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DETERMINANTS OF MARKET PARTICIPATION AMONG SMALLHOLDER STAPLE CROP FARMERS IN OYO STATE, NIGERIA

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ABSTRACT

This study examined the determinants of market participation among smallholder staple farmers in Oyo state. Multistage sampling technique was employed to select 356 respondents. In the first stage, 40 villages were selected in the 4 zones according to the presence of food crops farmers. In the second stage, households were randomly selected based on whether they participate or not in cassava and yam production. Two percent of the registered farmers were proportionately selected based on the number of staple food farmers. Analytical technique employed included descriptive statistics and Ordered probit. Descriptive statistics was used to describe the quantitative data while Ordered probit model was used to analyse the factors influencing the market participation of cassava and yam farmers in the study area. The results showed that the mean age of the respondents was 46years, their mean household size was 5 and 11 years of formal education. The mean years of experience was 19 years. The coefficients of age, gender and market information were statistically significant for net buyers, autarkic and net sellers of cassava. Similarly, for net buyers of yam, age, gender, household size, years spent in school and contract marketing, were statistically significant. Also, for autarkic and net sellers of yam, coefficients of age, gender, marital status, household size, years spent in school and contract marketing were statistically significant. It was concluded that the coefficients of age and gender significantly influenced a net buyer, autarkic and a net seller of cassava and yam respectively and recommended policy-makers to address the problem of market participation and level of participation among food crop farmers.

Keywords: ***Staple foods, net buyer, net seller, autarkic, Ordered probit model***

INTRODUCTION

In developing countries, smallholders produce between 60 and 80 percent of the food consumed and generate approximately between 40 and 60 percent of total rural income. Smallholder can be measured in terms of the farm size which is used to classify farmers into small and large. Although smallholder families live in farms which in many countries are significantly smaller than 2 hectares but they produce most of the food consumed in the developing world and their productivity growth has slowed down and is generally lagging. Policies should target them to increase productivity and investment, this will enhance food security- targeting nutrition, health and education, social protection can help subsistence smallholders to escape poverty traps and enter into a virtuous cycle of higher productivity and income generation. This is the cornerstone of the agricultural development policy thinking and the reason for the focus on smallholders. (Rapsomanikis, 2015). Smallholder farmers operate small-scale farms and resort to unmechanized labour-intensive production; small-scale farming absorbs 80 percent of all farmers and accounts for 90 percent of food production (Lowder *et al.*, 2021; Unsal *et al.*, 2020). Smallholder farmers with their own means of transportation are likely to

participate in the market because it leads to the reduction in the marginal cost of movement (Kondo *et al.,* 2019). Smallholder farmers lack the marketing knowledge and skill to sell their products, however, many of them often opt for lower prices at farm gate or in the local markets (Gyau *et al.,* 2016). Also, a smallholder could access the market either by selling to a buyer at the farm gate or physically transporting the produce to a market place using available means and also, good road condition and access to information were positively influential to farmers' participation and market access due to their effects on reducing transaction costs (Sebatta *et al.* 2014). The decision to participate in markets is not only influenced by prices, but also several other factors which are characteristic of both the farming household and environment in which the smallholder farmers and intermediaries operate. It is a problem for farmers to obtain a fair price when they market their products to brokers at the farm gate.

Global food prices have increased nearly 52 percent since 2019, driven by the global pandemic and shortages caused by the war in Ukraine (Okou *et al.,* 2022). Imported staple food prices have risen more than the costs of domestically produced staples over the last decade (2012-21); the prices of both cassava and maize in Nigeria are more than doubled, high food prices fuel headline inflation and, if not curbed, may undermine macro-economic stability (Okou *et al.,* 2022). Considering the consumption data from Food and Agricultural Organization (FAO) food balance sheets, the most consumed staple foods are selected by averaging the daily per capita caloric intake of each staple across countries. The staple foods are identified based on their average contribution to individual diets. A typical consumption basket is broadly made up of two types of staples: cereals and starchy roots. On average, cereals – such as maize, rice, and wheat – and starchy roots- such as cassava, sweet potatoes and potatoes account for almost two-thirds of daily caloric intake, the other third of daily food consumption comprised of vegetable oils, sugar, fruits, meat, and pulses. The five most consumed staples in SSA are maize, rice, cassava, wheat and palm oil, which contribute to about 54 percent of the average daily per capita caloric intake. The total quantity of food crops produced, farming experience, access to agricultural extension service, size of land used for cultivation, membership in cooperatives and household family size are important factors determining the level of commercialization of smallholder farms (Ele et al., 2013).

A food staple is a food that makes up the principal part of a population's diet. Food staples are eaten regularly, daily and supply a major proportion of a person's energy and nutritional needs. Most food staples are inexpensive and are plant-based foods. They are full of calories for energy. Cereal grains and tubers are the most common food staples. Although staple foods are nutritious, they do not provide the full, healthy range of nutrients. People must add other foods to their diets to avoid malnutrition (Stanley, 2023).

Market participation refers to the markets actors' decision on whether to be involved or not in the flow of products from producers to end users (Yaynabeba, 2013). Market participation has led to the rural road development, rural electrification, industrialization, as market participation extends some marketing activities, like sorting, processing, grading, and transportation, which development marketing activities (Mmbando, *et al.,* 2015; Tarekegn *et al.,* 2017). Most farmers who participated in the market tend to be food secure because the income they got from the sale of their output has enabled them to purchase other food items. Market

participation in rural households is an important strategy for poverty alleviation and food security. This implies that market participation pave the way for basic amenities to be available in remote areas and this bring high agricultural productivity.

The intensity of participation refers to the quantities of commodity sold by either party in a defined time period. The intensity of market participation positively influenced a household's access to credit, output price and ownership of tents (Macharia *et al*. 2014). A household that is a net seller of food crops sells more of it on the market either in weight or in value than what they buy on the market for a given season or a year. A net buyer of food crops buys more of it either in weight or value on the market than they sell for a given season or a year. Also, autarkic means a household that neither buys nor sells food crops. (Longman Business Dictionary, 2007). Farmers' market access raises their income, reduces poverty, and improves general welfare, and increases production and productivity since markets create a pull for the production systems (Arias *et al.,* 2013; Kangile *et al.,* 2020). Farmers' characteristics, farmers' risk perspective and transaction costs, influenced smallholders' decisions such as choices between alternative markets options (Mabuza *et al.,* 2014; Siddique *et al.,* 2017; and market participation (Mmbando *et al*., 2015). The choice of marketing agricultural products is measured by certain levels of profitability and cost (Soe *et al.,* 2015). A smallholder could access the market either by selling to a buyer at the farm gate or physically transporting the produce to a marketplace using available means.

Farm households located farther from a marketing centre rely on home-produced goods over market-produced goods and their degree of market participation reduces therefore, distance is a barrier to market participation (Wickramasinghe *et al*., 2014). Nearly, 1.5 billion smallholder farmers in the world are the world's poorest people (Shawn *et al.,* 2014). Farmers groups constitute platforms where members benefit from sharing information (Abdul-Hanan *et al*., 2014). The majority of smallholder farmers in developing countries fail to participate in the market due to high transaction costs involved. Moreover, collective action has become an important strategy for smallholder farmers in developing countries to remain competitive in rapidly changing markets and has been tagged as a means of reducing transaction costs (Gbadegesin and Popoola, 2020). Lack of credit facilities and inadequate agricultural inputs were some of the reasons the staple food farmers do not participate in the market (Oparinde and Daramola (2014).

It is in this context that this study attempted to examine the determinants of market participation among cassava and yam smallholder farmers in Oyo state. The findings from this study will contribute to the current government efforts of improving national food security through increased production of staple food crops such as yam and cassava. Also, it would be resourceful to policymakers and investors in their ways of identifying intervention areas for enhancing food crop farmers' market participation in the country. Therefore, this research addressed the following research objectives; 1) described the socio-economic characteristics and 2) analysed the factors influencing the intensity of market participation of smallholder staple farmers.

METHODOLOGY

Study Area

The study was carried out in Oyo State in Nigeria. It is located in the South-western part of Nigeria and lies between latitude 7^0 51'and 9.25^0N and longitude 3^0 55' and 52. 50^0E. Oyo state covers a total of 28,454 km^2 of land area. It borders Ogun State to the south, Kwara State to the north and Osun

State to the east. It also has an international border with the republic of Benin to the north. The state is made up of 33 local government areas with a total population of 5.581 million (National Population Commission [NPC], 2006). The climate in the state favours the cultivation of crops like maize, yam, cassava, millet, rice, and cashews. It is also a center of cash crop produce such as cocoa along with edible fruits like orange, banana, and pineapples. There is an abundance of clay, kaolin and aquamarine. Agriculture is the main occupation of the people. The climate is equatorial, notably with dry and wet seasons with relatively high humidity. The dry season runs from November to early March while the rainy season from March to October. The temperature ranges are 35 ^{O}C - 36 ^{O}C.

The sample frame of the study comprised of all cassava and yam farmers in the agricultural zone in Oyo State. A multistage sampling technique was employed to select the farmers. All four Agricultural Development Project (ADP) zones were involved which are Ibadan/Ibarapa, Oyo, Ogbomoso and Saki zones. A total of 356 food crop farmers formed the sample of the study in Oyo State in which one-third of selected local governments in each agricultural zone in Oyo State was selected. Secondly, the random selection of 50% of the cells in selected local governments was made and thirdly, 2% of the registered farmers were selected based on proportionately. Primary data were collected from selected food crop farmers through a structured interview schedule. Primary data collected were analysed using descriptive statistics and ordered probit model. The study was conducted in Oyo State, focusing on food crop farmers. Information on socio-economic characteristics, intensity of market participation was collected by using structured questionnaire between the months of June to September, 2019**.**

Analytical framework

A combination of analytical tools was employed in this study. These included descriptive statistics (e.g. means, frequency counts, and percentages) and ordered probit model. Descriptive statistics was used to analyse socio-economic characteristics of food crop farmers while ordered probit model was used to estimate factors influencing the probability of food crop farmers being a net buyer, autarkic or net seller.

Econometric approaches to modeling market participation

This study viewed market participation with the knowledge of bridging the existing gaps from previous studies. The decision to participate in marketing which most of the reviewed literature examined and the intensity of participation was a key advantage this brought to the existing literature. The application of triple hurdle to control for the heterogeneity of some of the variables was also an added advantage. The model equally was used to integrate participation decision and the level of participation as marketers are classified into net buyers, net sellers, and autarkic.

To determine the factors influencing market participation among smallholder staple crop farmers, the ordered probit model was used. Explanatory variables used in net sellers are used in net buyers and autarkic.

The important point is that buyers and sellers are on opposite “sides” of autarky. This study followed the approach of Burke *et al.* (2015). The model involves Ordered probit model to analyse net sellers, net buyers and autarkic. Multicollinearity could surface due to linear relationship among explanatory variables and the problem was that it caused estimated regression to have smaller t-ratio, high R^2 value, and large standard error with confidence interval (Gujarati, 2004). To solve the multicollinearity problem; some

methods were used, among them are probit post estimation and ordered probit post estimation. These were due to the fact that the analyses have been run before testing for multicollinearity.

In order to specify the likelihood function, the categorical variable is defined as ω_2 that takes the value 0 when $[y_1 - y_2 < 0]$, the value 1 when $[y_1 - y_2 = 0]$, and the value 2 when $[y_1 - y_2 > 0]$. Let x_1 be the variables explaining the first stage decision whether to produce or not to produce, x_2 be the variables explaining the decision to participate as a buyer or seller or remain autarkic. Ordered probit model was used to identify the marketing status of food crop farmers. Let d_1 represent the market participation of food crop farmers. The farmers' household market participation of food crops is represented by d_2. Ordered probit indicator function as y_2.

$$y_2 = 0\ [d_1 - d_2 > 0] \quad 1$$

$$y_2 = 1\ [d_1 - d_2 < 0] \quad 2$$

$$y_2 = 2\ [d_1 - d_2 = 0] \quad 3$$

where $y_2 = 0$ when the producing household is a net seller of food crops, $y_2 = 1$ when the producing household is a net buyer, and $y_2 = 2$ when the producing household is an autarkic of food crops.

The ordered probit model defines the latent variable y_2^*:

$$y_2^* = x_2\delta \cup_i \quad 4$$

where the random error term $\cup_i$ (unobserved factor influencing market participation) is assumed normal (Green, 2011) and x_2 is a vector of explanatory variable explaining market participation.

Assume $\propto_1 < \propto_2$ be unknown threshold parameters defined such that:

$$y_2^* = 0\ if\ y_2^* > \propto_2 \quad 5$$

$$y_2^* = 1\ if\ y_2^* < \propto_1 \quad 6$$

$$y_2^* = 2\ if\ \propto_1 < y_2^* < \propto_2 \quad 7$$

It is assumed that $\cup_i$ is normally distributed such that we can estimate the following probabilities:

$$Pr\ (y_2 = 1|x_2, \propto, \delta) = Pr\ (y_2^* \leq \propto_1 |x_2) = \Phi\ (\propto_1 - x_2\delta) \quad 8$$

$$Pr\ (y_2 = 2|x_2, \propto, \delta) = \Phi\ (\propto_2 - x_2\delta) - \Phi\ (\propto_1 - x_2\delta) \quad 9$$

$$Pr\ (y_2 = 0|x_2, \propto, \delta) = 1 - \Phi\ (\propto_2 - x_2\delta) \quad 10$$

Where $\Phi\ (\bullet)$ is the standard normal cumulative distribution function? The distribution of y_2 is the ordered probit:

$$f\ (y_2|x_2) = [\Phi\ (\propto_1 - x_2\delta]^{[y2=0]}\ [\Phi\ (\propto_2 - x_2\delta) - \Phi\ (\propto_1 - x_2\delta)^{[y2=1]}[1 - \Phi\ (\propto_2 - x_2\delta)]^{[y2=2]} \quad 11$$

Where

X_1 = Age (years)
X_2 = Gender (1 = male, 0 = female)
X_3 = Marital status (1 = Married, 0 = Not married)
X_4 = Household size (Actual number)
X_5 = Years spent in school (Actual years)
X_6 = Farming experience (Actual years)
X_7 = Association (1 = Yes, 0 = No)
X_8 = Contract marketing (1 = Yes, 0 = No)
X_9 = Distance from farm to market (kilometer)
X_{10} = Market information (1 = Yes, 0 = No)
X_{11} = Credit (1 = Yes, 0 = No)
β_0 = constant
β_1 to β_{11} = coefficients
μ = error term

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

Table 1 presented the summary of the socio-economic characteristics of the respondents

in the study area. It was revealed that the mean age was 46 years indicating that the food crop farmers were very agile and full of vigour and strength to carry out the laborious activities involved in agricultural production. Majority of the respondents were male and married. The result of the findings showed that more male participates than the female. This result contradicted that of Matsane and Oyekale (2014) where 59.6 % of the respondents were female. The mean household size was 5 persons. Singbo *et al*. (2021) reported household size of eight (8), and this was an indication of a large household size. Average number of years of f formal education among the respondents was about 11 years indicating that majority of the respondents had secondary education. This result disagreed the study of Boniphace *et al.* (2014) where majority (66.2 %) of the respondents had primary education and 8.6 % had secondary education. This was line with the work of Kondo *et al*. (2019) that majority of respondents had formal education. Having about 20 years of farming experience on average indicates that larger proportions of respondents are well experienced in food cropping. This finding was not in line with the work of Namazzi *et al.* (2015) where the average farming experience of respondents was 2.47 years.

Table 1: Socio-economic characteristics of Food crop farmer's household in Oyo State, Nigeria (n=356)

Variables	Description	Mean	Maxi	Mini	Standard Dev	
Age	Age of household head (years)	45.65	66.0	18.0	8.97	
Gender	Dummy for gender of household Head (male=1, female=0)	0.81	1.0	0.0	0.40	
Marital Status	Married = 1, Not Married = 0	1.08	5.0	0.0	0.62	
Household Size	Number of household members (actual)	5.31	10.0	1.0	2.09	
Years of Schooling	Number of years spent in school (years)		10.58	16.0	0.0	4.72
Farming experience	Years of farming (years)	19.76	50.0	1.0	11.20	

Source: author's computation from Field Data, 2013.

Factors Influencing Market Participation of Net Sellers Among Smallholder Staple Crop Farmers

Table 2 revealed the result of the ordered probit model for net sellers. The goodness of fit measured by the high Chi-square value of being net sellers were 41.8 and 102.6 for cassava and yam respectively. These values showed that the choice of explanatory variables included in the ordered probit model explained the variation. The log likelihood was -171.2 and -240.6 for cassava and yam respectively. The factors predicting the likelihood of being a net seller was presented in Table 2. From Table 2, age, gender, marital status, household size, years spent in school, and contract marketing were statistically significant for net sellers. The coefficients of age were positive and statistically significant at 10 % and 5 % for cassava and yam model respectively. This implied that the more the age of staple crop farmers increased, the more likely they were to be net sellers of cassava and yam by 0.75 % and 1.28 % respectively. The coefficients of gender were positive and statistically significant at 10 % and 1 % for cassava and yam respectively. This implied that as the number of male farmers increased, the more likely they were to be net sellers of cassava and yam by 9.79 % and 2.32 % respectively. This did not agree with the study of Burke *et*

al. (2015) where the average probability of a given female producer for a net seller was 70 % and the male – headed household was 63 %. Marital status was negative and statistically significant at 1 % for yam. This implied that the more the numbers of married male staple crop farmers increased by 1%, other factors remained constant, the less likely they were to be net sellers of yam by 46.38 %.

The positive sign coefficients of household size were statistically significant at 5 % for yam. This implied that the more the number of household members of staple crop farmers, the more likely they were to be net sellers of yam by 3.65 %. From the explanatory variable, farmers' years of education was positive and statistically significant at 5 % for yam. This implied that the more the years of education of staple crop farmers increased, the more likely they were to be net sellers of yam by 1.36 %. This finding agreed with Momanyi's (2016) where educational level of household head was positive and statistically significant at 10 %. The coefficient of market information was negative and statistically significant at 1 % for cassava. This implied that the more the staple crop farmers had access to market information the less likely they were to be net sellers of cassava by 13.17 %. This was not in line with the study of Momanyi (2016) where access to market information was positive and statistically significant at 5 %. The estimated coefficient of contract marketing was positive and statistically significant at 1 % for yam. This implied that the more the staple crop farmers had involvement in contract marketing other factor remained constant, the more likely they were to be net sellers of yam by 31.95 %. This was in line with the findings of Momanyi (2016) where contract marketing was positive and statistically significant at 1 %.

Factors Influencing Market Participation of Net Buyers Among Smallholder Staple Crop Farmers

Table 3 revealed the result of the Ordered probit for net buyers. The goodness of fit measured by the high Chi-square value for net buyers were 41.8 and 102.6 for cassava and yam respectively. This showed that the choice of explanatory variables included in the ordered probit model explained the variation. The log likelihood was -171.2 and -240.6 for cassava and yam respectively. From Table 3, age, gender, marital status, household size, years spent in school and contract marketing were statistically significant for net buyers. The result showed that the coefficient of age was negative and statistically significant at 10 % for cassava. This implied that the more the age of staple crop farmers increased, the less likely they were to be net buyers of cassava by 0.22 % while the coefficient of age was positive and statistically significant at 10 % level for yam. This implied that the more the age of staple crop farmers increased, the more likely they were to be net buyers of yam by 0.07 %. The coefficient of gender was negative and statistically significant at 10 % for cassava. This implied that the more the numbers of male staple crop farmers, the less likely they were to be net buyers of cassava participant by 2.55 %. On the other hand, the coefficient of gender was positive and statistically significant at 5 % for yam. This implied that the more the numbers of male staple crop farmers, the more likely they were to be net buyers of yam participant by 1.96 %. This could relate to the fact that male was positive and significant for the yam model. Household size was positive and statistically significant at 10 % for yam. This implied that the more the numbers of household members of staple crop farmers, the more likely they were to be net buyers of yam by 0.19 %. The coefficient of farmers' years of education was positive and statistically significant at 10

% for yam. This implied that the more the numbers of years of education of staple crop farmers, the more likely they were to be net buyers of yam by 0.07 %. This corroborated the study of Momanyi (2016) where educational level of household head was positive and statistically significant at 10 % level for a net buyer. The positive sign for the coefficient of market information was statistically significant at 1 % for cassava. This implied that the more the staple crop farmers had access to market information the more likely they were to be net buyers of cassava by 4.71 %. This was not in line with the study of Momanyi (2016) where access to market information was positive and statistically significant at 5 % for a net buyer. The coefficient of contract marketing was positive and statistically significant at 5 % for yam. This implied that the more the staple crop farmers had involvement in contract marketing other factors remained constant, the more likely they were to be net buyers of yam by 0.91 %. This result was not in agreement with the finding of Momanyi (2016) where contract marketing was positive and statistically significant at 1% for a net buyer.

Table 2: Estimates of factors influencing market participation of net sellers among smallholder staple crop farmers

Variables	CASSAVA			YAM		
	dy/dx	Standard Error	Z	dy/dx	Standard Error	Z
Age	0.00750	0.00417	1.80*	0.01280	0.00566	2.26**
Gender	0.09790	0.05623	1.74*	0.23172	0.05497	4.22***
Marital status	0.026111	0.06772	0.39	-0.46378	0.07689	- 6.03***
Household size	-0.02118	0.01307	-1.61	0.03648	0.01823	2.00**
Years of Education	-0.00805	0.00494	-1.63	0.01356	0.00563	2.41**
Farming Experience	0.00105	0.00282	0.37	-0.00261	0.0035	- 0.75
Membership in Association	0.12509	0.09093	1.38	0.12293	0.09921	1.24
Access to credit	-0.02316	0.03903	-0.59	0.01985	0.05675	0.35
Market information	-0.13171	0.02751	- 4.77***	0.18844	0.16575	1.14
Contract marketing	-0.01314	0.03242	-0.40	0.31947	0.06887	4.64***
Distance from farm to market	-0.00116	0.00074	-1.56	-0.000576	0.00123	- 0.47
Chi-square	41.83			102.57		
Log-likelihood	-171.22			-240.63		
Pseudo R^2	0.1088			0.1757		
Prob> chi^2	0.0000			0.0000		

***, **, * shows significance of the coefficients of 1 %, 5 % and 10 % levels respectively, Author computation, 2019.

Table 3: Estimates of factors influencing market participation of net buyers among smallholder staple crop farmers

Variables	CASSAVA			YAM		
	dy/dx	Standard Error	Z	dy/dx	Standard Error	Z
Age	-0.00216	0.0013	- 1.66*	0.00068	0.00038	1.80*
Gender	-0.02552	0.01444	- 1.77*	0.01964	0.00849	2.31**
Marital status	-0.00728	0.01835	- 0.40	0.00786	0.00819	0.91
Household size	0.00609	0.00401	1.52	0.00194	0.00116	1.67*
Years of Education	0.00231	0.00151	1.53	0.00072	0.00038	1.90*
Farming Experience	-0.00030	0.00082	- 0.37	-0.00014	0.00019	-0.72
Membership in Association	-0.03070	0.01999	- 1.54	0.00929	0.0103	0.90
Access to credit	0.00668	0.0114	0.59	0.00106	0.00309	0.34
Market information	0.04709	0.01479	3.18***	0.01826	0.02521	0.72
Contract marketing	-0.00537	0.01349	-0.40	0.00913	0.00401	2.28**
Distance from farm to market	0.00033	0.00023	1.48	-0.00003	0.00007	-0.46
Chi-square	41.83			102.57		
Log-likelihood	-171.22			-240.63		
Pseudo R^2	0.1088			0.1757		
Prob> chi^2	0.0000			0.0000		

***, **, * shows significance of the coefficients of 1 %, 5 % and 10 % levels respectively
Author computation, 2019.

Factors Influencing Market Participation of Autarkic Among Smallholder Staple Crop Farmers

Table 4 showed the result of the Ordered Probit model for autarkic. The log likelihood ratio statistics are -171.22 and -240.63 for cassava and yam respectively which have significant meaning that the explanatory variables included in the model jointly explain the probability of farmers being autarkic to participate in market. The chi-square values of 41.8 and 102.6 were statistically significant at 1% indicating that the explanatory variables jointly explain the probability of participating in marketing by staple crop farmers. Table 4 showed that age, gender, marital status, household size, years spent in school and contract marketing were statistically significant for being autarkic. The result indicated that the coefficient of age was negative and statistically significant at 10 % and 5 % for cassava and yam respectively. This implied that the more the age of staple crop farmers increased, the less likely they were to be autarkic for cassava and yam market participant by 0.53 % and 1.35 % respectively. The coefficient of gender was negative and statistically significant at 10 % and 1 % for cassava and yam respectively. This implied that the more the numbers of male staple crop farmers, the less likely they were to be autarkic for cassava and yam participant by 7.24 % and 25.14 % respectively. Also, the coefficient of marital status was positive and statistically significant at 1 % for yam. This implied that the more the numbers of married male staple crop farmers other factors remained constant,

the more likely they were to be autarkic for yam market participants by 45.59 %. The estimated coefficient of household size was negative and statistically significant at 5 % for yam. This implied that the more the number of household members of staple crop farmers, the less likely they were to be autarkic yam market participants by 3.84 %. This was not in line with the work of Ohajianya and Ugochukwu (2011) where the coefficients for household size was positive and significantly related to decision to be autarkic other than buyer and to be seller other than autarkic at 5 % level of probability.

Farmers' years of education was negative and statistically significant at 5 % for yam. This implied that the more the numbers of years of education of staple crop farmers, the less likely they were to be influenced by being autarkic yam market participant by 1.43 %. This disagreed with the work of Momanyi (2016) where educational level of household head was positive and statistically significant at 10 % for autarkic. Market information was positive and statistically significant at 1 % for cassava. This implied that the more the staple crop farmers had access to market information the more likely they were to be autarkic by 8.46 % for cassava. This was in line with the work of Ohajianya and Ugochukwu (2011) where the coefficients for market information was positive and significantly related to decision to be autarkic other than buyer and to be seller other than autarkic. Contract marketing was negative and statistically significant at 1 % for yam. This implied that the more the staple crop farmers had involvement in contract marketing, the less likely they were to be autarkic yam market participant by 32.86 %. This result disagreed with the work of Momanyi (2016) where contract marketing was positive and statistically significant at 1 %.

Table 4: Estimates of Factors Influencing Market Participation of Autarkic Among Smallholder Staple Crop Farmers

Variables	CASSAVA			YAM		
	dy/dx	Standard Error	Z	dy/dx	Standard Error	Z
Age	-0.00534	0.00299	-1.79*	-0.01348	0.00596	-2.26**
Gender	-0.07239	0.04324	-1.67*	-0.25135	0.06131	-4.10***
Marital status	-0.01883	0.04945	-0.38	0.45592	0.07046	6.47***
Household size	0.01509	0.00936	1.61	-0.03842	0.01921	-2.00**
Years of Education	0.00573	0.00354	1.62	-0.01428	0.00593	-2.41**
Farming Experience	-0.00075	0.00201	-0.37	0.00275	0.00369	0.75
Membership in Association	-0.09439	0.07244	-1.30	-0.13222	0.10913	-1.21
Access to credit	0.01648	0.02775	0.57	-0.02091	0.05982	-0.35
Market information	0.08462	0.01841	4.60***	-0.20670	0.19041	-1.09
Contract marketing	-0.01314	0.03242	-0.40	-0.32860	0.06902	-4.76***
Distance from farm to market	0.00083	0.00053	1.55	0.00061	0.0013	0.47
LR chi2(11)	41.83			102.57		
Log-likelihood	-171.22			-240.63		
Pseudo R^2	0.1088			0.1757		
Prob> chi^2	0.0000			0.0000		

***, **, * shows significance of the coefficients of 1%, 5% and 10% levels respectively; Author computation, 2019.

CONCLUSIONS AND RECOMMENDATIONS

The study was conducted in Oyo State. The study relied on farmers' memory due to a lack of farm records during the collection of the data. Also, it was limited to a state. From the results, the coefficients of age, gender and market information significantly influenced a net buyer, autarkic and net seller of cassava. Similarly, for yam, age, gender, household size, years spent in school and contract marketing significantly influenced a net buyer of yam. Also, the ordered probit of autarkic and net sellers of yam showed that the coefficients of age, gender, marital status, household size, years spent in school and contract marketing significantly influenced autarkic and net sellers of yam.

Education has a significant influence on the determinants of market participation among smallholder staple crops. Therefore, ways and modality of increasing the level of education through adult education is recommended.

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