Original Research Article

# ECONOMIC ANALYSIS OF LOCUST BEAN SEEDS PROCESSING AND MARKETING IN EKITI STATE,NIGERIA


## Abstract

This study estimated the economic analysis of the processing and commercialization of locust beans in Ekiti State, Nigeria. Using primary data and a multistage sampling method, 240 respondents were selected for the study. The collected data were analyzed using descriptive statistics and an inferential statistical technique, such as regression analysis. The technique of gross margin analysis was also used to assess the profitability of processing and marketing locust beans in the study area. Most respondents (75.8 percent) utilized the traditional method of processing, and all respondents engaged in wholesale and retail marketing of locust bean seeds. The processing and marketing locust beans business was profitable, with a weekly gross margin of ₦44,180. Similarly, the ratio of benefits to costs was 1.71. This indicates that the processing and marketing of locust beans are profitable in the studied area, as for every 1 invested, 1.71 will be gained. The coefficient of determination was 0.93. The regression analysis reveals that age, quantity processed, and stall rent coefficients were positive, while marital status, years of experience, and transportation cost were negative. Given that the processing and marketing of locust bean seeds are profitable, more locust bean trees should be cultivated and planted to increase the quantity of processed locust bean seeds and sales revenue.



**Keywords:** Locust bean, Processing, Marketing, Net Revenue and Regression Analysis.




## Introduction

The Locust bean, also known as Iru in Yoruba, is a crucial and economically significant component of the African locust bean tree "Parkiabiglobosa" (Ogunwole et al., 2011; Farayola et al., 2012). This tree belongs to the Fabaceae family's subfamily "Mimosoidea" and genus "Parkia". Robert Brown named the tree after Mungo Park in 1826. The tree is commonly recognized in West Africa as a significant, multipurpose Savannah tree. In addition to its use as a condiment for soup, the processed seed is an important source of carbohydrates, protein, iron content, and essential fatty acids, especially Vitamin B, riboflavin, and Vitamin A (Olalude et al., 2021; Nyadanu et al., 2017; Aju et al., 2008; Oduro et al., 2007)and medicinal ingredients (Sodimu et al., 2020). The tree itself provides numerous benefits. It produces fruits encased in numerous large pods, and it has adaptive characteristics such as its tolerance to a wide range of alluvial, sandy, and lateritic soil, as well as its resistance to pests and diseases, ability to withstand fires, and ability to thrive in full sun and tropical heat (Farayola et al., 2012). Locust bean marketing is predominantly a rural domestic industry dominated by women (Alao et al., 2020; Ogunwole et al., 2011, Odunfa and Adewuyi, 1985). The harvested bean seeds are sold in markets to women who process them.

The average daily ingestion of locust beans in Nigeria is low (Aremu et al., 2015), particularly in the Northern region, where it accounts for an estimated 1.4% of daily calories and 5% of total protein (Farayola et al., 2012). The marketing and consumption of locust beans are waning in

prominence, particularly among the expanding urban population (Akinoso&Adedayo, 2012). In order to save this product from the continuous importation of its substitutes, such as foreign cube flavour (Maggi), a study must be conducted in this area to alert interested parties about the importance of efficient marketing of locust beans. This study will also assist prospective entrepreneurs in identifying business opportunities in this area and preventing locust legume extinction.

Despite the significance of locust beans in ensuring food security and empowering rural women (Oso et al., 2022), their prevalence has decreased (Lelea et al., 2022), particularly among the urban population (Kolapo et al., 2020; Akande et al., 2010). This situation is also exacerbated by the increased importation of foreign soup flavours (Ogunwole et al., 2011). Its inefficient preservation method has necessitated the modernization of production techniques (Ijigbade et al., 2021) and the optimization of preservation methods through preservatives. One might even speculate that the demise of the marketing of locust beans is due to the laborious techniques required for its preservation and marketing concerning its profitability.

To understand the dynamics around locust bean, this study aims to determine the economic analysis of locust bean processing and marketing in Ekiti State, Nigeria. The specific objectives are to:

1. identify the socioeconomic characteristics of the locust bean processors/marketers in the study area;
2. identify the processing techniques and marketing channels of locust beans;
3. estimate the cost and returns on locust bean marketing;
4. determine the effect of socio-economic factors on the profitability of locust bean marketers.

**Methodology**

This research was conducted in Ekiti State, Nigeria. In the rural households of Ekiti State, locust beans are an essential culinary ingredient. The respondents were selected using a multiple-stage sampling method. First, four Local Government Areas (LGAs) were randomly chosen for the investigation. In the second stage, three communities prominent in the processing and commercialization of locust beans were selected from each LGA. Lastly, 20 respondents were interviewed in each community using the snowball sampling method to give 240 respondents. A well-structured questionnaire and interview schedule were utilized to collect primary data from marketers of locust beans in the selected markets. Information regarding the socioeconomic characteristics of locust bean marketers, the marketing channel, cost and return associated with locust bean marketing, and the limitations on effective marketing were retrieved.

The socioeconomic characteristics of locust bean marketers were described using descriptive statistics including mean, frequency distribution, minimum and maximum value.

Utilizing a profitability analysis, it was determined whether marketing locust beans was worthwhile.

$Profit = Total\ Revenue - Total\ cost;$

$i.e. \pi = TR - (TFC + TVC),$

$The\ Gross\ margin\ equation\ is\ given\ as:$

$GM = TR - TVC = P.Q - TVC;$

$Where: GM = Gross\ margin$ (₦),
$TR = Total\ Revenue$ (₦),
$P = Price\ of\ quantity\ of\ locust\ bean\ marketed$ (₦),
$Q = Quantity\ of\ locust\ bean\ processed\ (kg)$,
$TVC = Total\ Variable\ cost\ i.e.\ cost\ incurred\ in\ marketing\ locust\ bean$
$e.g.\ cost\ of\ raw\ material, storage\ cost\ and\ transportation\ cost$,
$TFC = Total\ fixed\ cost\ i.e.\ expenditure\ incurred\ on\ fixed\ assets\ used\ in\ marketing$
$e.g.\ calabash, pot - sieve\ etc.$

Regression analysis was used to analyze the relationship between respondents' socioeconomic characteristics and the profitability of locust beans.
The model for this analysis is given implicitly below:
$Y = f(X1, X2, X3, X4, X5, X6)$
$Where$:
$Y = Estimated\ Net\ Revenue$ (₦),
$X1 = Age\ (years)$,
$X2 = Marital\ status$,
$X3 = Stall\ rent$ (₦),
$X4 = Quantity\ processed\ (Kg)$,
$X5 = Years\ of\ experience$,
$X6 = Transportation\ Cost$ (₦).
The model specification was subjected to four functional forms: linear, exponential, semi-logarithm, and double logarithm. The lead equation was selected based on economic, econometric, and statistical criteria.
Four production forms equations are given as follows:
Linear equation: $Y = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + a_6x_6 + e_i$ ... (1)
Exponential: $lnY = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + a_6x_6 + e_i$ ... (2)
Semi log: $Y = a_0 + a_1lnx_1 + a_2lnx_2 + a_3lnx_3 + a_4lnx_4 + a_5lnx_5 + a_6lnx_6 + e_i$ ... (3)
Double log: $lnY = a_0 + a_1lnx_1 + a_2lnx_2 + a_3lnx_3 + a_4lnx_4 + a_5lnx_5 + a_6lnx_6 + e_i$ ... (4)
$e_i$= Stochastic error term.
$a_0 - a_6$= parameters to be estimated.

**Results and Discussion**
**Processing and Marketing of Locust Bean**
Table 1 reveals that 75.8% of respondents utilized the conventional processing method, while 24.2% utilized the enhanced method. Since most respondents are high school graduates, they may lack the technical expertise to operate the dehulling machine, limiting them to the traditional, modern method of processing locust bean seeds. All respondents engaged in the wholesale and retail distribution of processed locust bean seeds. Both of the marketing methods utilized by the respondents positively affect the economy. About 25.8% of the respondents operated four market cycles per month, while 63.4% operated eight market cycles per month. In addition, 10.8% of respondents operated 12 market cycles per month. This indicates that the majority of respondents operate eight market cycles per month. In addition, a more significant proportion of respondents sold an average of 60 kilograms of locust bean seeds per market. This could be because most processors use a method that is too demanding and discourages further processing. When family labour is unavailable or insufficient, the traditional processing method

also requires high labour costs; therefore, respondents reduced the quantity processed to reduce labour costs. Inexperience in the business could have reduced the quantity of locust bean seeds processed due to the dread of deterioration.

**Table 1: Information Related to the Processing and Marketing of Locust Bean**

| Variables | Frequency | Percentage |
|---|---|---|
| **Methods of processing** | | |
| Traditional | 182 | 75.8 |
| Improved | 58 | 24.2 |
| **Marketing form** | | |
| Retailing & Wholesaling | 240 | 100.0 |
| **Marketing cycle (number)** | | |
| 4 | 62 | 25.8 |
| 8 | 152 | 63.4 |
| 12 | 26 | 10.8 |
| **Quantity of locust bean marketed (Kg)** | | |
| 30 | 56 | 23.3 |
| 60 | 162 | 67.5 |
| 90 | 22 | 9.2 |

Source: Field Survey, 2021

**Costs and returns to locust bean processing and marketing per week**

The profitability of locust bean seeds processing and marketing enterprises was assessed using gross margin analysis (Table 2). From the result of the analysis, the total weekly cost of 240 respondents of locust bean seeds processors and marketers was calculated (using the straight-line depreciation method to compute the average fixed cost), and the total revenue was estimated to be:

Average fixed cost (AFC) = ₦4,169.04,
Average variable cost (AVC) = ₦51,820,
Total revenue (TR) = ₦96,000
Therefore, the profitability of the enterprise was calculated as;
Gross margin (GM) = Total revenue – Average variable cost; i.e.
Gross Margin (TR-AVC) = ₦96,000 - ₦51,820
GM = ₦44,180
Benefit-Cost Ratio (TR/TC) = ₦96,000/₦55,989.04 = 1.71
Similarly, the benefit-cost ratio was ₦1.71. This reveals that locust beans processing is profitable in the study area because, for every ₦1 invested, ₦1.71will be realized as a gain.

**Table 2: Profitability analysis of locust bean processing/marketing**

| Item | ₦ | ₦ |
|---|---|---|
| **A. Average Total Revenue** | | |
| 1. Average Total Output (Kg) | 40 | |
| 2. Unit Price per kg(₦/kg) | 2,400 | |

| | | |
|---|---|---|
| 3. Total Revenue(2x1) | | 96,000 |
| **B. Average Variable Cost (₦)** | | |
| 4. Cost of locust bean processed | 32,040 | |
| 5. Cost of labour | 12,500 | |
| 6. Cost of transportation | 2,450 | |
| 7. Cost of firewood | 4,830 | |
| **Average Total Variable Cost(4+5+6+7)** | | 51, 820 |
| **C. Fixed cost (Depreciation on equipment)(₦)** | | |
| 8. Cooking pot | 1,867.92 | |
| 9. Sieve | 561.92 | |
| 10. Bowl | 309.79 | |
| 11. Calabash | 527.65 | |
| 12. Basket | 352.29 | |
| 13. Bucket | 549.47 | |
| **Total Fixed Cost(8+9+10+11+12+13)** | | 4,169.04 |
| **Total Cost (TVC+TFC)** | | 55,989.04 |
| **Gross Margin (TR-TVC)** | | 44,180 |
| **Benefit-Cost Ratio (TR/TC)** | | 1.71 |

Source: Field Survey, 2021

**Determinants of net revenue on locust bean seeds processing and marketing**

The Production function analysis was employed to estimate the parameters of the regression model. The multiple regression equation was used to estimate the determinants of locust bean seeds processing and marketing. Four functional forms (Linear, Exponential, Semi-log and Cobb Douglas) were fitted into the data collected. The lead equation, the Linear equation, was chosen for having the largest coefficient of multiple determinations ($R^2$).

**Table 3: Regression analysis of four functional forms result**

| Variable | Linear | Exponential | Semi-log | Double-log |
|---|---|---|---|---|
| **Constant** | -2034.521 | 7.393 | -19223.32 | 4.655 |
| | (479.608) | (0.153) | (3397.374) | (o.853) |
| **Age (years)** | 24.477* | 0.007* | -443.906 | -0.003 |
| | (14.108) | (0.004) | (662.672) | (0.166) |
| **Marital status** | -32.117 | -0.045 | 36.121 | -0.053 |
| | (114.011) | (0.036) | (238.862) | (0.060) |
| **Stall rent (₦)** | 0.343 | 4.117E-5 | 328.906 | -0.006 |
| | (0.907) | (0.000) | (808.835) | (0.203) |
| **Quantity processed (kg)** | 231.919*** | 0.029*** | 11303.805*** | 1.536** |
| | (13.087) | (0.004) | (784.010) | (0.197) |
| **Years of experience (years)** | -11.916 | 0.001 | 84.569 | 0.055 |
| | (32.367) | (0.010) | (249.056) | (0.063) |
| **Transportation cost (₦)** | -0.793*** | -6.589E-5** | -2166.114*** | -0.223*** |
| | (0.085) | (0.000) | (300.626) | (0.075) |

| | | | | |
|---|---|---|---|---|
| **R-squared** | 0.930 | 0.735 | 0.906 | 0.780 |
| **Adjusted R-squared** | 0.926 | 0.721 | 0.901 | 0.768 |

Source: Field Survey, 2021. * - Statistically significant at 10% probability level, ** - Statistically significant at 5% probability level and *** - Statistically significant at 1 % probability level.Figures in parentheses are the standard error.

According to the regression analysis results presented in Table 3, the coefficients of age, quantity processed, and stall rent were all positive. Negative coefficients were found for marital status, years of experience, and transportation costs. Age was significant at 10% level of significance. This shows that, as age increases, the profit earns by the processor and marketer increases. The significance of quantity processed at 1% suggests that as the quantity processed increases, so does the net revenue. Transportation costs were considerable at 1 percent but had the opposite effect on net revenue, i.e., as transportation costs rise, net revenue falls. The coefficient of determination was 0.93. The stall rent had positive relationship with net revenue but not significant at the levels of significance considered. This indicates that approximately 93% of the net revenue, dependent variable (Y), variations are explained by the independent variables (X1-X6) included in the model, with the remaining 7% attributable to other factors not included in the model, i.e., the error term. At 1%, the F-Value was statistically significant and positive, indicating that all explanatory variables significantly impact net revenue.

**Conclusion and Recommendations**

Processing and marketing locust bean seeds is a profitable and lucrative enterprise that can be started with little capital in the study area. As a result, the research revealed that the locust bean seeds processing and marketing enterprise in the study area is a small-scale enterprise that provides income and employment to many households in the study area.

Based on the findings of the study, the following recommendations were made:

- Since locust bean processing and marketing is a lucrative business, emphasis should be placed on increasing the quantity of locust bean seeds processed and the income from its sales by cultivating and planting more locust bean trees for sustainability.
- The government should make the newly discovered processing machine (de-hullers, separators, and pressure cookers) available to processors at an affordable and subsidized price to improve product quality and eliminate low market prices.
- There is a need for an improved method of preservation, packaging, and marketing for the product to be acceptable on international markets by reducing the product's odour without sacrificing essential nutrients and palatability to generate foreign exchange and reduce the risk of deterioration.
- Advanced techniques for producing locust legumes should be encouraged to increase the product's marketability and productivity.
- Drying the processed seeds to the appropriate moisture content level in order to prevent fungal growth should be encouraged among the processors.

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