study Area**

The study was conducted in Kwara State, Nigeria, located in the North-Central geopolitical zone of the country. Kwara State lies between latitudes 7°45'N and 9°30'N and longitudes 2°30'E and 6°25'E. The state shares boundaries with Niger State to the north, Kogi State to the east, Ekiti, Osun, and Oyo States to the south, and the Republic of Benin to the west. Kwara State experiences a tropical



climate characterised by distinct wet and dry seasons, with annual rainfall ranging between 1,000 mm and 1,500 mm, making it suitable for agricultural production. The vegetation is predominantly guinea savannah, which supports the cultivation of arable crops such as maize, sorghum, rice, cassava, and yam. Agriculture remains the dominant economic activity in the state, with a significant proportion of the rural population engaged in crop farming, livestock production, and agricultural trading. The study specifically focused on Edu, Baruten, Kaiama, and Patigi Local Government Areas due to their high concentration of cereal crop farming activities.

**Sampling Techniques and Sample Size**

The respondents were selected using a multi-stage sampling method. The first stage involved purposive sampling of the four Local Government Areas namely Edu, Baruten, Kaiama and Patigi, due to their intensive involvement in maize and sorghum production. The second stage involved the random selection of two farming communities from each of the Local Government Areas, giving a total of 8 farming communities. To identify and recruit active maize and sorghum farmers in the selected communities, snowball sampling was employed in the last stage, where initial respondents helped identify other eligible respondents involved in cereal crop production and marketing. A total sample size of 91 respondents was selected for the study.

**Data Collection**

Structured questionnaires were administered and face-to-face interviews were conducted with farmers of maize and sorghum in the selected communities to gather primary data. The questionnaire aimed to collect relevant data regarding socio-economic attributes, farm production operations, market participation behaviour and institutional factors affecting agricultural commercialization of the respondents.

**Data Analysis**

Data collected were analysed using both descriptive and inferential statistical techniques. Market participation was assessed using the Market Commercialization Index (MCI), which is the ratio of the gross value of crop sales to gross value of total crop production, multiplied by 100. Farmers were classified according to the computed values as ≤50, 51–60, 61–70 and >70 percent commercialization. The index was dichotomised as market participants (MCI > 50%) and non-participants (MCI ≤ 50%) for econometric analysis. The binary nature of the dependent variable made a Probit regression model suitable for the analysis of the factors that influence market participation. The explanatory variables were gender, age, marital status, household size, level of education, ownership of personal transport, access to credit, farm size, farming experience, distance to market, association membership, and access to extension services. Maximum likelihood estimation was used to estimate the model and the log likelihood ratio, likelihood ratio chi-square and pseudo R<sup>2</sup> statistics were used to assess model fitness.

**Probit Regression Model**

This model was used in analysing the factors that influence the farmers decision to participate in marketing of their produce. Thus, the probit model could be written as

$$\Pr(Y = 1|X) = \Phi(X\beta) \dots\dots\dots(1)$$

Where pr(Y=1|X) is the probability of participating in market activities given the independent variables X

Where:

Y= is binary variable representing the decision to participate in market activities (participate=1, not participate=0)

X<sub>1</sub> = Gender (Male = 1, Female = 0)

X<sub>2</sub> = Age (years)

X<sub>3</sub> = Marital status (married=1, not married=0)

X<sub>4</sub> = Household size

X<sub>5</sub> = farming experience (years)

X<sub>6</sub> = Cooperative association membership (1 = Yes, 0 = No)

X<sub>7</sub>= Access to extension services (1 = Yes, 0 = No)

X<sub>8</sub> = Access to credit (1 = Yes, 0 = No)

X<sub>9</sub>= Distance to market (km)



- X<sub>10</sub> = Have personal transport (1 = Yes, 0 = No)
- X<sub>11</sub> = farm size (hecters)
- X<sub>12</sub> = Level of education
- α<sub>0</sub> = Intercept,
- α<sub>1</sub>, α<sub>2</sub>, α<sub>3</sub>..... α<sub>9</sub> = coefficients
- e = Error term

**RESULTS AND DISCUSSION**

**Level of Market Participation**

This subsection presents the distribution of maize and sorghum farmers according to their level of market participation using the Market Commercialization Index. The index measures the proportion of total farm output sold in the market relative to total production and provides an indication of the extent to which farmers are commercially oriented. Farmers were categorized into different commercialization levels to capture variations in their engagement with output markets. The results therefore provide insight into whether farmers operate primarily at subsistence, semi-commercial, or highly commercial production levels.

**Table 1:** Distribution of Respondents by Level of Participation (Market commercialization index)

<b>Crop</b>	<b>Participation Level (%)</b>	<b>Frequency</b>	<b>Percentage (%)</b>	<b>Mean</b>
<b>Maize (N = 53)</b>	≤50	16	30.2	54.21
	51–60	25	47.2	
	61–70	10	18.9	
	> 70	2	3.8	
	<b>Total</b>	<b>53</b>	<b>100.0</b>	
<b>Sorghum (N = 38)</b>	≤50	16	42.1	52.58
	51–60	15	39.5	
	61–70	6	15.8	
	> 70	1	2.6	
	<b>Total</b>	<b>38</b>	<b>100.0</b>	

Researcher’s Computation (2026)

The distribution of respondents by level of market participation based on the Market Commercialization Index (MCI) showed that most farmers operate within the moderate commercialization category (51–60%). Among maize farmers, the mean commercialization index was 54.21, indicating a moderate level of market engagement. Nearly half of the maize farmers (47.2%) fell within the 51–60% participation range, while 30.2% recorded commercialization levels of 50% or below, suggesting limited market orientation. Only a small proportion (3.8%) exceeded 70% commercialization, indicating that relatively few maize farmers operate at highly commercial levels.

Likewise, sorghum farmers had a mean commercialization index of 52.58, which was also considered moderate, but lower than maize farmers. Approximately 39.5% of sorghum farmers were in the 51–60% commercialization category, whereas a higher proportion (42.1%) had commercialization rates of 50% or less, indicating that sorghum farmers were less engaged in the market than maize farmers. Highly commercialized sorghum farming is still limited with only 2.6% of sorghum farmers reaching more than 70% commercialization. Overall, the results indicate that maize and sorghum growers are moderately commercialized, with maize growers being relatively more market-oriented.

**Factors Influencing Market Participation among Arable Crop Farmers in Kwara State**

This subsection examines the determinants of market participation among maize and sorghum farmers in the study area. A Probit regression model was employed to estimate the probability of farmers participating in output markets based on selected socio-economic, institutional, and farm-specific variables. The analysis identifies the key factors that either promote or constrain farmers’ ability to engage in agricultural markets. Understanding these determinants is essential for designing policies and interventions aimed at improving agricultural commercialization and strengthening smallholder farmers’ integration into output markets.



**Table 2** Factors Influencing Market Participation among Maize Farmers

Variable	Coefficient	Std. Err.	z-value	P> z
Constant	0.344***	0.101	3.403	0.001
Gender	-0.073	0.181	-0.403	0.687
Age	0.291**	0.112	2.598	0.009
Marital Status	-0.167	0.247	-0.675	0.500
Household Size	-0.221**	0.109	-2.021	0.043
Level of Education	0.271**	0.118	2.297	0.022
Have Personal Transport	0.143	0.321	0.445	0.657
Access to Credit	0.681***	0.254	2.682	0.007
Farm Size (Acres)	0.391**	0.194	2.021	0.043
Farming Experience	- 0.201	0.189	-1.063	0.288
Distance Farm to Market	- 0.188	0.176	-1.067	0.286
Belong to Association	0.207	0.246	0.841	0.400
Access to Extension	-0.128	0.612	-0.209	0.835

Log likelihood = -14.744

LR Chi-square = 22.591

Prob > Chi-square = 0.019

Pseudo R<sup>2</sup> = 0.315

As revealed in Table 2, age ( $P<0.05$ ), household size ( $P<0.05$ ), education ( $P<0.05$ ), access to credit ( $P<0.01$ ) and farm size ( $P<0.05$ ) were positive and significant in influencing the participation maize farmers in market,

The beneficial effect of age implies that older farmers have higher chances to participate in maize markets due to the experience in farming, the high control of resources and proper knowledge of the market channels. This result suggests the conclusion of Abate *et al.* (2021), who demonstrated that experience allows cultivating farmers to bargain prices better, establish better buyer relations, and engage in commercial transactions more effectively. On the same note, the importance of education means that farmers who are more educated are more commercial oriented as they have better access to information and can make better decisions. This finding is consistent with Osagiede (2024) and Ochieng *et al.* (2019) who stated that educated farmers are in a better position to embrace better technologies, market information, and strategic production decisions. Besides this, Siddique (2011) pointed out that better knowledge and skills lead to better service quality and performance that eventually helps to build a stronger participation in the market.

Availability of credit came out as the most predictive positive factor of market involvement, and it points to the relevance of financial liquidity in allowing farmers to acquire inputs, grow production, and meet marketing expenses. This conclusion endorses the previous research of Feder *et al.* (1990) and Karlan *et al.* (2014), who stressed that having access to credit improves the investment capacity, input utilisation, and willingness of the farmers to become members of the output markets. Similarly, the positive and significant impact of farm size confirms the commercialization theory and also agrees with the results of Dillon and Barrett (2017), which underlines the fact that larger farms have more chances of producing marketable surplus and thus engage in the markets. The adverse effect of household size, in its turn, corroborates the findings of Alene *et al.* (2008), Dillon and Barrett (2017), who suggested that larger households can store more produce to be used at home, thus reducing the amount to be sold. In this study, the variables of extension services and association membership were not statistically significant, unlike the results of Asfaw *et al.* (2022) and Konja and Mabe (2023), but the overall findings prove that demographic, educational, financial, and structural variables continue to be the key determinants of the participation of maize farmers in the markets.



**Table 3:** Factors Influencing Market Participation among Sorghum Farmers

Variable	Coefficient	Std. Err.	z-value	P> z
Constant	-0.207**	0.095	-2.176	0.030
Gender	0.042	0.168	0.248	0.804
Age	-0.051	0.134	-0.379	0.705
Marital Status	0.126	0.247	0.511	0.609
Household Size	0.088	0.206	0.428	0.669
Level of Education	0.167	0.142	1.175	0.240
Have Personal Transport	-0.139	0.339	-0.410	0.682
Access to Credit	0.599**	0.247	2.423	0.015
Farm Size (Acres)	0.557***	0.207	2.691	0.007
Farming Experience	-0.013	0.182	-0.071	0.943
Distance Farm to Market	-0.441**	0.195	-2.261	0.024
Belong to Association	0.524**	0.232	2.259	0.024
Access to Extension	0.604**	0.246	2.456	0.014

Log likelihood = -15.955

LR Chi-square = 14.137

Prob > Chi-square = 0.031

Pseudo R<sup>2</sup> = 0.306

Table 3 gives the Probit regression estimates that look at the determinant of participation by the sorghum farmers in the market. These findings indicated that access to credit ( $P < 0.05$ ), the size of the farms ( $P < 0.01$ ), the membership to the association ( $P < 0.05$ ), and access to extension services ( $P < 0.05$ ) were positive and significant in determining the likelihood of involvement of sorghum farmers in markets. While distance to market the proximity to the market ( $P < 0.05$ ) was negatively related to market participation. These findings suggest that access to finances, productive factors, institutions, and spatial market access are important factors that determine commercialization of sorghum.

The beneficial effects of credit availability implies that more well-off farmers can afford inputs, scale up their production, and deliver the products to the marketplace, therefore, raising their degree of business activity. This observation is in line with Ali *et al.* (2020), Hazell *et al.* (2020), and Asfaw *et al.* (2022), who revealed that financial access increases the productive capacity of the farmers and helps them to better engage in the output market. Likewise, the positive influence of the farm size is in favour of the theory of commercialization, which underlines that the larger landholding is, the more output is produced and the more marketable surplus can be produced. Farmers who own more farmlands are hence better positioned in diversifying their production choices, taking in production hazards, and practising market-oriented farming.

On the other hand, distance to market had a negative impact and significant effect on participation meaning that longer distance will raise transportation costs and limitations to access the market hence disheartening commercialization. This finding corroborates the results of Changalima and Ismail (2022), who indicated that the lack of infrastructure and distance is a significant obstacle to rural market participation. Moreover, being a member of the association had a positive impact on the participation, which leads to the conclusion that collective action can enhance information flow, price negotiation, and marketing opportunities access as presented by Fischer and Qaim (2018) and Bernard *et al.* (2019). Significant impact of extension services also is consistent with Jayne *et al.* (2020) and Yee *et al.* (2010) who stressed that the technical capacity of farmers, their productivity, and market preparedness are improved with the help of advisory service. In addition, the finding aligns with that of Wambura (2025) that observed capacity-building platforms and institutional support systems enhance the behavioural and performance outcomes among smallholder farmers. In general, the results suggest that the commercialization of sorghum is mostly motivated by the structural combination of financial accessibility and land sources, institutional support facilities, and spatial market factors.



## CONCLUSIONS AND RECOMMENDATIONS

The study concludes that age, education, household size, access to credit and farm size were significant predictors of maize farmers participation in market whereas access to credit, farm size, distance to market, association membership and extension services were important predictors of sorghum commercialization. Based on the findings of the study, the following recommendations are proposed:

1. Financial institutions and government programs should expand affordable credit schemes for smallholder farmers to enable them to purchase improved inputs, expand production, and participate more actively in output markets.
2. Extension agencies should intensify farmer training and advisory services to improve farmers' technical knowledge, productivity, and market orientation.
3. Encouraging farmers to participate in organized groups can enhance collective marketing, improve bargaining power, and facilitate access to market information and financial services.
4. Investments in rural road networks, transportation systems, and market facilities are necessary to reduce transaction costs and improve farmers' access to profitable markets.
5. Policies that facilitate access to land, improved seed varieties, and modern farming technologies can increase farm productivity and generate the surplus required for commercialization

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