SOCIO-ECONOMIC DETERMINANTS OF THE PRODUCTIVITY OF GARDEN EGG (*Solanum melongena*) FARMERS IN IMO STATE, SOUTHEAST NIGERIA

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Abstract
Lofty policies and programmes of successive governments in research and development have failed to yield the desired results in ensuring sustained increases in agricultural productivity. This is partly attributable to poor adoption of the research innovations by the rural clientele due to their socio-economic features. This study was conducted in Imo State, Southeast Nigeria to unravel the socio-economic determinants of the productivity of garden egg producers. Data were collected with structured questionnaire from 96 randomly selected garden egg farmers drawn from a pre-survey sample frame of 320 garden egg farmers present in the three agricultural zones of the state. Data were collected on the socio-economic variables, quantities of inputs and outputs in physical and in value terms. Data were analysed using descriptive statistics and ordinary least squares multiple regression techniques. Results showed that land rent(X_1), labour cost(X_2) , age of the farmer (X_6) and farm size((X_7) are the major determinants of garden egg productivity in the study area. It also showed that the mean age of the farmers, farm size, land rent per hectare per annum and labour cost per hectare per annum are 51years, 0.5ha, ₦32,222.36 and ₦86,669.72 respectively. Conclusively, garden egg productivity will be enhanced if adequate farm land is made available to farmers and infrastructural facilities provided in the rural villages to discourage rural-urban migration that makes efficient farm labour scarce and expensive.

KEY WORDS: Productivity, Garden egg, Determinants, Solanum melongena,Farmers socio-economic.

Introduction

Garden egg is scientifically known as *Solanun melongena* (Ofori et al; 2007). The fruits may be pear shaped, round, long or cylindrical depending on the variety. The genus solanum comprises over 1000 species and almost cosmopolitan, with at least 100 indigenous African species (PROTA, 2004). Four cultivar groups are recognized within solanum specie, three of which are important for Africans (PROTA, 2004; Horna and Gruere; 2006).

- Gilo group; this group has mature leaves covered with stellate hairs, generally not prickly; fruit subglobose to ellipsoid; 2.5-12cm long. The fruits are consumed, this is the most important cultivar group which includes cultivars with smooth fruits that are popular in west and east African. Depending on the location, preference is given to cultivars with pure white, creamy white, pale green, dark green, brown or purple fruits (PROTA, 2004).

- Kumba group; mature leaves glabrous apart from minute glandular hairs, not prickly, fruit depressed globosely, and deeply furrowed. The fruit are consumed as well as the leaves occasionally. Cultivars of kumbea group are mainly found in hot, semi-arid regions of sahel.

- Shun group; mature leaves glabrous from minute glandular hairs, not prickly. Fruit subglobose, 1-3cm in diameter. It is mainly a leafy vegetable. It is most widespread in central Africa, popular in Cameroon, Nigeria and Uganda. It is mainly found in warm, high-rainfall areas or under irrigation (PROTA, 2004).

- Aculeatum group; stems and leaves prickly, mature leaves covered with stellate hairs, fruits subglobose, furrowed and are about 3-8cm in diameter. Generally, garden egg can grow up to 90cm in height, (Norman, 1992). Obeng-Ofori et al; (2007) reported that the plant can attain a height between 0.6 to 1.2m and the root may extend to depths from 75 to 90cm in homogeneous soil.

For optimum performance, the eggplant is a warm season crop which prefers relatively high temperatures for optimum growth and development. It requires optimum day temperature of 25-35^{0}C and optimum night temperature of 20-27^{0}C (Norman, 1992; Obeng-Ofori et al; 2007). A well-drained soil rich in organic manure and P^H ranging from 5.5-6.5 is suitable for its production (Rice et al; 1993).

The concept of agricultural productivity transcends the factors relating to production but touches the input output relationship involved in that production process. Olayide and Heady (1982), defined agricultural productivity as the index of the ratio of farm output to the value of the total input used in producing the output. However, Ehui and Spencer (1990) went further to identify partial productivity as the ratio of total output to a single input. The word productivity usually denotes the ratio of economic output to any or all associated inputs (in real terms), or output per unit of productive input. Increases in productivity mean that the amount of goods and services available per capita is growing, assuming a constant population. Garden egg productivity is being hampered by many factors which includes marketing problems, infrastructural problems and socio-economic and institutional problems.

Abort and Makeham (1980) suggested that the first step in improving marketing of agricultural products is to provide transport and storage facilities where they do not exist. Reddy et al; (2004) recommended that provision of appropriate storage facilities and the application of scientific techniques can reduce physical damage and quality deterioration in agricultural products. On the other hand, Njoku (1986) stated that improved marketing system should concentrate on the provision of adequate transport and storage facilities more than the activities of the middlemen. The above facts suggest that agricultural production and indeed garden egg production in Nigeria is constrained by a lot of factors. Studies have shown these factors through the institutional, ecological and marketing perspectives but facts specific to the socio-economic characteristics of the farmers who do the actual production are scanty or unavailable. Therefore, this study is aimed at unravelling those socio-economic variables that seriously affect the productivity of garden egg farmers in the study area.

Different methods of data analysis have been used by researchers in the analysis of their data. Data analysis typically involves applying systematic and verifiable techniques, formula and procedure to compute and derive measures of variables and their relationships. Understanding the concepts of variables and relationships between variables are therefore fundamental to the choice of appropriate data analysis techniques and tools (Eboh, 2009). With reference to the efficiency and productivity of resources, the common methods include the production function analysis (Eboh, 2009). The process of transforming inputs into outputs is called production. Then the technical relationship between the inputs and outputs is called the production function (Adegeye and Dittoh, 1985). Production function analysis is useful for comparing average and marginal products of specific resources on different farmers or in different enterprises (Upton, 1997). According to Dillon, (1977) there are many functional forms that could be used to describe production relationships, but in practice the commonly used forms include; Linear, Exponential, Semi-log, and the Double-log /Cobb-Douglas or Power functional forms. Others are the Hyperbolic, Quadratic, and the Square root forms. In this study, the first four functional forms listed above were used to analyse the data in line with the ordinary least square multiple regression technique. Subsequently, the lead equation was chosen based on the statistical criteria or first order tests i.e the signs and sizes of the following; F-Statistics, t-Statistics, Coefficient of multiple determination (R^2), Adjusted R^2 and Standard Error (SE).

Materials and Methods

This study was carried out in Imo State, Southeast Nigeria. The state lies between longitudes 6^{0}35' and 7^{0}28'E and latitudes 5^{0}10' and 5^{0}37'N, covering an area of 5156.60km^2.). Imo State has an estimated population of 3,934,897 persons with population densities ranging between 200 and 1500 persons per square kilometer (INEC, 2008). Administratively, the State has 27 Local Government Areas found in three distinct agricultural zones. These zones are, Okigwe, Orlu and Owerri.

The soil varies from eroded acidic soil on the coastal plain, sandy and alluvial soil along the low terrace of the water basins. The soil's PH ranges from 5.0 to 5.5 (ISMANR, 1986). On estimation, ISMANR (1986) reports 84% of the total land as being potentially productive with 48% put into the cultivation of food crops under rotational bush fallow system while 36% is under plantation crops.

The area has tropical climate characterized by high rainfall and temperature ranges of 1500mm to 2300mm and 34^{O}C to 37^{O}C respectively. Correspondingly, the vegetation is tropical rainforest that has suffered lots of deforestation. The occupation of majority of the inhabitations is farming. Almost every family farm as a primary or secondary occupation, cultivating mainly food crops like cassava, yam, cocoyam, maize,

vegetables and tree crops like oil palms, coconuts, oranges, mangoes and numerous others.

Data for this study were collected from a sample frame of 320 garden egg producers proportionately drawn from the registers of zonal extension agents in the three agricultural zones. A sample size of 96 respondents was randomly selected from this frame and their responses served as the data for this study. The data were collected with the aid of well structured questionnaire administered to the respondents by the researcher and other trained enumerators. Most of the data collected bothered on the farmers' socio-economic variables, input and output relationships in physical and in value terms.

Analytical Procedure

Data were analysed using descriptive statistical and the ordinary least square multiple regression techniques. The regression model is stated explicitly in four functional forms as thus;

Linear form:

$AgP = b_o + b_1P_{X1} + b_2P_{X2} + b_3P_{X3} + b_4P_{X4} + b_5A_I + b_6A_G + b_7F_Z + b_8E_D + b_9F_E + e$ ……eqn (1)

Semi-log fuction:

$AgP = b_0 + b_1 \ln P_{X1} + b_2 \ln P_{X2} + b_3 \ln P_{X3} + b_4 \ln P_{X4} + b_5 \ln A_I + b_6 \ln A_G + b_7 \ln F_Z + b_8 \ln E_D + b_9 \ln F_E + e$ ……..eqn (2)

Double –log function

$\ln AgP = b_0 + b_1 \ln P_{X1} + b_2 \ln P_{X2} + b_3 \ln P_{X3} + b_4 \ln P_{X4} + b_5 \ln A_I + b_6 \ln A_G + b_7 \ln F_Z + b_8 \ln E_D + b_9 \ln F_E + e$ ……eqn(3)

Exponential function:

$\ln AgP = b_o + b_1P_{X1} + b_2P_{X2} + b_3P_{X3} + b_4P_{X4} + b_5A_I + b_6A_G + b_7F_Z + b_8E_D + b_9F_E + e$ ……..eqn(4)

Where

AgP = Aggregate agricultural productivity of the farmers measured as

$$AgP = \frac{PyQ}{\sum_{i-1}^{n} PiXi}$$

Where AgP = Aggregate agricultural productivity

Py = Unit price of output in naira

Q = Total quantity of output of garden egg fruit in (kg)

Pi = Price per unit of each input used

Xi = Quantity of each input used

i = 1, 2, ….n (input type) .

X_1 = land area (Ha)

X_2 = labour input (mandays)

X_3 = Quantity of planting material (Kg)

X_4 = Quantity of agro-chemical input (litres)

P_{X1} = land rent (naira)

P_{X2} = labour cost (naira)

P_{X3} = cost of planting materials (naira)

P_{X4} = agro-chemical input costs (naira)

A_I = annual income (naira)

A_G= age (years)

F_Z= farm size (hectare)

E_D= educational level (years)

F_E= farming experience (years)

e= stochastic error term

It is expected a priori that the coefficients of P_{X1}, P_{X2}, P_{X3} P_{X4}, and, $A_G < 0$ while the coefficients of A_I, F_Z, E_D, and $F_E > 0$.

Results and Discussions

Table (i) shows that the mean age, educational level, household size, and farm size are 51 years, 12 years, 6 persons, and 0.5 hectare respectively. This implies that farmers in the study area are at their middle ages and within the working class limit. They are in the position to effectively and efficiently utilize available resources to them. Their 12 years mean level of education implies that most of the farmers obtained at least primary education. This feature makes them capable of understanding and adopting available innovations that encourages increases in garden egg production. Also the mean household size of 6 persons shows that the farmers have reasonable family sizes that are not too large or too small. The mean farm size of 0.5 hectares agrees with the previous findings that majority of farmers in Sub-Saharan Africa are smallholders of farm sizes of less than 6 hectares (Olayide, 1980; Ogungbile and Olukosi, (1991) Nwaiwu, 2007;). This farm size available to the garden egg producers obviously shows that they produce at subsistence level and are also using rudimentary capital for production. The mean level of experience in garden egg production was 23 years which implies that most of the farmers interviewed have been in the business for a reasonable number of years. This period would have exposed them to various challenges associated with garden egg production and therefore would have found adaptive strategies to those challenges hence better productivity. The mean annual income from and expenditure on garden egg per hectare is ₦246,818.94 and ₦140,973.58 respectively. This shows a net farm income of ₦105,845.36/ha which depicts that garden egg enterprise is a profitable venture.

From table (i) also, the cost of land (rent), labour, planting materials, and agro-chemicals in naira per hectare were 32,222.36, 86,669.72, 6827.29, and 9420.86 respectively. These figures clearly show that labour constitutes about 64.13% of the total expenses incurred in garden egg production in the study area. According to Olayide and Heady, (1982) labour is the second most important

resource in farm production and constitutes a serious limiting input in the production process. Olayide and Heady (1982) and Upton (1997) also posit that labour and entrepreneurship are the most important resources next to land in traditional agriculture because it is in them that the decision making power in any production process resides. In view of this prevailing high cost of labour in the study area, increases in the output of garden egg would have been seriously constrained by this factor. Another serious limiting resource in garden egg production is land rent. The high rate of expenses on land rent also implies that land for agriculture is not available and affordable to the resource poor farmers.

According to table (ii), out of the four functional forms estimated the Cobb-Douglas or Double-Log functional form provided the best fit and hence chosen as the lead equation. This choice is based on the premise that it has the highest number of t-values that are statistically significant at 5% level (ie P_{X1}, $P_{X2,}$ $A_{G,}$ and F_Z). It also has a relatively high R^2, and F-values of 61.37% and 15.18 respectively, and low standard error of 0.1275. The R^2 value implies that 61.37% of the variations in the dependent variable (AgP) are explained by the variations in the independent variables. The F-value of 15.18 also shows that the proportion of the explained variation on the dependent variable by the independent variables is statistically significant at 0.01 levels. The result also shows that the socio-economic factors such as land rent, labour cost, age and farm size significantly affected the productivity of garden egg farmers in the study area. The coefficients of $P_{X1,}$ $P_{X2,}$ F_E and $E_{D,}$ are negative. This shows an inversely proportional relationship existing between the productivity of garden egg and land rent, labour cost, farming experience, and level of education. It also implies that the higher the value of these independent variables, the lower the value of the dependent variable, AgP = Aggregate agricultural (garden egg) productivity of the respondent farmers. Also the coefficients of $X_{3,}$ $P_{X4,}$ $P_{X5,}$ A_G and F_Z are positive. This shows a directly proportional relationship between the dependent variable and these independent variables. Following the observed results, we therefore say that $P_{X1,}$ $P_{X2,}$ $A_{I,}$ and F_Z agreed with the a priori theoretical expectation while the others did not.

Conclusion

From the fore-going, the major socio-economic determinants of garden egg farmers' productivity in the study area are land rent, labour cost, age of the farmers and farm size. This presents that land availability vis-à-vis low land rent, sufficient labour supply or availability to farmers and optimum age of the farmers would ensure increased garden egg productivity, hence agricultural productivity. This issue on land and labour also confirms the result in table 1 where labour and land constituted the highest expenditure items incurred in garden egg production. Consequently it is recommended that more youths should be encouraged to go into agricultural production by providing basic infrastructural facilities required in the rural villages where food production usually takes place. This will discourage the rural-urban migration that makes agricultural labour scarce and expensive to farmers. Furthermore, land for agricultural production should be made available to genuine farmers at relatively lower rents to ensure that they have access to them. This will strongly ensure improvement in declining agricultural productivity in Nigeria.

List of Tables

Table (i) shows the Socio-economic Characteristics of Garden Egg Producers in the Study Area

Table (i): Distribution of farmers according to socio-economic characteristics

VARIABLE		
	Mean Value	**Std. deviation**
Age (years)	51	10.07
Educational Level (years)	12	4.22
Household size (number of persons)	6	2.12
Plot size cultivated (Ha)	0.511	0.21
Farming Experience (Years)	23	15.3
Land rent (naira)/ha/annum	32222.36	1412.45
Labour cost (naira)/ha/annum	86669.72	33684.93
Cost of planting material (naira)/ha/annum	6827.29	2828.10
Cost of agro-chem. Inputs/ha,annum	9420.86	3671.72
Cash expense on Garden egg enterprise (₦)/Ha	140,973.58	-
Annual income from Garden egg enterprise (₦)/Ha	246,818.94	-

Source: Field Survey Data, 2011

Table (ii) shows the multiple regression results of the models explicitly stated in equations 1-4.

Table (ii) Multiple Regression Result of Model Explicitly Stated in Equations 1-4

Variable	Linear function	Semi-log function	Double-log function	Exponential function
Land rent (P_{X1})	-1.7 E05	-0.29273	-0.1806	-1.1E 05
	(-4.01682)*	(-4.15673)*	(-4.59926)*	(-4.63124)*
Labour cost(P_{X2})	-1.1 E 02	-0.53219	-0.28037	-5.9 E06
	(-4.73773)*	(-5.70493)*	(-5.3902)*	(-4.49753)*
Cost of planting material (P_{X3})	2.49 E05	0.152906	0.096843	1.7 E06
	(0.778372)	(1.243343)	(1.41226)	(0.950484)
Cost of agro-chemical(P_{X4})	4.11 E 05	0.1239	0.0758	2.3 E 05
	(1.859653)***	(1.167378)	(1.28083)	(1.86254)***
Annual income(A_I)	1.2 E 07	0.165007	0.072946	5.11 E 08
	(0.348182)	(1.889901)***	(1.498368)	(0.266409)
Age($A_{G)}$	0.0062672	0.302159	0.215041	0.004245
	(1.53815)	(1.569754)	(2.003542)**	(1.869621)***
Farn size(F_Z)	1.017672	0.448847	0.254758	0.561928
	(7.984533)*	(7.019755)*	(7.145497)*	(7.903859)*
Educational level (E_D)	-0.00306	-0.02172	-0.01466	-0.00224
	(-0.45211)	(-0.40094)	(-0.48543)	(-1.12856)
Farming experience(F_E)	-0.003	-0.05725	-0.03821	-0.0018
	(-1.04863)	(-0.99528)	(-1.19131)	(-1.12856)
R^2	0.609151	0.609151	0.613744	0.614637
Adj. R^2	0.569571	0.568249	0.573322	0.574309
Std. error	0.228328	0.568679	0.12751	0.127363
F- ratio	14.96779**	14.89268**	15.18335**	15.24071**
N	96	96	96	96

(*) Significant at 1%
(**) Significant at 5%
(***) Significant at 10%

Source: Field Survey Data, 2011

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