(RESEARCH ARTICLE)

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Economic analysis of cassava production in Ogbia Local Government Area, Bayelsa State

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Abstract

The study was carried out to analyze "the Economics of cassava production in Ogbia Local Government Area of Bayelsa State, Nigeria". The specific objectives of the study were to describe the socio-economic characteristics of cassava farmers; analyze costs and returns of producing cassava; determine technical efficiency; determine factors influencing technical efficiency of cassava farmers; and Identify constraints associated with cassava production in the study area. The sample of (94) cassava farmers was drawn from (10) communities in Ogbia and structured questionnaires were administered. Descriptive statistics, Translog Stochastic Frontier Production Model (SFPM) and budgetary model were used to analyze the data. Female (87.23%) dominated cassava production. 74% falls within the age of 21-50 years. Majority were married (65%) and 54.26% had a family size of 6-10. 52.13% of the respondents were basically farmers and all of them get there source of income for farming from personal savings and 72.34% used both family and hired labour in the production of cassava with 58.51% of them having farm size ≤0.5. The study further reveals that the gross margin was ₦521,313.50 and the profitability index was 64.07, while the rate of return on investment was 178.31, benefit-cost ratio of 2.8 proving the viability of cassava production in the study area. Lack of credit facilities, high spread of disease, lack of land were the major constraints faced by the farmers. Loans and grants should be made available to farmers either by government agencies or rather programs to fund cassava production should be created.

Keywords: Technical efficiency; Profitability; Cassava production; Budgetary Model; Translog stochastic Production Model

1. Introduction

Cassava (*Manihot esculenta*) is a woody perennial dicotyledonous crop of the euphorbiacae family that is grown annually in most part of the world. It is ranked the most important root crops in terms of world production (international institute of tropical agriculture [1]. It is grown principally for it swollen roots but its leaves are also eaten in some part of Africa. Cassava is rich in carbohydrate and it is a major source of energy. The crop can easily adapt to different climatic and soil condition, hence its ability to grow and be available all year round, which gives it advantage over other tuber crops like yam, cocoyam and potato. Cassava products are generally accepted by all classes of Nigerians, which makes it attractive to farmers [2]. The crop and it derivatives have excellent potentials in livestock feed formulation, textile industry, plywood, paper, brewing, chemicals etc. [3].

According to the International fund for Agricultural Development [4], Africa is one of the continents of the world where some 600 million people are dependent on cassava for food. [5] revealed that about 42% of harvested cassava roots in West and East Africa are processed into dried chips and flour.

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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 planting period is April to May. Nigeria is the world's largest exporting country of dried cassava with a total of 77% of world export. In Nigeria, agriculture provides food for the teeming population and contributes about 33% to the Gross Domestic Product (GDP) of the nation [6]. The sector employs about one third of the total labor force and provide a livelihood for the bulk of the rural populace [7]. Total area devoted to agricultural cultivation is about 30.7 million hectares with farmers cultivating less than 2 ha averagely, operating with simple tools.

Nigeria produces more than half of total world cassava. But most of the Cassava is traditionally consumed by processing the fresh roots into Garri, fufu and flour [8]. It also offers flexibility to resource poor farmers because it serves as either as a food or as cash crop.

Bayelsa State is ranked 18th in the production of cassava in Nigeria with a mean yield of 15.3 MT [9].

This shows that cassava possesses the potential of eliminating food crisis and famine. In order to boost cassava production in Nigeria, the Federal Government and International Fund for Agricultural Development (IFAD) jointly initiated the cassava multiplication Programme with the aim of promoting cassava utilization as a commodity-based approach against food insecurity [10]. Cassava is a major contributor to development in Nigeria, there is increasing demand for cassava due to the rapidly growing population, the crop can also be processed into several secondary products of industrial market value such as chips, pellets, flour, adhesives, alcohol and starch which are vital raw materials in the alcohol, textile and soft drinks industries [11]. There is need to incorporate appropriate utilization of resources in the production of cassava especially in Bayelsa State, which made this study a timely response. This study sought to examine the profitability and technical efficiency of cassava production.

2. Methodology

Study area, Data collection and sampling Techniques.

The research was carried out in Ogbia Local Government Area of Bayelsa state. Ogbia local government Area is made up of thirty two autonomous communities including ogbia town which is the administrative headquarters and the central business district in the south of the area at 4°39′00″N 6°16′00″E. Bayelsa state has a population of 1,304,515 people of which Ogbia Local Government Area constitute 179,926 as at the 2006 Census, [12]. Multi-stage sampling technique was adopted. First stage involved random selection of ten (10) communities. Second stage involved selection of eleven (11) farmers randomly from each of the communities using the extension list. A total number of one hundred and ten (110) farmers from ten (10) communities were selected in the study area and ninety four (94) questionnaires were retrieved for the analysis.

2.1. Analytical tools

The data for the study was analyzed using both descriptive (such as percentage, frequency and mean) and inferential techniques. 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;

$$\text{In } Y_i = \beta_0 + \beta_1 \text{In} X_1 + \beta_2 \text{In} X_2 + \beta_3 \text{In} X_3 + \beta_4 \text{In} X_4 + \beta_5 \text{In} X_5 (V_i + U_i) \dots\dots\dots (1)$$

Where:
Y_i: Output of cassava (kg/ha)
X_1: Cost of transportation (₦)
X_2: Cost of harvesting (kg)
X_3: Cost of planting (₦)
X_4: Cost of stems (₦)
X_5: Hired Labour (Mandays)
The inefficiency model U_i is defined by
$$U_{ij} = \delta_0 + \delta_1 Z_{1ij} + \delta_2 Z_{2ij} + \delta_3 Z_{3ij} + \delta_4 Z_{4ij} \dots\dots\dots (2)$$
Where;
Z_1: Age (years)
Z_2: Farming experience (years)
Z_3: Farm size (hectare)
Z_4: Educational level (years of formal educational qualification)

2.2. Budgetary model

In line with [14], Budgetary analysis was employed to achieve this objective. The formula is explicitly defined as follows;

π = 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)

3. Results and discussion

3.1. Socio economic characteristics

The results show that Majority (74%) of cassava farmers observed fall within the age bracket of 21-50 years with a cumulative of 78% of the total respondents which constituted an active work force. It also showed that majority of the farmers were females with 82.23% and 12.77% of the respondents were male respectively. The finding of the study is in line with [15] who state that women traditionally play significant roles in agricultural activities.It also revealed that most were married as 13.83%, 69.15%, 9.57% and 7.45% of cassava farmers in Ogbia Local Government Area were single, married, divorced and widowed respectively. This could be narrowed to the fact that married people requires income to carter for their families .The result also showed that 8.51%, 10.64%, 62.77%, and 18.09% of the respondents had acquired no formal education, primary education, secondary education and tertiary education respectively .Level of education is believed to affect the acquisition of required skills in cassava production which in turn has a relationship with technical efficiency, which agreed with the finding by Ajani and [16] in which secondary level of education has the highest percentage (82.00%).

Table 1 Socio economic characteristics of cassava farmers in the study area

Variables	Frequency	Percentage
Sex		
Male	12	12.77
Female	82	87.23
Total	94	100
Age		
21-30	16	17.02
31-40	21	22.34
41-50	37	39.36
51-60	12	12.77
>60	8	8.51
Total	94	100
Marital status		
Single	13	13.83
Married	65	69.15
Divorced	9	9.57
Widowed	7	7.45
Total	94	100

Educational Level		
No Formal Education	8	8.51
Primary	10	10.64
Secondary	59	62.77
Tertiary	17	18.09
Total	94	100
Farming Experience (Years)		
1-5	22	23.40
6-10	14	14.89
11-15	18	19.15
16-20	13	13.83
>20	27	28.72
Total	94	100
Family Size		
1-5	35	37.23
6-10	51	54.26
11-15	8	8.51
>16	0	0.00
Total	94	100
Occupation		
Civil Servants/Public Servant	9	9.57
Trading	35	37.23
Teacher	1	1.06
Farming	49	52.13
Total	94	100
Source of Income		
Personal Savings	94	100
Relatives/Friends	0	0.00
Grants/Loan	0	0.00
Total	94	100
Source of Labour		
Family/Communal	22	23.40
Hired	4	4.26
Both	68	72.34
Total	94	100
Farm size (Hectares)		
≤0.5	55	58.51
0.6-1.0	15	15.96
1.1-1.5	6	6.38
1.6-2.0	10	10.64
>2.0	8	8.51
Total	94	100

Source: Field Survey Data, 2021.

Table 1 further showed that respondents who had 1-10 years farming experience in cassava production is 38.29% while 11 years above is 61.7% In conformity with [17] who outlined that farmers with more years of experience are better

compared to farmers with few years of experience. Results also showed that 37.23%, 54.26%, 8.51% of the respondents had family size of 1-5, 6-10 and 11-15 respectively. This shows that the respondents had a large household size. Also 52.13 % were farmers; this implies that cassava production is not just an occupation but also their way of life in the study area which have a positive influence on the technical efficiency in that they are already used to the agricultural practices before time. Also 94 (100%) of the respondents had their source of income from personal savings alone. Furthermore, it was revealed that majority (72.34%) of the respondents uses both family and hired labor in order to reduce cost of labor. Majority of the correspondents had a farm less than 0.5 hectare. This indicates that majority of the respondents were small-scale farmers who produce at a subsistence level.

3.2. Technical Efficiency of Cassava Production

Table 2 Technical efficiency of cassava production in the study area

Efficiency level	Frequency	Percentage
0-0.2	17	18.09
0.21-0.40	17	18.09
0.41-0.60	19	20.21
0.61-0.80	14	14.89
0.81-1.0	10	10.64
>1.0	17	18.09
Total	94	100.00
Minimum	0.1357	
Maximum	1.0549	
Mean	0.72204	

Source: Field Survey Data, 2021.

Table 2 showed the distribution of the farmers' technical efficiency indices derived from the analysis of the stochastic frontier production function. The result indicated that technical efficiency of farmers sampled in the study area were on average below the maximum frontier output. The range of technical efficiency showed that the most efficient farmer was above the maximum frontier output of 1.0 as the maximum was 1.05, while the least efficient farmer was producing at only 18% (0.18) efficiency level leaving much room for improvement. The mean technical efficiency was 72% thus the output of cassava farmers can still be increase by 28% to reach level of optimum technical efficiency. The frequency distribution of level efficiency of the farmers showed that 18.09% of them were operating at between 0-0.2 level of efficiency, 18.09% operated at 0.21-0.40 level of efficiency, 20.21% operated at between 0.41-0.60 level of efficiency, while 18.09% operated at over 1.0 efficiency level.

3.3. Factors Influencing Technical Efficiency

According to the results in table 3, it shows that five of the ten independent variables (educational level, family size, farming experience, family labor and age) influenced positively and significantly affected the farmers' technical efficiency The relationship between output and farming experience which had a coefficient of 0.02 was positive indicating that as years of farming experience increased, the amount of output increased. These findings are similar to [18] (years of experience $p<.05$). Transport (0.02), planting material (0.94) and education (0.36) had positive coefficients but were not significant. This implies that, these variables though contributed to the influence of farmers' resource efficiency but their contributions were not significant. Generally, the results imply that all the variables together explained about 57.43% of R^2 value and F-ration of 15.29 in the total variability of rural farmers' cassava production in the study area.

Table 3 Factors Influencing Technical Efficiency

Variables	Parameter	Coefficients	Standard Error	t Stat	P-value
Constant	β_0	10.0507	0.4648	21.6238	2.6E-36
Ln(Transportation cost)	β_1	0.05189	0.02779	1.8674	0.06529
ln(Pre-planting costs)	β_2	-0.0994	0.08449	-1.1764	0.24274
ln(Planting costs)	β_3	0.00646	0.08832	0.07314	0.94187
ln(Planting material)	β_4	-5E-05	6.8E-05	-0.6679	0.50604***
Inefficiency effects					
Constant	Z_1	0.12972	-0.1611	0.18206	0.1691
Age (Years)	Z_2	0.00092	0.06478	0.01416	0.98874***
Farming experience (Years)	Z_3	-0.0122	0.04687	-0.2602	0.79533
Land (ha)	Z_4	-0.3269	0.08225	-3.9746	0.00015**
Education level	Z_5	-0.0759	0.08162	-0.9296	0.35521
Multiple R	0.61926				
R Square	0.38349				
Adjusted R Square	0.32546				
Standard Error	0.5507				
F	6.60898				
Significance F	1.1E-06				

, * stand for level of significance at 5%, and 1%, respectively

3.4. Costs and Returns Associated with Cassava Production

Table 4 Total Costs and Returns from Cassava Production by Respondents

Items	Unit of Measure	Size of unit	Quantity	Cost/unit	Total (₦)	%
Land/rent	Hectares	1	0.84	17,468.09	14,650.89	5.01
Hoes/cutlass	Number	1	5.26	651.77	3,427.06	1.17
Basin	Number	1	1.27	823.15	1,048.20	0.36
Bags	Number	1	3.88	40.32	156.38	0.05
Total Fixed Cost					19,282.54	6.60
Variable cost items	Unit of Measure	Size of unit	Quantity	Cost/unit	Total	
Planting material	Bundle	1	1.83	79.04	144.63	0.05
Pre-planting operations	Man-day	1	18.04	3,600.00	64,960.00	22.22
Planting operations	Man-day	1	15.78	2,574.47	40,619.39	13.89
Market stall			1.00	3,900.00	3,900.00	1.33
Harvesting operations	Man-day	1	22.15	7,303.57	161,774.11	55.33
Transport cost			1.00	1,679.07	1,679.07	0.57
Total Variable Cost					273,077.19	93.40
Total cost					292,359.73	100.00
Revenue	Unit of Measure	Size of unit	Quantity	Cost/unit	Total	
Cassava tubers	Kg	1	5,428.72	149.88	813,673.23	
Gross margin	540,596.04					
Net Income	521,313.50					
Profitability Index	64.07					
Rate of Return on Investment	178.31					
Benefit-Cost Ration =	813,673.23÷292,359.73	= 2.8				

Source: Field Survey Data, 2021.

Table 4 shows the cost and returns of cassava farming in the study area. The fixed cost items used in cassava production including land/rent, hoes/cutlass, basin and bags which amounted to ₦14,650.89, ₦3,427.06, ₦1,048.20 and ₦156.38 of the total fixed costs incurred after depreciation which also amounted to ₦19,282.54 and were present 6.60% of the total cost incurred, while the variable cost items included planting material, pre-planting operation, planting operation, market stall, harvest operations, transport cost, which amounted to ₦144.63, ₦64,960.00, ₦40,619.39, ₦3,900.00, ₦161,774.11, and ₦1,679.07 of which the highest amount was spent on harvesting operation which represented 55.33% of the total cost. The total variable cost amounted to ₦273,077.19 and represented 93.40% of the total cost incurred. The total cost incurred was ₦292,359.73.The revenue accrued was ₦813,673.23. The gross margin (total revenue-total variable cost) was ₦540,596.04. The net income (total revenue-total cost) was ₦521,313.50. The profitability index was 64.07, while the rate of return on investment was 178.31. The Benefit-Cost Ration was 2.8, which agrees with the findings of [14] work which had a BTC of 1.9 proving the proficiency of cassava production.

3.5. Constraints Associated with Cassava Farming in the Study Area

Table 5 showed that 27.10%, 20.70%, 17.10%, 13.00%, 7.10%, 6.40%, 5.00% and 3.60% of the respondents indicated Lack of credit facilities/Little or no Capital to Start, Inadequate storage facilities, High Spread of Disease, Lack of Land, Poor processing and packaging, Lack of good planting Stock, Lack of feeder road/ Lack of Transportation to Markets and Inadequate market information as constraints faced in cassava production respectively. This conform also to the findings by [16] work which had similar kinds of constraints faced by cassava production farmers.

Table 5 Constraints Associated with Cassava Farming in the Study area

S/N	Constraints	Frequency	Percentage (%)	Rank
	Little or no Capital to Start	38	27.10	1st
	Inadequate storage facilities	29	20.70	2nd
	High Spread of Disease	24	17.10	3rd
	Lack of Land	18	13.00	4th
	Poor processing and packaging	10	7.10	5th
	Lack of good planting Stock	9	6.40	6th
	Lack of Transportation to Markets	7	5.00	7th
	Inadequate market information	5	3.60	8th
	Total	**140***	**100**	

Source: Field Survey Data, 2021.

4. Conclusion

The study concluded that cassava production was very profitable, but it is still faced with a wide range of constraints which makes it suffer from been at a small scale level to a standard commercial scale. The issue of farmers education was also seen to be eminent as the socio-economic characteristics of the farmers was seen to have influence of the production of cassava. There was also a very high portion of respondents from the study who indicated lack of capital or little capital to start up cassava production has been a serious challenge. Therefore Financial assistance such as loan and grants should be made available to farmers either by government agencies or rather programs to fund cassava production should be created. The issue of lack of fund can also be addressed by encouraging commercial and microfinance banks to give loan to farmer at affordable interest rate and enough time be given to pay back, this might encourage farmers to acquire loan and effectively carry out their cassava production activities in a larger scale. Government agencies in charge of Cassava should also ensure that varieties that are not desirable are eliminated from the system and replace with desirable ones.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

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