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Investment Analysis of Gari Processing Machineries in Ondo State, Nigeria

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Abstract: The study examined the investment analysis of gari processing machineries in Ondo State, Nigeria. Multi-stage sampling technique was used to select a sample of 45 respondents. Data was collected from primary sources through the use of well-structured questionnaires. Tools utilized included descriptive statistics and budgetary analysis. In addition, tools of investment analysis (NPV, BCR and IRR) were used to appraise investment in a model mechanized gari processing plant. The study revealed that there are gari processors who procure cassava tubers and use processing facilities owned by other entrepreneurs to process their cassava into gari. They hence incur no fixed cost. It also revealed that there are entrepreneurs, though fewer in number, who invest in gari processing machines and set up processing centres. They charge tolls (rates) for the use of their machines by other processors. The operations of both the processors and owners of the processing centres were found to be profitable. The empirical results of budgetary analysis revealed that the gross margin to gari processors was ₦148,029 per annum. The ratio of the gross margin to the average variable cost was 1:0.16. It also revealed that the estimated net revenue of owners of gari processing machineries was ₦1,286,400 per annum which represent 125.7% of the total cost of production. The implication is that for every one nairainvested, the processor gained 125.7 kobo. The investment analysis for a model mechanized gari processing centre was also found to be profitable with an NPV of ₦6,248,430, BCR of 1.1 and IRR of 46%. The result of the study showed that gari processing enterprises are profitable and investment in mechanized gari processing could be profitable if there is adequate supply of cassava tubers. It was therefore recommended that Credit facilities should be channeled to processors through the current micro-credit scheme of the Government to enable producers strengthen their enterprises by acquiring processing inputs which they claim are currently beyond their reach.

Keywords: Investment, Gari Processing Machineries, Budgetary Analysis, Discounted Cash Flow Analysis

1. Introduction

Nigeria is predominantly an agricultural society but has a heavy dependence on petroleum for its budgetary revenue, over 70% of the population engages in agricultural production at a subsistence level [2]. Agriculture is a major contributor to Nigeria's Gross Domestic Product, with cassava playing a leading role [3]. Nigeria is the highest cassava producer in the world, producing a third more than Braziland almost double the production capacity of Thailand and Indonesia [9]. The National Bureau of Statistics (NBS) in its 2010/2011 agricultural survey stated that the aggregate production of cassava was 42,533,000 metric tons per annum, a figure expected to double by 2020 [6]. Although the world leader in cassava production, Nigeria is not an active participant in cassava trade in the international markets because most of her cassava is targeted at the domestic food market [12]. Her production methods are primarily subsistence in nature and therefore unable to support industrial level demands [8]. However, most of what is produced is consumed locally, with over 50 percent of the harvested produce wasted due to production and post harvest inefficiencies [11]. Cassava is a very versatile commodity with numerous uses and by – products [5]. Cassava can be processed into Gari, High Quality Cassava Flour, Odourless Fufu Flour, Fermented Cassava Flour (Lafun), Tapioca, Cassava pellets, Cassava chips, and Cassava Starch [1].

The major constraint of cassava processing is rapid

deterioration of the roots. Cassava roots have a shelf-life of 24–48 hours after harvest [7]. Once harvested, it has to be either consumed immediately or processed into more stable product forms. Fresh roots must be processed within 2 to 3 days from harvest. To reduce this level of losses, it is very necessary that they are processed as early as possible. Cassava processing using traditional methods is tasking, ineffective, time- consuming and also inefficient [4]. Mechanization of cassava processing operations will no doubt play a pivotal role in removing the negative attributes of the traditional processing techniques and promote timely large scale processing of the tubers in hygienic environment [10].

In view of the different options to combine different machines with different costs and value offerings in the production of gari, there is the need to critically analyze the investments into gari processing machineries, given different combinations of available machines [14].

The main objective of this study is to carry out the investment analysis of Gari processing machineries in some selected local government areas of Ondo State. The specific objectives are to; describe the socio-economic characteristics of respondents in the study area; identify the gari processing machineries used by processors; analyze the cost and returns to gari processors and owners of gari processing machineries and identify the processing constraints faced by respondents in the study area.

2. Methodology

2.1. The Study Area

The Study area is Ondo State. Ondo State is located in the South-Western zone of Nigeria. The State is bounded on the East by Edo and Delta States, on the West by Ogun and Osun States, on the North by Ekiti and Kogi States, and on the South by the Atlantic Ocean [13]. The State has 18 Local Government Areas with an approximate land area of 14,793,186 square kilometers and a population of about 3,441,024 [18]. The state is agrarian and food crops grown are yam, maize, cassava, rice, plantain, banana, cocoyam, ginger, potatoes, tomatoes, fruits and vegetables, while cash crops cultivated include cocoa, coffee, rubber, kolanut, oil palm, cashew and raffia. Also animals like cattle, goats, sheep, rabbits and poultry are reared in the study area [15]. Apart from agriculture, they also engage in trading, crafting and other commercial activities [20].

2.2. Types of Data and Instrument of Data Collection

Primary data were used for this study. Data were collected using well structured questionnaire. However, secondary data were used especially in the review of the extant literature on this study, and consultation of subject matter experts, market surveys on machines will also be carried out.

2.3. Sampling Technique

A multistage sampling technique was used to select the respondents. Firstly, two (2) Local Government Areas (LGAs) namely; Akure South and Akure South-West were purposefully selected. Secondly, four (4) communities were randomly selected from each Local Government Area of the State. In the third stage, respondents were randomly selected from each of the community, making that a total of forty-five (45) respondents sampled for the study. This was due to the limited number of gari processors in the study area.

2.4. Analytical Tool

Data collected were analyzed using descriptive statistics, profitability, cash flow analysis and multiple regression analyses. Descriptive statistics such as frequency distribution, percentage table and mean were used to ascertain the socio-economic characteristics of the respondents. Budgetary analysis such as net revenue will be employed to analyze the costs and returns to gari production in the study area. The methods of Net Present Value, Internal Rate of Return, and Benefit-Cost Ratio were used to evaluate the feasibility of investing in gari processing operation.

2.4.1. Net Present Value (NPV)

NPV is the present worth of the future income stream to be generated by the investment at a determined interest rate. The *a priori* expectation criteria or decision rule is that the NPV must be positive for a good business [17].

Mathematically, it is given as;

$$\text{NET PRESENT VALUE (NPV)} = \sum_{t=1}^{n} \frac{Bt-Ct}{(1+r)}t \quad (1)$$

2.4.2. Benefit-Cost Ratio (BCR)

BCR is the ratio of discounted revenue to discounted cost. It is the ratio obtained when the present worth of the benefit stream is divided by the cost stream. For a business to be qualified to be a good one, the BCR must be greater than unity [19].

Mathematically, it is given as;

$$\text{BENEFIT-COST RATIO (BCR)} = \sum_{t=1}^{n} \frac{\frac{Bt}{(1+r)t}}{\frac{Ct}{(1+r)t}} \quad (2)$$

2.4.3. Internal Rate of Return (IRR)

The IRR determines the discount rate that makes the net present worth of the incremental net benefit stream or incremental cash flow equals zero. It represents the maximum interest that a project could pay for the resources used if the project is to recover its investment and operating costs and still break even [16].

The *a priori* expectation criteria is that the IRR must be greater than the market interest rate.

$$\text{IRR} = Lowerinterestrate + Differencebetweenthetwointerestrate\left(\frac{Netpresentvalueoflowerineterstrate}{NPVatlowerinterestrate+absolute\ valueoftheNPVathigherinterest\ rate}\right) \quad (3)$$

2.4.4. Net Return

The Net Revenue is given as:

$$\text{Net Revenue} = \text{G. M} - \text{TFC} \quad (4)$$

$$= \text{TR} - \text{TVC} - (\text{TFC})$$

$$= \text{TR} - (\text{TVC} + \text{TFC})$$

Where G. M=Gross margin
TVC= Total Variable Costs
TFC= Total Fixed Costs

3. Results and Discussion

Socio-economic characteristics of gari processors and owners of gari processing machineries in the study area are presented in Table 1 and 2 respectively. The mean age of gari processors was 49 years implying that they belong to the economically active population category which is between 41-60 years. The mean age of owners of gari processing machineries was 47.8 years, implying that they belong to the economically active population category which is between 21-40 years. Majority (80 percent) of the respondents were females while 20 percent were males. This suggests that cassava processing is a female dominated activity. This was in line with the observation of [8].

Also, the result shows that 27.5% had primary education while 32.5% had NCE/OND/Nursing Degree with HND and B. Sc/ B. Tech accounted for 22.5% of the respondents. The implication of this level of education is that the processors are likely to readily adopt new technology and innovation. Majority of the gari processors had at least 11-20 years of experience. The number of years an individual had spent in the business gives an indication of the practical knowledge acquired over the years. The experience acquire is expected to impact positively on the efficiency of operation.

Table 1. *Selected Socio-Economic Characteristics of Gari Processors.*

Characteristics	Frequency	Percent
Sex		
Male	8	20
Female	32	80
Total	40	100.0
Age		
21 to 40	2	5.0
41 to 60	37	92.5
61 to 80	1	2.5
Total	40	100.0
Education		
Non-formal	7	17.5
Primary Certificate	11	27.5
NCE/OND/Nursing	13	32.5
HND	6	15.0
B. Sc/B. Tech	3	7.5
Total	40	100.0
Religion		
Christianity	19	47.5
Islam	21	52.5
Total	40	100.0
Years of Experience		
0 to 10	18	45.0
11 to 20	20	50.0
21 to 30	2	5.0
Total	40	100.0

Source: Survey data, 2016

Table 2. *Selected Socio-Economic Characteristics of Owners of Gari processing machineries.*

Characteristics	Frequency	Percent
Gender		
Male	4	80
Female	1	20
Total	5	100
Age (Years)		
21-40	1	20
41-60	3	60
61-80	1	20

Characteristics	Frequency	Percent
Total	5	100
Marital Status		
Single	1	20
Married	4	80
Total	5	100
Level of Education		
Non-formal	1	20
Primary Certificate	1	20
SSCE/GCE	2	40
B. Sc/B. Tech	1	20
Total	5	100
Years of experience		
0 to 10	3	60
11 to 20	2	40
Total	5	100

Source: Survey data, 2016

The estimated cost and returns to gari processors is presented in Table 3. Results showed that the cost of fresh cassava tubers accounted for the largest proportion of the total variable cost which indicates that fresh cassava tubers are a significant variable in gari production. The costs of peeling, frying, firewood and grating/milling were ₦66,600 (7.2%), ₦60,780 (6.6%), ₦60,320 (6.5%), and ₦37,620 (4.1%) respectively of the total variable costs. The revenue generated from the sale of gari was ₦1,071,176. From the analysis, the estimated gross margin was ₦148,029 per annum per respondent. The ratio of the gross margin to the average variable cost was 1:0.16. The implication is that for every one nairainvested in the processing of cassava, the gari processor gained 16 kobo.

Table 3. *Estimated Cost and Returns to Gari Processors.*

Item	Total (₦)
Variable Cost (VC)	
Fresh cassava tubers	543,600
Transportation of fresh cassava tubers to the processing site	34,380
Peeling	66,600
Washing	18,300
Grating	37,620
50kg polythene bags	16,440
30kg polythene bags	24,840
Bagging the grated mash (in 50kg polythene bags)	8,280
Dewatering the grated mash (in 30kg polythene bags)	16,560
Sieving	16,560
Frying	60,780
Firewood	60,320
Packaging	11,040
Transporting the gari to the market/home/processing site	6,840
Palm oil	1,008
Total Variable Cost (TVC)	923,168
Total Revenue (TR)	1,071,176
Gross Margin (TR - TVC)	148,029

Source: Survey data, 2016

Table 4. *Estimated Cost and Returns to Owners of Gari Processing Machineries.*

Item	Total (₦)
Fixed Cost	
Land	800,000
Grater	75,000
Mechanical press	72,000
Frying stoves	47,000
Shed	34,000
Total Fixed Cost (TFC)	1,028,000
Variable Cost (VC)	
Salaries of workers	360,000
Operating cost on grating machine	36,000
Repairs on grating machine	12,800
Operating cost on dewatering machine	9,600
Repairs on dewatering machine	2,500

Item	Total (₦)
Measuring basins	5,000
Frying basins	8,000
Buckets, Knives & Sieve	4,000
Total Variable Cost	432,900
Total Revenue (TR)	2,310,000
Gross Margin (TR-TVC)	1,432,000
Less: Depreciation	145,600
Net Revenue (GM - TFC)	1,286,400

Source: Survey data, 2016

Table 5. *Summary of Annual Capital Cost for Gari production.*

Type	Cost (₦)
Land	1,000,000
Building	3,000,000
Machinery and Equipments	5,700,000
Well plus water borehole and overhead tank	500,000
Office furniture and fittings	400,000
50KVA Generator	2,500,000
Project van	2,000,000
Total	15,100,000

Source: Survey data, 2016

The estimated cost and returns to owners of gari processing machineries is presented in Table 4. The average annual total revenue, total fixed cost and total variable cost were ₦2,310,000, ₦145,000 and ₦878,000 respectively. The determined gross margin was ₦1,432,000 per annum per respondent which represent 163% of the total variable cost of production. The implication is that for every one naira invested, the processor gained 163 kobo. The estimated net revenue was ₦1,286,400 per annum per respondent which represent 125.7% of the total cost of production. The implication is that for every one naira invested, the processor gained 125.7 kobo.

Table 5 shows the capital cost estimate for a model Gari Processing Centre. It shows the amount of capital investment that is required for a typical gari production firm. The cost of each item is based on the mean cost of purchase.

Table 6 shows an estimated operating cost for a model Gari Processing Centre. The operating cost estimate consists of the cost of fresh cassava tubers, supplies, utilities, charcoal, salaries of workers, maintenance and repairs that is required for a typical gari production firm.

Table 6. *Estimated Annual Operating Cost for Gari Production (₦'000).*

Item/Year	Year 1	Year 2	Year 3	Year 4	Year 5
Fresh cassava tubers	6,240	8,280	11,325.6	14,534.52	18,271.97
Supplies	193.4	223.9	268	312.1	356.2
Utilities	4,287	4,715.7	5,187.27	5,706	6,276.6
Cost of charcoal @₦7,500/day	2,250	2,475	2,722.5	2,944.75	3,244.23
Salaries of workers	5,520	6,072	6,679.2	7,347.12	8,081.83
Maintenance	1,095	1,204.5	1,324.95	1,457.45	1,603.19
Repairs	935	1,028.5	1,131.35	1,244.49	1,368.94
Total	20,520	24,000	28,639	33,546	39,203

Source: Survey data, 2016

Table 7. *Earnings Estimates for Mechanized Gari production, (₦'000).*

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	21,600	29,700	39,204	50,312	63,249
Less:					
Operating Costs	20,520	24,000	28,639	33,546	39,203
Gross Margin	1,080	5,700	10,565	16,766	24,046
Less:					
Depreciation	1,240	1,240	1,240	1,240	1,240
Net Revenue	(160)	4,460	9,325	15,526	22,806

Source: Field data and projected figures

Table 7 shows the estimated net revenue analysis for five years of operation. The table revealed that the estimated gross margin will be positive from the first year and will increase over the five year period. However, net revenue is expected to be negative in the first year but positive and increasing from the second year to the fifth year. This implies that modern gari production earns more profit.

The cash flow for the modern gari production is shown in Table 8. The table reveals that mechanized gari production is highly profitable. The Net Cash Flow is expected to be negative in the year in which capital assets were procured but will increase starting from the first year of operation to the fifth year.

Table 8. *Cash flow Analysis for Mechanized Gari Production, (₦'000).*

Cash flow	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cash-in-Flow	0	21,600	29,700	39,204	50,312	63,249
Less:						
Cash-out-Flow	15,100	20,520	24,000	28,639	33,546	39,203
Net Cash Flow	(15,100)	1,080	5,700	10,565	16,766	24,046

Source: Field data and projected figures

Table 9 shows the cash flow and profitability analysis for mechanized gari production. The indicators were shown to be positive and hence the project is profitable and feasible. The NPV stood at ₦6,248,430, the B/C was 1.1 and the IRR was 46%.

Table 9. *Cash Flow and Profitability Analysis for Gari production, (₦'000).*

Year	Costs (C_t)	Revenue (B_t)	DF at 30%	Discounted Cost at 30%	Discounted Benefit 30%	DF at 50%	Discounted Cost at 50%	Discounted Benefit at 50%
0	15,100	0	1	15,100	0	1	15,100	0
1	20,520	21,600	0.769	15,779.1	16,610.4	0.667	13,686.8	14,407.2
2	24,000	29,700	0.592	14,208	17,582.4	0.444	10,656	13,186.8
3	28,639	39,204	0.455	13,030.75	17,837.82	0.296	8,477.14	11,604.38
4	33,546	50,312	0.350	11,741.1	17,609.13	0.198	6,642.12	9,961.78
5	39,203	63,249	0.269	10,545.6	17,014.01	0.152	5,958.86	9,613.85
Total				80,405.33	86,653.76		60,520.95	58,774.01

Source: Field data and projected figures

The study identified some challenges faced by respondents in the study area. High perishability of fresh cassava tubers (26.7%) constituted the highest constraint faced by the respondents while insufficient extension agents to teach new technologies (24.4%) and lack of collateral security required to secure loan for cassava processing machineries (13.3%) were significant constraints faced by the respondents. Table 10 shows the processing constraints faced by respondents

Table 10. *Processing Constraints faced by Respondents.*

Constraints	Frequency	Percent
High perishability of fresh cassava tubers	12	26.7
High cost of processing inputs	4	8.9
Problem of labour shortage in processing gari	2	4.4
Shortage of water for cassava processing	1	2.2
Poor market characterized by poor pricing of product	3	6.7
Tedious nature of cassava processing	2	4.4
Insufficient extension agents to teach new technologies	11	24.4
Insufficient knowledge on sources of credit to support business	3	6.7
Lack of collateral security required to secure loan for cassava processing machineries	6	13.3
Lack of capital for business expansion	1	2.2
Total	45	100

Source: Survey data, 2016

4. Conclusion

The result of the study showed that gari processing enterprises are profitable and investment in mechanized gari processing could be profitable if there is adequate supply of cassava tubers. The 5-year profitability analysis carried out on the study generated positive indicators. This shows that the cash flow analysis conducted was technically feasible, financially viable and economically desirable.

Recommendations

Based on the findings of the study, the following recommendations were suggested for policy direction.

a) Government policies should be modified to improve on the provision of training programme to disseminate scientific knowledge to cassava processors to enable them use the available resources efficiently and increased productivity.
b) Credit facilities should be channeled to processors through the current micro-credit scheme of the Government to enable producers strengthen their enterprises by acquiring processing inputs which they claim are currently beyond their reach.
c) The Research-Extension-Farmer linkage should be strengthened to furnish the processors with modern labour saving processing techniques that would enhance their productivity and profitability.

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