
**ANALYSIS OF PROFITABILITY AND DETERMINANTS OF PLANTAIN PRODUCTION IN
IFE AGRICULTURAL DEVELOPMENT PROJECT (ADP) ZONE OF OSUN STATE, NIGERIA**

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Abstract

This study analyzed the profitability and determinants of plantain production in the Ife Agricultural Development Project (ADP) zone of Osun State. Three Local Governments areas; Ife South, Ife North and Ife East were randomly chosen from the ADP zone. Thirty (30) plantain farmers were randomly selected per each ADP zone, making a total of 90 plantain farmers households. The questionnaire was used for the purpose of extracting needed information from the respondents. The results showed that plantain production enterprise was male dominated. Majority of the farmers were married and also at their prime age. Most of them (72.2%) have had some form of formal education and also experienced farmers. The cost and returns analysis showed that plantain production is a profitable enterprise accruing back about ₦4 for every naira invested into it. Regression estimates result revealed that the size of farm, age of the farmer, labour, farming experience, access to credit and extension service were the factors affecting plantain production in the study area. Climatic change and variability in the form of heavy wind and rain, lack of capital and credit inaccessibility were identified as the top major constraints to the production of plantain. The study therefore recommends that efforts be mobilized to provide incentives both in cash and kind to the farmers.

Key Words: Determinants, Plantain, Production, Profitability, Farming Experience

Introduction

There is no formal botanical distinction between banana and plantain. The use of either term is based on how the fruit is consumed. Plantain tends to be firmer and lower in sugar content than banana. Banana is eaten raw when ripe while plantain can be consumed ripe, unripe or overripe. Plantains are tree-like perennial herbaceous plants of proximal height of 2-9 meters with an underground rhizome or corn. The main species of plantain are *Musa paradisiaca* which is also known as the French plantain, *Musa acuminata* also called Gross, Michel and Cavendish and *Musa corniculata* also known as the Horn plantain. The outward appearance of plantain is greenish when unripe, it is slightly curved in length and when ripe, has dark or yellowish colour and in some cases, with dark patches (Emaga *et al*, 2007; Ayanwale, *et al*.2016). Plantain is considered as one of the most important staple food crops grown in the tropics and sub-tropics region of the world. The region is characterized by warm temperatures, bright sunlight and adequate moisture which create an optimum growing environment for the crop. Plantain requires an optimum temperature of 30°C, a well distributed mean monthly rainfall of 100mm and a well drained sandy-loam soil of 4.5 to 7.5 pH (IITA, 2014; Okoje, 2014). It is cultivated along the Coast of West and Central Africa stretching from Guinea to the Democratic Republic of Congo and Central Africa Republic

(Swennen, 1990). The major producing countries with an annual output exceeding a million tonnes include Nigeria, Ghana, Cote d'Ivoire and Cameroon. Production in West Africa has risen from approximately 4 million tonnes in the 1990 to about 12 million tonnes in 2011.

The underlining potentials in Plantain as a staple food crop has made it the fourth most important in the world after rice, wheat and maize, occupying a strategic position in tackling the issue of food insecurity and poverty in the developing worlds (Phillip *et al*, 2009). In the sub-Saharan Africa alone, plantain provides more than 30 percent of the carbohydrate and 15 percent of the calorie for approximately 70 million people in the region (Baruwa *et al*, 2011). For Nigeria, plantain occupies a strategic position not just for rapid food production but also in her drive to attaining nutritional security and poverty alleviation. Plantain ranks third among the nations starchy staples and the country's output has more than doubled in the last 20 years. Nigeria has been placed as one of the largest plantain producing countries not just in West Africa but also in the world (FAO, 2006). Its production is concentrated in Southern parts of the country with the share of its annual production of about 2.4 million metric tonnes. States like Edo, Delta, Ogun, Osun and Ondo States are the major producers of the crop. Other states like Rivers, Cross River, Imo, Anambra, Lagos, Benue, Abia and Enugu also produce but not on a large scale (Ayanwale, *et al.*, 2016). The contribution of plantain to the income of rural household in the major producing areas in Nigeria continues to increase tremendously in the last few years. Unlike some other starchy staples whose demand tend to fall with rising income, demand for plantain increases with increasing income. This can be ascribed to the rapid urbanization and the increasing demand for easy and convenient foods that can well be satisfied by this crop. Today, income is generated from processing this product into so many forms like chips, shredded fried plantain, fried plantain, plantain flour and *dodo ikiire* (local culinary) among others (Akinyemi, *et al.* 2008). With the potential for industrial processing of plantain which is gaining popularity, it is believed that Nigeria will continue to be one of the world's largest producer of the crop (Akinyemi, *et al.* 2008).

Despite these potentials and its increasing importance, plantain production is still very much concentrated in the hands of small scale farmers with crude practices, who over the years have indigenously integrated the crop into various cropping systems. In fact, plantain is still viewed as a backyard crop and in most cases raised for the purpose of using them as a cover crop. With the growing demand for plantain, it is becoming more and more difficult to consolidate the demand and supply gap. This gap is the reason why consumers pay more for this crop and also the country's inability to generate foreign income from the crop. Inadequate knowledge on the potentials of the crop is a major reason why production is still low. Farmers have therefore not been able to rely on plantain production as their major source of income. This therefore makes the current study which evaluates the potentials and deterrents to plantain production activities timely to filling the existing gap in knowledge and literature. The objectives of the study were therefore to;

- i. determine the profitability accrued to plantain production;
- ii. determine the factors determining production of plantain

- iii. determine the constraints to production of this crop in the study area.

Methodology

Area of Study

This study was carried out in Ife ADP zone of Osun State. The Osun State Agricultural Development Project (OSSADEP) zoned Osun State into four agricultural zones based on the states cropping practices and agro-ecological considerations. These are Osogbo, Ife, Ijesha and Iwo Agricultural zones. Ife ADP zone is the highest producer of plantain in Osun State. Ife ADP zone is made up of four LGAs namely: Ife North, Ife South, Ife East and Ife Central. The zone is one of the larger centres and probably the oldest town of the Yoruba people. The dominant occupation and economic activities of the people center around farming, agro-allied production, trading, artisanship, school administration, teaching and cottage industries. The dominant crops produced are cocoa, palm oil and kernels, yams, cassava, maize, pumpkins, plantain, banana and kola nuts (OSSADEP, 1997).

Sampling Techniques

The target population for this study were the plantain farmers' households in the Ife agricultural zone. The zone was purposively selected for the study due to the high production of plantain in the area. Ife ADP zone consist of four local governments namely: Ife North, Ife South, Ife East and Ife Central. For the study two stage sampling procedure was used. The first stage of sampling involves the purposive selection of three local government areas namely Ife east and Ife south and Ife north while the second stage involved the random selection of thirty (30) plantain farmers households from each of the selected LGAs, making a total of 90 plantain farmers households used for the study. Data used were primary obtained through questionnaire and the focus group discussion.

Analytical Techniques

Descriptive and inferential statistics

Descriptive/inferential analysis was used to analyze respondent's socio-economic characteristics. This involves the use of mean, frequency distributions and percentages.

Gross margin (GM)/and Benefit-cost ratio (BCR)

This was used to estimate the cost incurred and the returned accrued to plantain production activities in a production year. This costs and returns were estimated based on the previous production season. The variables were measured in naira. Gross margin analysis is specified as:

$$GM = TR - TVC \quad (1)$$

Where;

GM = Gross margin

TR = Total revenue

TVC = Total variable cost (these are the expenses incurred in production that does not depend on the level of output.). This includes costs of chemical, fertilizers, labour, and suckers. This was then be used to calculate the net farm income (NFI) given as:

$$NFI = GM - TFC \quad (2)$$

TFC = Total fixed cost (salvage value was assumed to be zero).

Benefit-cost ratio was used to analyze the returns to investment. It is given as:

$$BCR = \frac{\text{Total revenue}}{\text{Total cost}} \quad (3)$$

Ordinary least square OLS regression

The OLS regression was used to determine factors affecting plantain production as applied in Fakayode *et al* (2011) and Kainga and Seiyabo (2012). This is specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e \quad (4)$$

Y = Total farm output in kilogram

X₁ = Land size in hectares

X₂ = Farming experience in years

X₃ = Level of formal education in years

X₄ = Cost of fertilizer in Naira

X₅ = Cost of chemical (herbicide & pesticide) in Naira

X₆ = Farm labour in Man-days

X₇ = Cost of sucker in Naira

X₈ = Access to credit (1 = Yes; 0 = No)

X₉ = Access to extension service (1 = Yes; 0 = No)

X₁₀ = Age of farmer in years

e = error term

Likert scaling

The likert scale method was used in determining the constraints to plantain production in the study area. The scale is a five-point scale and employs the ordinance level of measurement. As a five-point scale, responses are grouped into five points. These are: very serious (5), serious (4), moderately serious (3), least serious (2) and not serious (1). The mean and standard deviation values were used to make decisions (Bowling, 1997).

Results and Discussion

Socio-economic Characteristics of Plantain Farmers

The result for the analysis of the socio-economic variables for the plantain farmers households respondents is shown in Table 1.

Table 1: Socio-economics Characteristic of Respondents

Socio-economic variables	Frequency (N = 90)	Percentage (%)
Gender		
Male	78	86.7
Female	12	13.6
Marital status		
Married	53	58.9
Single	24	26.7
Separated	4	4.4
Widowed	9	10.0
Age distribution		
20-30	16	17.8
31-40	32	35.6
41-50	28	31.1
>50	14	15.6
Level of formal education		
None	17	18.9
Primary	25	27.8
Secondary	29	32.2
Tertiary	11	12.2
Adult	8	8.8
Years in farming		
<5	6	6.7
6-10	26	28.9
11-15	26	28.9
16-20	18	20.0
>20	14	15.6
Primary occupation		
Farming	50	55.6
Trading	15	16.7
Civil servants	17	18.9
others	8	8.9
Mixed cropping types		
Plantain alone	24	26.7
Cassava + plantain	29	32.2
Cocoa + plantain	18	20.0
Maize + plantain	19	21.1
Total	90	100

Source: Field Survey, 2016

Table 1 shows that plantain production is gender dependent given that majority of the farmers were male (86.6%). This agrees with the findings of Tijani *et al*, (2009) who also reported

that the plantain enterprise was male dominated. The enterprise is energy demanding which can only be met amongst the male hence their concentration in the enterprise. This probably explains why female generally are found to process and market plantain (Adetunji and Adesiyan, 2008; Eronmwon *et al*, 2014). Most of the farmers were found to be married. This implies that they are responsible for some people's care and could easily have access to their household family labour. Majority of the farmers (66.7%) were in their prime age of 47 years. It was also observed that majority of the farmers (72.2%) have had some forms of formal education. This implies that they could be expected to be able to read and write and adopt improved plantain production technologies. Most of the farmers are also well entrenched in plantain farming. Over three-quarters of them have been involved in farming for over 5 years. The farmers claimed that farming is their primary occupation. Further enquiry revealed that most of the farmers (73%) intercropped their plantain with other crops. Given the life cycle of the crop, farmers claimed they raise side crops to boost income in the times of low to no harvest of plantain.

Cost and Returns to Plantain Production

The cost and returns structure of any enterprise is very important in order to determine its returns to labour and management. In explaining the profitability of plantain production, the gross-margin analysis was calculated by subtracting the total variable cost from the total revenue and thereafter subtracting the total fixed cost to get the net farm income.

Table 2: Costs and Returns Analysis

Items	Naira per Hectare (N/ha)
Total revenue	
Sale of plantain	97,766.22
Variable costs	
Fertilizer	856.22
Chemicals	928.44
Labour	13,378.22
Planting material (sucker)	5,467.28
Total variable cost	20,630.16
Fixed cost	
Land cost (rental)	2,300.21
Depreciation on tools	1,112.5
Total fixed cost	3412.71
Total cost = TVC +TFC	24,042.87
GM = TR-TVC	77,136.06
Net farm income	73,723.35
Benefit-cost ratio	4.07

Source: Field Survey 2016

Table 2 shows the cost and returns analysis for the plantain production enterprise. Plantain production as an enterprise can be clearly seen as profitable giving back about ₦4 for every naira invested on a plantain hectare. The cost of fertilizer is low due to the fact that not all the farmers utilized fertilizer and even where they did it was always at the early stage of cultivation. The result further revealed that total variable cost and total cost of was ₦20,630.16/ha and ₦24,042.87/ha respectively. The gross margin was ₦77,136.06/ha while the net farm income was ₦73,723.35/ha.

Regression Analysis

Table 3 shows the regression estimates result for the factors affecting plantain production in the study area. The value of the adjusted coefficient of multiple determination (R^2) obtained and its statistical test indicates that the size of farm, age of farmer, labour, farming experience, credit access and extension service variables explain about 63.3% of the variation in quantity of plantain produced.

Table 3: Factors affecting plantain production.

Variables	Coefficient	t-stat
Constant	-15.344	0.94
Farm size	13.654***	3.71
Farming experience	0.4405**	2.21
Level of education	0.0000602	0.06
Cost of fertilizer	5.411	1.46
Cost of chemical	-0.234	-1.61
Labour	16.428***	2.99
Age	-4.135*	-1.89
Input price (sucker)	-0.00185	-0.76
Credit access	2.8592**	2.07
Extension service	4.663*	1.82
R ²	0.633	

(*** = significant at 1%; ** = significant at 5%; * = significant at 10%)

Source: Field Survey, 2016

Land size, farming experience, access to credit, access to extension services and labour were found to be positively significant at 1%, 5%, 5%, 10% and 1% respectively, implying that an increase in these variables will give rise to an increase in production. This resultant increase in plantain production was all elastic except for farming experience which was inelastic. Land and labour gives room for expansion while farming experience, extension services and access to credit gives room for efficiency (Kainga and Seiyabo, 2012; Okoje, 2014). Access to credit provides the farmers with more capital for investment and the more experienced farmers is informed, effective and able to make efficient decisions on plantain farming. Access to extension services allows the farmers to make informed decisions and indulges them in best cultural practices in plantain production. Age was found to be negatively significant at 5%, implying that aging will result in a fall in production. This is quite understandable given the

fact that as the farmer grows older, his/her efficiency reduces. This also agrees with the work of Kainga and Seiyabo, (2012) who reported that farmers were less efficient as they age.

Plantain Production Constraints

The result of production constraints for plantain is presented in Table 4

Table 4: Constraints to Plantain Production

Constraints	Mean	Standard Deviation
Land unavailability	2.551	1.404
Inadequate Capital	3.931	1.024
Labour unavailability	3.000	1.134
Access to credit	3.719	1.161
Climatic problem	4.000	1.102
Theft	3.655	1.396
Product loss	2.965	1.108
Access to input (sucker)	3.193	1.202

Source: Field Survey, 2016

It is shown that climate change wind and heavy rains are the major problems encountered in plantain production with a mean score and standard deviation of 4.0 and 1.1019 respectively. This is followed by insufficient capital with a mean score and standard deviation of 3.931 and 1.024 respectively. This is followed by access to credit with a mean score of 3.719. Farmers complained that their poor access to credit was a major set-back to their production. This is followed by theft. They complained their products were stolen on farm. Product loss then followed while insufficient arable lands were the least of the constraints reported.

Conclusion and Recommendations

This study revealed that plantain production enterprise is male dominated which means its production process is energy demanding. Majority of the sampled farmers were found to be married implying that they had dependants and easy access to family labour. Majority of the farmers were in their prime age of 47 years. It was also observed that majority of the farmers (72.2%) have had a form of formal education and also experienced in plantain farming. Cost and returns analysis clearly showed that plantain production is profitable giving back about ₦4 for every naira invested on a hectare of plantain land. Size of farm, experience in farming, labour, age of farmer, access to credit and access to extension services were the factors found to affect plantain production in the study area. Climatic change and variability in the form of wind and heavy downpour is the major problem encountered in production. This is followed by inadequate capital and then access to credit, theft, post-harvest loss and then insufficient land. Thus, it is recommended that assistance both in cash (through loans at affordable interest rates and grants) and kind (fixed and variable inputs) should be made available to the farmers by the government. Also, affordable land rental services for agricultural purposes should be made accessible to farmers and other interested parties who are interested in

farming larger land to encourage production. Finally, capacity building of extension agents and constant visit by the agents to farmers will facilitate better plantain production.

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