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ECONOMICS OF PLANTAIN PRODUCTION IN YENAGOA LOCAL GOVERNMENT AREA OF BAYELSA STATE

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ABSTRACT
The study examines the economics of plantain production in Yenagoa Local Government Area of Bayelsa State. To do this, 63 structured questionnaire were administered among randomly selected plantain farmers in Yenagoa Local Government Area of the State. Results show that greater number of the plantain producers surveyed fall within the age bracket of 36-50 years. The result also showed an estimated average farm size of 0.7 hectares for plantain production. Output per hectare was estimated at 500 bunches per year, and sold at an average cost of ₦ 600.00 per bunch. The total cost of production per hectare was estimated at ₦ 76,580.00, with total annual revenue of ₦ 300,000.00. Net income was estimated at ₦223, 420.00. The result shows that plantain production in the study area is profitable. The double log production function had the best fit to the set of data employed in the analysis of input –output relationship in plantain production. The value of the coefficient of multiple determination (R^2) obtained and its statistical test at 5% and 1% indicate that farm size, labour, number of suckers, fertilizer, amount of capital, age of farmer and farmer's experience explain about 89.2% of the variation in quantity of plantain produced. The result further showed that fertilizer application had no significant relationship at both 1% and 5% level. Majority of the plantain farmers complained of inadequate capital investment, inadequate land and poor extension service among others in the study area.

Key words: Economics, Plantain, Production, Yenagoa

INTRODUCTION
The phenomenon of crop productivity and growth to a large extent hinges on the input-output relationship. Plantain is one of the most important staple food crops grown in the tropics and sub-tropics of the world. Frison and Sharrock, (1999) observed that banana and plantain represent more than 25 percent of the food energy requirement of Africa. Plantain plays vital roles in the feeding systems of both human beings and farm animals. It has a very high nutritional value in source of dietary carbohydrates, vitamins and minerals. Plantains are extremely rich in vitamin A.

In spite of the consumption of plantains as a staple food; it is also used in the food industries for the manufacture of chips, flakes, cakes, thereby creating important opportunities to the populace directly or indirectly and invariably income for small holder farmers. At the household levels, plantains are consumed raw with water, soaked garri, fried as dodo, boiled, roasted and can be dried and grounded into flour for feature use.

Today plantain is grown in 52 countries with world production of 33 million metric tons (FAO, 2004). Production of plantain in Nigeria between 1990 to 2004 indicates a downward trend in terms of yield per hectare while price per ton have steadily increased within the period (FAO, 2006, FAO STAT, 2011). However, only eight African Countries were named among the top ten world producers of plantain with Nigeria ranking as the fifth highest producer of the crop (FAO, 2004). In terms of total production, the banana ranks after oranges, grapes, and apples, but when plantain production is added, it becomes the world's number one fruit crop.

According to Begg et al (1984) when the economy is producing the maximum possible quantity of the goods given the resources and technology available, the economy as a whole is said to be efficient. It therefore means that optimal production is achieved when the available resources are utilized fully. Plantain being a major staple food in the humid tropics is not exonerated from some of the cost associated with other food crops. Yet, sustainable production of plantain in Africa is crucial to secure food and provide income to millions of people.

Most plantains are produced by small scale farmers who often do not have the financial resources for sustained production by means of the application of chemical fertilizers, fungicides and pesticides. Farmers attached little premium to the foregoing, and thus apply less, with the belief that plantain can always produce for itself with little organic manure derived from kitchen and animal remains.

On the other hand, Black sigatoka disease (a leaf spot plantain/banana disease) has reduced production resulting in acute scarcity of the crops with a resultant high cost of the fruits. Yield loss of up to 50% and more were recorded making the disease a major threat to the farm economy in west and central Africa (Jeger et al, 1995). Notwithstanding, it is known that profitability is an important concept because it relate to the financial feasibility of expansion, or indeed starting up of an enterprise and contains information of the efficiency of the technical and managerial process.

Profitability in common usage means the ability to earn profit. The profitability of any enterprise is measured in relation to the size of the business. It is affected thus, by both revenue and cost. Different forms of business produce goods and service for sale in other to earn income. If the income earned does not exceed cost of production in turn, the firm cannot stay in business for a long time therefore the aim of any enterprise is to minimize cost and maximize output in other to maximize net revenue.

The broad objective of this study therefore was to examine the economics of plantain production in Yenagoa Local Government Area of Bayelsa State. The specific objectives were to: (i) determine the socio-economic characteristics of plantain producers; (ii) analyze the costs and returns associated with plantain production; (iii)

determine the input/output relationship in plantain production; and (iv) examine the problems and prospects associated with plantain production.

RESEARCH METHODOLOGY

Study Area

The study was carried out in Yenagoa Local Government Area of Bayelsa State which is located in the capital territory, within latitudes $4^{o}45$ N and $5^{o}23$ S and Longitudes $5^{o}15$ E and $6^{o}45$ E. The Area constitutes a population of 353, 344 (National Population Census 2006) and lies within the rainforest zone, with a humid equatorial climate and mean annual rainfall ranging from 2,000 to 4,000mm and alternating rainy (March-November) and dry (December to February) seasons, featuring a short dry period between July and September (August break). Maximum average temperature is $30^{o}C$ with a relative humidity between 55 and 90 percent, depending on season and location.

The major occupation of the people are fishing, farming and trading. Other means of livelihood include hunting, lumbering, distillation, palm oil milling, building, and weaving (Alagoa 1999).

Sampling Technique

Multi – stage sampling technique was used. The first stage involved stratified sampling which was used in grouping the various clans in Yenagoa Local Government Area (YELGA) into Izon and Epie – Atissa language speaking clans, and then random sampling was used in selecting one from the minority and two from the majority, making three clans which were Biseni, Gbaran and Epie clans. The third stage involved random selection of three communities in each clan making nine (9) communities. A list of such farmers was collected from the respective community's council of chiefs and Bayelsa State A.D.P (Agricultural Development programme).

The communities so chosen were Kalama, Tien, Tuburu in Biseni clan; Agbia, Obunagha, Asingbene in Gbaran clan; Akenfa, Okaka and Igbogene in Epie clan. Furthermore, seven (7) plantain farmers in each community were interviewed using structured questionnaire giving a total of sixty three (63) plantain farmers.

Method of Data Analysis

Statistical tools such as frequency distribution, production function and budgetary analysis were used in analyzing the data for this study. Specifically, the frequency distribution was used to analyze objective one and four, while budgetary model and production function model were used to analyze objective two and three respectively.

Model specification

It was postulated in this study that the output of plantain is a function of the farm size, labour, planting materials, fertilizer used, capital investment, age of farmer and farmer's experience that were employed in the production process.

The regression model depicting this functional relationship was given in its implicit form as

Y = quantity of plantain produced in tonnes.
X_1 = Farm size (in hectare).
X_2 = Labour (in manday).
X_3 = Planting material (number of suckers).
X_4 = Fertilizer applied (in kilograms).
X_5 = Capital investment (in naira)
X_6 =Age of farmer (in years).
X_7 = Farmer's experience (in years)

Generally, the quantity of plantain obtained is expected to increase with the increase in the farm size, labour, planting material, fertilizer, capital, age of farmers and farmer's experience employed. The quantity of plantain and farm size, labour, planting material, and fertilizer were expected to be positively related. Consequently, the expected sign of the production coefficients in the equation was positive. Four functional forms were employed in the analysis of input –output relationship in plantain production by the method of Ordinary Least Squares. They were the exponential, semi-log, linear and double log.

Budgetary model

Budgetary analysis involves estimation of gross revenue and total cost of production period. The difference between these two estimates gives a measure of net income. Mathematically budgetary model can be express as:

N= GR- TC

Where N = net income, GR = Gross revenue, and TC = Total cost

RESULTS AND DISCUSSION

A greater number of the plantain producers' surveyed fall within the age bracket of 36-50 years, with a mean age of approximately 43 years (Table 1).

Table 1: Socio-economic characteristics of the plantain farmers (n=63)

	Frequency	**Percentage**
Farmer's Age		
Below -20	2	3.18
21-35	14	22.22
36-50	30	47.62
51 and above	7	26.98

Sex		
Male	41	65.08
Female	22	34.92
Level of education		
Primary school	15	24
Secondary school	8	13
Higher college	2	3
University	2	3
Never attended	36	57
Secondary occupation		
Hunting	2	3
Fishing	8	13
Fishing /hunting	2	3
Fishing/ weaving	7	11
Fishing / carving	2	3
Carpentry/fishing	3	5
Carpentry	2	3
No secondary activities	37	59
Source of capital		
Through personal savings	39	62
Through money lenders	4	6
Through commercial bank	0	0
Through personal and relation	7	11
Through money lenders and relation	2	3
From relation	11	18
Farmer's experience		
1-5	17	27
6-10	20	32
11-15	7	11
16-20	11	17
21-25	8	13
Farm Size		
Less than 0.5	16	25
0.5-0.75	29	46
0.76-1	15	24
Above 1	3	5

Kind of labour		
Hired labour	6	10
Family labour	16	25
Both	41	65
Nature of problem		
Poor extension service	35	28.0
Water logged land	28	22.4
Inadequate capital	40	32.0
Pest and diseases	22	17.6
Total multiple response	125 *	100

The result obtained shows that plantain farmers also embark on other secondary occupation such as hunting, fishing, carpentry, etc The mean experience of plantain producers was 11 years. Majority of the farmers cultivate less than 0.75 hectares of farm land for plantain production while average farm size was estimated at 0.7 hectares. Output per hectare was estimated at 500 bunches per year, and sold at an average cost of ₦ 600.00 per bunch.

Average fixed cost of the plantain farmers surveyed was estimated at ₦41, 080.00. This amount represents expenses on knives, machetes, files, hoes, spades, canoes, paddles, etc. Total variable cost was estimated at ₦35, 500.00. This represents expenses on suckers used; labour activities etc. Finding also showed that the total cost of production per hectare was ₦76, 580.00, with total annual sales of ₦300, 000.00. Net income per hectare was estimated at ₦223, 420.00 (Table 2).

Table 2: Estimated Costs and Returns

Items /activities	**Number owned**	**Cost/unit**	**Total cost**
A: fixed cost			
Knife	1	₦100.00	₦ 100.00
Machete	5	₦900.00	₦ 4,500.00
File	2	₦ 100.00	₦ 200.00
Hoes	3	₦ 1,200	₦ 3,600
Spade	3	₦ 1,700.00	₦ 5,100.00
Wheelbarrow	1	₦ 9000.00	₦ 9000.00
farm house	0	**0**	**0**
rent (land)	3	₦ 500.00	₦ 1,500.00
Canoes	1	₦15,000.00	₦15,000.00
Paddle	4	₦ 400.00	₦ 1,600.00
Rope	1	₦ 100.00	₦ 100.00
Bag	6	₦ 30.00	₦ 180.00
Tape	1	₦200.00	₦ 200.00
			₦ 41,080.00

B: variable cost			
land preparation	4 (person)64man	₦1,500.00	₦ 6,000.00
Planting	3 (person)48man	₦1,500.00	₦ 4,500.00
Weeding	4 (person)64man	₦1,500.00	₦ 6,000.00
harvesting	2 (person)32man	₦1,000.00	₦ 2,000.00
transportation	2 km	₦500.00	₦ 1,000.00
suckers used	700 (sucker)	₦20.00	₦ 14,000.00
fertilizer	2 (bag)	₦1,000.00	₦ 2,000.00
			₦35,500.00
Total cost of production = (A+B)			₦76,580.00
C: Gross revenue	500bunches@ ₦600		₦300,000.00
D: Net income	= (C-A+B)		₦223,420.00

The result implies that plantain production in the study area is profitable. Of the four functional forms employed in the analysis of input –output relationship in plantain production, the double log form had the best fit to the set of data employed. This was followed by the exponential, semi-log and linear functional forms in that order (Table 3).

Table 3: Ordinary Least Squares Multiple Regression Results of Input-Output Relationship in Plantain Production in Yenagoa LGA of Bayelsa State, Nigeria

Regression Coefficient	**Linear**	**Exponential**	**Semi-log**	**Double-log**
Constant	189.4023	87.4022	113.5229	95.3339
S.E	(13.0039)	(0.2793)	(9.8603)	(0.0413)
Farm size (X_1)	14.1087	0.0056	1.6743	0.0713**
S.E.	(6.3513)	(0.0019)	(0.6104)	(0.0226)
t-value	2.2214	2.9474	2.7429	3.1549
Labour (X_2)	15.4421	0.0078	3.7229	0.0667**
S.E.	(13.9678)	(00027)	(2.8147)	(0.229)
t-value	1.1055	2.8889	1.3227	2.9127
Planting material (X_3)	17.3392	0.0092	1.8712	0.0843**
S.E.	(6.0827)	(0.0027)	(1.2133)	(0.0308)
t-value	2.8506	3.4074	1.5422	2.737
Fertilizer applied (X_4)	-14.0027	-0.0083	-2.8821	-0.0813+
S.E.	(13.1067)	(0.0078)	(2.4845)	(0.0709)
t-value	-1.0684	-1.0641	-1.1601	-1.1467
Capital investment (X_5)	13.1643	0.0038	9.2013	0.0349**
S.E.	(12.1903)	(0.0021)	(8.7108)	(0.0103)
t-value	1.1059	1.8095	1.0563	3.3883

Age of farmer (X_6)	-21.3093	-0.0065	-14.9117	-0.0844**
S.E.	(19.1142)	(0.0051)	(3.1608)	(0.0317)
t-value	-1.1148	-1.2745	-1.5539	-2.6625
Farmer's experience (X_7)	17.2092	0.0089	1.5442	0.0524*
S.E.	(4.6183)	(0.0029)	(1.3349)	(0.0209)
t-value	3.7262	3.0689	1.1568	2.5072
R^2	0.4703	0.6036	0.3903	0.8924
F-value	6.9767	11.9762	5.0232	65.0437

\+ = Not Significant at both 5% and 1% T - Ratio < 1.96 not Significant at 5%

* = Significant at only 5% T - Ratio > 1.96 -2 .57 significant at 5%

** = Significant at both 5% and 1% T - Ratio > 2.58- ∞ significant at 1%

Consequently, the double log was chosen as the lead equation on the basis of conventional statistical and econometric criteria.

The estimated production function of the double log form is given as follows:

$$Y = 95.339 + 0.0713x_1 + 0.0667\,x_2 + 0.0843\,x_3 - 0.0813\,x_4 + 0.0349\,x_5 - 0.0844\,x_6 + 0.0524\,x_7,\ R^2 = 0.892 \text{------(iii)}$$
(0.0413) (0.0226) (0.0229) (0.0308) (0.0709) (0.0103) (0.0317) (0.0209)

The figure in parenthesis represents the respective standard error.

The value of the coefficient of multiple determination (R^2) obtained and its statistical test at 5% and 1% indicates that the size of farm, labour, number of suckers, fertilizer, amount of capital, age and experience of farmers explain about 89.24% of the variation in quantity of plantain produced. The regression analysis further showed that every size of farm employed in plantain production yields 0.0713 tonnes of plantain, while every labour employed yields 0.0667 tonnes of plantain, number of suckers employed yield 0.0846 tonnes of plantain, while capital employed yields 0.0349 tonnes of plantain.

The use of fertilizer and farmers age in the study area inversely yields 0.0813 tonnes and 0.0844 tonnes of plantain respectively. The size of farm, labour, number of suckers, amount of capital, and age of farmer were significant at both 1% and 5% levels while farmer's experience was significant at only 5%. This means that the farm size, labour, number of sucker, capital in naira, Age of Farmers, Experience of farmers employed in the production process influences the quantity of plantain produced.

However, there was no significant relationship between fertilizer applied and plantain produced at both 1% and 5% levels. This suggests that fertilizer application had no effect on the output of plantain. This was attributed to lack of fertilizer product and technical know-how. Majority of the plantain Farmers complained of inadequate capital investment and poor extension service. Plantain farmers in the study area do not have access to loan from the bank but majority go into production through their personal savings.

CONCLUSION AND RECOMMENDATIONS

The study showed that plantain production in the study area is profitable. Given the necessary economic incentive, its productivity and growth could be enhanced. However, majority of the plantain farmers were faced with the problem of poor extension services, water logged farm land, inadequate capital to go into large scale production, and pest and disease attacks.

Thus it is recommended that government should employ and train more extension agents that would design an extension programme to equip farmers with the necessary basic knowledge in farm practices, and new innovation on plantain production. The government, nongovernmental organization, banks and other financial agencies, should assist farmers through the provision of loans, subsidies and other incentives with minimum collaterals to enhance plantain productivity in the area. Research institutes such as the International Institute of Tropical Agriculture (IITA) should make available improved varieties of plantain suckers, to boost plantain production in the area.

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