

Economic analysis of cassava production in Akoko District of Ondo State, Nigeria

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Abstract

The study evaluated the economic analysis of cassava production in Akoko area of Ondo State, Nigeria. Data were collected using a well-structured questionnaire and interview schedule. Descriptive statistics, budgetary techniques and multiple regression model were employed for the data analysis. The results showed that the majority (72.7%) of cassava farmers were male households and they were within the active age group given a mean of 50 years with a mean household size of 5 persons. About 80.7% of the farmers were married and had an average farming experience of 13 years while about 82.0% of them had formal education. The cassava farmers had an average farm size of 1.9 ha and many (62.7%) of them started their farming business with their personal income. The results of budgetary analysis revealed that the net farm income was ₦149,101.92 with the return on investment of ₦1.5. This implies that for every ₦1 invested in the business, there is a return of 50k. The result of the multiple linear regression showed that agrochemical, labour, farm input, and age were the major factors that had a significant influence on the profit of the cassava farmers. Again, inadequate capital for start-up, unstable price, and high cost of inputs were the main constraints faced by the farmers in the area. From the findings, there is a need for the cassava farmers in the study area to form a cassava farmer cooperative to solve problems of accessibility to loan, resource allocation, dissemination of information and other challenges as this will increase their productivity and output.

Keywords: Production; Net farm income; Cooperative; Resource; Accessibility

1. Introduction

Agriculture continues to be the most important sector of the Nigeria economy in terms of provision of employment in spite of its declining contribution to the nation's foreign exchange [1]. Nigeria's wide range of climate variations allows it to produce a variety of food and cash crops [2]. The staple food crops include cassava, yams, corn, coco-yams, cow-peas, beans, sweet potatoes, millet, plantains, bananas, rice, sorghum, and a variety of fruits and vegetables. Commercial farming in Nigeria is limited to just a few while others practice subsistence farming, producing what is just enough for them and their families [3, 4]. The leading food and cash crops in Nigeria are cassava, cocoyam, sorghum, millet, yam, sweet potato, soybeans, kola nut, cocoa, cotton, groundnuts, and sugarcane, cashew, wheat, sesame, ginger, oil palm, and rubber. Hence, Nigeria is the world's largest exporting country of cassava with a total of 77% of world export [5]. In Nigeria, cassava is grown in all the ecological zones; the crop is planted all year round depending on the availability of moisture. The peak of the planting period is April to May. Mixed cropping system is the most practiced method of cassava production. Throughout the tropics, its roots and leaves provide essential calories and income. Africa is one of the continents of the world where some 600 million people are dependent on cassava for food [6].

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Cassava is tolerant to low soil fertility and more resistant to drought, pest, and disease [7]. Cassava is rich in carbohydrates, calcium, and vitamin B and C. However, nutrients composition differs according to variety and age of harvested crop, and soil conditions, climate and other environmental factors during cultivation. Cassava is very versatile and its derivative starch are applicable in many types of products such as food (garri, fufu, lafun, pupuru etc.), confectionery, sweeteners, glues, plywood, textile, paper, biodegradable products, monosodium glutamine and drugs. Cassava chips and pellets are used in animal feed and production of alcohol [8].

The growth in cassava production has been primarily due to rapid growth in population, large domestic demand, complemented by the availability of high-yielding improved varieties for cassava, a relatively developed market, and the existence of improved processing and technology [9]. Cassava is a cheap and reliable source of food for more than 700 million people in the developing world [10]. It is estimated that 250 million people in sub-Saharan Africa derive half of their daily calories from cassava [11]. Cassava is Africa's second most important food staple, after maize in terms of calories consumed.

Cassava can be grown on a wide range and can yield satisfactorily even in acidic soils where most other crops fail [12], the crop has continually played very vital roles, which include the income for farmers, low-cost food sources for both the rural and urban dwellers as well as household food security [13]. Cassava has many uses, which has made the crop a potentially high major foreign exchange earner in Nigeria [14]. Cassava is produced largely by small-scale farmers using simple farm implements. As a food crop, cassava fits well into the farming system of the smallholder farmers because it is available all year round; a major source of income and it ensures food security [15].

The ban on the importation of food resulted in an increase in demand for food products and cassava products in particular, including being a source of raw materials for local industries. The demand for cassava in Nigeria has been on the increase due to the increasing growth in population, income levels, urbanization, and associated changes in the family occupational structure [5]. On the contrary, the rate of supply of cassava has lagged behind that of demand, leaving a wide gap between demand and supply. Cassava production is faced with constraints like low capitalization, price fluctuation, diseases and pests, and poor storage facilities. These have affected its production over the years [16]. In view of this, the study attempted bridging this gap and add to the body of knowledge on the economics of cassava production in Nigeria with emphasis on the subject theme and area. In the past, farmers have had to abandon their cassava farms due to what experts termed the "cyclic effect" mainly resulting in perennial problem of seasonal variation in product prices which ultimately results in poor returns for farmers and marketers. The consistent requirements of fresh roots by cassava-based industries cannot be supported by the current subsistence production systems. Although the cassava production sector holds an important position on economic development in Nigeria, systematic studies have not been conducted on the economic analysis of cassava production in Akoko areas of Ondo State, Nigeria. Again, profitability parameters vary across regions, hence, there is paucity of information from the study area on factors affecting cassava returns using functional forms with the way it is done in this study. The study explored more profitability measures other than gross margin and profit to explain the economic viability of cassava production business in the study. Hence, the focus of this study is to analyze the economics of cassava production in Akoko area of Ondo State, Nigeria. This study will also evaluate the factors affecting the production of cassava and possible ways of improvement. The specific objectives of this study were to describe the socio-economic characteristics of respondents in the study area; estimate the costs and returns of cassava production; examine the factors influencing the returns of cassava production in the study area; and identify the challenges in cassava production in the study area. The study through its objectives will serve as basis for farmers to know the factors affecting cassava production and provide solutions with a view to boost its production.

2. Methodology

The study was carried out in Akoko district of Ondo State, which comprises Akoko North-East, Akoko North-West, Akoko South-East and Akoko South-West Local Government Areas. Akoko land is within Longitude 5°E and 6°E and Latitude 7°N and 7°45' N. Akoko area is topographically hilly and granite out-crops of attractive sceneries. Akoko land in Ondo State of Nigeria lies in the tropics, characterized by two seasons; the dry and the rainy season. The mean annual temperature for Akoko is 28°C and it is high throughout the two seasons only dropping slightly at the peak of the rains and harmattan. The vegetation of Akoko varies from Forests to Guinea savannah. Akoko is endowed with abundant mineral resources. Predominant occupations of the community include; farming and teaching [17].

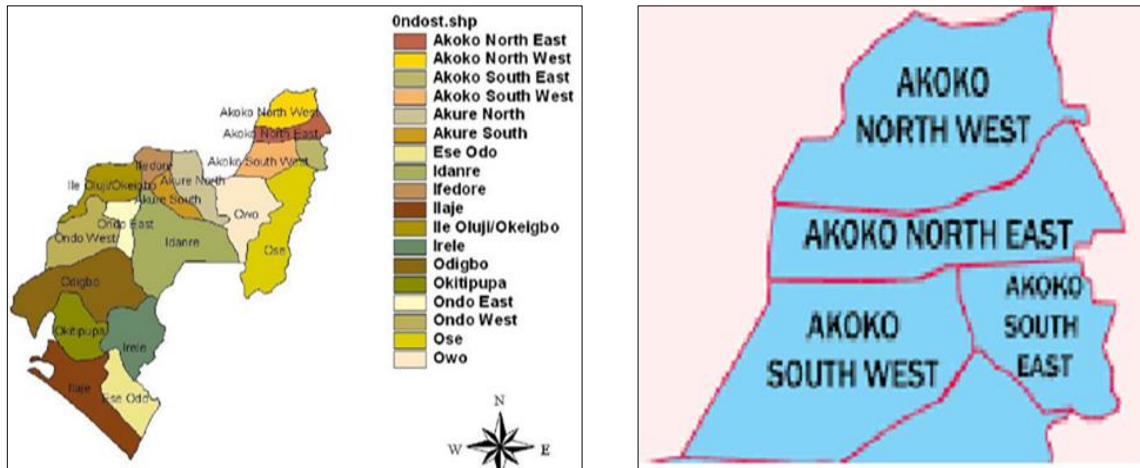


Figure 1 Map of Akoko District

Primary data were used for this study. The primary data were in form of a well-structured questionnaire administered to cassava farmers in selected communities of Akoko areas of Ondo state. The questions were tailored towards meeting the set objectives of the study. Data on personal characteristics as well as farm activities and cost of production data were collected. A multistage sampling procedure was used to select respondents for this study. The first stage involved the use of purposive sampling in selecting two (2) Local Government Areas which were Akoko North East and Akoko South West Local Government Areas in Akoko district, which have the largest cassava production in the district. In the second stage, simple random sampling was used in selecting three (3) communities each from the two Local Government Areas which have more cassava farmers. They include, Ikare, Ugbe, and Ogbagi were selected in Akoko South West while Oka, Oba and Supare were selected in Akoko South West. The third stage involved random selection of twenty-five (25) cassava farmers in each of the communities thus making a sample size of 150 respondents for the study. Descriptive statistics (such as mean frequency and percentage), budgetary technique and multiple linear regression were used as the analytical techniques for the study. Descriptive analysis was used to describe the socio-economic characteristics of respondents in the study area. Budgetary analysis was used to estimate the costs and returns of cassava production in the study area. Multiple linear regression was used to examine the factors affecting the cassava production in the study area, while descriptive statistics was also used to identify the challenges faced in cassava production.

The following arithmetical computation was used in the study to analyze the cost structure and the net farm income in the study area. The gross farm income is the total revenue generated from the production, while net farm income is the difference between the total revenue and total cost. The total cost of production includes both total variable cost and total fixed cost. Total variable cost includes; cost of seed, cost of labour, and cost of agrochemical while total fixed cost includes cost of sprayer, cost of cutlass and cost of file.

The formula for estimating the net farm income is stated as follows.

$$NFI = TR - TC$$

Where:

NFI= Net Farm Income (Naira)

TR= Total Revenue (Naira)

TC= Total Cost of Production (Naira)

TC= TVC+TFC

Total Cost (TC) = Total Variable Cost (TVC) + Total Fixed Cost (TFC)

Variable Inputs = seed, fertilizer, labor and agrochemicals

Fixed Inputs = cutlass, file, and knapsack sprayer

The fixed inputs were depreciated using the straight-line method given by $D = P - S / N$

Where:

D = Depreciation (Naira)

P = Purchase value (Naira)

S = Salvage value (Naira)

N = Life span of asset (years)

Return on Investment (ROI) was obtained by dividing the Total revenue (TR) over the Total Cost (TC).

Therefore, $ROI = TR / TC$

Where:

ROI = Return on Investment

TR = Gross Income

TC = Total Cost

2.1. Model Specification

An estimated production function was used to estimate factors affecting cassava production in the study area. The implicit form of the regression model is expressed as;

$$Y_i = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8)$$

The regression model is stated explicitly and the model variables are defined as follows

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + U_i$$

Where,

Y_i = Net Farm Income (₦)

X_1 = Agrochemical (liters)

X_2 = Total labor used (Man-day)

X_3 = Farm size (hectares)

X_4 = Farm implements (N)

X_5 = Age

X_6 = Household size

X_7 = Education

X_8 = Experience

The production function was estimated using the ordinary least square regression technique. The following functional forms were estimated for the production function and the one that best satisfies the theoretical, statistical and econometric criteria for a production function was selected as lead equation. The functional forms that were estimated are: Linear, semi log, double log and exponential.

2.1.1. Linear function

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + U_i$$

2.1.2. Semi-Log

$$Y_i = b_0 + b_{1\log}X_1 + b_{2\log}X_2 + b_{3\log}X_3 + b_{4\log}X_4 + b_{5\log}X_5 + b_{6\log}X_6 + b_{7\log}X_7 + b_{8\log}X_8 + U_i$$

2.1.3. Exponentials

$$\text{Log } Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + U_i$$

2.1.4. Double log

$$\text{Log } Y_i = b_0 + b_{1\log}X_1 + b_{2\log}X_2 + b_{3\log}X_3 + b_{4\log}X_4 + b_{5\log}X_5 + b_{6\log}X_6 + b_{7\log}X_7 + b_{8\log}X_8 + U_i$$

Lastly, mean ranking was used to identify specific challenges encountered during cassava production. Thereby making it easy to identify the major challenges.

3. Results and discussion

3.1. Socio-economic Characteristics of the Respondents

The result from Table 1 indicates that majority (72.7%) of cassava farmers in the study area are male while 27.3% of the respondents are female. The predominance of male in farming operation may be attributed to the tedious nature and hard work involved in the various farm enterprises. Similar findings have been reported by [18] who stated that 84% of the farmers in Paiko Local Government Area of Niger State were male. The study further revealed that most (51.3%) of the respondents belonged to the age bracket of 51 years. The findings revealed that 0.7% of the cassava farmers were below 30 years of age. The mean age of the respondents was 50 years. This implies that most of the farmers

in the study areas were very active to carry out agricultural activities. The findings from the Table further show that majorities (80.7%) of the respondents are married, while (3.3%) are single, (12.7%) of the farmers are widows; also (3.3%) are divorced. The proportion of married persons that participated in cassava production activities was high, the predominance of married individuals agreed with a study carried out by [19] which revealed that about 85.8% of the Edo state farmers were married. The predominance of married persons that participated in activities implies that they were ready to improve their livelihood and that of their families since marriage is often associated with occupational stability and responsibility [19]. Furthermore, the result revealed that the majority (55.3%) of the farmers have a household size between 4 and 6 persons, this implies that respondents had access to family labour which will positively increase agricultural production. [20] noted that large household size served as an important source of farm labor in order to improve productivity. The majority (82.0%) of the respondents had formal education, whereas, 18.0% had no formal education (Table 1).

Table 1 Socioeconomic characteristics of the cassava farmers

	Frequency	Percentage	Mean
Gender			
Male	109	72.7	
Female	41	27.3	
Age			
≤30	1	7	
31-40	28	18.7	
41-50	44	29.3	50
≥51	77	51.3	
Marital Status			
Single	5	3.3	
Married	121	80.7	
Widowed	19	12.7	
Divorced	5	3.3	
Household Size			
≤3	27	18.0	
4-6	83	55.3	
7-9	38	25.3	5
≥10	2	1.3	
Educational status			
No formal education	27	18.0	
Primary education	56	37.3	
Secondary education	57	38.0	
Tertiary education	10	6.7	
Experience			
≤10	83	55.3	
11-20	47	31.3	13
≥21	20	13.3	

Source: Field Survey, 2021

Among those with formal education, primary education accounted for 37.3%, 38.0% had secondary education while 6.7% had tertiary education. This implies that the respondents were educated and they were more likely to utilize information on agriculture to enhance food production. [21, 22] stated that education plays an important role in creating awareness in farming communities because educated people are capable of sourcing information on agricultural innovation. The study also revealed that 55.3% of the respondents had less than 10 years of farming experience, followed by 31.3% who had between 11 and 20 years of experience, 13.3% of the farmers had more than 21 years' experience in cassava production. The mean farming experience was 13 years. This implies that quite a number of the respondents have been farming for a long time. According to [23] farming experience enhances productivity and has shown to encourage the rapid adoption of farming innovation.

3.2. Cost and Return

The profitability of the cassava production enterprise was examined using costs and returns analysis. The estimated costs and returns of small-scale cassava farms in the study area are presented in Table 2, the gross return realized by small-scale cassava producers was ₦164,974.96 per average cassava farmer. The total variable cost in cassava production was ₦81,125.96 of the total cost of production comprising 60.68% of labour, 15.92% of transportation, 5.06% of herbicides, and 1.96% of insecticides. The total fixed cost of production was ₦15,873.04, comprising 0.92% and 0.33% of hoes and baskets, respectively. Also, 0.71% accounted for cutlass, 1.51% accounted for knapsacks, and 2.12% for wheelbarrows. The total cost of production for a typical small-scale cassava farmer was ₦96,998.99. The net farm income was ₦149,101.92. The return on investment was ₦1.5 k, implying that for every one naira invested on the business, there is a profit of 50k. Hence, cassava production is profitable in the study area. This implies that farmers can continue with cassava production in order to increase their source of income. The results of this study were similar to the findings of [24] that was carried out among yam farmers and [25] that was carried out among cassava farmers in the area. The same view was shared by [26] that farming enterprise is profitable especially in cassava production in the area.

Table 2 Costs and Returns of Cassava Farming

Costs and Returns	Amount (₦/Ha)	% Of Total Cost
Variable cost		
Transportation cost	15,438.89	15.92
Herbicides	4,912.50	5.06
Insecticides	1,912.50	1.97
Labour	58,862.07	60.68
(A)Total variable cost	81,125.96	
Fixed cost		
Rent on land	10,452.26	10.78
Depreciation on wheelbarrow	2,055.74	2.12
Depreciation on knapsack	1,467.00	1.51
Depreciation on cutlass	684.64	0.71
Depreciation on hoe	893.40	0.92
Depreciation on basket/bowl	320.00	0.33
(B)Total fixed cost	15,873.04	
(C)Total cost	96,998.99	
(D)Total Revenue	246,100.92	
(E)Net farm income (D-C)	149,101.92	
Gross margin (D-A)	164,974.96	
Return on investment $\frac{R}{C}$	1.50	

Source: Field Survey, 2021

3.3. Production Function Estimation

The results of regression analyses of the four functional forms (linear, semi-log, double-log and exponential) are presented in Table 3. On the basis of the criteria of choice of the lead equation, (statistical and econometric criteria) Cobb Douglas gave the best fit. The value of adjusted R² was 0.857 which implies that nearly 86% of the total variation in the level of returns was accounted for by all the explanatory variables in the regression model while the remaining 14% was explained by the random error. The significance of the F -Value implies that all the explanatory variables jointly exerted a significant influence on the return of cassava production in the study area. The regression analysis revealed that the cost of agrochemicals, cost of labor, farm input, and farmers' age had a significant contribution to cassava returns while farm size, education, experience and cost of implementation have a negative significant effect on cassava returns in the study area. This implies that a unit increase in any of their value would lead to an increase in the returns of cassava production. On the other hand, labour (in man-day) made a positive significant contribution to the returns of cassava as also observed by [1]. This also indicated that a unit increase in the hour of labour would lead to an increase in the return of cassava production in the study area.

Table 3 OLS Regression Estimation of Production Function for Cassava

Variables	Linear(P-value)	Double log(P-value)	Semi log(P-value)	Exponential (P-value)
(Constant)	8822.10(0.774)	11.47(0.000) ***	13.37(0.001) ***	-74944.10(0.466)
Agrochemical	4.10(0.239)	0.01(.002) ***	1.33(0.000) ***	27623.20(0.001) ***
Labour	4.90(0.004) ***	0.01(0.010) ***	-1.76(0.000) ***	-35395.60(0.001) ***
Farm size(ha)	6334.40(0.077)	-0.015(0.888)	-0.468(0.436)	33531.70(0.040) **
Farm input	1996.50(0.000) ***	-0.151(.001) ***	-2.18(0.000) ***	-16612.60(0.110)
Age	991.60(0.013) **	0.02(0.046) ***	1.79(0.017) **	48480.40(0.016) **
Household size	3924.50(0.042) **	0.09(0.117)	0.37(0.321)	14016.80(0.164)
Education	-1305.70(0.730)	-0.07(.555)	-0.41(0.278)	-5311.70(0.600)
Experience	-677.90(0.135)	-0.02(0.127)	-0.34(0.063)	-9671.50(0.048) **
R2	0.580	0.857	0.736	0.523
F-value	11.068	42.009	21.96	8.65

Source: Field Survey, 2021; ***: Significant at 1 percent; **: Significant at 5 percent

3.4. Challenges Encountered during Cassava Production

Table 4 Distribution of Challenges faced during Production

Constraint	Not at all		Mild		Serious		Very serious		Mean	Rank
	F	%	F	%	F	%	F	%		
Inadequate capital/credit	14	9.3	37	24.7	30	20	69	46	3.03	1
High cost of input	19	12.7	28	18.7	44	29.3	59	39.3	2.95	2
Pest and Disease	24	16	24	16	40	26.7	62	41.3	2.93	3
Transportation cost	15	10	42	28	33	22	60	40	2.92	4
Shortage of labour	21	14	38	25.3	37	24.7	54	36	2.83	5
Unstable price	20	13.3	41	27.3	34	22.7	55	36.7	2.83	6
Lack of modern equipment	38	25.3	20	13.3	31	20.7	61	40.7	2.77	7
Incidence of pilfering/theft	31	20.7	29	19.3	42	28	48	32	2.71	8
Environmental hazard	56	37.3	8	5.3	41	27.3	45	30	2.50	9

Source: Field Survey, 2021

The major constraints encountered in cassava production in Akoko district is inadequate capita or credit facilities, ranking highest, followed by high cost of input. Table 4 revealed that farmers faced the problems of pest and diseases infestation which was ranked the third major challenge to cassava production in the study area. Transportation cost was also a major challenge during cassava production; this is due to far distance of their farms to the major road which led to an increased cost as also noticed by [22]. Also, bad road linking their farms to the major road constituted high transportation cost. Shortage of labor was also seen as the fifth major challenge during production as also agreed with the findings of [27]. Incidence of pilfering and theft and environmental hazard were not major challenges during production.

4. Conclusion

The study critically and empirically evaluated the economics of cassava production using Akoko district as a case study. The study employed econometrics to predict the profitability and the probable factors that could influence returns in cassava production using a survey data collection at farm level. It was concluded that the cassava farmers in the area are young and active in the enterprise but are dominated by male household. The long years of experience and the literacy level of the farmers are good enough to understand the enterprise very well in order to accrue tangible profit in the process. Like other agricultural enterprises, most farmers do not have access to credit and thereby results to personal savings or borrowing money from their friends/relatives to engage in cassava farming. Cassava farming was found to be a profitable enterprise in the study area because it recorded a positive net farm Income and return on investment. This study also concluded that the average rate of returns on investment (returns per naira invested) was 1.50 on cassava farming, indicating that for every ₦1 invested in the study area, a profit of 50 kobo was made. Considering the profit realized on each naira invested on cassava farming, it is recommended that financial assistance in form of on-lending facilities should be provided for cassava farmers in order to reduce the major constraint of limited capital faced by the farmers. Again, to further improve on the profitability of the cassava farmers, certain variables such as agrochemicals, labour, farm size, age of the farmers and farming experience should be critically looked into by the policymaker and the Government as this will help in designing policies that will boost production for sustainable livelihood in the area. The problems that need urgent attention are inadequate funds, high cost of inputs, and pest and disease infestations. Government should provide soft loans to the farmers and as well subsidy the cost of planting materials and also empower research institutions to come up with resistant varieties and lasting solutions to the common pests and diseases affecting cassava production in the area.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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