



# **Economic Analysis of Locust Bean Seeds Processing and Marketing in Ekiti State, Nigeria**

**K. A. Abdu-Raheem<sup>a\*</sup>, F. O. Osundare<sup>a</sup>, O. C. Ajewole<sup>a</sup>,  
A. O. Adekunmi<sup>a</sup>, A. O. Kolawole<sup>a</sup> and F. M. Oluwatusin<sup>a</sup>**

<sup>a</sup> *Department of Agricultural Economics and Extension Services, Ekiti State University, Ado Ekiti, Nigeria.*

## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

## **Article Information**

### **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/101177>

**Original Research Article**

**Received: 13/04/2023**  
**Accepted: 15/06/2023**  
**Published: 27/06/2023**

## **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

\*Corresponding author: E-mail: [kamal.abduraheem@eksu.edu.ng](mailto:kamal.abduraheem@eksu.edu.ng);

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.*

## 1. INTRODUCTION

The Locust bean, also known as Iru in Yoruba, is a crucial and economically significant component of the African locust bean tree "Parkia biglobosa" [1,2]. 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 [3,4,5,6] and medicinal ingredients [7]. 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 [2]. Locust bean marketing is predominantly a rural domestic industry dominated by women [8,1,9]. The harvested bean seeds are sold in markets to women who process them.

The average daily ingestion of locust beans in Nigeria is low [10], particularly in the Northern region, where it accounts for an estimated 1.4% of daily calories and 5% of total protein [2]. The marketing and consumption of locust beans are waning in prominence, particularly among the expanding urban population [11]. 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 [12], their prevalence has decreased [13], particularly among the urban population [14,15]. This situation is also exacerbated by the

increased importation of foreign soup flavours [1]. Its inefficient preservation method has necessitated the modernization of production techniques [16,17] 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.

## 2. 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.

$$\text{Profit} = \text{Total Revenue} - \text{Total cost};$$

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

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' socio-economic 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:

$$\text{Linear equation: } Y = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + a_6x_6 + e_i \dots \dots \dots (1)$$

$$\text{Exponential: } \ln Y = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + a_6x_6 + e_i \dots \dots \dots (2)$$

$$\text{Semi log: } Y = a_0 + a_1\ln x_1 + a_2\ln x_2 + a_3\ln x_3 + a_4\ln x_4 + a_5\ln x_5 + a_6\ln x_6 + e_i \dots \dots \dots (3)$$

$$\text{Double log: } \ln Y = a_0 + a_1\ln x_1 + a_2\ln x_2 + a_3\ln x_3 + a_4\ln x_4 + a_5\ln x_5 + a_6\ln x_6 + e_i \dots \dots (4)$$

$e_i =$  Stochastic error term.  
 $a_0 - a_6 =$  parameters to be estimated.

### 3. RESULTS AND DISCUSSION

#### 3.1 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**

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

Source: Field Survey, 2021

### 3.2 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:

$$\begin{aligned} \text{Average fixed cost (AFC)} &= \text{₦}4,169.04, \\ \text{Average variable cost (AVC)} &= \text{₦}51,820, \\ \text{Total revenue (TR)} &= \text{₦}96,000 \end{aligned}$$

Therefore, the profitability of the enterprise was calculated as;

$$\text{Gross margin (GM)} = \text{Total revenue} - \text{Average variable cost; i.e.}$$

$$\text{Gross Margin (TR-AVC)} = \text{₦}96,000 - \text{₦}51,820$$

$$\text{GM} = \text{₦}44,180$$

$$\text{Benefit-Cost Ratio (TR/TC)} = \frac{\text{₦}96,000}{\text{₦}55,989.04} = 1.71$$

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, ₦1.71 will be realized as a gain.

### 3.3 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 ( $R^2$ ).

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.

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

Item	₦	₦
<b>A. Average Total Revenue</b>		
1. Average Total Output (Kg)	40	
2. Unit Price per kg(₦/kg)	2,400	
3. Total Revenue(2x1)		96,000
<b>B. Average Variable Cost (₦)</b>		
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	
<b>Average Total Variable Cost(4+5+6+7)</b>		<b>51, 820</b>
<b>C. Fixed cost (Depreciation on equipment)(₦)</b>		
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

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

Variable	Linear	Exponential	Semi-log	Double-log
Constant	-2034.521 (479.608)	7.393 (0.153)	-19223.32 (3397.374)	4.655 (0.853)
Age (years)	24.477* (14.108)	0.007* (0.004)	-443.906 (662.672)	-0.003 (0.166)
Marital status	-32.117 (114.011)	-0.045 (0.036)	36.121 (238.862)	-0.053 (0.060)
Stall rent (₦)	0.343 (0.907)	4.117E-5 (0.000)	328.906 (808.835)	-0.006 (0.203)
Quantity processed (kg)	231.919*** (13.087)	0.029*** (0.004)	11303.805*** (784.010)	1.536** (0.197)
Years of experience (years)	-11.916 (32.367)	0.001 (0.010)	84.569 (249.056)	0.055 (0.063)
Transportation cost (₦)	-0.793*** (0.085)	-6.589E-5** (0.000)	-2166.114*** (300.626)	-0.223*** (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

#### 4. 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 (dehullers, 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.

#### ACKNOWLEDGEMENT

We would like to express our sincere gratitude to the Tertiary Education Trust Fund (TETFUND), Nigeria, for their generous financial support. This funding has played a crucial role in the successful execution of our research project, enabling us to achieve our research objectives and contribute to the advancement of knowledge in our field.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

#### REFERENCES

1. Ogunwale FO, Olawuyi SO, Akinniran TN. Economic analysis of locust bean processing and marketing in Iwo local government, Osun State. *International Journal of Applied Agricultural and Apicultural Research IJAAAR*. 2011; 7(1&2):54-63.
2. Farayola CO, Okpodu V, Oni OO. Economic analysis of locust beans processing and marketing in Ilorin, Kwara State, Nigeria. *International Journal of Agricultural Research, Innovation and Technology*. 2012;2(2):36-43.
3. Olalude C, Adegboyega A, Bamigboye A, Abiona D, Anifowose O, Babatunde S. Proximate analysis and mineral content determination of traditionally processed locust bean (*Parkia biglobosa*) fruit pulp for possible industrial application. *Edelweiss J. Biomed. Res. Rev*. 2021;4(1):10-13.
4. Nyadanu D, Adu Amoah R, Obeng B, Kwarteng A O, Akromah R, Aboagye L M, Adu-Dapaah H. Ethnobotany and analysis of food components of african locust bean (*Parkia biglobosa* (Jacq.) Benth.) in the transitional zone of Ghana: implications for domestication, conservation and breeding of improved varieties. *Genetic Resources and Crop Evolution*. 2017;64:1231-1240.
5. Aju PC, Iwuanyanwu UP, Popoola LA, Uwalaka RE. An assessment of nutrition and commercial values of *Gnetum africana* in Imo State, Nigeria. In: Onyekwelu JC; 2008.
6. Oduro I, Ellis WO, Narh ST. Expanding breadfruit utilization and its potential for pasta production. *Discovery and Innovation*. 2007;19:243-247.
7. Sodimu AI, Usman MB, Olorukooba MM, Oladele NO, Suleiman R, Lapkat GL, Awobona TA. Empirical studies of indigenous and medicinal utilization of african locust beans (*Parkia biglobosa*. Jacq Benth) in Zaria local government area of Kaduna State, Nigeria. *Asian Plant Res. J*. 2020;4:1-8.
8. Alao OT, Olanrewaju KO, Oyeleke OR. Women involvement in locust beans processing as a livelihood activity in Ejigbo local government area, Osun State, Nigeria. *Nigerian Journal of Rural Sociology*. 2020:20(1).
9. Odunfa SA, Adewuyi E. Optimization of process conditions for fermentation of african locust bean, effect of time,

- temperature humidity. Food Chemical Microbiology. 1985;9:118-121.
10. Aremu MO, Awala EY, Opaluwa OD, Odoh R, Bamidele TO. Effect of processing on nutritional composition of african locust bean (*Parkia biglobosa*) and mesquite bean (*Prosopis africana*) seeds. Communications in Applied Sciences. 2015;3(1).
  11. Akinoso R, Adedayo OA. Estimating energy requirements in the processing of african locust beans (*Parkia biglobosa*) into condiment. Agricultural Engineering Today. 2012;36(3):1-7.
  12. Oso AO, Adebajo AE, Babalola FD, Philip E, Odebiyi BR, Adegoke AT. Socio-economic contributions of selected non-timber forest product (locust bean) to the livelihood of traders in Yewa division of Ogun State. KIU Interdisciplinary Journal of Humanities and Social Sciences, 2022; 3(2);129-132.
  13. Lelea MA, Konlan LM, Zibbila RC, Thiele LE, Amo-Aidoo A, Kaufmann B. Strategies to promote sustainable development: the gendered importance of addressing diminishing African locust bean (*Parkia biglobosa*) resources in northern Ghana's agro-ecological landscape. Sustainability. 2022;14(18):11302.
  14. Kolapo A, Omopariola OE, Adeoye AO, Kolapo AJ. Adoption of improved processing technology among African locust bean processors in South-west, Nigeria. International Journal of Agricultural Research, Innovation and Technology (IJARIT). 2020;10(2355-2020-1370):123-128.
  15. Akande FB, Adejumo OA, Adamade CA, Bodunde J. Processing of locust bean fruits: challenges and prospects. African Journal of Agricultural Research. 2010; 5(17):2268-2271.
  16. Ijigbade JO, Aturamu OA, Osundare FO. Value addition analysis of locust beans (*Parkia biglobosa*) in Akoko Northwest local government area of Ondo State, Nigeria. International Journal of Advanced Economics. 2021;3(4):97-105.
  17. Olaoye JO. Machinery needs for processing of locust bean seeds in Nigeria. In Proceedings of International Agricultural Engineering Conference. 2010; 1-53.

© 2023 Abdu-Raheem et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:

<https://www.sdiarticle5.com/review-history/101177>