

DETERMINANTS OF PROFITABILITY OF SMALL-SCALE PLANTAIN PROCESSING ENTREPRENEURS IN OSUN STATE, NIGERIA

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Abstract

The study empirically evaluates the profitability of small-scale plantain processing entrepreneurs in Osun State, Nigeria. Cross-sectional data were employed for the study, while a multi-stage sampling procedure was used to randomly select 120 respondents. Descriptive statistics, gross margin, and Ordinary Least Square (OLS) were used for the analysis of the data. The results showed that the enterprise was dominated by female households (70.8%) with an average age of 30 years. Majority (80%) of them were married with an average processing experience of 8 years, while many (50.8%) purchased their raw plantain from the local farmers. It was revealed that roasted plantain (67.5%) and flour (26.7%) were the main processed plantain products available in the area. The average values of gross margin (N23,592.50) and profit (N21,777.80) showed that the enterprise is profitable. The value of return on investment (1.73) implies that the processors are capable to realize N1.73k for every one naira invested. The results of OLS indicated that cost of bowl, plantain price, transport cost, and labour cost were the significant factors influencing profit accrued in the area. However, high cost of labour, lack of storage facility, and high cost of transportation were the most serious constraints faced by the processors in the area. Therefore, it can be recommended that a proactive policy that would address storage facility, good road networks and as well create enabling market environment should be put in place.

Key words: gross margin, market, Osun State, plantain, processors, profit, regression

INTRODUCTION

Nigeria is a major producer and consumer of plantains in Africa, and is among the top 20 plantain-producing countries in the world, according to the Food and Agriculture Organization [15]. Plantains are the world's fourth most important food crop, after rice, wheat, and maize, according to the International Institute for Tropical Agriculture [19]. It is a vital staple food crop for both rural and urban areas, and it is strategically positioned for rapid food production in Nigeria. Nigeria is one of the main producers of plantain in West Africa, according to [16], with an annual production of about 2.74 million metric tons.

The plantain (*Musa paradisiaca*) is a member of the Musaceae family that originated in Southeast Asia. The plantain is a tall (3-10 m) plant with a conical false trunk created by the leaf sheaths of its spirally arranged 1.5 to 3 m

long and 0.5 m wide leaves. Plantain is one of the main sources of carbohydrates in humid tropical Africa, according to the International Institute of Tropical Agriculture [18], as it comprises around 35 percent starch, 0.2 to 0.5 percent fats, 1.2 percent protein, and 0.8 percent ash. It is high in minerals, especially iron, and contains many vitamins, including A, B, and C. It is low in protein and fat, but high in minerals, particularly iron. It's also cholesterol-free, high in fiber, and low in sodium. Plantain is useful in the treatment of a variety of diseases, according to [30], including cardio-vascular and kidney disorders, dehydration in infants and diabetic patients, arthritis, and gastrointestinal ulcers. Again, its economic importance cannot be over-emphasized in terms of food security, job creation along its value chain, and source of livelihoods to many rural households. Many people have developed commercial processes of plantain fruits to provide a wide

variety of products, such as puree, flour, jam, jelly, chips, crisps, flakes, vinegar, and wine, according to [13]. The author went on to say that while the plantain fruit is the main economic commodity, other parts of the crop plant can be used as food, feed, or raw materials for acid manufacturing industries, and the leaves can also be used to wrap food. Plantain flour can be combined with wheat flour to make bread, cake, and biscuits, according to [23]. More so, plantain products, such as fruits and peels, are used as animal feed in agriculture; farmers use the peels as organic manure. Plantain's dead leaves and pseudo-stems are mulched or allowed to decompose into organic manure. Plantain consumption has increased dramatically in Nigeria in recent years, owing to increased urbanization and high demand for comfortable and convenient foods among the non-farming population [6, 5]. The growing industry of plantain flour and plantain chips, the two most popular products made from processed plantain, is thought to be the cause of the country's current high demand for plantain [19]. It is important to note that these goods are in demand not only within Nigeria but also outside its borders. As a result, sales of plantain-processed goods may be a potential source of revenue for Nigeria [27]. According to [13], previous research works have shown that the plantain sub-sector faces several constraints such as high post-harvest losses, diseases, poor pricing, bad road networks, and inadequate transportation to convey produce amongst others. Plantains, like other crops, are perishable, necessitating their preservation. Fresh bananas and plantains have a limited shelf life, according to [10], and rough handling, unprotected storage conditions, and poor transportation result in post-production losses of 30-40%. Postharvest losses have been a constraining factor in plantain output, but increases in yield brought about by technological advancements through research have had little effect on small-scale farmers' economy [21]. Presently, the processing of plantain has become a big business, both in major cities and small towns in the Southern part of Nigeria with prevalent

production in the study area [5], which necessitate an in-depth study of this kind.

Therefore, the study will specifically ascertain the socio-economic characteristic of the respondent; identify the main processed plantain products in the study area; estimate the profitability of plantain processors; determine factors affecting the profitability of the processor; and identify the constraints faced by the processors in the area. The significance of this study at the period Nigeria is deviating from a mono-economy of crude oil to accommodate other opportunities in other sectors including agriculture. Again, due to lack of functioning storage facilities which has aided post-harvest loss in agricultural products including plantain, makes processing a necessity. As a result, plantains and plantain products can improve national food security while also eradicating rural poverty [1]. It would be an eye-opener to the policy-makers on how to commercialize the products and as well help in building functioning organized market in plantain products. More so, the findings of this study will not only depict the determinants of profitability and other marketable potentials of plantain processing, but it will also be a guide for policymakers to effectively plan for the growth and development of the industry through formulating effective processing and marketing policies. Again, this will help the processors to readjust their resources to generate sustainable income for their families and as well improve the quality of their lives as also reported by [5].

Literature Review: Entrepreneurship is an idea or vision which one can explore and optimize for profit in business [12]. This would also help in creating new jobs and economic empowerment among people. The entrepreneurial knowledge applies to plantain processors as it is found in other products. [24] stated that every day in the rural community's food crops is processed for sale as convenient ready-to-eat foods. The industry which accomplishes this daily food processing task is characterized by its small scale, simple technology, and orientation towards its consumers. In most cases, the final product is produced from raw materials by only one

person. No formal standard of quality or quantity is observed by the producers. There is gainful employment for thousands of rural people, primarily women, and a substantial amount of locally generated income, resulting from the functioning of this processing industry [17]. Plantain production is currently becoming a significant source of income for both large-scale and small-holder farmers in Nigeria, and it is one of the primary commodities for investment across the southern part of the country, where it occupies a strategic position for rapid food production [7]. Nigeria is expected to remain one of the world's largest producers of plantain due to the potential for industrial processing, which has recently been adopted, and the increased interest in development by small and large-scale farms in the region [7]. Several studies have been carried out on plantain in terms of production and marketing but only a few of them focused on the processing component of the chain. For instance, [8] researched the conceptual design of a process plant for plantain flour production from green plantain pulp, while the area of product differentiations and the performance evaluation were not covered by the study. [11] focused their research on characterizing the plantain cropping systems, genetic diversity, and production constraints as a baseline to the full utilization of this resource in crop improvement and to identify the potential production and agronomic qualities. [22] worked on the potential of plantain residues for the Ghanaian bioeconomy and found out that there is a substantial interest of private enterprises for high-quality fibers and confirmed the availability of the rich plantain pseudo-stems as fibers. Again, [3] examined the role of plantain processing and appropriate storage technologies in ensuring food security and food availability in Africa. The study dwelled on the post-harvest handling and storage of the product for improved food distribution, while [24] looked at the constraints and survival approaches of small-scale processors using Ordinary Least Square regression. The study of [5] evaluated the organization, cost, and return on plantain trade. The study employed the Gini

coefficient, gross margin, and regression analysis to examine the inequality among the plantain marketers and the factors affecting the sales in the area. Therefore, this study contributes to the knowledge in the sense that not many studies in the literature have examined the factors that determine the profitability of the plantain processors in Nigeria, and very scarce in recent time most especially in Osun State. Most studies stopped at examining their profitability but failed to do in-depth analysis as does by this study.

MATERIALS AND METHODS

The research was conducted in Osun State, Nigeria. The State covers an area of approximately 14,875 square km and lies within the geographical coordinates 7°30'N and 4°30'E. The State experiences a mean daily temperature of 33°C, wind speed of 3km/h, and a humidity of 57% [2, 8, 25].

The data for the study were collected by administering on the processors through a well-structured questionnaire and interview scheduled. For this analysis, a multi-stage sampling technique was used. The first stage involved a purposive sampling technique of two (2) Local Government Areas that are well known for plantain cultivation and processing. The second stage involved using a simple random sampling method to select three (3) communities from each LGAs, making six (6) communities in total. Therefore, a simple random sampling procedure was used in stage three to select twenty (20) processors, making a total of one hundred and twenty (120) respondents. Descriptive statistics, Gross Margin, and multiple regression were used for the objectives of the study. Descriptive statistics such as mean, standard deviation, frequency tables, and percentages were used to analyze the socio-economic characteristics, identify products processed from plantains, and constraints faced by the processors. Gross Margin Analysis and Return to investment (ROI) were used to analyze costs and returns from the processed products of plantains.

The Gross Margin formula is represented as:

$$G.M = TR - TVC$$

where: G.M=Gross margin

TR = Total revenue

TVC = Total variable cost

The profitability also represented symbolically by

$$\pi = TR - TC$$

where: π = profit

TR = Total revenue/gross income

TC = Total cost [Total fixed cost (TFC) + Total variable cost (TVC)]

Ordinary Least Square (OLS) was used to analyze the determinants of profitability in the area. The explicit linear functional form is stated as:

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

Where:

Y_i = Profit accrued from the enterprise (₦)

X_1 = Cost of transportation (₦)

X_2 = Cost of purchasing plantain (₦)

X_3 = Cost of bowl (₦)

X_4 = Cost of Sack (₦)

X_5 = Cost of knives (₦)

X_6 = Cost of Labour (₦)

U_i = error term.

RESULTS AND DISCUSSIONS

Socio-economic Characteristics of Plantain Processors

The result in Table 1 reveals that most (46.6%) of the plantain processors fell in the age bracket of 26 - 35 years old with the mean age of 30 years old. This indicates that most of the processors were still in their youthful and economic age in the area. This is in support of [4, 26] who reported that most of the people involved in marketing activities were young persons who are vibrant and energetic with a significant market influence. The plantain processors were dominated by the female household with about 71%. It was also shown that most of the respondents (55.0%) have a family size between 4 and 6 persons per house with a mean of 4 people per household. This is an advantage because labour optimization can be attributed to the large household size which can also raise their earnings and profitability. This finding supports the result of [14] who reported that large households complement labour to enhance production and reduce the cost of

hired labour. Again, about 55.0% of the respondents had processing experience of 6-10 years, with an average mean of 8 years while 22.5% had an experience of 11-15 year. This tallies with the finding of [29] that experience in agribusiness enhances output performance. The Table showed that the majority (80%) of the respondents were married. This explains why they tend to respond favorably to risk in terms of economies of scale, as the couple may combine their resources to increase output which in turn increases their income. The result agrees with the findings of [20] who reported that married individual had greater involvement in agricultural production could be as a result of high labour requirement in which they use members of their family as labour force. Also, about 50.8% of the processors purchased directly from local farmers, 45.0% purchased from plantain depot in the market, and 4.2% purchased from the bulk market.

Table 1. Distribution of the Respondents by Their Socioeconomic Characteristics

Variable	Frequency
Age (years)	
Less than 25	11
26 - 35	56
36 - 45	35
46 - 55	13
> 55	5
Sex	
Male	35
Female	85
Household size	
1 - 3	21
4 - 6	66
7 - 10	33
Experience in plantain processing (years)	
1 - 5	27
6 - 10	66
11 - 15	27
Marital Status	
Single	5
Married	96
Divorced	14
Widowed	5
Purchasing point	
Direct from local farmers	61
From plantain bulk market	5
Plantain depot in the market	54
Total	120

Source: Field Survey, 2019.

Available Plantain Processed Products in the Area

The result from Table 2 presented the availability of plantain products available in the study area. The majority (67.5%) of the respondents attested that roasted plantain was the most available product in the area, followed by flour (26.7%) and then chips (5.8%). It could be deduced that many processors engaged in roasted plantain business because of the less technology involved in processing it. Likewise, it is highly demanded for among the transporters as a fast and read-to-eat food [24].

Table 2. Distribution of the Plantain Products available in the Study Area

Plantain products	Frequency
Chips	7
Flour	32
Roasted	81

Source: Field Survey, 2019.

Costs and Returns of Respondents in the Study Area

The result reveals that on average, the total cost incurred on plantains was N29,559.7 per month. The total return and net return were N51,337.5 and N21,777.8 respectively (Table 3).

Table 3. Average Costs and Returns of Plantain Processors

Item	Mean Value in dozen
Raw plantain	23,008.33
Labour	3,917.09
Transportation	552.46
Storage	2,666.67
Total variable cost (TVC)	27,744.60
Depreciation cost on the knife	701.17
Depreciation cost on the bowl	525.00
Depreciation cost on the sack	588.90
Total Fixed Cost (TFC)	1,815.10
Total Cost (TC)	29,559.70
Total Revenue (TR)	51,337.50
Gross margin	23,592.90
Profit	21,777.80
Return on investment (ROI)	1.73

Source: Field Survey, 2019.

This result implies that plantain processing in the study area is profitable, and this should encourage more entrants into the business of plantain processing and marketing. This

justifies one of the needs of this study as plantain offers many socioeconomic benefits including income provision. It can be deduced from the above result that plantain marketing is a profitable venture. The result of the return on investment (ROI) further reiterated the profitability of plantain processing in the area. The ROI value of 1.73 implies that for every one naira expended on processed plantain ₦1.73k is realized. It means that the processor makes a gain of 73 kobo for each naira they invest in the business. This conforms with the findings of [4, 26].

Factors Affecting Profitability of the Plantain Processors

The linear functional form of multiple regression was used in the model and presented in Table 4. The co-efficient of multiple regressions (R^2) was given as 0.62, this implies that about 62% of the variation in profit (Y) was explained by the explanatory variables captured in the regression model. The regression results showed that four (4) out of the six (6) explanatory variables had a significant effect on the profit from processed plantain. These variables were bowl cost, plantain cost, transportation cost, and cost of labour. The coefficient of bowl cost was statistically significant at a 1% probability level and had a negative relationship. This implies that an increase in the cost of the bowl will bring about a corresponding decrease in the profit of the plantain processors. The plantain cost's coefficient was statistically significant at a 1% level, implying that the cost of plantain is a critical factor in the plantain processors' profit. An increase in the cost of plantain will bring about an increase in profit. This result means that if the plantain processors increase the price of the plantain products more than the respective increase in the cost of plantain, it will thereby; bring about more increase in the profit. The coefficient for transportation cost was statistically significant at a 1% probability level. This also implies that an increase in transportation cost will bring about an increase in their profit, *ceteris paribus*, but contrary to the *apriori expectation*. The probable reason was that an increase in transportation cost makes the plantain

processors increase the price more than the respective increase in the transportation cost, thereby bringing more profit. The coefficient of cost of labour was statistically significant at a 1% probability level but had a negative influence on the profit accrued. An increase in labour cost will bring a decrease in the plantain processors profit.

Table 4. Result of OLS on the Factors that Affect the Profitability of the Processors

Variables	Coefficients	Standard error	t
Constant	16,816.440	7,961.810	2.11
knife cost	.108	.549	0.19
bowl cost	-13.468	2.133	-3.3
sack cost	-1.880	1.609	-1.1
Plantain price	1.164	0.166	6.9
Transportation cost	7.190	2.099	3.4
Labour cost	-4.330	1.286	-3.3
R ²	0.602		
F-value	28.20*		
*significant at 1 percent **significant at 5 percent Dependent variable: Profit accrued in naira			

Source: Field Survey, 2019.

Constraints Faced by the Plantain Processors in the Area

From Table 5, the mean score of each statement was used to rank the response of the processors on the constraints faced in the area. The Table revealed that the high cost of labour (mean = 4.60) was ranked as first main problem faced in the area. The respondents claimed that the labour cost incurred on conveying the raw plantain to the processing point with the cost of peeling and washing is high due to shortage of labour.

The second on the list was lack of storage facilities (mean = 3.94). Plantain is a perishable good and sometimes processors might need to purchase them in bulk to reduce cost but because of the lack of storage and preservative facilities, they could one buy what they can process at once. High cost of transportation (mean = 3.12) was ranked third. Hike in fuel price cum the poor road networks contributed immensely to the high cost of transporting the raw plantain from either the market or farm-gate to the processing point.

Similar result was also reported by [28] on the study on transportation system and output market participation in Ondo State, Nigeria. Lack of credit (mean = 1.67) was noted as fourth serious problem in the area. Most of the processors claimed that funds were not made available for the expansion of the business and the available ones were unaffordable because of the high interest rate. The fifth ranked problem was price instability (mean = 1.65). This is peculiar to most markets in the area as the price fluctuates because of many factors such as fuel price, supplier cost and future expectation. Likewise, unorganized market was ranked sixth while high cost of processing equipment and scarcity of plantain were not seen as a constraint in the area. It can be deduced that the processors had enough plantain for processing with cheap processing equipment.

Table 5. Distribution of the Respondents based on the constraint faced

Constraint faced	SA (%)	A (%)	U (%)
Cost of labour	86.7	0.8	0
Lack of storage facilities	10.0	82.5	1.7
High cost of transportation	3.3	63.3	4.2
Lack of access to credit	80.0	13.3	0
Price instability	5.0	60.5	0.8
Un-organized market	4.2	11.7	3.3
High cost of processing equipment	0	10.0	2.5
Scarcity of plantain	0	8.3	2.5

Note: SA = Strongly agreed; A = Agreed; U = Undecided; D = Disagreed; SD = Strongly disagreed
 Source: Field Survey, 2019.

CONCLUSIONS

This research study was able to determine the profitability of processed plantain in Osun State Nigeria. The prospects of plantain processing are high. It is therefore a good business opportunity for creating employment for many Nigerians to become actors in the plantain value chain (as inputs dealers, farmers, marketers, transporters, and processors). It was concluded that roasted plantain is the most available plantain product in the area. Factors like plantain price, transportation cost, and labour cost are significant in determining the profitability of

plantain processors in the area. The high cost of labour, lack of storage facilities, high cost of transportation, and lack of access to credit were the main challenges that need urgent attention in the area. Based on the findings of this research study, the following recommendations are made:

(i)The various levels of governments should give serious attention to the challenges posed by the processors. The government should construct and repair roads network to link farm-gates in the rural areas to market locations in the urban centers. This will reduce the hike in the cost of transportation.

(ii)Federal and State Ministries of Agriculture should promote plantain production by encouraging farmers to produce more to meet the increasing market demand for local consumption, plantain processing industries, and export markets. This will encourage more participants in the enterprise and as well reduce high cost of labour.

(iii)The Ministry of Trade and Investment should encourage value addition to plantain produce to avoid the challenge posed by its high rate of perishability due to the lack of storage facilities.

(iv)The government should put up favourable credit policies that would encourage plantain processors to take loans for their business expansion.

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