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SOCIO-ECONOMIC DETERMINANTS AND PRODUCTIVITY IN BANANA AND PLANTAIN PRODUCTION

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Abstract

The study examined the socio-economic characteristics and relationship between socio-economic variables and the outputs of banana and plantain farm enterprises. A sample size of 180 farm households was involved. The data were analyzed using descriptive statistical tools and Cobb-Douglas production function model. The findings showed that average age, average farming experience and average family size was 45 years, 4 years and 6 persons respectively. About 84.4% were married while 75% had farming as their primary occupation. Approximately 70.6% could read or write in English. Age of farmer, educational attainment and family size were negatively related while farmer's experience, age of banana crop, extension access and farm size were positively related to banana output. All the socio economic variables were positively related to plantain output. Farmer's experience, extension access and farm size for both enterprises and age of plantain crop had strong relationship ($P \leq 0.05$). There was significant difference between the output of banana and plantain farm enterprises (F-Statistic = 12. 34478, probability of F-Statistic P= 0.00). Only farm size was statistically significant (t-Statistic = 5.293212, P = 0.00). It means that, an increase by a unit of farm size will lead to a unit increase in farm output in both banana and plantain farm enterprises. While F-ratio of 46.44 and 51.72 for banana and plantain respectively were significant at 5% level of probability.

Keywords: *Socio-economic Determinants, Productivity, Banana and Plantain, Production.*

Introduction

Banana is grown in 130 countries world-wide, with an estimated world production of 71 million metric tonnes, while Plantain is grown in 52 countries with production of 33 million metric tonnes. (Faturoti *et al*, 2007; Babatunde, 1991). Plantain (Musa paradisiaca L.) and Banana (Musa Sapientum L.) are not only considered a staple food and cash crop in the diet and economy, but several millions of people subsist mainly on plantain and banana for their source of food energy (FDA, 2000). Annual consumption of plantain per capita in Nigeria is estimated at 8.5kg. Its consumption cuts across ethnic, social barriers and also considered a major component of livestock feed (Babatunde, 1991a; FAO, 2007; Uchegbu *et al*, 2008). The challenge of crop productivity and sustainable production in plantain and banana based farm enterprises in Africa is critical to agricultural transformation in sub-Saharan tropical countries as well as any given agro-economy. According to Kassie *et al*, (1999) the declining trend of agricultural production in sub-Saharan Africa is associated with major problem of poverty, low crop and animal productivity and large scale resource degradation and achieving sustainable increase in agricultural production is a major concern for scientists and policy makers alike. Furthermore, agricultural productivity is determined by certain factors. Such determinants have been highlighted by (Beets, 1990). He described them as physical (land area, soil and climate), technological (know-how to be disseminated) and human factors (socio-cultural behaviour) (Todaro, 1980; Olomola, 1988). Productivity however, could be enhanced by expanding the area planted to crops, raising the yield per unit area of individual crop enterprise, and growing more crops per year (Beets, 1982). Olayide and Heady, (1982) refers productivity as the index of the ratio of the value of the total farm output to the value of total inputs used in production. According to them, maximum resource productivity implies obtaining the maximum possible output from the minimum possible set of inputs. According to Lipsey, (1983) productivity can be enhanced by increase in quality of inputs, changes in techniques, substitution of capital for labour, better trained labour, better organization of production and new ideas even when there are no changes in the quantity, or proportions of factors.

Since it is a known fact that natural and socio-economic variables such as climate, population, food prices, input costs among others are not constant and issues of resource productivity, price responsiveness, and optimum enterprises combinations among others have been addressed by studies on the technical and allocative efficiency of farm resources allocation and utilization. Therefore, a study of this nature could be of utmost relevance to all stakeholders. According to Ekong, (1988) the specific agricultural practice adopted by the people of any given community or region, may be influenced by socio-economic activities, among others. The broad objective of this study was to determine the socio-economic determinants and productivity in banana and plantain production. The specific objectives were to describe the socio-economic characteristics and examine the relationship between socio-economic variables and the outputs of banana and plantain farm enterprises. The hypothesis of this study was there is no significant difference between the output of banana and plantain farm enterprises.

Research Methodology

The Study Area

Bayelsa State is located in the heart of the Niger Delta in Southern Nigeria, (Alagoa, 1999; Kainga, 2004; BYSG, 2008). The state is bounded on the North by Delta State in Western Niger Delta, on the East by Rivers State in Eastern Niger Delta and the West and South by the Atlantic Ocean (Alagoa, 1999; BYSG, 2008). The State is situated between latitude $04^0$15" N to $05^0$23'' N and longitude $05^0$22" E to $06^0$45" E. By the 2006 census (NPC, 2006), the state had a population of 1,703,358 people. Bayelsa State has a humid semi-hot equatorial climate with mean annual rainfall from 2,000 to 4,000mm (Oyegun, 1999). Temperature is fairly constant throughout the year over the entire state with a maximum of 30^0C. Owing to its proximity to the Atlantic Ocean, the relative humidity of the state is comparatively uniform, which ranges between 65 to 90% (Alagoa, 1999; Oyegun, 1999).

Sampling Technique

Data collection was between 2009 to 2010 cropping seasons. Though banana and plantain are not annual crops, farms visited were mainly matured and stabilized farms. A three stage sampling technique was used in drawing the sample for this study. The first stage involved purposive selection of four (4) of the eight (8) local government areas (LGAs) in Bayelsa State on the basis of predominance of farming activities. The LGAs were Southern Ijaw, Yenagoa, Sagbama and Ogbia. In each of these LGAs so selected, nine (9) villages were randomly selected from a list of villages in the LGA. In each village sampled, five (5) farm households who engaged in banana and plantain based farm enterprises were randomly selected and studied. This gave a sample size of 180 farm households.

Method of Data Analysis and Model Specification

The data for this study were analyzed using descriptive statistical tools and production function models for each of the crops banana sole and plantain sole enterprises assuming other crops combination to be constant. In estimating the parameters the Cobb-Douglas production function were transformed or linearized in logarithmic form for the purpose of empirical estimation of the required elasticities of production (Subba Reddy et al, 2004; Olayemi, and Olayide, 1981; and Olayemi, 1998) and the ordinary least square (OLS) method of regression analysis was applied. The socio-economic variables that were used to form the regression matrix include: Age of the respondents (in years), Farmers experience (in years), Farmers formal education (in years), Family size (in numbers), Age of plantain and banana (in months), dummy variable for provision of extension services (Yes = 1 or otherwise = 0), and Farm size (in hectares). The implicit form of the model was as follows:

$Y_i = AX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b6}X_7^{b7}e$…….. (1)

$\text{Log}Y_i = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + \log e$- - - - - (2)

Where, Log = log to base10 and:

Y_i= total output per farm enterprise in Kg or Value in Naira of aggregate output per farm of ith farm enterprise.
X_1= Age of the respondents (in years);
X_2= Farmers experience (in years)
X_3= Farmers formal education (in years);
X_4= Family size (in numbers);
X_5= Age of plantain and banana (by harvest time in months);
X_6= dummy variable for provision of extension services (Yes = 1 or otherwise = 0); and
X_7 = Farm size (in hectares).
b_1….b_7 = Production coefficients or elasticities of production of the explanatory variable X_1, X_2… X_7; and
A= multiplicative constant or intercept of the production plane.

The research hypotheses of this study was tested with the t-test at the 5% or 0.05 level of significance while the regression coefficients from the transformed Cobb-Douglas production function was subjected to the test. Furthermore, the overall significance of the independent variables was determined by the F-ratio from the regression model. For the hypothesis, the output from plantain and banana farm enterprises that were used for this study were subjected to the test. The factors that influence farm output or profit were also established. They include farm size, family labour, hired labour, working capital, fixed capital and age of plant. The implicit form of the model was as follows:

$Y_i = AX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b6}e$…….. (3)

$\text{Log}Y_i = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + \log e$- - - - - (4)

Where, Log = log to base10 and:

Y_i= total output per farm enterprise in Kg or Value in Naira of aggregate output per farm of ith farm enterprise.
X_1= Farm size in hectare;
X_2= Family labour employed per farm in man days;
X_3= Hired labour employed per farm in man days;
X_4= Working capital employed per farm in Naira (i.e. expenditure on seeds, etc);
X_5= Fixed capital employed per farm in Naira (i.e. depreciation on farm tools/ implements, rent, etc.)
X_6= Age of plant by harvest time in months.
b_1….b_6= Production coefficients or elasticities of production of the explanatory variable X_1, X_2… X_6; and
A= multiplicative constant or intercept of the production plane.

Student T-Test

The t-test is a parametric statistical tool used to test hypothesis about the difference between mean of groups. The t-test is used to determine whether mean X_1 and X_2 are significantly different at a chosen level of significance. However, test of significance involves testing the difference between statistics from two or more groups within the sample or

otherwise and statistical tests are done because the fact that one estimate is larger than the other does not imply that there is surely a difference (Eboh, 2009). The t-test is used in several past works among them is Onyekuru (2008) who determined the socio-economic characteristics affecting household use or non use of alternative energy sources in the urban areas of Enugu State of Nigeria.

$$t\ statistic = \frac{X1 - X2}{\frac{SD1}{\sqrt{n1}} + \frac{SD2}{\sqrt{n2}}} \quad \text{---------- (5)}$$

at $n_1 + n_2 - 2$ degrees of freedom

where X_1 = Mean output of banana production enterprises in tonnes
X_2 = Mean output of plantain production enterprises in tonnes
SD_1 = Standard deviation of output of banana production enterprises
SD_2 = Standard deviation of output of plantain production enterprises
n_1 = number of banana production enterprises; and
n_2 = number of plantain production enterprises
level of significance 5% or 0.05.

Results and Discussion

Socio-economic Characteristics of Respondents

From Table 1, the findings showed that the average age of the farmers was approximately 45years with an average of 4 years' experience in farming. The mean age of plantain farmers is in the range with the findings of Kainga and Seiyabo, (2012), Allison-Oguru, (2004) and Dzomeku, Dankyi and Darkey, (2011) with 43, 46 and 47 years respectively. The relatively low experience in farming is an indication of relatively new entrants who decide to take up banana and plantain farm enterprises as a means of livelihood and income generation. The average family size of the farmers was approximately 6 persons. However, those that assist in farm activities were 2 persons on average. It can thus be inferred that in the last 4 years or so, family size has dropped compared to earlier studies of 10 on average (Allison-Oguru, 2004). The foregoing is attributed to increased awareness in family planning campaigns in recent times. According to Rahji (1999) in Allison-Oguru, (2004) farm household size is an important determinant of family labour availability as well as hired labour needs in Sub-Saharan Africa.

About 84.4% of the farmers studied were married while 75% had farming as their primary occupation. Results showed that approximately 70.6% were educated in one form or the other by acquiring primary education, secondary education and some level of tertiary education. With effective agricultural extension, therefore farmers' level of education is not likely to pose any serious limitation to farm production and the adoption of improved agricultural technologies in the area. Thus the production of banana and plantain as a business, can be encouraged through government youth empowerment and poverty alleviation programmes. Studies on farm households have described farmers as illiterates, but this study showed that in recent times farmers who engaged in plantain and banana farming cannot be described as illiterates. This is in contrast to the findings of Allison-Oguru, (2004) and Allison-Oguru, *et al*, (1999) who describe majority of the farmers to be stark illiterates. Furthermore, the percentage of farmers without formal education (17.5%) was lower than the findings of Allison-Oguru, (2004) which was 46%. Farmers access to land and use for banana and plantain production is influenced by the mode of acquisition and location. Land is drastically a limiting factor in the study area. It is in short supply and the mode of its acquisition is mostly by inheritance (71.7%).

Socio-economic Determinants of Banana and Plantain Output

The relationship between the socio-economic variables and banana output (P_1) and plantain output (P_2) using the Double log model were generally weak with R^2 =44.91% and R^2 = 51.22% respectively. However, age of farmer, educational attainment and family size were negatively related to the output of banana while farmers' experience, age of banana crop, extension access and farm size were positively related. In the case of plantain production, all the Socio-economic variables were positively related to plantain output. Nevertheless, farmers' experience, extension access and farm size had strong relationship with the output of both banana and plantain and age of plantain ($P \leq 0.05$) (Table 2). This implies that output in banana and plantain production were mainly influenced by farmers experience, extension access, farm size and age of plantain. It therefore means that, banana and plantain could be increased through increased farm size and government investment on extension service. And the more experienced a farmer is the higher the output. Furthermore, the longer the age of plantain the greater the output which could be regenerated often through the application of external inputs such as organic manure or fertilizer. Previous study by Kainga and Seiyabo, (2012) showed that double log form gave the best fit in the input-output relationship in plantain production and showed further that farm size, labour, number of suckers, capital in naira, age of farmer and farmers experience influences the quantity of plantain produced.

Test for Significant Difference in Output Determinants between Banana and Plantain Production Enterprises

The difference in output determinants as shown in the regression of output of banana and plantain as against the determining factors between plantain and banana farm enterprises using the t- test shows that, there is significant difference between the outputs of banana and plantain farm enterprises in the study area. The F – Statistic was 12.34478, while probability of F-- Statistics P = 0.00 (Table 4). However, the results show that among the variable factors (determinants) such as farm size, family labour, hired labour, working capital and fixed capital; only farm size was statistically significant ($P \leq 0.05$) with t- test =5.293212 and P = 0.00 (Table 4) and an increase by a unit of farm size will lead to a unit increase in farm output in both banana and plantain farm enterprises. Farm size has a direct relationship with farm output and by implication farm profit in both enterprises. The implication of this finding is that, the output

level or profit margin of any farm enterprise is also very vital for consideration by farmers in making their choice of farm enterprises they would want to embark upon.

Conclusion and Recommendations

The results showed that socio economic variables such as farmer's experience, extension access and farm size has strong relationship with banana and plantain outputs respectively, and age of crop for plantain ($P \leq 0.05$). There was significant difference between the outputs of banana and plantain farm enterprises in the study area. An increase in farm size will lead to an increase in farm output as farm size among the determinants was statistically significant ($P \leq 0.05$). Thus planning and implementation of banana and plantain production should hinge on socio economic determinants such as farmer's experience, extension access, farm size, and age of crop for plantain.

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Annexure

Table 1. Socio-economic Characteristics of Banana and Plantain Farmers

Age Group (Years)	Frequency	Percentage Frequency
Less than 25	2	1.1
25 – 34	24	13.3
35 – 44	70	38.9
45 – 54	46	25.6
55 – 64	27	15.0
65 and above	11	6.1
Farming Experience (years)	Frequency	Percentage Frequency
Less than 5	7	3.9
5 - 9	31	17.2
10 - 14	35	19.4
15 - 19	40	22.2
Family Size (Persons)	Frequency	Percentage Frequency
Less than 5	33	18.3
5 – 9	119	66.1
10 -14	22	12.2
15 – 19	4	2.2
20 - 24	1	0.6
25 and above	1	0.6
Level of Education	Frequency	Percentage Frequency
No formal Education	32	17.8
Attempted primary school	11	6.1
Completed primary school	41	22.8
Attempted secondary School	23	12.8
Completed secondary School	49	27.2
Attempted Tertiary school	10	5.6
Completed Tertiary school	14	7.8
Type of Occupation	Frequency	Percentage Frequency
Farming	135	75
Civil Service	37	20.6
Transporter	1	0.6
Petty Business	7	3.9
Marital Status	Frequency	Percentage Frequency
Married	152	84.4
Widow and Divorcees	23	12.8
Single	5	2.8
Marital Status	Frequency	Percentage Frequency
Mode of Acquisition	Frequency	Percentage Frequency
Purchased	22	12.2
Lease (Rented)	21	11.7
Gift	8	4.4
Inheritance	129	71.7

Source: Field Survey Data, 2009/2010

Table 2 Regression Coefficients of Socio-economic Variables on Banana Output n=180

Socio-economic Variables	Coefficients	Std Error	t – stat	P-Value
Intercept	7.241872	0.576545	12.5608	0.00
Farmers experience	0.582725	0.168302	3.4623*	0.00
Age of farmer	- 0.1094	0.236611	-0.4623	0.64
Educational Attainment	- 0.12251	0.111336	-1.1003	0.27
Family size	- 0.38392	0.320977	-1.1960	0.23
Age of crop	0.135303	0.098841	1.3688	0.17
Extension Access	1.336006	0.150085	8.9016*	0.00
Farm size	0.989463	0.075623	13.084*	0.00
R^2 =	0.449089			

Source: Field Survey Data, 2009/ 2010. Note:* Means significant at 5% level of probability.

Table 3 Regression Coefficients of Socioeconomic Variables on Plantain Output n=180

Socio-economic Variables	Coefficients	Std Error	t – stat	P-Value
Intercept	7.196018861	0.573139	12.5554	0.00
Farmers experience	0.696073646	0.167308	4.16043*	0.00
Age of farmer	0.00518898	0.235213	0.02206	0.98
Educational Attainment	0.000407165	0.110678	0.00367	1.00
Family size	0.499617811	0.319081	-1.5658	0.12
Age of crop	0.197102943	0.098257	2.00598*	0.05
Extension Access	1.463123868	0.149199	9.80654*	0.00
Farm size	1.096915	0.075584	14.5124*	0.00
R^2 =	0.512272542			

Source: Field Survey Data, 2009/ 2010. Note:* Means significant at 5% level of probability.

Table 4 Test for Significant Difference in Output Determinants between Banana and Plantain Production Enterprises n=180

Variable	Coefficient	Standard Error	t-Stat	P-Value
Intercept	10.07962	1.732802	5.81694	0.0000
Farm size	0.704992	0.133188	5.293212*	0.0000
Family labour	-0.078473	0.063646	-1.2329	0.2193
Hired labour	0.042290	0.061166	0.69139	0.4903
Working capital	0.230545	0.156648	1.47173	0.1429
Fixed asset depreciation	0.030129	0.055419	0.54365	0.5874
R^2 =	0.266368			
F –Stat =	12.34478			
Prob F –Stat =	0.000000			

Source: Field Survey Data, 2009/ 2010. Note:* Means significant at 5% level of probability.