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Economic Analysis of Plantain Production in Irewole Local Government Area, Osun State, Nigeria

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ABSTRACT

This paper carried out economic analysis of plantain production to see how profitable it is, and what factors impact on its output. Data for the study was obtained, through random sampling technique involving 100 plantain producers, with the aid of well structured questionnaire. Budgetary technique and multiple regression analysis, involving the use of ordinary least technique (OLS) were employed in analyzing data set for this paper. Budgetary analysis, as revealed by mean net revenue (profit) per hectare by farm size (₦1668.75), shows that plantain production is profitable. Multiple regression results, revealed that farm size, hired labour wage, fertilizer and cooperative membership are significant at $p<0.05$, $p<0.05$, $p<0.01$ and $p<0.10$, respectively. Returns to scale of all inputs used in plantain production was found to be above unity (1.24), showing that plantain producers are in the irrational stage of production. It is thus concluded that plantain production is economically viable. Policy focus, therefore, should address problem of incessant hike in critical agricultural inputs and strengthening of farmers' cooperative societies at the rural sector, in order for rural farmers to have access to loan facilities that can aid their production to go beyond subsistence level.

Key words: *Economic, Production function, Returns to scale, Plantain, Osun state, Nigeria*

Introduction

The challenge of self-sustenance in agriculture (food and raw materials), according to Udumah (2007), is of recent gaining serious attention of the governments of the developing countries (of which Nigeria is one), due to the problem of equating food supply with increasing food demand, arising from ever increasing population growth that is noted to be peculiar to developing countries. Population growth rate in Nigeria, going by 2006 census is 3.2 percent, while aggregate food production rate is put at 2.5 percent by Ajibefun and Kadir (1999), thus showing that agricultural production is lagging behind population growth. These figures bring to focus the need to increase food production with a view to keeping pace with ever increasing food demand in Nigeria. The pertinent question to ask is which food item should be given serious attention, as solution to food security problem presently being experienced in Nigeria, as in other developing countries, is responsible for wide spread malnutrition, hunger and poverty, as well as deterioration of natural resource base being observed in these countries (Dimithe, *et al*, 2001). While high quality grains, tubers and livestock/poultry products, would readily come to mind. There are, however, other high nutritive food items, which are of high economic value in terms of production cost and marketing that are often ignored. One of such food item is plantain (Tijani, 1993).

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Plantain (Musa AAB or *Musa paradisiaca*), also known as cooking banana in some part of the world, is an important starchy fruit crop grown in all humid tropical zones of Africa, Asia, Central and North America, which in Africa correspond to the rain forest belt (Alasiri, *et al*., 1998; du Montcell, 1987). In Nigeria, plantain is often grown as backyard crops or intercrop with food crops, such as yams, cassava, vegetables, and cash crops, such as cocoa, kolanuts, rubbers, coffee, etcetera, as shade/cover for young seedlings of such tree crops. Plantain production in Africa, according to FAO (1990), is estimated at more than 50 percent of all plantain produced in the world. About 70 million people in West and Central Africa are estimated to derive more than one quarter of their energy requirement from plantain, thus making it the most important source of energy throughout the Africa low land forest zone (IITA, 1992; Swennen, 1990). Some where between 30 and 50 million tones of plantains are consumed annually in the area of production in the moist tropics, while some 6 million tones a year are traded internationally (du Moncel, 1987).

The importance of plantain, which contains more starch than banana and can be eaten both in the ripe, and unripe state, cooked, fried or roasted, lies in its being the cheapest source of starch (energy) and having the least cost of production among food crops in terms of per hectare/kilogramme and per 1000 calories (Ngeze and Gathumbi, 2004; Johnston, 1958), while du Moncel, (1987) stated that, plantain come second after cassava in terms of production of energy per hectare. Plantain, apart from being useful as staple food for human being, animal feeds for livestocks, manure and mulching materials, in preparation of various products as flour, chips, juice, jams, soft drink, among others, it, like banana fruits, contain carbohydrate (starch, stored in form of sugar), fats, proteins, calcium, phosphorous, iron, vitamins A, B_1, B_2 and C (Ngeze and Gathumbi, 2004; Anochilli and Tindall, 1986).

Notwithstanding all the attributed advantages of plantain, little records on the economic analysis of plantain production is available, which Oduwole (1986) put at 3.29 percent of all publications on plantain between 1900-1975, a situation that has not improved yet as search for economic analysis materials on "net" compared to volumes of materials one could get on agronomic practices involved in plantain production, is discouraging. This paper, therefore, aims first at improving available materials on economic analysis of plantain production and on the long-run, assist in enhancing our domestic food supply, by refocusing our research attention towards plantain production.

Methodology

Study area and data collection

The study was carried out in heavy plantain production areas in Irewole local government areas. Cross-sectional data, which is used in this paper, was obtained through structured questionnaire administered on 100 plantain farmers, who were selected through random sampling technique. Information sourced for include socio-economic characteristics of the farmers, quantities and price of inputs used, and that of output.

Data analysis

Descriptive statistics, budgetary technique (involving simple cost and returns calculation) and multiple regressions were used in analyzing data collected for this paper. Specifically, budgetary technique was carried out to determine how profitable plantain production is, while multiple regression equation, involving the use of ordinary least square technique (OLS), was employed to investigate the magnitude and direction of independent variables on plantain output. Data collected were fitted to double-log (Cobb-Douglas) functional forms, since its acknowledged to be flexible.

Model specification

The model used in this paper is specified as:

$$Y_i = f\,(X_{i,j};\ \alpha_j;\ e_i\ ) \quad \text{.....1 (Implicit)}$$

$$Y_i = \alpha_0 + \alpha_{ij}\Sigma X_{ij;} + e_i \quad \text{.....2 (Explicit)}$$

Where, Y_i = Quantity of plantain output per hectare (kg/ha); X_i = Farm size (ha); X_2 = Family labour (man-day); X_3 = Hired labour wage (₦); X_4 = Cost of fertilizer used (₦); X_5 = Cooperative membership, 1= Member & 0 = Otherwise; α_0 & α_i = Parameters to be estimated; e_i = Error term; i = 1, 2,…, 100; j=1,…,5.

Results and discussions

Socio-economic characteristics: Table 1 shows that majority of the farmers fall within the age range of 41-60 years corresponding to 48% of the total respondent farmers, suggesting that majority of plantain farmer are approaching their old age which may negatively affect their productivity and discourage them from adopting improved technology. Male dominates plantain production in the area of study and is represented by 78%, indicating that plantain production is energy demanding, especially at the point of severing young suckers from parent plants, digging for planting new suckers and mulching of newly planted suckers. This probably explain why female respondents were found to be involved in the processing of plantain to various products and marketing of plantain, which are considered to be less tedious. The highest year of experience among the respondent is between 11 and 20 years, represented by 49%, while majority of the plantain farmers did not have formal education, which is represented by 40%. This implies that plantain farmers count more on their years of experience in plantain production rather than educational attainment in enhancing their productivity, whereas the high illiteracy level recorded among the respondent farmers could negatively affect their ability to understand evaluate information on new farming techniques and technology being disseminated by extension agents in the state. Finally, more than 60% of the respondent farmers are non-cooperative member, implying that majority of the farmers did not have access to credit facility, as such could not afford to purchase critical inputs necessary for boosting plantain production. This has serious implication on their productivity, with serious consequence on food security in the country (Nigeria).

Table 1: Distribution of Respondents by Socio-economic Characteristics

Characteristics	Frequency	Percentage (%)
Age (Years):		
≤20	4	4.00
21-30	18	22.00
31-40	14	36.00
41-50	22	58.00
51-60	26	84.00
>60	16	100.00
Sex:		
Male	78	78.00
Female	22	22.00
Experience (Years):		
≤10	23	23.00
11-20	49	72.00
21-30	18	90.00
>30	10	100.00
Years of Schooling:		
Non-formal	40	40.00
Primary	20	20.00
Modern/JSS	18	18.00
Secondary/SSC	13	13.00
Tertiary	9	9.00
Cooperative Membership:		
Member	32	32.00
Non-member	68	68.00

Source: Field Survey, 2008

Budgetary analysis:

Table 2 depicts a U-shaped curve with average revenue, cost and net revenue (profit), by farm size, decreasing to a point corresponding to 3.1-4.5 hectare farm size, and thereafter starts increasing, thus reflecting law of variable proportions, in which there is a phase of increasing productivity (falling unit costs) and a phase of decreasing productivity (increasing unit costs) of variable factors. The lowest point corresponding to farm size 3.1-4.5 hectare, represent the point where unit cost of production is at its minimum and shows the point of optimal combination of both fixed and variable factors (inputs used in plantain production) (Koutsoyiannis, 1987).

Regression results:

The result of estimated lead equation (linearised form of Cobb-Douglas production function) as shown in table 3 revealed that the functional form chosen is a good fit given the high value of R^2 and the F-value which is significant at $p<0.01$. Moreover, the R^2 value indicates that the inputs used in the model were able to explain

Table 2: Average Costs and Returns per hectare by Farm Size (N/Ha)

Farm Size (ha)	Average Revenue per Hectare (N)	Average Costs per Hectare (N)	Net Revenue (Profit) (N)
≤1.5	2,262.86	1,453.44	809.42
1.6-3.0	1,741.59	1,025.62	715.97
3.1-4.5	1,393.05	865.15	527.90
>4.5	1,548.80	946.58	602.22

Source: Field Survey, 2008

Table3: Estimated Multiple (OLS) Regression Equation for Plantain Production

Variables	Coefficient	t-statistic	R^2	F
Constant	0.418	4.028	0.895	105.98***
Farm size (Ha) X_1	0.042**	0.683		
Family labour (Man-day) X_2	0.168	1.715		
Hired labour wage (N) X_3	-0.776**	-4.667		
Fertilizer (N) X_4	-0.158***	-1.779		
Cooperative membership X_5	0.137	2.040		

*** = 1%; ** = 5%; *= 10% Source: Field Survey, 2008

90% variation in plantain production in the area of study, while the significance of F value at $p<0.01$ implies the rejection of the null hypothesis that inputs used have no significant effect on plantain production (output).

In addition, table 3 revealed hired labour wage and fertilizer cost being negatively significant at $p<0.05$ and $p<0.01$respectively, following *a prior* expectation, implying that increase in the cost of any of these inputs will lead to a drastic reduction in the use of such input with consequent effect on farmers' and farm land productivity. Moreover, negative sign of the hired labour wage coefficient indicate that increase in labour wage will make their (hired labour) services un affordable, thereby limiting hectarage, cultivation with consequent reduction in plantain output, which will eventually results to farmer's profit being negatively affected. This agrees with Onyenweaku and Effiong (2005) finding. Land being positively significant at $p<0.05$, implies that increase in farm size would lead to increase output, thus emphasizing the importance of land to agricultural production. Cooperative membership being positively significant at $p<0.10$ indicates the importance of farmers belonging to cooperative society, especially at such rural areas, could afford the farmers the opportunity of pooling their financial resources together (Ihimodu, 1988), for the purpose of enhancing their agricultural activities (which include production, marketing and procurement/distribution of needed critical inputs), and engage in non-farm activities, thereby stimulating rural economy. Furthermore, membership of cooperative is significant because most of the rural dwellers in developing countries (Nigeria inclusive) are farmers and poor, and the poor according to Hossain (1988) may find it difficult to save on there own enough that could lead to increase in their agricultural production. Again, most formal financial institutions are not favourably disposed to siting their branches in the rural areas because of the "penny economies" at that sector, nor be disposed to lending to rural farmers because of their scale of operations in addition to such factors as lack of collaterals, production being subsistence, scattered locations and production being at the mercy of weather effect.

The rate of returns to scale for plantain producers in the area of study is positive and above unity (>1=1.24), indicate that plantain producers are in the irrational stage of production. Though, this situation according to Olayide and Heady (1982) is not very common in agriculture, it nonetheless indicates responsiveness of plantain output to change in price due to its positive sign, and demand for any of the variable inputs used being fairly elastic. Finally, the value indicates that, each additional unit of input used would lead to a large increase in output than the preceding unit.

Table 4: Returns to Scale in Plantain Production

Explanatory Variables	Elasticity ($\beta \cdot X_i$)
Farm size (Ha) X_1	0.02
Family labour (Man-day) X_2	0.25
Hired labour wage (N) X_3	0.69
Fertilizer (N) X_4	0.24
Cooperative membership X_5	0.04
Returns to Scale	1.24

Source: Field Survey, 2008

Conclusion and recommendations

Based on the findings of this paper, it is concluded that plantain production is economically viable, hence further investment in existing plantain farms is worthwhile, and starting a new plantain farm is encouraged. Policy that will address land tenure problem and incessant increase in critical agricultural input like fertilizer is strongly recommended, while rural farmers are encouraged to revitalise dying rural farmer's cooperative societies as a way of overcoming the credit constraint they are facing with respect to their production activities.

Development of infrastructures and provision of amenities at the rural sector is seriously canvassed for to stem rural-urban migration that is denying peasant farming requisite family manpower, leaving rural farmers at the mercy of cut-throat charges of hired labour.

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