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PROFITABILITY AND YIELD DETERMINANTS IN NIGERIAN COCOA FARMS: EVIDENCE FROM ONDO STATE

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ABSTRACT

This study assessed the profitability of cocoa farms in Nigeria's largest cocoa producing state and ascertained their profitability determinants. A stratified random sampling method was used to select a total of 125 farmers from 5 Local Government Areas of Ondo state. Primary data was collected via a set of structured questionnaire. Data were analyzed using descriptive statistics, budgetary analysis and OLS multiple regression models. Results showed that cocoa production is profitable with mean profit of *US$10342.93. The determinants were labour, capital, seedlings planted and household size.* It was recommended that cocoa farming be promoted to create jobs/reduce poverty as well as microfinance banks and agricultural agencies to provide farmers with access to credit. Farmers need to be trained on most efficient ways of production to guarantee sustainable production of cocoa in Nigeria.

Keywords: Cocoa, Profitability, resource productivity, Ondo State, cocoa farming.

INTRODUCTION

Cocoa, botanically known as Theobroma cacao belongs to the family Stericulinacea. Cocoa originated from the upper Amozon region of the South America from where it spread to different parts of the world.(Osun, 2001). According to Microsoft Encarta (2009) cocoa has a high food value, containing as much as 20 percent protein, 40 percent carbohydrate, and 40 percent fat. It is also mildly stimulating because of the presence of theobromine, an alkaloid that is closely related to caffeine. The beans are sold in international markets. African countries harvest about two-thirds of the total world output; Ghana, Côte d'Ivoire, Nigeria, and Cameroon are the leading African cocoa producers. Most of the remainder comes from South American countries, chiefly Brazil and Ecuador. The crop is traded on international commodity futures markets. Attempts by producing countries to stabilize prices through international agreements have had little success.

Cocoa cultivation in Nigeria started about 1879 when a local chief established a plantation at Bonny in the defunct Eastern Nigeria (Amos, 2007). FAO (2004) in Amos (2007) noted that Nigeria was able to produce 0.37million metric tons of cocoa, which amounted to 10.28 percent of the world cocoa production. It is worth noting that the world cocoa production is on the scale of 3 million tons and Ondo state is the largest cocoa-producing state in Nigeria (Amos & Adeleke, 2010). Ondo State is commonly known as the cocoa belt or the land of cocoa farmers.

In Nigeria agriculture is the largest non-oil export earner, a key contributor to wealth creation and poverty reduction, the largest employer of labour (Central Bank of Nigeria, 2005). Cocoa export plays a pivot role in this regard in Nigeria. In terms of foreign exchange earnings, no single agriculture export commodity has earned more than cocoa. With respect to employment, the cocoa sub-sector still offers, quite a sizeable number of people employment both directly and indirectly. It is an important source of raw materials, as well as source of revenue to governments of cocoa production states (Nkang 2007). Despite the huge potentials of cocoa in stimulating agricultural growth in Nigeria, it is surprising and unfortunate to note that the trend of cocoa production in Nigeria is not on a steady accent at a time the country eagerly seeks for diversification from its monolithic economy that is built around crude oil exports to launch herself into the world's 20th greatest economies come 2020 (envisaged in Vision 2020). Besides, there are reports of low productivities from cocoa farms in the country among other problems (Daniel, 2009). In fact cocoa has declined in economic importance at the aggregate national level (Adeogin and Oluyide. 2006). Such uncertainties in productivity of a very important export crop calls for concern and gives threatening signals to realizing the sustainability potentials of the sub-sector. There is a need for a business to be able to exhibit capacity for sustainability in terms of business growth (Green Economy Post, 2012) and resilience to changes in environmental factors such as climate change which has already become a serious global problem now (Intergovernmental Panel on Climate Change, IPCC, 2007 and Productivity Commission, 2012). According to the Green Economy Post (2010) there is a strong correlation between the commitment of sustainable business practices and the financial performance of the firm. Even in attempt to adapt to climate change effects, farms with higher productivities appear to be more resilient that those which are already operating on low productivity margins. Given this background it is expected that a lot of research efforts should be directed towards finding solutions to problems of low productivity and stagnation in cocoa production in Nigeria, However, sufficient works have not been done in this regard yet. This study is therefore a response to filling this knowledge gap as well as providing some policy impetus to stake holders in Nigerian agriculture, especially the cocoa industry for reviving this major foreign exchange earner of Nigeria..

Objectives of the Study

Given the above background this study was designed to find out the major drivers of profitability in cocoa production in Ondo Statte, Nigeria. It specifically ascertained the profitability of the cocoa farms in the study area and then determined the factors influencing the productivity of cocoa farms in the study area.

Literature Review

According to Idowu, Osuntogun and Olusola (2009) scholars indicated that the adoption of SAP gave an estimated positive gross margin of N1,585.00 per hectare in 1989 compared to negative gross margin of N105.00 per hectare in 1985. Also, the production function estimated by CBN/NISER (1992) in Idowu, Osuntogun and Olusola (2009) indicated that the aggregate output of cocoa is determined by real producer prices, exchange rates, interest rates, farm wage rates, world prices, and SAP dummy variable. They also found that mandays of labour and intensity of chemical used were statistically significant in determining output of cocoa in some areas while farm sizes returned negative signs or effects in some Local Government Areas. In terms of factors influencing productivity of cocoa Amos (2007) noted that the major contributing factors to production efficiency were age of farmers, level of education and family size.

Theoretical and Analytical Framework

Profit maximization is one of the major objectives of firms (Samuelson and Nordhaus, 2005). Schultz (1964) describes the peasant production mode as profit-maximization behaviour, where efficiency is defined in a context of perfect competition (i.e., where producers all apply the same prices, workers are paid according to the value of their marginal product, inefficient firms go out of business, and entrepreneurs display nondiminishing marginal utility of money income). Conflicting evidence apart, the main caveat in this approach is that profit maximization has both a behavioral content (motivation of the household) and a technical-economic content (economic performance of the farm as a business enterprise (Mendola, 2007). A number of *utility* maximization theories have been applied to peasant production behaviour too. The main difference between them and the profit-maximization theory is that utility maximization approaches encompass the dual character of peasant households as both families and enterprises and thereby take account of the consumption side of peasant decision making. The idea that farm households aim at reducing income risk and therefore may forego profit-maximizing activities (which may include a range of activities) were also reviewed by Mendola (2007) in addition to the above mentioned theories.

For firms to make profit (an indicator of productivity) they need to consider their costs when making pricing decisions (Crawford, 1997). Production costs and efficiency are primarily determined by the prices of inputs including time, labour, capital and technological advances (Samuelson and Nordhaus, 2005). Costs can be broadly categorized as fixed and variable. Fixed costs do not vary with the level of production. Rents, insurances, the salaries of administrative staff and depreciation on capital equipment are all examples of expenditures which do not directly vary with the level of production. If the production of an organization in a given time period were zero, these costs still have to be met. In contrast, variable costs are those expenditures which vary in direct relation to volumes of production. Examples of this class of cost include raw material costs, hourly labour rates and packaging costs. Yotopoulos and Lau (1979) and other economic theorists applied and recommended the use of unit output profit model and a Cobb-Douglass production function to test for productivity of firms.

Net Farm Income (NFI) and Gross Margin (GM): Johnson (1982) and Kay (1986) recommended the use of Net Farm Income in ascertaining the profitability of farmers. NFI, according to them is derived after obtaining the Gross Margin (GM). GM is the amount of money realized after deducting variable expenses or costs from total sales or income. NFI is obtained by adjusting net cash farm income for total depreciation, net inventory changes and value of products consumed at home. NFI, according to Kay (1986) is the only true measure of profit for the accounting period since it includes the above adjustment which could be quite large. NFI is the profit from the year's operation and represents the return to the farm owner for personal and family labour, management and equity capital used in the rice farm.

Gross Margin = Total Income (TI) – Total Variable Costs (TVC).

NFI = GM – Total Fixed Cost (TFC).

Regression Analysis: According to Gujarati (2006) and Greene (2008) the primary objective of regression analysis is to determine the various factors which cause variations of the dependent variable. SPSS software defined it as the estimation of the linear relationship between a dependent variable and one or more independent variables or covariates.

RESEARCH METHODS

Area of Study: Ondo state was created on 3 February 1976 from the former western state. It is located in South Western Nigeria; Ondo state covers 14, 606 square kilometers. Ondo state, in the north by Ekiti and Kogi states, in the west by Osun and Ogun states and in the south by the Alantic Ocean.The state is made up of 18 local governments that produced cocoa in 2006, 2007 2008, 17 local government and acknowledged as the leading producer of cocoa in Nigeria (Ministry Agriculture Akure, n.d.). The grids of Ondo State are around latitude 7° 10′ 0″ N and longitude 5° 5′ 0″ E .

Figure 1. Map of Nigeria, Highlighting Ondo State (The Shaded Area).
Source Wikipedia (2012).

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. The empirical model is the NFI earlier defined as the profit from the year's operation and the model is represented by:

Gross Margin (GM) = Total Income (TI) – Total Variable Costs (TVC).

NFI = GM – Total Fixed Cost (TFC).

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 three functional forms including linear, semi-log and double-log (Cobb-Douglas) functional forms.

Model specification

The model used in this paper is specified as:

Yi = *f* (Xi;j; αj; ei)……1 (Implicit)

Y = Yield Quantity of cocoa/ha, X_1 = labour (mandate), X_2 = quantity of cocoa seeds planted by (in kg/ha), X_3 = capitals, X_4 = educational level, X_5 = farming experiences (years), X_6 = household size, X_7 = marital status, X_8 = age of farmers (years). e = random term (which is assumed to have zero mean and constant variance). The functional forms to be fitted are specified as follow.

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + e \quad (1)$$

$$\log Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + e \quad (2)$$

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + b_8 X_8 + e \quad (3)$$

RESULTS AND DISCUSSION

Profitability Estimates of Cocoa Farms in Ondo State: Results of costs and returns analysis of cocoa farms in the sample survey are presented in table 1.

From table 1.0 it could be seen that the average revenue from cocoa output was found to be ₦ 1,754,387.16 per annum. The total variable cost incurred was ₦1,022,277.24 the Gross Margin of Cocoa Farmers were N 1,748,681.63, while the Net farm income was ₦1,634,182.72. The profitability level using the Net Farm Income is ₦ 1,634,182.72 which is approximately US$10342.93 implying that the business of cocoa production is profitable. In terms of sustainability the profitability of this business is expected to be a major factor that can motivate the farmers to continue in this business while those who are aware of the profitability inherent in this business can take to cocoa farming as a way of earning their living. This implies that Cocoa has exhibited its potentials in being a source of job creation and poverty alleviation as profits earned from the business will help the farmers meet up with their household needs and even make them to be employers of labour in this enterprise.

Yield Determinants in Cocoa Farms of Ondo State

The summary of regression analysis to find out the factors influencing yield of cocoa in the study area are presented in Table 2.0 and Table 3.0 then discussed in the following section.

Table 1.0 Estimated Profitability Level of Cocoa Farms in the Study Area

ITEMS	Amount in Naira (₦:K)	Total Amount (N: K)
Total Revenue		1,754,387.16
Less Variable Costs		
Cost of Planting Materials	143,968.57	
Wages	850,072.57	
Pesticides Costs per Annum	11,856.57	
Transport Expenses	10,674.00	
Marketing cost/ICT/Packaging	5,705.53	
Total Variable Costs		1,022,277.24
Gross Margin		1,748,681.63
Less Fixed Costs		
Rent on land	97,721.43	
Depreciation of Fixed Assets (Farm Tools)	2,308.91	
Taxes and Levies	14,468.57	
Total Fixed Cost		114,498.91
Net Farm Income		1,634,182.72

In selecting the model for the economic analysis, Akaike Information Criterion (AIC) and other model selection criteria such as value of F-ratio and its p value, adjusted R^2 and number of variables' coefficients which conform to theoretical expectations, were applied following Gujarati and Sangeetha (2007) and Greene (2008). The double log model was eventually selected as the lead equation for this study's analysis based on the foregoing criteria. The adjusted R^2 of the double log model is 0.87 implying that 87 percent of the observed variations in yield of the cocoa

Table 2.0 Model Fitness Test Results

Indices	**Linear Model**	**Semi-Log Model**	**Double-Log Model**
Adjusted R-squared	0.585613	0.778035	0.83*8126*
R-Squared	0.658087	0.811451	0.870662
Akaike info. Criterion	0.859774	18.60518	0.868561
Schwarz criterion	1.166745	1.89427	1.127653
F-Statistic	2.140612	2.055729	4.940902
Prof (F-statistic)	0.000176	0.000013	0.00000

farms were explained by the explanatory variables incorporated in the model. The F-ratio estimated (4.9409) was statistically significant at 1 percent level which indicates that the joint effects of all the explanatory variables' on the yield variation of cocoa farms studied was significantly above zero. The intercept is significant at 1 percent statistical significance level implying that the state of technology of the farms was significant and also positive in influencing the yield of cocoa in the study area.

Discussion

The presented model characteristics in the foregoing presentation indicate that the model selected is fit for economic analysis. Labour's slope coefficient is significant at 5 percent while the slope coefficient of seedling is significant at 1 percent. Both labour and seedlings' quantities' slope coefficients were positively signed implying that the marginal contributions of these resources to the output of cocoa in the farms studied were increasing function of the respective variables.

It is not surprising as much labour activities are required in several aspects of cocoa production in the area from land preparation, planting of seedling, weeding, harvesting and even preparing the pods for packaging and marketing. Most of the tasks are still manually done. It is probably the reason why the slope coefficient of household size variable which often serve as source of labour in the farm operation appeared positive too and significant at 1 percent statistical significant level **Table**

3.0 Multiple Regression Estimates to find out the determinants of yield on cocoa farms in the study in Ondo State Producers on output

Model/Variables	Linear	Semi-log	Double Log
	5.994717***	-7610.220***	5.729916***
Intercept	(15.75093)	(-2.384522)	(12.75293)
Labour	0.73348***	0.89665***	1.30499***
	(2.458315)	(2.750935)	(2.608926)
Seedlings	0.001589***	9.704252***	0.001644***
	(3.344550)	(2.865223)	(3.447880)
Capital	-0.73198***	-608965.4***	-0.140345***
	(-2.458255)	(-2.750919)	(-2.608866)
Education	-0.005478^{NS}	-19.64751 ^{NS}	-0.005243^{NS}
	(-0.808574)	(-0.408775)	(-0.774892)
Farming Experience	0.006112^{NS}	-9.015844 ^{NS}	0.002634^{NS}
	(0.711266)	(-0.266779)	(0.553612)
Marital Status	-0.007110^{NS}	-75.63368 ^{NS}	-0.008420^{NS}
	(-0.956750)	(-1.417339)	(0.320808)
Household Size	0.015821***	31.11129^{NS}	0.2317445***
	(4.486883)	(0.134890)	(4.537268)
Age	0.023821^{NS}	70.52697^{NS}	0.006088^{NS}
	(0.486883)	(1.080452)	(1.104014)

Source: Field Data, 2011.

NB: ‘‘NS”’=Not Significant ‘‘*** ” means figures are significant at 1 percent probability level ‘‘** ”, significant at 5 percent level and ‘‘ * ” significant at 10 percent probability level. Source: Field Data, 2011. (Figures in parentheses are t-statics)

implying that the more the number in the farm households the more the output per ha (yield). This is in tandem with the earlier findings of Amos (2007) who noted that farm household size was a significant determinant of cocoa productivity in the study area. The positive and significant influence of quantity of seedlings applied in determining the cocoa yield could be attributed to the nature of the farms in terms of their ages. Most of the farmers established their farms above 20 years and had to replace the aging and dead plants by planting new and improved varieties of seedlings as replacement stocks. Such practice or farm operation has the capacity of boosting yield of crops as demonstrated by the effects of planting new seedlings in the farms surveyed. Another factor which was found to have a significant influence on cocoa yield in the study area is capital invested in the farm business. The slope coefficient of this variable (capital) is significant at 5 percent level respectively. The foregoing findings are also in line with earlier theory posited by Samuelson and Nordhaus (2005) who established that capital invested in a business, among other resources such as labour cost influence productivity of resources. The negative slope coefficient of capital however implied that the input was being over utilized and so the marginal contribution of capital was therefore diminishing. The negative sign of the capital coefficient could imply that the opportunity cost of capital invested in the cocoa business was getting too high and that much expenses were being made without commensurate return on the invested capital rather as more capital were being plunged into the business improper utilization or management of the fund could have resulted in diminishing marginal contribution of the equity of the thereby limiting expansion and yield with possible consequent reduction in farmer's marginal profit.

CONCLUSION

The study noted that cocoa farming still remains a profitable business in the cocoa belt of Nigeria. Since the business is a profitable one, the government and institutions (including NGOs) aimed at providing jobs and profitable livelihood activities for Nigerians especially in the cocoa growing regions should promote the production of cocoa. This will equally boost the foreign exchange earning capacity of this agricultural sub-sector of the economy thus helping in accelerating growth of the agricultural sector of the economy. For cocoa production to assume its prime position as the greatest non-oil foreign exchange earner, the drivers of productivity of the crop in the largest cocoa growing area of Nigeria identified in this study must form the axis of policy implementation to reinvigorate the positive drivers and reduce the negative effects of some variables retarding the productivity of this important crop. Hence efforts must be geared towards mechanizing the activities involved in cocoa production in the area so as to reduce drudgery arising from increasing labour intensity observed in the farms surveyed. In addition to this there is a need to build the labour capacity through provision of agricultural extension services to the cocoa farmers in the study area. Government should pursue programmes that will make improved seedlings, which can guarantee higher yields and higher market values, readily available from the research stations to the cocoa farmers so that their overall output will increase in both quantity and quality. Government and other stake holders such as NGOs, microfinance banks and agricultural agencies should provide farmers with access to credit at affordable interest rates or cost of capital so that then productivity of capital may be guaranteed. If the above recommendations are put in place there will be the likelihood of guaranteeing a conducive business environment to make cocoa a sustainably profitable enterprise in Nigeria again. Farmers need to be trained through increased engagement of agricultural extension agents to teach them the most efficient ways of production to guarantee sustainable production of cocoa in Nigeria.

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