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An economic assessment of plantain production in Rivers State, Nigeria

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Abstract: This study examined the profitability and resource-use of plantain production in Nigeria, using Rivers State Nigeria as a case study. The study sample respondents comprised eighty 80 plantain producing households. These were selected randomly across River State. The gross margin and regression analysis were used to analyse the farmers' plantain production data. The result showed that the plantain farmers in the study area are aged and of poor literacy status Gross margin per hectare of plantain averaged **N**34,317.00 while net farm income averaged **N**31,267. Rate of returns on investment and rate of return on capital invested are 173 and 73 per cent respectively implying that plantain production is a profitable and viable venture. The OLS regression estimate showed that labour did not significantly influence plantain output. However land and planting material: sucker are shown to enhance plantain production Theft, bad roads, poor producer prices and high cost of fertilizer were reportedly the constraints to plantain production. The study therefore recommends subsidy on fertilizer, group marketing of plantain by farmers themselves via their cooperative, provision of basic rural infrastructural (road) and the rehabilitation of existing ones, so as to better rural life thereby attracting youth population to the rural areas for plantain production.

Keywords: gross margin, rate of return, suckers, factors, resource-use, regression.

INTRODUCTION

Plantain and banana are major sources of food in many regions throughout the world. Total world production of these crops is estimated to be over 76 million metric tones, out of an estimated 12 million metric tones are produced in Africa annually. Most of these are consumed or traded locally (INIBAP, 2003). About 70 million people in the African sub-region are estimated to derive more than one quarter of their food energy requirements from plantain. Plantain is very critical in bridging the gap between the demand and supply of the basic carbohydrate staples. It also control land degradation which could occur with the constant use of machinery (FA0, 1993). Plantain is undoubtedly one of the oldest cultivated fruits in west and central Africa. In Nigeria, plantain production is becoming a significant economic activity for income generation for both large scale and small holder farmers, especially for those who produce them within their home compounds or gardens. Plantain also plays an important role in the structuring of rural landscape throughout the producing areas in the country. Also, the gross value of plantain and

banana in terms of their annual product exceeds that of several other crops such as maize, rice, cassava and sweet potato in sub-Saharan Africa (FAO, 2001).

Plantain production is becoming a significant economic activity for income generation for both large scale and small holder farmers in the country, especially for those who produce them within their home compounds or gardens. The crop is one of the Primary Commodities for Investment across the south-south zone in Nigeria, River state inclusive (Table 1)

Though, the gains derivable from plantain are numerous, its level of production in Nigeria has been inconsistent and low (FOS, 1999). To harness the export potential of plantain, the current level of its production must be improved. This implies that the limited resources available to plantain farmers have to be optimized. The poor plantain output problem in Nigeria therefore centers on the efficiency with which farmers use resources on their plantain farm. It also borders on how the various factors that affect plantain production can be examined, so as to improve plantain production in the country. This quest therefore raises research questions as to how could farmers be enhanced to produce a basic stable crop like plantain more efficiently? How productive is the plantain enterprise?, how viable is it? What are the constraints and possible areas of conservation towards a greater plantain output? This study thus examined the productivity of plantain farms in Nigeria using River state, Nigeria as a case study. The study specifically examined the resource use efficiency, and the nature of costs and returns in plantain production.

This study assumes sizeable importance in view of the traditional system of plantain production in Nigeria (Ogunfowora and Olayide, 1975, Awotide *et al*, 2004). Such traditional systems are characterized by low level of productivity (FACU, 1992; FDA, 1993, 1995).. The efficiency with which farmers use existing resources and technologies in these systems is therefore important. This is more so where farmers are not making efficient use of existing resources, in the face of geometrical growth in population, increasing pressure on natural endowed resources diminishing traditional fallows and fast shrinking land frontiers. It is no surprise therefore that considerable effort have been devoted to the analysis of farm level efficiency in developing countries. An underlying factor behind much of these works is that if farmers are not making efficient use of existing technology, then efforts designed to improve efficiency would be more cost-effective that introducing new technologies as a means of increasing agricultural output (Shapiro, 1983). In an economy where resources are scare and opportunities for new technologies are lacking, efficiency studies can show the possibility of raising productivity by improving efficiency without expanding the resource base. Plantain farmers can thereby maximize profit and produce more, leading to food security and competitiveness in plantain production. This study will therefore serve as a guide to agricultural key players on plantain production investment decisions. It could also serve as a

source of relevant information to other countries facing similar situation.

Study Area and Data

The study was carried out in River State, Nigeria. Rivers State is one of the 36 states of Nigeria. Its capital is Port Harcourt. About two thirds of Rivers state lies in the Niger Delta geographical terrain of Nigeria and the state is bounded in the south by the Atlantic ocean which has a great influence on the its climate. To the North, the state is bounded by Anambra, Imo and Abia States, to the East by Akwa Ibom State and to the West by the Bayelsa and Delta States. The state has a population of about three million people and occupies an area of 21,850 square kilometers (NPC,2006) The dominant ethnic groups in the state are the Ijwa, Ikwere, Etche, Ogoni, and Ogba/Egbema. Ijaw and Ikwerre are the most spoken languages although pidgin English is widely used in radio and television broadcasts. Rivers State is currently made up of 22 local government areas. These are Ogba/Egbema, Ndoni, Ahoada, Ikwerre, Etche, Andoni/Opobo, Bonny, Okrika, Iyigbo, Ehana, Gokana Tai/Eleme, Obio/Akpor, Emohua, Degema, Aseri Toru, Akuku, Abua/Odial, Omumma, Opobo/Nkoro, Ogu/ Bolo, Ahaoda West and Eleme (Ngex Nigeria Site,2008).

Agriculture is the main occupation of the people of Rivers State and the agricultural policy of the state government is anchored on food production. This provides employment for young school leavers and university graduates. These agricultural activities are grouped' under Community Block Farming Scheme, Community Fishing Scheme, Livestock Scheme and Rabbi try. Major crops cultivated in the state include yam, cassava, maize, oil palm, banana and plantain.

The inland part of Rivers state consists of tropical rainforest; towards the coast the typical river delta environment features many mangrove swamps. Rivers state's climate consists of two main seasons, the dry and wet seasons. The rainy season fall between March and October of each year. The state also enjoys low temperature ranges of between 22^{o}C-33^{o}C and a high relative humidity due to its proximity to the Atlantic Ocean. (River State Ministry of Information, 2008).

Plantain is produced in nearly all the local government areas of Rivers State (RSADP, 2003). However, some towns and villages in three local government areas of the state are popular for plantain production. These include Ikwerre, Emohua and Obio/Akpor (Table 2).

Based on the foregoing, albeit pertinent information, the study sample was spread across the three popular plantain production areas in Rivers State. The sampling procedure thus adopted comprised a two stage sampling procedure. The first stage involved the random selection of towns and villages across the three popular plantain production areas in Rivers State. The second stage comprised a random selection of ten (10) respondents across the selected towns and villages. In all a total of one hundred (100) respondents were interviewed for the study. However due to non-response, only eighty of the respondents information were processed for the study (Table 3)

Data Analysis

The gross margin and regression analysis were employed to analyse the data for

the study. The gross margin analysis was employed to determine the overall gross margin per hectare and net farm income (NFI) per hectare. The Gross Margin and net farm income were estimated as equations (1) and (2)

GM = TVP – TVC …….. (1)

NFI = GM – TFC…… (2)

Where GM = Gross Margin, TVP = Total Value of Production, TVC = Total Variable Cost, NFI = Net Farm Income and TFC = Total Fixed Cost

Other estimations from the gross margin were the Rate of Return on Investment ROR and the Rate of Return on Capital Invested RORCI. The rate of return on investment is the ratio of the total revenue to total cost of production. It is almost similar to the undiscounted benefit/cost of a project. The Rate of Return on Capital Invested RORCI is the ratio of the profit to the total cost of production. It indicates what is earned by the business per naira outlay. The ROR and RORCI were estimated as equations (3) and (4)

Rate of return on investment =Total value of production / total cost of production (3)

Rate of return on capital invested =Profit / total cost of production (4)

Regression Analysis

The Regression tool was employed to identify the factors affecting plantain production in the study area. The regression equation estimated is stated as equation (5)

$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \mu$ …… (5)

Where Y = Total Value of Output in Naira (N), X_1 = Size of land cultivated to plantain in hectares, X_2 = Quantity of Labour used in Man-days, X_3 = Value of Purchased input (sucker) in Naria (N) and μ= Stochastic error term. The Xis are the factors hypothesized as factors affecting of plantain production

The data gathered on these variables were fitted to different regression models (example Cobb – douglas, semi – log, quadratic and the exponential models). The model that gave the best fit was therefore selected as the lead equation based on different econometric criteria. These criteria include the magnitude of the models' R^2, the number of independent variables that were statistically significant, and the number of independent variable's co-efficient signs that conform to apriori expectation.

The Resource use efficiency ratio was also estimated for each of the resources used in plantain production, as in equation

$$\text{Resource use Efficiency Ratio} = \frac{MVP}{UFC} \text{…….(6)}$$

Where MVP = Marginal Value Product, UFC = Unit Factor Cost

$$MVP = b\frac{Y}{X} \text{ ……..(7)}$$

Where MVP = Marginal Value Product, b = Regression Co-efficient, Y = means of Output, X = Mean of input.

If RUE = 1 resource is optimally utilized

If RUE = >1 resource is under – utilized

If RUE = <1 resource is over – utilized

RESULTS AND DISCUSSION

The summary statistics of some socio-economic variables are presented in Table 4: The mean age of 53 years shows that the farmers are relatively old based on (WHO, 2003) average life span 42 years for Nigeria. This results because majority of the youths in the study area have migrated to the urban areas to seek for white collar jobs. This generally aged plantain farmers could have negative implications on the

future of plantain cultivation in the study area. Table 3 also indicates that the respondents on the average have had five years of formal education. This duration of schooling is below the primary school duration period in Nigeria which is six years. The poor literacy level of the respondents could affect their choice of inputs and the utilization of existing inputs and also their willingness to adopt improved technologies. However the average rice farming experience for the plantain farmers is 15years. An average farming experience of at least 15 years for the plantain farmers implies that plantain farmers in the study area can be considered to be quite knowledgeable on the operations and constraints of plantain production. The plantain farmers could therefore appreciate any improved technology introduced to them.

The area of land farmed by the farmers is very important as it determines to a large extent the crop population on the farm and consequently the quantity of harvest. Majority of the plantain farmers cultivated small plots that were equal or less than 1 hectare. The mean farm sizes for is 0.86 hectare implying that the plantain farm units were generally small sized. Plantain farming in the study area is therefore on small scale basis. These findings agree with Okunola and Adekunle, (2000) that majority of the Nigerian farmers are the small scaled types. The small–scale platain cultivation may constrain the quantity of farmers output. Mean income earned by the plantain farmer is N 73,416.15 (US$ 622.17).

Costs and Returns

The costs and returns on average farm size of one hectare is presented in Table 5. The table shows that on average the variable cost is N43,692.05 per hectare which accounts for about 97.8% of the overall production cost. The fixed cost is N3,900:06 and it accounts for only 9.2% of the overall production cost. The gross margin and net farm income were N 38,678.11 and N34,773.05 respectively. The rate of return (ROR) estimates is N173% meaning that for every N1 invested into the plantain cultivation, N1.73 is made as revenue. The Rate of return on capital invested (RORCI) estimate is 0.75 and is therefore greater than the prime lending rate of between 25 –35 per cent (Table 5). The results therefore support both viability and profitability of plantain production in the study area.

Regression Estimates

A stepwise regression analysis was carried out to identify the factors affecting plantain production in the study area. The lead equation is the Cobb Douglas. The variable coefficients of the independent variables: farm size (X_1), labour input (X_2) and the cost of plantain suckers (X_3) hypothesized as factors affecting plantain production were positively indicating that all the variables had the expected a priori signs. The positive coefficients implies that a unit increase in these variables will raise the level of plantain production. The presence of the positive co-efficient variable inputs/factors therefore contributes to plantain production. However, only the sucker and farm size variables have coefficients that are significant at 5 percent levels. These variables are therefore those that significantly affect plantain production. The labour variable was not significant even at 10 per

cent level. The lead equation which is the Cobb Douglas has the highest R^{-2} value of 0.721 and is significant at 5 per cent level of significance as indicated by the F-ratio. The R^{-2} value of 0.721 implies that the lead equation explains 72.1 per cent of the variability in the quantity of plantain produced.

$\log Y = \log 2.505 + 0.438 \log X1 + 0.911 \log X_2 + 2.017 \log X_3$

(17.179) (1.965)* (0.168) (2.658)*

$R^2 = 0.721$

F = 204.603.

Figures in brackets are t-values

* variable significant at 5 per cent level

Resource Use Efficiency

In order to examine the productivity of resources used in plantain production, the resource use efficiency ratios of the various factor inputs used in plantain production were estimated. In estimating the ratio, the marginal value product (MVP) of each resource was computed and compared with its unit factor cost (UFC) (Table 6).

Table 5 indicates that land (X_1) and purchase plantain suckers (X_3) have low efficiency ratios that are less than unity. This implies that land and plantain sucker have more potential to raise plantain yields in the study area scale basis. For the labour input to the efficiency ratio is also less than unity implying that the labour resource is underutilized. The result on labour is due to the inefficient use of labour in plantain production. Though plantain usually shades areas around it thereby suppressing weeds and reducing soil water losses from the soil, the result indicates that the addition of more labour into plantain farming would improve efficiency in the plantain production.

Constraints Associated with Plantain Production

Table 7 shows the main constraints to banana production in the study area. The Table indicates that the most popular constraint to plantain production is the high price for the fertilizer input. This is followed by the poor and unstable price of the commodity, bad road networks, inadequate farm land and theft. The issue of land is common because most of the land owners were reportedly not willing to lease out their lands for farming purposes.

CONCLUSION AND RECOMMENDATIONS

This study examined the efficiency and viability of plantain production farms in River State, Nigeria. The study result indicates that plantain production is profitable through the rate of return and rate of return to capital invested to plantain production are 173 per cent and 73 per cent respectively. However, plantain is practiced by the aged farmers, who are of poor literacy status. The result also indicates that land and planting material (sucker) are determinants of plantain production in the study area. The efficiency ratio result indicates that land, labour and planting material (sucker) are underutilized in the production of plantain. Inadequate land for farming purposes, theft, bad roads, poor producer prices and high cost of fertilizer were reportedly the constraints to plantain production.

Based on the study findings, the study recommends the need to provide and rehabilitate the necessary infrastructures and other utilities in the study area. This would help to discourage

rural–urban migration. This can help retain young people including extension agents in the rural areas. Also efforts at making available lands, and improved planting materials for plantain production should be enhanced. Land which is a very scarce commodity, especially in the study should be made available readily to the plantain farmers in the study area. In the light of this, government and other stake holders should sought ways by which some of the degradated soils in the study area could be reclaimed for agricultural uses. Also the rural people who are mostly the farm households should be encouraged to improve on their farm knowledge and practices. There is an urgent need to ensure easy access of farmers to adult and farm related education, when farmers are educated, they can better appreciate improved technologies. Subsidy on the fertilizer input to relieve costs of plantain production is indeed necessary to enhance good plantain output. Group marketing of plantain by farmers via farmers cooperative can also help alleviate unstable prices and poor returns to plantain production. Lastly, small scale agro-processing industries could be enlightened and encouraged to exploit the potentials of plantain.

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Table 1: Priority Primary Commodities for Investment across Zones in Nigeria (Rank 1 = Highest and 7 lowest)

Primary Commodity	Rank assigned						
	NC	NE	NW	SE	SS	SW	NIGERIA
Staple Foods							
Rice	7	1	3	2			3.25
Maize	3	2	1	4			2.5
Millet	5	3	4				4.0
Cowpea	6	4	2				4.0
Sorghum		5	5				5.0
Cassava	2	6	6	1	1	2	3.0
Yam	1	7	7	3	2	1	3.5
Sweet Potato				5			5.0
Cocoyam				6			6.0
Melon				7			7.0
Plantain					4		4.0
Guinea Corn	4						4.0

Key: NC=Northcentral, NE=Northeast, NW=Northwest, SE=Southeast, SS=Southsouth, SW=southwest
Source: Manyong *et al* , 2008

Table 2: Popular Plantain Production Areas in Rivers State, Nigeria.

Local Government Areas	Towns/Village
Ikwerre	Omuanwa, Ubioma, Ozuaha, Elele
Emohua	Obelle, Ibaa, Ndele, Alimiru
Obio/Akpor	Choba Village, Ekekahia, Ozuoba

Source: Rivers State Agricultural Development Programme (2003)

Table 3: Sample Design Outlay for the Study

Local Government Area	Town/village	No of Respondents	No of Responses
Ikwerre	Omuanwa Elele Ubima Ozuaha	10 10 10 10	10 7 7 8
Emohua	Alimini Ndele Ibaa Obelle	10 5 5 10	7 5 5 9
Obio/Akpor	Choha Ozuoba Elekahia	10 10 10	8 8 8
Total	11	100	80

Source: Field Survey, (2007)

Table 4: Summary Statistics of Socio- economic Variables of Respondents

Variable	Mean
Education (years)	5.41
Experience (years)	15.7
Age (years)	53.8
Farm Size (hectare)	0.86
Income (in Naira N)	73,416.15

(US 1 dollar = 118 naira)

Source: Results Based on Data Analysis

Table 5: Cost and Returns in Plantain Production in the Study Area.

Variable	Amount in Naira (N)
Total value of production (revenue)	82365.16
Total variable cost	43,692.05
Gross margin	38,673.11
Total fixed cost	3900.06
Net farm income	34,773.05
Rate of return (ROR) (%)	173
Rate of return on capital invested RORCI (%)	73
Bank interest rate (%)	25% - 35%

(US 1 dollar = 118 naira)

Source: Results Based on Data Analysis

Table 6: Resource-use Efficiency Ratios of Inputs used in Plantain Production

Resource	MVP	UFC (N)	Efficiency Ratio
Land	2.713	2000	0.001365
Labour	2.59	450	0.00575
Purchased Input Sucker	0.93	200	0.00465

Source: Results Based on Data Analysis

Table 7: Reported Constraints of Plantain Production

Constraint	Frequency	Percentage
High cost of fertilizer	68	85.0
Bad roads	65	81.3
Theft	34	42.5
Poor price	77	96.3
Inadequate farm land	56	70.0

Source: Results Based on Data Analysis