Determinants of Levels of Participation in Cassava Production by Male and Female Farmers in Imo State Nigeria

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Abstract
This study investigated the determinants of levels of participation by male and female farmers in cassava production in Imo State, Nigeria. Purposive and multi-stage random sampling techniques were used in the selection of 240 respondents comprising of 120 males and 120 females involved in this study. Instrument for data collection was a set of structured and pre-tested questionnaire. Ordinary least square regression was used to analyse the data generated. Results obtained showed Cobb Douglas model as the lead equation for males. Five independent variables namely occupation, farm size, distance from farm to market, quantity processed, and years of experience were statistically significant at given levels underscoring their importance as determinants of level of participation of male respondents in cassava production. For the females, the Linear model was the best fit and indicated that occupation, household size, farm size, quantity processed, monthly income from cassava business and years of experience in cassava production were the determinants of level of female participation in cassava production. Policy issues targeted at increasing cassava production in the state should target these determinants as drivers for increased level of participation.
Keywords: Cassava, level of participation, Cobb Douglas, Linear, Farmers

Introduction

Cassava is important, not only as a food crop but even more so as a major source of income for rural households. As a cash crop, cassava generates cash income for the largest number of households in comparison with other staples (Adeniji *et al*., 2000). Cassava farming is popular among rural dwellers in south eastern Nigeria especially in Imo state.

Both men and women have been reported to participate in its production playing gender dependent roles (Amadi and Ezeh, 2018). Men dominated upstream operations such as site selection, land clearing, burning of cut thrash, land cultivation, application of herbicide, access to and control of finance. Women dominated most other operations including gathering of thrash from clearing and burning, planting, weeding, fertilizer application, harvesting, carrying of harvested roots to house and market, preparing food and bringing water for farm labour, access to and control of inputs (Amadi, 2018).

Participation in agricultural production by rural dwellers is affected by their socio-economic characteristics. A study carried out by Nandi *et al.* (2011) found that farmers within the ages of 30 – 59 were more productive than farmers who were 60 years and above because they are still active and very energetic. Years of farming experience is another factor that influences productivity among farming households in Nigeria. Farmers with more of years of farming experience have been observed to have higher farm outputs than those with lesser years of farming experience (Udoh *et al.,* 2006). The need for education in agriculture cannot be overstressed since the level of education of a farmer not only increases his productivity but also enhances his ability to understand and evaluate new production techniques (Amanze *et al.,* 2010). Okike (2006) reported that farm size contributed positively to cassava farming thus

indicating that cultivation of larger hectare of land leads to increase in cassava output. Access to fertilizer, agro-chemicals and improved planting materials has proven an important driver of agricultural production among farmers. Ukoha *et al.* (2010) and Ogundele and Okoruwa (2006) found that an increase in fertilizer use brought about a higher output by farmers in Abia state and in the dry savannah and humid forest agro-ecological zones of Nigeria. Reported effects of household size on farm output are inconsistent; while Shehu *et al.* (2007) reported decreases output as household size increased, Awoniyi *et al.* (2009) also noted that large household sizes assist in providing family labour for cassava farmers, thus leading to a more efficient use of resources and higher output. A study by Okoh (2008) revealed that small-scale farmers faced a lot of constraints when trying to acquire credit from the formal credit sources due to the following reasons: lack of tangible assets to use as collateral for credit, lack of knowledge about formal credit availability and long loan-processing time of financial institutions.

The objective of this work is to ascertain the socio-economic determinants of the level of participation of male and female farmers in cassava production in Imo state Nigeria.

Methodology

The study was carried out in Imo State in South Eastern Nigeria. The state lies within latitudes 4°45'N and 7°15'N of the Equator and longitudes 6°50'E and 7°25'E of the Greenish Meridian with an area of 5,100 sq km. (NPC, 2006). Purposive and multi-stage sampling technique was used in selecting two hundred and forty (240) cassava farmers with equal number of males and females. Data were obtained using semi-structured questionnaire to gather primary data including socio-economic characteristics of respondents like age, education, occupation, marital status, household size, farm size, distance from farm to market, quantity of roots produced, quantity of roots processed, distance from house to processing centre, farming/processing experience, income from cassava business, membership of cooperative societies, types of cassava products produced and gender.

Ordinary Least Square (OLS) regression was used to estimate determinants of levels of participation using quantity of roots produced as a proxy for level of participation. The model is specified thus;

$Y = f(X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + X_9 + X_{10} + X_{11} + X_{12} + X_{13}) + e$

Where:

Y = {proxy by the weekly output of cassava roots (Okoye *et al.*, 2016)}, Y= Level of Participation (1 - ∞), X_1 = Age (years), X_2 = Education level (years spent in school), X_3= Occupation, X_4 = Marital status, X_5 = Household size, X_6 = Farm size (hectare), X_7 = Distance farm to market (km), X_8= Quantity of roots produced (kg), X_9= Quantity of roots processed (kg), X_{10}= Monthly income from cassava business (₦), X_{11} = Farming experience (years), X_{12}= Membership of cooperative society, X_{13}= Gender, e = error term. The four functional forms of linear, exponential, Cobb-douglas and semi-log were estimated. The best form was chosen for discussion based on a high R^2 value, number of significant factors and agreement with a priori expectations.

Results and Discussion

Determinants of Levels of Participation in Cassava Production by Male Respondents

Four functional forms (Linear, Cobb Douglas, Exponential and Semi-Log) of the regression model were tried out to determine the model with the best fit. The result shows that Cobb Douglas model as the lead equation based on the high R^2 value, number of significant variables and agreement with *a priori* expectation. The R^2 value of 0.7583 indicates that 75.83% variability in level of participation is explained by the independent variables included in the model. The F value was highly significant at 1.0% indicating that the model was good

The Cobb Douglas regression coefficients presented in Table 1 indicated that five independent variables were statistically significant at given levels underscoring their importance as determinants of level of participation of male respondents in cassava production. These variables were occupation, farm size, distance from farm to market, quantity processed, and years of experience.

The Coefficient of occupation (0.245) was positive and significant at 1.0% alpha level, implying that full time farming as an occupation enhanced male respondents' level of participation in cassava production thereby conforming to expectation. Nandi *et al.* (2011) found that off-farm income was inversely related to cassava output, meaning that as non-farm income increases, cassava output decreases. They further noted that as the farmer generates more income from other activities; his concentration on cassava farming reduces, thereby decreasing output our proxy of participation.

The coefficient (0.464) of farm size was positive and significant at 1.0% alpha level which implies that the larger the farm size, the greater the level of participation of male respondents in cassava production, also conforming to *a priori* expectation. Onubuogu *et al*. (2014) found that large farm size increases agricultural productivity and improves farmers' technical, allocative and resource use efficiency. Okike (2006) reported that farm size contributed positively to cassava farming indicating that cultivation of larger hectare of land leads to increase in cassava output.

Distance from farm to market negatively affected the level of participation of male respondents in cassava production as indicated by the negative coefficient of -0.049 which was significant at 1.0% alpha level. Increasing distance from farm to market decreased the level of participation as it increases the cost and stress of conveying produce from farm-gate to market. Jerumeh and Omonona, (2018) opined that increased distance to market from farm sites affects accessibility to markets and given the perishability of cassava tubers, farmers are dis-incentivized and consequently this may prompt them to reduce level of participation in cassava production. Nwaogu *et al. (*2016) found that the distance farmers travelled to their farms from their homes had a negative toll on cassava productivity at 10.0% significance and implicated drudgery and fatigue associated with trekking long distances as being responsible.

The coefficient for quantity of roots processed (0.030) was positive at 10.0% alpha level. This indicated that level of participation of male respondents in cassava production increased with increase quantity roots processed. This finding is in conformity with expectation since food or cash needs which prompts increase in quantity of roots processed provides the same impetus for increasing the intensity of production.

The coefficient (0.068) of years of experience in cassava production was positive and significant at 1.0% alpha level, indicating that with increasing years of experience in the business, the level of participation of male respondents in cassava production also increased. This result is in concordance with economic theory, since quantity of roots produced was used as a measure of participation, farmers would get more output from their cassava farms as they get more experienced. This finding is in consonance with that of Nwaogu *et al. (*2016) who also found farming experience to be positively related with cassava output; and with level of involvement in cassava enterprise (Lagat and Maina, 2017). Nwaogu *et al. (*2016) explained that experience is an important variable which enables farmers to make certain innovative and market driven decisions such as adoption of modern farm practices and use of improved inputs. Experienced farmers are also able to overcome certain production challenges and farm intricacies, thus, losses through ignorance and adoption or continuous utilization of obsolete practices are avoided. Similarly, Lagat and Maina, (2017) opined that the positive coefficient for experience suggests that the longer men participate in cassava enterprise, the more they

appreciate the benefits and hence increase their involvement in its production. Furthermore, farmers with more years of experience acquire knowledge and skills necessary for choosing appropriate farming technologies (Faturoti *et al.*, 2006)

Table 1: Cobb Douglas regression estimates of the determinants of level of participation in cassava production by male respondents in Imo State

Variable	Coefficient	Z Value
Constant	5.539	8.37***
Age (years)	-0.046	-0.33
Education (years)	0.037	0.75
Occupation	0.245	4.02***
Marital status	0.044	0.54
Household size	-0.092	-0.98
Farm size (ha)	0.464	13.32***
Farm to market (km)	-0.049	-4.15***
Qty processed weekly (kg)	0.030	2.06*
Farm income	0.044	1.14
Experience	0.068	4.16***
Membership of coop society	-0.024	-0.28
R^2	*0.7583*	
Adj R^2	*0.7337*	
Prob> F	*0.0000*	

Source: Field survey 2017 analyzed with STATA 13; ***, **, *, Probability = 1%, 5% and 10% respectively;

Determinants of Levels of Participation in Cassava Production by Female Respondents
The linear model was the best fit of the four functional forms of the ordinary least square (OLS) regression tested for estimating coefficients for determinants of level of participation of female respondents in cassava production and is presented in Table 2. The linear model was chosen as the lead equation based on the high R^2 value, number of significant variables and agreement with *a priori* expectation. The R^2 value of 0.7898 indicates that 78.98% variability in level of participation of female respondents in cassava production is explained by the independent variables. The F value was highly significant at 1.0% indicating that the model was good.

The model posted five independent variables as statistically significant at given levels indicating that they were determinants of level of participation of female respondents in cassava

production. These variables include occupation, household size, farm size, quantity processed, monthly income from cassava business. Coefficient of occupation (31.121) was positive and significant at 5.0% alpha level, implying that full time farming as an occupation enhanced female respondents' level of participation in cassava production. This finding is consistent with that of Nandi *et al.* (2011) and if in conformity to expectation. The coefficient (-4.144) of household size was negative and significant at 5.0% alpha level which implies that the larger the household size, the lower the level of participation of female respondents in cassava production. This finding is not in conformity with *a priori* expectation. It is likely that in the study area most members of enlarged household may not be available for farming as they have migrated to urban areas or are in school such that resources that would have gone into farming are diverted into training and upkeep of children. Nwaogu *et al. (*2016) also found this unexpected negative relationship of household size with cassava output and opined that this may have arisen from the fact that many of the farming households had a large dependency ratio, thus limiting the available labour for increased output. Shehu *et al.* (2007) in their study on productivity and technical efficiency of small-scale rice farmers in Adamawa State of Nigeria found that as number of people in a household increases, household consumption expenditure increases, thereby making little money available for purchase of necessary farm inputs and meeting other farm financial obligations, which consequently results in decreased farm output.

The coefficient (142.317) of farm size was positively significant at 1.0% alpha level. This implies that increasing farm size of female respondents enhanced their level of participation in cassava production. This conforms to *a priori* expectation as farm size still remains a major determinant of level of participation. In the study area farmers depended solely on crude implements, and without the capacity for farm intensification, output only increased with increase in land area under cultivation.

The coefficient for quantity of roots processed (0.060) was positive at 1.0% alpha level implying that level of participation increased with increase quantity processed. The level of participation of female respondents in cassava production increased with increase in monthly income from cassava business. This can be deduced from the positive coefficient of (0.005) which was positive and significant at 1.0% alpha level. This finding is in conformity with other published reports (Onyemauwa, 2012; Ben-Chendo, 2014; Jerumeh and Omonona, 2018). As expected, as income from selling cassava roots and processed products increased, farmers were incentivized to increase the area under cassava production. However, Damisa *et al.,* (2007) reported an inverse relationship between level of income and level of participation of the women in agricultural production and to explain their unexpected finding they suggested that it could possibly be due the risk and uncertainty associated with agricultural production such that women with high disposable income level would prefer to diversify their resource base in less risky investments than to be fully embedded in agriculture.

Table 2: Linear regression estimates of the determinants of level of participation in cassava production by female respondents in Imo State

Variable	Coefficient	Zvalue
Constant	80.383	(0.92)
Age (years)	-1.139	(-0.68)
Education (years)	0.743	(0.27)
Occupation	31.121	(3.07)**
Marital status	-9.036	(-0.25)
Household size	-4.144	(-3.74)**
Farm size (ha)	142.317	(8.08)***
Farm to market (km)	0.148	(0.04)
Qty processed weekly (kg)	0.060	(4.56)***
Farm income	0.005	(8.20)***
Experience	-0.644	(-0.29)
Membership of cooperative society	9.744	(0.25)
R^2	0.7898	
Adj R^2	0.7684	
Prob> F	0.0000	

Source: Field survey 2017 analyzed with STATA 13; ***, **, *, Probability = 1%, 5% and 10% respectively; + Lead equation; Figures in parenthesis are t-values

Conclusion

Occupation, household size, farm size, quantity processed and monthly income from cassava business were the determinants of level of participation in cassava production by female farmers while occupation, farm size, distance from farm to market, quantity processed, and years of experience were the determinants of the level of participation by male farmers in cassava production in the study area. Policies aimed at improving the level of cassava production in Imo State should focus on these determinants.

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