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Profitability Analysis of Cassava Production in Three Local Government Areas of Taraba State, Nigeria

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ABSTRACT

The profitability analysis of cassava production in three local government areas of Taraba State was investigated to identify the economics of cassava production in three local government areas of Taraba State. The specific objective was to examine the production function, gross margin, total return in different farm sizes. Contributions of primary and secondary data were used for the investigation. Simple descriptive statistics, production analysis and farm budget techniques were used for the analysis. The results showed that the average cost of production was ₦36,864.48 per hectare, while the gross return per hectare was ₦1,652,677.2. Therefore, the gross margin per hectare was ₦1, 615,812.72. Further analysis showed that for every naira invested in cassava production, ₦2.48 was realized as profit. Also, a test of hypothesis on profitability showed that cassava production was profitable in the study area, it was concluded that cassava production in the study area is economical. Also, it is recommended that the government should encourage the production of cassava in the area of the study.

Keywords: Profitability Analysis, Cost of Production, Gross Margin, Cassava Production

INTRODUCTION

Every nation attempts to address the relevant issue of food security. In Nigeria, agriculture provides food for the teeming population and contributed about 33% to the Gross Domestic product (GDP) of the nation (Bureu of Africa Affairs, 2010) the sector employs about one-third of the total labour force and provide a livelihood for the bulk of the rural populace (FMARD, 2006). Total area devoted to agricultural cultivation is about 30.7 million hectares with farmers cultivating less than 2 hectares averagely operating with simple tools. The performance of small holding farms in Nigeria is observed to be unsatisfactory. The

agricultural sector of Nigeria has failed to keep pace with the demand of households and industries for farm produce as food or raw materials (Nwaiwu *et al,* 2010).

Cassava (*Manihot esculenta*) is one of the most important root crops in the tropics, it derives important from the fact that its starchy thickened tuberous roots are valuable source of cheap calories especially in developing countries where calories deficiency and malnutrition are wide spread (IITA, 2005).The major problem facing developing countries in the tropics is the production of sufficient food, increase in human population at a rate which is considerably higher than the increase in food production continues to widen the gap between demand and supply of food (Youdeowei *et al,* 1986). However, Nigeria still manifests symptoms of peasant agriculture because the farms are mainly dominated by small scale farmers who represent a substantial proportion of the total farming population and produce over 90% of the total agricultural output in the country (Ajibefun*et al,* 2002).

Cassava is mainly produced by small-scale farmers in the rural communities of the country with little or no use in agricultural business sector as an industrial raw material (Raphael, 2008). Over two-third of the total production of cassava is consumed in various forms by humans; and it is a stable food crop for over 50 million Nigerians, providing more than 70% of their energy requirement. Cassava has many uses which give the crop high potential as foreigner in Nigeria. Apart from its use as food, it is an important industrial raw material for the production of starch, flour, alcohol, chips, gum, paper, pellets, adhesive, confectionaries, pharmaceuticals and livestock feeds (IITA, 2005).

Simonyam *et al.,* (2010) stated that Nigerians are poor and hungry despite effort made by various governments in improving agricultural productivity and efficiency of the rural farmers who are the major stakeholders of agricultural production. This effort is geared towards

programs that will result to effective production. One of such products is the Root and tuber expansion program, aimed at increasing root and tuber crop production. Specification in the area of cassava, presidential unit five on cassava production and export was untold by Nigerian governments in 2002. The interactive was aimed at using cassava production as the engine of economic growth for the nation. Based on this, in 2005, the federal government of Nigeria promulgated a law, making it mandatory for bakers to use composite flour of 10% cassava and 90% wheat for bread production. The initiative seeks to generate about us & 5 billion as export revenue in 2007. Since then, the demand for cassava product globally has increased, making the cultivation to increase but not enough to curb demand, thereby, putting a lot of pressure on production of cassava. According to food and agriculture organization of the united nation database (FAOSTAT, 2009) Nigeria is the largest producer of crops with 45,721,000, 43,410,000 and 44,582,000 million tones in 2006 2007, and 2008 respectively. About 90% of things is however, consumed as food (Awoyinka, 2009) gentian is yet to fully harness the socio-economic potential of cassava that would translate to higher ranking of cassava next to petroleum an major contributor to the Gross Domestic Product (GDP). For this to be achieve cassava farmers production efficiency and profit margins need to be established.

In Nigeria, as in most developing countries, cassava is one of the most important carbohydrate sources. The large population of Nigeria depended on cassava daily as their main disk such as gain and fufu, the leaves are consumed as vegetable, and it serves as raw materials to industries as well as been a means of alleviating poverty. In spite of the various uses cassava is known for, as an agent of self sufficiency in food production, the gain derived from it's production by rural farmers is still not sufficient to keep the resources poor farmers above the poverty line. Efforts aimed at increasing cassava output to meet the demand for the output cannot be properly directed unless the cost and returns to cassava production are determined. If this is done, farmers will be guided on

inputs to focus on, thereby, increasing profit which will in turn result to higher standard of living. Establishing cassava farmers economic is salient for policy implication to address factors responsibility for mineral production and bring about increasing incomes of farmers. Therefore, the broad objective of this study is to examine the economics of areas of Taraba state. The specific objectives are to: describe the socio economic characteristics of cassava farmers analyze the costs and return in cassava production and determine the resource use the efficiency of cassava production in the study.

Hypothesis:

H_0: Cassava Production is not profitable

MATERIALS AND METHOD

The study was conducted in Ardo-Kola, Jalingo and Gassol local government area (LGAs) of Taraba state. The study are is located in north and central part of the state and lies between latitude 8:89^4 and 8:53° north and longitude 11:37° east. The bulk of agricultural production in the state farmers who produce over 80% of the food in the state using family labour, capital and management. The main crops grown in the state are yam cassava, maize, rice, sorghum cowpea etc.

Purposive sampling was used to select two villages from each of the three local government areas and 20 cassava growers were selected using simple random sampling techniques from each of two villages selected. Primary data were collected with the help of the state agricultural development projects (ADP_s) extension workers as enumerators, survey method using structured questionnaire and oral interview were used. The data were collected based on 2014 and 2015 cropping season.

The data were analysed using descriptive statistic production functions analysis and farm budget technique. Arithmetic mean was used to estimate average farm size, input and output. For the regression model

semi-log, double log and quadratic functions were employed in order to estimate the production function. The best regression fit was determined using a combination of criteria of the higher adjusted coefficient of multiple determination (2), the level of significance of the overall equation (f- statistics), the level of significance of each coefficient (t-statistics) and the correct signs of the coefficient relative to prior; expectations.

The empirical models of regression are given as:

(i) Semi-log production

$$Y = a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + e$$

Where = output of cassava (kg)

X_1 = Farm size (ha)

X_2 = Labour (man- day)

X_3 = Fertilizer (kg)

X_4 = Stem cutting (kg)

$b_1 – b_4$ = Regression coefficients

a = constant term

e = error term

(ii) Double-log production function

$$\text{Log } Y = \log a + b_1 \log X + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + \log e$$

Where,

Y, X_1, - X_4, $b_1 – b_4$, a and *e* are as defined in semi-log function above

(iii) Quadratic production function

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_1^2 + b_6 X_2^2 + b_7 X_3^2 + b_8 X_4^3 + b_9 X_1 X_2 + b_{10} X_1 X_3 b_{11} X_1 X_4 + b_{12} X_2 X_3 + b_{13} X_2 X_4 + b_{14} X_3 X_4 + b_{15} X_1 X_2 X_3 X_4$$

Where Y, $X_1 – X_4$ and *e* are defined in semi-log function above.

Production functions were fitted into the data, three of the forms tried are linear, semi-log and cobb-Douglas. The implicit form of the regression model used was

$Y=f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, U)$

Where

Y = Output of cassava (kg)
X_1= Gender (1=male, 0=female)
X_2= Educational level (year of formal schooling)
X_3= Capital (Naira ₦)
X_4= Farm size (in hectares)
X_5= Non-farm income (Naira ₦)
X_6= Labour (in man days)
X_7= Age of farmers (in years)
X_8= Farming experience (in years)
X_9= Family size (number)
X_{10}= Cassava cuttings (number of bundles)
U= Error term

Farm Budgeting Technique

A general model of the farm budge presented in the equation below was used in the budgeting analysis.

$Gm = GFI - TVC$

Where,

Gm = Gross Margin (N/ha)
GFI = Gross Return (N/ha)
TVC = Total Variable Cost (N/ha)

(iii) The Z – statistics was used to test whether cassava production is profitable. The formula for Z- statistics is given as: -

$$Z = R - C$$

$$\frac{\bar{R} - \bar{C}}{\sqrt{R^2 + C^2}}$$

$\overline{N_R + N_C}$

Z = The Z value calculated
$\bar{R}$ = Mean of returns (Naira)

$\overline{C}$ = Mean of cost of production (Naira)
$\overline{R}^2$ = Variance of the return (Naira)
$\overline{C}^2$ = Variance of the cost (Naira)
Nr and Nc = are sampled size associated with returns and costs (Nr=Nc same population size)

RESULTS AND DISCUSSION

Table 1: Percentage Distribution of the farmers according to their socio-economic characteristics

Variable	Description	Frequency (n=120)	Percentage %	$\bar{X}$
Age (years)	20-30	12	10	
	31-40	24	20	32
	41-50	72	60	
	51 and above	12	10	
Gender	Male	63	52.5	
	Female	57	47.5	
Marital status	Single	27	22.5	
	Married	60	50	
	Separated	5	6.7	
	Divorced	10	8.3	
	Widowed	15	12.5	
Family size	1-4	18	15	
	5-8	48	40	
	9-12	48	40	
	12 and above	6	5	
Educational Level	Non formal	;	12-5	
	Primary	26	21.7	
	Secondary	441	34.2	
	OND/NCE	27	22.5	
	HND/B.Sc	9	7.5	
	MSC	2	1.7	
Animal income	<60,000	6	5	
	60,001-100,000	36	30	
	100,001-150,000	30	25	
	150,001-200,000	12	10	18,000
	200,001-250,000	6	5	
	250,001-300,000	18	15	
	300,001 and above	12	10	
Farmingexperience	1-5	12	10	
	6-10	66	55	
	11-15	24	20	10
	16-20	18	15	
Farm size	3-5	54	45	
	6 and above	66	55	6

Source: Field Survey, 2015.

Socio-economic characteristics of the respondent

The socio-economic information on the respondents in table 1 showed that 63% of cassava production is not gender exclusive but is monthly carried out by the male. The age range of the farmers varied, 90% of the respondents foul between 20-50 years of age, implying that, in the study area, cassava production is done active and energy people in the middle age of production. This conforms in the finding of Okunade*et al.*, (2005) that in Surelere Local Government Area of Oyo State, cassava farmers are mostly between 20-50 years of age. Married people constitute 50% of the respondent, 95% of the farmers have family size of 5-12 people. Those with farming experience of 6 years and above comprise 80%. This implies that cassava farming is not only an occupation but a way of life of people in the study area.

Again (38-2%) of respondent had attached secondary school education, 21-7% of them had attached secondary school education, and 31-7% them acquired post-secondary school education, while education. by implication a reasonable numbers of farmers in the area should be able to understand the use of improved the use of technologies and apply to achieve increase in production through education, the quality of labor is improved and with it the propensity to adopt new techniques (Tijaw*et al.*, 2006; Hyuha, 2006). Thus, cassava farmers in the study area would easily adopt new technologies could improve their level of profit ceteris paribus.

The result revealed an average income of ₦180, 000 per animal. The break down shows that most (45%) of the farmers earned an annual income of between ₦100,000- 150,000, 12% earned between ₦150,000 to ₦200, 000, 30% of them earned above ₦200,000 per annual income signifying that the respondent are low income earners and this will have a negative effect on the rate of adoption of improved cassava technologies in the area, since capital is needed to procure most of modern cassava technologies.

The result also showed that most of the farmers have been in the business of cassava farming for up to 10 years. This is an indication that that majority of the farmers has taken into cassava farming for quite a while in the area. This is also in consonance with the findings of Oladeebo and Oluwaranti (2012) who reported average of 13 years farming experience for cassava farmers in average was 5ha, while majority (45%) held a size of between 3 to 4ha. This followed the study of Oladeeho and Oluwaranti (2012), reported average of 4ha farm size for cassava farmers in Southern Western, Nigerian.

Table 2: Coefficient from semi-log production function of cassava production in three LGAs of Taraba state

Variable	Regression coefficient	Standard	T-value
Farm size(X_1)	19441	3900.036	4.985*
Labour(X_2)	7131.041	2627.726	2.714*
Fertilizer(X_3)	10354	3450.798	3.001*
Stem cutting(X_4)	7253.748	3943.002	1.840**
Constant	42307	12114.945	3.492*
(R^2)	0.8852		
F	203.488		

Source: Field Survey Data, 2015.

* *Significant at 1% level of profitability.*

** *Significant at 10% level of profitability.*

The semi-log production function had the best fit and was selected as the lead equation for the analysis of input out relationship (Table 2).Based on the adjusted value of the coefficient of multiple determination, 2 of the semi-log function the specific input explained 88.52 percent of the variability in cassava output. This reasonably high, the F-value (203.488) was significant at one percent level of probability. This implies that all the inputs used in cassava production jointly contributed to the output of cassava.

The coefficient for farm size (X_4) was positive and significant at 1% percent level of probability. This implies that a unit of increase in the

size of land when other explanatory variables are held constant is consistent with increased output level.

The coefficient of labour (X_2) was positive and significant at 1 percent level of probability. The positive coefficients are in agreement with expected signs and imply that as the amount of labour is increased, the outputs also increased.

The coefficient of fertilizer (X_3) was also positive and significant at 1 percent level of probability and in accordance with the expected sign. This means that he level of fertilizer applied was directly related to output. Stem cutting was positive and significant at 10 percent level of probability. This means that as cutting is increased all things being equal, the output will also increase.

Table 3: Average Costs and Return from Cassava Production per hectare

Items	Value
Yield(kg)	20.1546
Price(kg)	8.20
Gross return(GR/N)	1,652,677.2
Labour	
Family (₦)	11,760.00
Hired ₦15,888	15,880.00
Total labour₦27,640	27,640.00
Stem cutting ₦1,12.12	1,127.12
Fertilizer (₦)	4,913.4
Other cost ₦3,183.96	3,183.96
Total variable cost (TVC)/ha	1,615.812.72
Average rate of return (GM-TVC)/ha	2.48

Source: Field Survey Data, 2015.

Gross margin

The gross margin per hectare represents the difference between the total values of all output per hectare (gross revenue) and the total variable cost per hectare. Table 2 shows that the total variable cost per hectare was ₦36,864.48 while the gross return was ₦1,652,677.2. The gross

margin was ₦1,615,812.72. Further analysis showed that for every Naira invested in cassava production, ₦2.48 was realised.

Hypothesis

The mean return and mean cost of production were used to test he hypothesis which states:

H_O: Cassava Production is not profitable

Table 4: Mean Cost and Returns of Cassava Production:

Item	Value in Naira
Average return R(N)	1,652,672.2
Average cost C (N)	36,864.48
Variance of return	330377336.66
Variance of cost	61832273.22
Estimated Z value	2.58
Nr=Nc	120
Level of significance	0.01

Source: Field Survey Data, 2015.

Table 5: Cobb-Douglas Regression result of cassava production

Variables – Inputs	Coefficient	T- ratio
Gender (X_1)	0.033	5.467**
Education (X_2)	1.155	
Capital (X_3)	0.310	
Farm size (X_4)	0.996	
Non-farm income (X_5)	-4.685	
Labour (X_6)	1.844	
Age (X_7)	1.459	
Farming experience (X_8)	0.721	
Family size(X_9)	-1.613	
Cassava cutting(X_9)	1.476	
R^2	0.946	

Extracted from computer analysis result ** ; significant at 1% , * significant at 5% level of significance; no significant

The result on table 4 shows that gender(X_1) education (X_2) capital (X_3), farm size (X_4), labor (X_5), age (X_7), farming experience (X_8) and cassava

cutting (X_{10}) has positive sign. This means that the variables are directly related to cassava input. A one input increase in any of the variables o non-farm- income (X_5) and family size (X_9) has negative coefficient, meaning they are inversely related to cassava input, increasing these variables by one unit will lead to a decease in cassava output by the coefficient of the estimate variable. This could be that some of the family members are engaged other activities more than cassava farming. As non- farm income increase, cassava output decreases meaning as the farmer generate more income from other activities concentrated in cassava production reduces, there by reducing output.

Gender (X_1), capital (X_3), farm size (X_4) labor (X_6) and non- farm income (X_5) are significant at 1% level of significance while education (X_2), farming experience (X_8) and cassava cutting (X_{10}) are significant at 5% level of significant whereas age (X_7) and family size (X_9) are insignificant at all level of tested. The coefficient of determination (R_2) is 0.946 this implies that 946% of the variety on the output of the cassava production on the study area is explained by the explanatory variables in the model. Labor was found to be the must important determination of cassava out in the study area. This conforms to the study of Onniah*et al.,* (2008).

Alouyide and Heavy,(1982) defined return to seal as the sun of the elasticites that are associated with a certain production process return to scale measure the proportionate in all output if all the input change simultaneously by one percent. It represent the sun of al elasticites of production with respect to all input (Yakasai, 2010) various forms of return to scale are;

Increasing (EP>1), constant (EP=1) and decreasing return to scales (EP<1). The sun of production with respect to explanatory variables in the study area is 1.696 this shows that cassava farmers are operating in increasing return to scale region (EP>1) that is, stage production

process, which Olukusiand Ogungbile(1989) termed "irrational stage" ties implies that if all the explanatory variable are increased simultaneously by 10 %, cassava output in the area will increase by 16.96%. Therefore, increase in variable inputs is still possible to obtain a higher output of cassava. This agrees with the findings of Oniah*et al.,* (2008) who stated that swamp rice farmers in Obubra Local Government Area are operating in stage one and are inefficient in the use of other resources.

CONCLUSION

From the study, it can be concluded that cassava farming is a profitable venture in the study area. It recorded that a gross margin of per hectare. The benefit cost ratio shows that for every one naira invested in the enterprise, a profit of 1.24 will be realized. The return to scale value of 1.96% was obtained, which is increasing return to scale region, meaning the farmers are operating in stage one of the production process. Therefore, the farmers are in inefficient in the use of their resources in cassava production in the study area. Therefore, more variable resources should be employed in order to achieve maximum output from cassava production and increase their profit margins.

RECOMMENDATIONS

The government agencies in charge of cassava should try to ensure that varieties that are not desirable are eliminated from the system and replaced with desirable ones. Extension service should be improved to facilitate adoption of new technologies that will encourage the production of the crop where it is favourable but not considered to be grown. Good road networks should be provided to ease the cost of transportation. Also, it is recommended that, the government should encourage the production of cassava in the study area since gross return per hectare was profitable.

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