



Factors Influencing Tomato Farmers' Market Participation and Constraints in Production

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Abstract

Smallholder market participation is imperative for agricultural growth and development leading to a structural transformation of the agricultural sector which entails a reduction in poverty and food insecurity among rural households in sub-Saharan Africa. This study investigates the factors influencing smallholder farmers' participation in tomato marketing in Akinyele Local Government Area, Oyo State, Nigeria. The objective is to understand the level of participation and the determinants affecting it. The study employs a multistage sampling technique, resulting in 217 usable responses from tomato farmers. The socio-economic characteristics of respondents are described, revealing that the majority are male (94.9%), married (71.9%), and primarily engaged in farming (79.3%). The analysis employs the Market Participation Index (MPI) and a Probit regression model to assess the factors influencing market participation. The findings suggest that 74.7% of farmers have a high level of participation in tomato markets. The Probit regression identifies significant factors affecting participation: marital status, farm size, and source of capital. Being married and having a larger farm size are associated with reduced market participation, while increased access to capital positively impacts participation. The study contributes to understanding the dynamics of smallholder farmers' engagement in market activities, highlighting the importance of financial support in promoting agricultural commercialization. Policymakers and stakeholders can utilize these insights to design targeted interventions that enhance market participation and contribute to rural development.

Keywords: Commercialization, market activities, smallholder farmers, tomato marketing, Probit regression, and constraints

Introduction

The main objective of agricultural commercialization is the achievement of food self-sufficiency (Osmani and Hossain, 2015). The benefits of commercialization/market participation of smallholder farmers include job creation, increased labour and profit incomes, as well as agricultural profits obtained from sales of surplus production (Mtaki and Sage-el, 2017). Furthermore, smallholder market participation is imperative for agricultural growth and development leading to a structural transformation of the agricultural sector which entails a reduction in poverty and food insecurity among rural households in sub-Saharan Africa (Owusu and Nketia, 2019). Moreover, markets act as avenues for increasing rural incomes, particularly for these rural farming households (Adeoti *et al.*, 2014). However, the participation of smallholder farmers in competitive markets has been hindered due to factors such as remoteness, inadequate transport and storage facilities,

bad roads, and inadequate access to market information especially on products and prices (World Bank, 2007). Despite this, the availability of modern technologies and government support has resulted in the commercialization of agricultural production systems though there is still a need for improvement in commercialization (Osmani and Hossain, 2015). Specifically, horticultural and dairy products are noted as means of achieving agricultural commercialization through the promotion of value addition to these high-value agricultural commodities, as they support agribusiness and link farmers with markets (World Bank, 2007).

Tomato is a high-value horticultural crop which has a range of value-added products; thus, it can be considered a viable source of agricultural commercialization for the smallholder farmers engaged in its production. Therefore, the objectives of this study

were to determine the level and factors that affect farmers' participation in tomato marketing in Akinyele Local Government Area, Oyo State.

Methodology

The Study area

This study was carried out in Akinyele Local Government Area of Oyo State, Nigeria. It is one of the 23 Local Government Area in Ibadan, Oyo State. It lies between latitude 7°34'N and 7°47'N and longitude 3°33'E and 3°45'E. The Local Government Area has a land area of 575 square kilometres and it shares a boundary with Ibadan North Local Government Area in the south, Afijo Local Government Area in the north, Lagelu Local Government Area in the east and Ido Local Government Area in the west. It has a population size of 239,745 according to 2006 population census figures (NPC, 2006). The major occupation of the people residing in the area are farming, carpentry, trading, marketing, food processing as well as carving work. Akinyele is heterogeneously populated by Nigerian tribes such as Ibo, Yoruba, Nupe, Hausa, Fulani etc. and the crop types cultivated in the area include vegetables, maize, plantain, cassava etc.

Sampling procedure

The study population is tomato farmers in Akinyele Local Government Area of Oyo State. A multistage sampling technique was adopted in the selection of the respondents; the first stage was purposive sampling of tomato farmers in the study area (Akinyele Local Government Area). The second stage was the random selection of 11 wards and 2 villages were randomly sampled in each ward. The last stage was a random selection of 10 respondents from each of the villages. A total of 220 respondents were selected, and a well-structured questionnaire was used to elicit information from the tomato farmers. Information was collected on farm size, labour used, and cost of transportation, access to capital, quantity of produce and socio-economic characteristics of respondents such as major occupation years of farming experience, educational status and household size of the respondents. However, 217 questionnaires were found to have complete information and were used for the analysis.

Data Analysis

The analytic techniques adopted include descriptive statistics such as frequency and percentage, while the Market Participation Index (MPI) was calculated and the Probit regression model was also used.

$$MPI = \left(\frac{\text{Gross value of crop sold}}{\text{Gross value of all crops produced}} \right) \dots (1)$$

Market Participation Index was classified based on the threshold of index value between 0.8-1.0 as high-level market participants (commercialized) farmers and 0.1 – 0.79 as low-level market participants (subsistence) farmers (Randela *et al.*, 2008). The procedure for analyzing the probit model starts with identifying the dependent variable, which is a dummy and can assume only two values (either 0 or 1). It acts as a transformation from sigmoid to linear and then runs a regression on the

relationship. A probit regression model was used to test for the level of significance between the response variable/ dependent variable (y) and the independent variable (x).

$$P_{(y=1)} = f(z_1) = \frac{1}{\sqrt{2\pi}} \sum_{-\infty}^{z_1} \frac{e^{-u^2}}{2} \dots (2)$$

Where the unobservable z_1 is a linear combination of the observable explanatory variables.

The explicit functional form used in the linear function is given below:

$$Y = \alpha_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + \beta_{11} x_{11} + e \dots (3)$$

Where,

Y = Level of farmers' market participation (Dummy: 1 high participation, 0 otherwise)

α_0 = Intercept

x_1 = Sex (gender) (Dummy: 1 = male; 0 otherwise)

x_2 = Age of the household head (years)

x_3 = Marital status of the household head (single = 1, married = 2 etc.)

x_4 = Household size (number of persons)

x_5 = Educational status (years spent in school) x_6 = Major occupation Distance to market (km)

x_7 = Farming experience (years)

x_8 = Farm size (Ha)

x_9 = Access to market information on price (Dummy: 1 = Yes, 0 otherwise)

x_{10} = Average transportation cost (N)

x_{11} = Access to capital (Dummy: 1 = Yes, 0 otherwise)

e = Error term

Results and Discussion

Socio-economic characteristics of respondents

This section provides an overview of the socio-economic characteristics of the respondents, offering insights into the demographics of the smallholder farmers engaged in tomato production and marketing. The majority of respondents (94.9%) are male, highlighting the predominant role of men in tomato farming and marketing activities in the study area, Table 1. This might reflect traditional gender roles in agriculture, where men are often more involved in cash crop cultivation. The predominance of male farmers highlights the need to address gender disparities in agricultural activities, ensuring that women have equal access to resources and opportunities. The age distribution shows that a significant portion of respondents (36.4%) falls within the 31-40 age group. This suggests that middle-aged individuals are actively participating in tomato farming and marketing, possibly due to their experience and maturity. The prevalence of middle-aged farmers suggests that experience and knowledge play a crucial role in market participation. Efforts to support younger farmers and transfer knowledge from experienced farmers could enhance market engagement. The majority of respondents (71.9%) are married. Marital status could have implications for market participation, as the responsibilities associated with family life might influence the time and resources available for marketing

activities. The data indicate that a significant portion of respondents (64.1%) have household sizes of less than 10 members. Smaller households might have more flexibility and resources available for engaging in market activities. About half of the respondents (48.8%) have secondary education. This suggests a moderate level of literacy, which could positively impact the farmers' ability to access market information and adopt new agricultural practices. The majority of respondents (79.3%) have farming as their major occupation. This underscores the significance of agriculture as the primary livelihood activity in the study area. About 20.7% of the farms primarily rely on family labour, indicating a preference for self-sufficiency or potential limitations in hiring labour. A majority of farms, 61.3%, hire labour, suggesting a larger workforce and potential for commercialization and a higher level of market participation. About 18% of farms use a combination of family and hired labour, striking a balance between self-reliance and scalability. Consequently, the implications are; that farms that rely solely on family labour may face limitations in terms of labour availability and scalability. Farms using hired labour might have more potential for growth but should consider the cost implications and reliance on external factors. Farms combining family and hired labour have the advantage of flexibility and reliability. The majority of farms, 67.3%, have small farm sizes of less than 1 hectare, indicating potential challenges in achieving economies of scale. Farms in the 1.1-2.0-hectare category make up 16.1% of the respondents, presenting opportunities for modest market participation. The remaining farms are distributed across larger farm size categories, with fewer farms having land sizes above 3 hectares. However, smaller farm size dominates in the study area, implying a need for support in terms of technology and market access. Larger farm sizes offer opportunities for commercial farming but require careful resource and labour management. These findings can guide policymakers, agricultural extension services, and farmers in making informed decisions regarding labour management, farm size optimization, and resource allocation. A considerable portion of respondents (60.9%) have less than 10 years of farming experience. This might indicate a relatively young farming population, with implications for their level of knowledge and expertise.

Distribution of respondents based on farmers' participation in marketing tomato

This section provides insights into the distribution of respondents based on their level of participation in tomato marketing. The majority of respondents (74.7%) are classified as having a high level of participation in tomato markets (Table 2). This indicates that a significant portion of farmers is actively engaged in market activities, which aligns with the objective of agricultural commercialization (Megerssa *et al.*, 2020). It suggests that many farmers are willing to participate in market activities to generate income and enhance their livelihoods. About a quarter of the respondents (25.3%) in the study area have a low level of

participation in tomato markets. These farmers might be more focused on subsistence farming and have limited involvement in market-oriented activities (Dube, *et al.*, 2020). The presence of farmers with low market participation emphasizes the need to address barriers that hinder their engagement. Understanding the factors influencing this low participation can guide targeted interventions to promote market-oriented practices. Tables 1 and 2 collectively provide insights into the demographics, characteristics, and levels of engagement of smallholder farmers in tomato marketing. These insights help policymakers, development organizations, and agricultural extension services tailor their interventions to address the specific needs and challenges faced by farmers in the study area. By understanding the socio-economic context and levels of participation, stakeholders can design more effective strategies to promote agricultural commercialization, enhance rural livelihoods, and contribute to overall rural development.

Factors influencing farmers' participation in tomato marketing

This section shows the factors influencing the level of farmers' participation in tomato markets (Table 3). The R-squared value suggests that the model explains about 59.7% of the variation in farmers' market participation. This indicates that the included variables collectively have a moderate explanatory power. The F-test assesses the overall significance of the model. A larger F-statistic indicates a better fit of the model. In this case, the value of 3.648 suggests that the model is statistically significant in explaining the variation in market participation. The coefficient of marital status (-0.187) is negative and statistically significant ($Z = -2.059$). Being married hurts tomato farmers' participation in the market. This suggests that married farmers are less likely to actively participate in tomato marketing compared to their unmarried counterparts. The significance of this variable indicates that marital status is an important factor influencing farmers' choices in participating in the market. The economic implications are that married farmers may have more responsibilities within their households, which could limit the time and resources they can allocate to marketing activities (Egbetokun and Amao (2022)). It also implies that policies or programs aimed at increasing market participation should consider the potential constraints faced by married farmers. The finding is similar to the finding of the study carried out by Afolabi and Salawu (2017). The negative coefficient of farm size (-0.021) is statistically significant ($Z = -1.861$). Larger farm sizes are associated with reduced market participation in the study area. Farm size hurts farmers' market participation. A unit increase in farm size reduces the likelihood of a farmer actively participating in tomato marketing in the study area. The finding is the opposite of the finding of the study carried out by Dube, Ddamulira and Maphosa, (2020). This suggests that larger farms might face constraints or trade-offs that limit their engagement in the market. Larger farms may face challenges related to economies of scale or labour

constraints, which could reduce their incentive or ability to participate actively in the market (Asuming-Brempong and Adu, 2018). This finding suggests that smaller farms may be more flexible and better positioned to engage in tomato marketing. Policymakers should consider the needs of larger farms, possibly providing support to overcome these barriers and maximize their market participation. Support mechanisms, such as improved access to markets or post-harvest infrastructure, may be necessary to alleviate the barriers faced by larger farms in participating in tomato marketing. The positive coefficient of access to capital (0.027) is statistically significant ($Z = 0.633$). This result highlights the significance of financial resources for farmers and the positive impacts on market participation. This suggests that financial resources enable farmers to engage more actively in markets in the study area. Farmers with access to capital are more likely to invest in inputs, technology, and transportation, all of which can enhance their participation in the market. Ensuring farmers have access to credit or capital sources can stimulate economic growth in the agricultural sector, leading to increased production and income. This finding is in line with the findings of the study conducted by Adeoti *et al.*, (2014), and Egbetokun *et al.*, (2017). This suggests that farmers who have access to capital from various sources are more likely to engage actively in tomato marketing. Facilitating access to capital for farmers, whether through credit facilities, grants, or other means, can significantly enhance their participation in the tomato market. This result underscores the importance of financial support mechanisms for smallholder farmers.

Conclusion

In conclusion, this study sheds light on the dynamics of smallholder farmers' participation in tomato marketing in Akinyele Local Government Area, Oyo State, Nigeria. The findings highlight both the significant level of participation and the influential factors that shape farmers' engagement in the market. The socio-economic characteristics of the respondents paint a picture of predominantly male, married, and relatively young farmers who primarily rely on farming as their major occupation. This demographic composition underscores the role of smallholder farmers in contributing to the agricultural sector and the local economy. The high level of participation in tomato markets, with most of farmers actively engaging, is a positive indicator of the potential for agricultural commercialization in the region. This demonstrates that smallholder farmers are eager to capitalize on market opportunities and maximize their profits through value addition to their produce. However, the study also reveals variations in participation levels influenced by certain factors. The Probit regression analysis identifies four key factors that significantly influence market participation: marital status, farm size and access to capital. The negative relationship between being married and market participation suggests that household responsibilities associated with marital status might limit farmers' ability to engage more extensively in market activities.

Similarly, larger farm sizes appear to have a constraining effect, potentially due to the increased demands of managing larger plots of land. On the other hand, increased access to capital is indicative of the critical role that financial resources play in enabling farmers to participate more actively in markets. Enhanced access to capital provides farmers with the resources necessary for investment and scaling up their operations. This study underscores the importance of creating an enabling environment for smallholder farmers to participate effectively in market activities. Policymakers, development agencies, and stakeholders should focus on providing financial support to farmers. By addressing these factors, the agricultural sector can experience further growth and transformation, leading to poverty reduction, increased food security, and improved rural livelihoods. As the agricultural landscape continues to evolve, understanding and addressing the factors influencing market participation among smallholder farmers will remain crucial for sustainable agricultural development and rural prosperity.

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Table 1: Socio-economic characteristics of respondents (n=217)

Variables	Frequency	Percentage
Gender		
Male	206	94.9
Female	11	5.1
Age		
<20	11	5.1
21-30	45	20.7
31-40	79	36.4
41-50	46	21.2
51-60	35	16.1
61 and above	1	0.5
Marital Status		
Single	57	26.3
Married	156	71.9
Divorced	4	1.8
Household Size		
<10	139	64.1
11-20	60	27.6
21-30	16	7.4
31 and above	2	0.9
Educational Status		
No formal Education	51	23.5
Primary Education	42	19.4
Secondary Education	106	48.8
Adult Education	18	8.3
Major Occupation		
Farming	172	79.3
Marketing	45	20.7
Source of Labour		
Family	45	20.7
Hired	133	61.3
Family and Hired	39	18
Farm size (ha)		
<1.0	146	67.3
1.1-2.0	35	16.1
2.1-3.0	24	11.1
3.1-4.0	9	4.1
4.1-5.0	2	0.9
5.1 and above	1	0.5
Farming Experience (years)		
<10	130	60.9
11-20	45	20.7
21-30	35	16.1
31 and above	7	3.2

*Source: Field Survey, 2021***Table 2: Distribution of Respondents Based on their Level of Participation in Marketing Tomato (n=217)**

Variables	Frequency	Percentage
High Level of Participation in Marketing		
Yes	162	74.7
No	55	25.3

Source: Field Survey, 2021

Table 3: Factors influencing farmers' participation in tomato marketing (n= 217)

Parameter	Coefficient	Std. error	t-value
Sex	-0.065	0.088	-0.735
Age	0.007	0.005	1.616
Marital status	-0.187	0.091	-2.059**
Household size	-0.010	0.006	-1.535
Educational status	0.023	0.047	0.495
Major occupation	0.053	0.202	0.260
Farming experience	0.006	0.006	1.037
Farm size	-0.021	0.011	-1.861**
Access to market information on price	-0.040	0.101	-0.395
Average transportation cost	0.000	0.000	-0.867
Access to Capital	0.027	0.043	0.633**
Intercept	-2.469	0.266	-9.266
R ²	0.597		
F	3.648		

*Source: Field Survey, 2021. **- 5% level of significance*