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Research Article

Economic Analysis of Cassava Production in Ogun State, Nigeria

Akerele EO*, Idowu AO, Oyebanjo O, Ologbon OAC and Oluwasanya OP

Department of Agricultural Economics and Farm Management, College of Agricultural Sciences, Olabisi Onabanjo University, Yewa Campus, Ayetoro, Ogun State, Nigeria

***Corresponding Author:** Akerele EO, Department of Agricultural Economics and Farm Management, College of Agricultural Sciences, Olabisi Onabanjo University, Yewa Campus, Ayetoro, Ogun State, Nigeria.

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Abstract

The study was carried out in Yewa North Local Government Area of Ogun State, Nigeria. It analyzed the economics of cassava production in the study area. The required data for this study were obtained through the use of well-structured questionnaire that was administered to the farmers and the questionnaire is a total of ninety-eight respondents. The study discovered that majority of the farmers (34.7%) are between 41 - 50 years of age, 64.3% of the farmers are Christians, 46.9% of the respondents in the study area are married with responsibilities to their families, 44.9% of the respondents had secondary school education, 48% of the respondents had household size between 6 - 10 persons, 61.2% of the respondents are Muslim, 93,9% of the respondents are solely farmers. Stochastic frontier efficiency model was employed to estimate the level of efficiency among the cassava farmers. The results revealed that the slope co-efficient of the stochastic technical function frontier are statistically significant at 1%, 10% and 5% respectively. Cassava production was technically efficient as the level of technical efficiency among them, ranged between 17% and 99% with a mean technical efficiency 36%. This study reveals that the output was higher in farms operated by male farmers compared to their female counterparts. The budgetary analysis revealed gross margin of N143,670 and a net income of N137,793.23. The profitability index, rate of return on investment are as follow: 0.6627 and 357.867 respectively. The study also revealed that cassava farming is generally profitable irrespective of the size of the farms, but sex of the farmer, household size, level of education all have significant positive effect on the output of the farmers. It is therefore, recommended that government should ensure that enough credit institutions which are well-equipped and are motivated to support the small-scale farmers by making credits easily and readily available to them.

Keywords: Credit; Cooperative; Cassava; Profitability; Production

Introduction

Cassava (*Manihot esculenta crantz*) is its binomial. It is a popular food crop and its popularity cannot be disputed in many countries including Thailand, Brazil, India and several West African countries. Cassava is a multi-dimensional food crop which was likely first domesticated not more than 10,000 years BP by 6600 BC. It likely originated further in Northern Brazil and Central America [1]. Its high food potential made it a staple food for pre-Columbian people in Portuguese. However, cassava was introduced to traders in Warri, the then Bendel State of Nigeria, in the 16th - 17th century [2]. Cassava has replaced traditional African crops as the continent's second most important staple food. It is a woody shrub cultivated because of its edible starchy tuberous roots. Cassava is sometimes described as the "bread of the tropics".

Nigeria is the world's largest producer of Cassava, Thailand is the largest exporting country of dried cassava and in the subtropical region of Southern China, Cassava is the fifth largest crop produced. Cassava is the third largest source of food carbohydrate in the tropics and also an important source of food which gives the highest yield of food energy per cultivated area per day among crop plant except possibly for sugarcane. Cassava plays a particularly important role in agriculture especially in a developing economy like Nigeria. Cassava has its own inherent characteristics which makes it unique from other food crop. It yields well on poor soils even with low rainfall and because it is a perennial it can be harvested as required [3].

The importance of cassava to many Africans is epitomized in (Ewe - A language spoken in Ghana, Togo and Benin) in the name for the plant, "Agbeli" meaning "there is life". Cassava varieties are often categorized as either sweet or bitter respectively which signifies the absence or presence of highly toxic level of cyanogenic glucosides which are linamarin and lotaustralin. A dose of 40 mg of pure cassava cyanogenic glucoside is sufficient to kill a cow. And societies that traditionally eat cassava generally understands that one form of processing (Drying, soaking, cooking, fermentation, etc.) is necessary to avoid getting sick.

In African countries and Indonesia, fermentation method is widely used. The processing reduces the level of anti-nutrients, thereby making the food more nutritious. Cassava is a main source of carbohydrate and it is mostly starchy in nature, they are found in storage organs, which may be enlarged roots or tubers [4].

Cassava is an important crop in Nigeria because of its comparative production advantage over other staples. Cassava can produce the nationally required food security if further encouraged. Cassava is a rich, cheap and reliable source of food for more than 700 million people in developing world [5]. Cassava has been estimated that about 250 million people in the sub Saharan Africa derive half of their daily calories from cassava [6]. Cassava is Africa's second most important staple after maize in terms of the calories consumed. It has the capacity to yield under marginal soil conditions and also its tolerance to drought is notable [7].

Nigerians prefer Cassava compared to any other staple food because of its availability all year round and consequently, Cassava has a broad base of end users [8] as a cash crop, cassava generates cash incomes for the largest number of households in comparison to other staples. Cassava is good for consumption when properly processed and prepared. Cassava contains significant amounts of calcium (500 mg/100g), phosphorus (400 mg/100g), and vitamin C (25 mg/100g). Cassava is also a source of protein and also rich in amino acid (lysine). The cassava crop consists of 15% peel and 85% fresh tuber flesh. The tuber consists of 20 - 30% starch, 62% water content, 2% protein, 1 - 2% fiber with trace of vitamin and minerals [9]. Cassava has the following economic importance in the Nigerian economy.

1. Source of employment to millions of people both in its production and processing.
2. Source of income to individuals and serves as revenue for the government.
3. Cassava serves as a source of foreign exchange to individuals and the government.
4. Cassava serves as raw materials for some industries.
5. Cassava is a rich and very important source of food item to millions of people.

Objectives of the Study

The broad objective of the study was to examine the economic analysis of cassava production in Yewa North Local Government Area of Ogun State. The specific objectives were to examine the technical efficiency of the cassava farmers; determine the factors influencing productivity of the cassava farmers in the study area; and also estimate costs and returns structure of cassava farmers in the study area.

Research Methodology

Study Area

The empirical setting for this study was Yewa North Local Government Area of Ogun State, Nigeria. Ogun State is in the southwest rainforest zone of Nigeria. The state was created on the third of February, 1976 under the military government, It lies within latitude 6055 - 70N and longitude 3046 - 40150E, and lies within the latitude of 26° and longitude 36° by Greenwich Meridian and is bounded in the West by the Republic of Benin, on the East by Ondo State, on the North by Oyo State arid on the South by Lagos and the Atlantic Ocean. It has human population of about 2,236,609 as at the 1991 census [10]. The average rainfall in the state ranges between 1250 mm and 1800 mm with a slight bimodal rainfall distribution which peak in June and October while the dry season stretches from mid-November to mid- March. Temperature ranges from 240C to 320C and average relative humidity of 80% to 90%. Ogun State covers about 16,409.26 square kilometers [11].

Sources and Methods of Data Collection

Survey data were collected from cassava farming households. The study made use of both primary and secondary data. Primary data were sourced for, with the aid of well-structured questionnaire to obtain information from the respondents in the study area and through oral interview. Secondary data were sourced for, from journals, statistical publications, textbooks, articles, past projects, and the internet.

Sampling Techniques

A two stage and purposive sampling techniques were employed in selecting respondents for the study. In the first stage, seven (7) farming communities and villages were randomly selected, where there is appreciable number of cassava farmers. The second stage involved the purposive selection of ten (14) farmers from each towns selected in stage one. In all, data were sourced from a total

of ninety-eight (98) respondents who are basically cassava farmers in the study area.

Methods of Data Analysis

Both descriptive and quantitative techniques were used to analyze the data collected.

The descriptive statistics (such as frequency tables, percentages and all forms of indices) was used to describe the socio-economic variables (such as age, sex, marital status, educational level, household size, year of farming experience) of the respondents in the study area.

Examination of technical efficiency of the cassava farmers

Stochastic frontier production model was employed in capturing this objective

The explicit Cobb Douglas functional form for cassava farm in the study area is specified as;

$InYi = \beta 0 + \beta 1InX\_1 + \beta 2InX\_2 + \beta 3InX\_3 + \beta 4InX\_4 + \beta 5InX\_5 (Vi + Ui)$ ..... (1)

Where:

Y_i: Output of cassava (kg/ha)

X_1: Cost of transportation (₦)

X_2: Cost of fertilizer (kg)

X_3: Cost of herbicides (₦)

X_4: Cost of stems (₦)

X_5: Hired Labour (Manday)

The inefficiency model U_I is defined by

$U\_I = \delta + \delta\_(1)\, Z\_(1) + \delta\_(2)\, Z\_2 + \delta\_(3)\, Z\_(3) + \delta\_(4)\, Z\_(4)$

Where;

Z_1: Age (years)

Z_2: Farming experience (years)

Z_3: Farm size (hectare)

Z_4: Educational level (years of formal educational qualification)

Determination of the factors influencing productivity of cassava farmers

Ordinary Least Square (OLS) method of analysis was employed to capture this objective

Explicitly, the model is specified as follows

Y= f(X1, X2, X3, X4, X5, X6, X7,X8,Ui)……..(2)

Where,

Y: Cassava' output (kg)

X1: Age (years)

X2: Gender (1= male, 0 if otherwise)

X3: Educational level (years of formal education)

X4: Farming experience (years)

X5: Cost of production (₦)

X6: Marital status (1= single, 0 if otherwise)

X7: Income (₦)

X8: Other operating expenses such as; transportation, association levy etc. (₦)

Ui: Error Term

Estimation of the cost and return structure of cassava business in the study area

Budgetary analysis was employed to achieve this objective.

The formula is explicitly defined as follows;

$\pi = TR - TC$……..(3)

Where:

TR = PQ (Price x Quantity)……..(4)

TC = Total Fixed Cost + Total Variable Cost

GM = TR-TVC…….. (5)

NI = TR-TC…….. (6)

GM: Gross Margin (N)

TR: Total Revenue (N)

TVC: Total Variable Cost (N)

TFC: Total Fixed Cost (N)

NI: Net Income (N)

Profitability Index (P2)

P1 = NI/TR X 100%.....(7)

Rate of Return on Investment = NI/TC x 100……..(8)

Results and Discussion

This section presents the result of descriptive analysis aimed at describing the socio-economic characteristics of the farmers in the study area. This socio-economic variables examined includes age, sex, marital status, educational level, religion among others

The age of the farmer is an important determinant of productivity in cassava farming business. Age influences the level of physical work and productivity as production in this part of the world is believed to be largely labour intensive. As shown in table 1, it was revealed that 34.7% of the farmers fall within age 41 - 50 years, which implies that they are adults in their prime, and active working age which may translate to high efficiency of cassava production.

Sex may determine the ability to perform some physical work. It is a general belief that men are more actively productive and efficient in farming practices due to labour intensive nature of agriculture, especially in a developing economy like ours and because farming requires carrying out strenuous work on the farm, other than their female counterparts. This therefore is the basis for analyzing the sex distribution of the cassava farmers. The distribution

of respondents by sex of respondents reveals that majority of the cassava farmers were male representing 64.3% of the respondents which implies that farming activities are dominated by men because it requires strength and agility, while the female are the minority representing 35.7% of the respondents. The study shows that substantial percentage (35.7%) of the female in the study area is now venturing into cassava farming business. Marital status of the respondents may determine the level of household size of the respondents and this will have implication on the family labour, income composition, consumption and savings pattern. Majority, which accounted for (46.9%) of the farmers are married with family responsibilities.

Variables	Frequency	Percentage
Age (years)		
20 - 30	1	1.0
31 - 40	15	15.3
41 - 50	34	34.7
51 - 60	17	17.3
61 - 70	25	25.5
71 and above	6	6.2
Marital Status		
Single	10	10.2
Married	46	46.9
Divorced	31	31.6
Widowed	11	11.3
Educational Level		
No formal Education	21	21.4
Primary education	33	33.7
Secondary education	44	44.9
Tertiary education	-	-
Household Size (person)		
1 - 5	21	21.6
6 - 10	48	48.8
11 - 12	29	29.6
Religion		
Christian	38	38.8
Muslim	60	61.2
Occupation		
Farming	92	93.9
Others	6	6.1
Year of Farming (years)		
1 - 5	10	10.2
6 - 10	18	18.2
11 - 15	33	33.8
16 - 20	10	10.2
21-30 and above	27	27.6
Total	98	100

Table 1: Socio-Economic Characteristics of the Cassava Farmers. Source: Field Survey, 2015.

Education is of paramount importance in rational decision taking, It can indirectly determine the decision of household heads as regards consumption and savings. The distribution of respondents by level of education revealed that most of the respondents had some form of formal education. About 44.9% of the farmers attained secondary school education, 33.7% of the farmers were educated to at least primary level, while about 21.4% of the farmers had no formal education. This implies that education is vital to increase in productivity and profitability level of cassava production in the study area.

The household size of farmers most especially in the rural setting may determine the family labour, costs of operating the cassava business. It is also believed to have negative relationship with profitability of the cassava farming business notwithstanding, the availability of family labour enhances productivity. The finding reveals that some (48.8%) of the farmers had household size within 6 - 10 persons as the household size. The farming households can be said to have considerate household sizes which may not be unconnected to their high literacy level.

Religion is believed to play a significant role in the occupation practiced by people in a particular community as some religion forbids its members from certain practices and occupation, and this is the basis for analyzing the religion distribution of the respondents. The result reveals that 38.8% of the farmers in the study area are Christians, and 61.2% of the farmers are Muslims, this implies that the cassava production is not restricted to a particular religion but it is practiced mostly by Muslims as shown by the findings.

The occupation practiced majorly is one of the most important factors to be considered in the study, this was analyzed to determine the distribution of people who practice farming majorly and those who combine farming with other occupations. The result of the study reveals that 93.9% of the respondents were majorly farmers while 6.1% of the respondents were farmers who combine other occupation with farming i.e. trading or craftsmanship.

Farming experience is an important determinant of efficiency. According to a prior expectation, farming experience is to have a positive relationship with efficiency. Distribution of respondents by years of experience indicated that 10.2% of the farmers had between 1 - 5 years of farming experience, while majority (33.8%) of the farmers had between 1 - 15 years of farming experience which implies that since majority of the cassava farmers possessed more farming experience, it will help to increase probability of high efficiency.

Determinants of Technical Efficiency of Cassava Farmers

Given the specification of the Cobb-Douglas frontier production function, the technical efficiency of cassava production in the study area was calculated. The predicted level of efficiency differs substantially among the farmers, ranging between 17% and 99% with a mean of 36.2% which shows that they are technically efficient. Also, there exists a reasonable gap between the efficiency of the best technically efficient farmer and that of the average farmer. Furthermore, the varying socio-economic characteristics of the sampled farmers such as age of farmers, farming experience, farm size and level of education, all these influence the farmers ability to use improved cassava varieties, and production.

The stochastic production frontier was used to determine the technical efficiency of cassava farmers in the study area. The slope coefficients of the stochastic frontier are significant at 1%, 5% and 10% profitability level respectively. The three co-efficient contribute positively to technical efficiency. Cost of transportation is significant at 10%. In the MLE, level of education is significant at 5% and has positive relationship. The co-efficient of years of experience, level of education, age of the respondents were positive, indicating that these factors led to decrease or increase in technical efficiency of the cassava farmers in the study area. This implies that a unit increase in any of those variables, let us assume by 1% will lead to proportional increase in technical efficiency of the farmers.

Technical Efficiency estimates of the cassava farmers

To this end, the level of efficiency is presented in table 3 which shows that about 43.8% of the sampled cassava production farms had the level of technical efficiency between 15% and 25%. About 4.0% of the farmers had the efficiency level ranging between 76% and 85%, 3.0% of the farmers had efficiency level ranging from 86% and 95%, while 7.1% of the farmers had technical efficiency ranging between 96 and 100%. This implies that most farmers in the study area are technically inefficiency, which may be due to a number of factors such as low level of education, inadequate farm inputs, poor funding and management system.

Explanatory variables Stochastic frontier	Parameters	OLS	MLE
Constant	β_1	-1.250	1.210
		(-1.232)	(1.331)
Cost of transportation	β_2	0.979	0.485
		(1.677)***	(1.412)
Cost fertilizer	β_2	0.155	0.156
		(1.171)	(1.228)
Cost herbicides	β_3	-0.007	-0.0009
		(-0.048)	(-0.039)
Cost stem	β_4	0.142	-0.087
		1.252	(-0.202)
Cost of labour	β_5	-0.045	0.0001
		(-0.278)	(0.045)
Inefficiency variable			
Constant	δ_0	0	1.144
			(1.676)
Age	δ_1	0	-0.095
			(-0.599)
Farming experience(years)	δ_2	0	-0.057
			(-0.645)
Farm size (hectares)	δ_3	0	0.031
			(0.302)
Education	δ_4	0	0.783
			(2.108)**
Diagnostic static		0.286	0.108
Sigma square			1.510
Gama		0.050	0.999
			8.233
Log likelihood function		-2.746	-2.192
LR test		3.111	
Mean Efficiency		0.362	

Table 2: Technical Efficiency Results of Cassava Farmers.

***: Significant at 1%; **: Significant at 5%; ***: Significant at 10%.

Source: Field Survey, 2015.

Decile range of T.E	Frequency	Percentage
0.15 - .025	43	43.8
0.26 - 0.35	11	11.2
0.36 - 0.45	7	7.1
0.46 - 0.55	11	11.2
0.56 - 0.65	7	7.1
0.66 - 0.75	5	5.1
0.76 - 0.85	4	4.0
0.86 - 0.95	3	3.0
0.96 - 1.00	7	7.1
Total	98	100.0

Table 3: Decile Range of Technical Efficiency of the Cassava Farmers.

Mean = 36.2%; Minimum= 17%; Maximum= 99%

Source: Field Survey, 2015.

Regression Analysis showing determinants of productivity of cassava farmers

In order to estimate the coefficient and determine the signs of factors that determine gross farm income, which was used as a measure of agricultural product (cassava output), multiple regression analysis was used. From the table 4, it could be deduced that the explanatory power of 65.1% of the variation in the cassava output of cassava farmers is explained by identified factor influencing the output was caused by the extraordinary variable not included in the model. Thus, the regression has a good fit implying that the most important explanatory variables are included in the model. Also, the F-value of 24.017 was significant at 99% level of confidence. Thus, it indicates a strong influence of the selected seven variables on the cassava output.

Data in table 4 shows that the coefficient of age, sex, cost of transportation, cost of production and year of farming experience was found positive and statistically significant at 5% and 10% respectively. This implies that a unit increase in these variables will cause a proportional increase in cassava output while marital status, year of farming experience has negative relationship which implies that increase in these variables may not necessary increase the cassava output of the producers.

Cost and Return Structure of Cassava Production

Budgetary analysis of profitability of cassava producers in the study area is presented in the table 5 and it reveals the average gross margin of the farmers is valued at N143,670.27. The profitability index and rate of return on investment of cassava farmers to be 0.6627 and 352.8673% respectively. This implies that on every ₦1 realized as revenue, about 66 kobo is realized as profit. The total fixed cost of the farmers which are (hoes, cutlasses and baskets) valued at N6,477.040, the total variable cost of the farmers are (land clearing, herbicides, transportation, fertilizer, cost of planting materials, cost of labour) valued at N33,901.15, Net Income of the farmers valued at N137,193.23. The rate of return on investment of 352.86% implies that the farmer earns 352 kobo for every N1 invested. From this indication, it is evident that cassava farming is profitable.

Variable Code	Variable Name	Coefficient	T-value
β_o	Constant	64.756	-0.535
X_1	Age	0.109	1.459***
X_2	Sex	0.100	1.431
X_3	Marital status	-0.049	-0.710
X_4	Education	0.120	1.789***
X_5	Years of farming	-0.140	-2.070**
X_6	Cost of transportation	0.688	9.016*
X_7	Cost of production	0.178	2.416**
F- Value	24.017*		
R Square	0.651		
Adjusted R^2	0.624		

Table 4: Determinants of Productivity of the Cassava Farmers.

*: Significant at 1%; **: Significant at 5%; ***: Significant at 10%.

Source: Field Survey, 2015.

Constraints Militating against Cassava Production

Cassava farmers have over the years been plagued by various constraints which have reduced the farmers' income and made large production difficult if not impossible. This motivated the interest to identify the obstacles militating against efficient and improved cassava production in the study area. The specific constraints identified include: high cost of labour, high cost of production materials, inadequate capital, diseases outbreak and inadequate capital.

The findings summarized as follow: 70.4% high cost of labour, 83.7% high cost of production materials, 98% inadequate capital, while 28% experienced disease outbreak. This is evident in a previous study by IITA (2004) which identified incidence of pest and diseases and lack of capital as the major problems encountered by farmers. It was revealed most cassava farmers suffer inadequate capital in their production. Efforts are to be made circumvent the situation by making more funds available to cassava production [12-21].

Production constraints	Response	Frequency	Percentage
High cost of labour	High	69	70.4
	Low	29	29.6
Total		98	100.0
High cost of production material	High	82	83.7
	Low	16	16.3
Total		98	100.0
Inadequate capital	High	96	98.0
	Low	2	2.0
Total		98	100.0
Diseases outbreak	High	70	71.4
	Low	28	28.6
Total		98	100.0

Table 6: Distribution of constraints militating against cassava farmers in the study area.

Source: Field Survey, 2015

Conclusion and Recommendations

The study concluded that the cassava production was found profitable and most cassava producers were technically efficient; even there were few that were technically inefficient due to such identified factors such as inadequate capitals, farm inputs, poor farming practices and management system. There were various constraints to cassava production, which inadequate fund top the list. Based on the findings, it is therefore, recommended that:

1. Government through credit agencies should make available loanable fund and credit available to cassava producers.
2. To tackle the menace of pest and diseases, pesticides should be made available to the farmers at subsidized prices to prevent losses, also this should be communicated to them through a channel well known to them, e.g. radio, extension agents, and it should be brought closer to them for easy accessibility.
3. Government should provide good storage facilities and good roads in order to prevent spoilage before the cassava tuber roots gets to the urban areas where the product price appreciates. Government should also as a matter of urgency set in motion policies that will eradicate high costs of production for the cassava e.g. set price ceiling for agricultural tools, and encourage existing farmers whereby more people would love to venture into it because of its attractive reward.

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