WILLINGNESS TO PAY FOR CENTRALIZED MODERN LOCUST BEAN PROCESSING EQUIPMENT IN EKITI STATE, NIGERIA

Abstract

This study investigated the propensity to pay for modern apparatus processing locust beans in Ekiti State, Nigeria. Utilizing primary data and a multistage sampling strategy, 240 processors were chosen for the study. The collected data were analyzed utilizing descriptive statistics and an inferential statistical instrument, such as Logit and ordinary least square regression analysis. About 72 percent of processors were married, and they had an average of eight years of experience processing locust legumes. The majority of respondents belonged to a cooperative group (66.7%) and had no access to credit (100%). The average monthly income from processing was ₦18,000. The majority of respondents (65%) were unwilling to pay for the service of centralized, advanced or contemporary processing equipment. According to the results of the Logit regression analysis, the variables that significantly influence willingness to pay for the service of centralized modern locust bean processing equipment were household income and processing experience (1%), level of education and age (5%), and household size (10%). The Ordinary Least Square (OLS) analysis reveals that household size and education level were significant at the 1% level, while age and marital status were significant at the 5% level and processing experience was significant at the 1% level. The study suggests that processors ready to pay should form a formidable cooperative to secure grants or loans to establish a centralized, contemporary locust processing cottage. The government should educate processors on modern food processing and safety at all levels.

Keywords: Willingness-to-pay, locust bean, modern processing, Logit & OLS Regression analysis.

Introduction

Locust bean, or Iru in Yoruba, is a crucial and economically significant component of the African Locust bean tree "Parkia biglobosa" (Ogunwole et al., 2011; Farayola et al., 2012). This tree belongs to the subfamily "Mimosoidea" and the genus "Pakia" of the Fabaceae family. Robert Brown named the tree after Mungo Park in 1826. The tree is commonly recognized in West Africa as a significant, multipurpose Savannah tree. When the seed is processed, it can be used for a variety of purposes, including as a condiment for broth (Musara et al., 2020). As demonstrated in Table 1, locust bean is a significant source of carbohydrates, protein, iron content, and essential fatty acids, especially Vitamin B, riboflavin, and Vitamin A (Aju et al., 2008; Oduro et al., 2007; Termote et al., 2022). Numerous benefits are provided by the tree itself, which produces fruits enclosed in numerous large clusters. It can tolerate a wide variety of alluvial, sandy, and lateritic soil, resists pests and diseases, endures fires, and thrives in full

sunlight and tropical temperatures (Farayola et al., 2012; Builders, 2014). The tree also has some medicinal properties (Dedehou et al., 2016; Rohini & Rajesh, 2020)

Table 1: Nutrition composition of locust bean seed

Component	Amount (%)
Crude protein	40.0 – 47.4
Fat	31.4 – 42.9
Carbohydrate	15.0
Crude fibre	3.1 – 5.6
Ash	3.3 – 5.6
Calcium (mg/100g)	309.0 – 880.0
Iron (mg/100g)	480.0 – 546.0
Phosphorous (mg/100g)	517.0 -584.0
Metabolic energy (Kcal/100g)	480.0 – 546.0
Gross energy (Kcal/100g)	517.0 – 618.0

Source: Odunfa, 1985

The production and sale of *Dawadawa* is a significant economic activity for women throughout the region who participate in its production. (Odunfa and Adewuyi, 1985) The harvested bean seeds are sold in markets to women who process them. In Nigeria, it functions as a food buffer during lean periods, while cultivators and women who harvest, process, and market the product earn a reliable income (Farayola et al., 2012). It provides a source of income, helps alleviate destitution, and contributes to Nigeria's food security (FAO, 2010).

In addition to being prospective food sources, edible oil, fodder lumber, firewood, and green manure, locust bean trees thrive in arid regions. Onnyi et al. (2004) estimated that approximately 200,000 tons of African locust bean seeds are harvested annually in Nigeria alone, in addition to volumes produced in the savannah region of Oyo, Osun, and Kwara States of Nigeria (Akin-Idowu, 2021). Unfortunately, the locust bean is quickly losing prominence to other flavouring agents such as *Maggi, Royco, Knorr*, etc., and its nutritional value cannot be compared to that of these synthetic sources. In 2003, the Federal Office of Statistics (now the National Bureau of Statistics) reported that Nigeria spends approximately $200 million annually on imported food flavours, with a projected annual increase of 15%, although traditionally produced flavouring products have lower caloric value and higher dietary protein content than imported flavour. This situation may result from the product's odour and quality due to outdated processing methods. The expectation is that automating the processing of locust legumes will reduce the tedium of the traditional processing phases and improve their flavour.

However, this study investigated the motivation of locust bean processors to pay for modern processing apparatus. The specific objectives are to:

i. describe the socioeconomic characteristics of locust bean processors;
ii. ascertain their willingness of locust bean processors to pay for centralized modern processing equipment;
iii. determine the factors influencing willingness to pay for the services of centralized modern locust bean processing equipment;
iv. examine the factors influencing the quantity of locust beans processed.

Methodology

This research was conducted in Ekiti State, Nigeria. In the rural households of Ekiti State, locust beans are an essential culinary ingredient. A multistage sampling technique was used to select processors of locust bean seeds. Initially, six Local Government Areas (LGAs) were randomly chosen for the research. In the second stage, four communities renowned for their processing of locust beans were chosen from each LGA. Using the snowball sampling technique, 10 respondents were interviewed from each community to give a total of 240 respondents. Information from locust bean processors was collected as primary data using a well-structured questionnaire and interview schedule. To improve the efficacy of locust bean processing, it is necessary to collect data on the socioeconomic characteristics, propensity to pay, and constraints of locust bean processors.

The socioeconomic characteristics of locust bean processors were profiled by descriptive statistics such as mean, frequency distribution, minimum and maximum value, whereas the propensity to pay for centralized modern locust bean equipment was analyzed using a Logit regression model. The ordinary least square regression model was used to analyze the variables affecting the quantity of processed locust bean seed per cycle.

The Logit Model is stated in Equation 1,

$$Y_i = \beta_0 + \beta_i X_i + e_i \quad (1)$$

Y_i = Willingness To Pay (1 If a Respondent Is Willing to Pay, 0 Otherwise)

X_1 = Age (years)

X_2 = $Marital\ Status$ (1 $married$, 0 $single$)

X_3 = $Processing\ Experience$ (years)

X_4 = Household size (number)

X_5 = Access to institutional credit (1: yes; 0: no)

X_6 = $Level\ of\ education$ ($years$)

X_7 = $Access\ to\ extension\ agent$ (1: yes; 0: no)

X_8 = $Household\ income$ (Naira)

β_{is} = $Estimated\ parameters$

e_i = Random error

The OLS regression model is stated in Equation 2,

$$Y_i = \alpha_0 + \alpha_i X_i + e_i \quad (2)$$

Y_i = Quantity of Locust Bean Processed (Kilogram)

X_1 = Age (years)

X_2 = $Marital\ Status$ (1 $married$, 0 $single$)

X_3 = $Processing\ Experience$ (years)
X_4 = Household size (number)
X_5 = Access to institutional credit (1: yes; 0: no)
X_6 = $Level\ of\ education$ $(years)$
X_7 = $Access\ to\ extension\ agent$ (1: yes; 0: no)
X_8 = $Household\ income$ (Naira)
α_{is} = $Estimated\ parameters$
e_i = Random error

Results and Discussion

Socioeconomic Characteristics of Locust Bean Processors

Table 2 displays the socioeconomic characteristics of locust bean processors and marketers in the study area. According to observations, most locust bean seed processors were between the ages of 26 and 35. The minimum age of respondents was 18, the maximum age was 65, and the average age stood at 35 years old. This research contradicts the findings of Farayola et al. (2012), who found that the locust bean processors are elderly. This indicates that adolescents are now more involved in processing locust bean seeds than in the past when most locust bean seed processors were primarily older women.

Additionally, 100 percent of respondents were female. This suggests that most locust bean seed processors and sellers are women. This result is consistent with the findings of the majority of researchers who have studied locust bean processors, such as Farayola et al. (2012), Ogunwole et al. (2011), and Akande et al. (2010). Approximately 72 percent of those who processed and sold locust bean seeds were married. This may encourage businesses to employ family labour. Most respondents had household sizes between 6 and 10, which will reduce the cost of employing labour to process locust bean seeds. This result indicates a large household size with a mean of 10 persons in the study area. According to the results, a more significant proportion of respondents had secondary education, indicating that most young people involved in this enterprise began shortly after completing secondary school. This may make it challenging for them to understand the enhanced method of processing locust bean seeds. The minimum experience among respondents was one year, the maximum experience among respondents was 20 years, and the mean experience was eight years. Consequently, this business has been dominated by young people over the past decade while older women have been sent to rest. Most respondents (66.7%) earned less than ₦21,000 per month. The respondents' minimum income was ₦8,000, their maximum income was ₦48,000, and their mean income was ₦18,000. This is due to their lack of business experience.

In addition, increased proportions of respondents utilize the conventional method of processing. Loss of locust bean seeds when pressing with leg or mortal to remove the cotyledon may result in a low income. The washing process necessitates more labour, which increases labour costs and consequently decreases respondents' income. Approximately 66.7 percent of respondents were members of the locust bean marketers' cooperative society, whereas 33.3% were not members of the association. None of the respondents had access to cash-based credit from any association or bank. They only have access to credit in the form of goods and not cash. Typically, they collect

the unprocessed locust bean seeds (Iyere) on credit from the seller and return the money after they have sold the processed locust bean seeds. They do this because they have no access to cash-based credit and the locust bean seeds may contain many empty seeds. The amount owed will decrease when there are numerous empty seeds (with evidence).

Table 2: Distribution of Locust Bean Processors by their socioeconomic characteristics

Socio-economic Variables	Frequency	Percentage	Mean
Age (years)			
< =25	46	19.2	
26 - 35	88	40.8	35
36 – 45	46	19.2	
46 - 55	38	15.8	
> 55	12	5.0	
Gender			
Male	0	0	
Female	240	100.0	
Marital Status			
Single	40	16.7	
Married	172	71.7	
Widow	14	5.8	
Divorced	14	5.8	
Household Size			
<5	6	2.5	
5-10	234	97.5	10
Educational Level			
None	52	21.7	
Primary	84	35.0	
Secondary	104	43.3	
Processing/Marketing Experience (years)			
<=5	84	35.0	
6-10	98	40.8	
11-15	30	12.5	
16-20	28	11.7	
Monthly Income (Naira)			
< =10,000	48	20.0	
11,000 – 20,000	112	46.7	18,000
21,000 – 30,000	58	24.2	
31,000 – 40,000	8	3.3	
> 40,000	14	5.8	
Access to Credit			

Yes	0	0
No	240	100.0
Cooperative Membership		
Yes	160	66.7
No	80	33.3

Source: Field Survey, 2021

Willingness to Pay for Centralized Modern Processing Equipment

The distribution of locust bean processors willing to pay for centralized modern processing equipment at a subsidised rate less than the total cost and difficulty of traditional processing in the study area is depicted in Figure 1. Most respondents (65%) were unwilling to pay for the service of advanced or contemporary processing equipment. According to the interview schedule, they were unwilling to pay due to their residual technical knowledge of the traditional aspects of the processing; therefore, they viewed payment as wasteful. Those unwilling to pay also believed there would be a significant difference in flavour between locust beans processed locally and those processed with modern equipment. It was asserted that locally processed locust beans retain their aroma, flavour, and composition better than those processed by machines. About 35 percent of processors of locust beans were willing to pay for modern processing apparatus. This may increase consumer satisfaction among elites, in contrast to the traditional dehulling procedure, which entails bare feet.

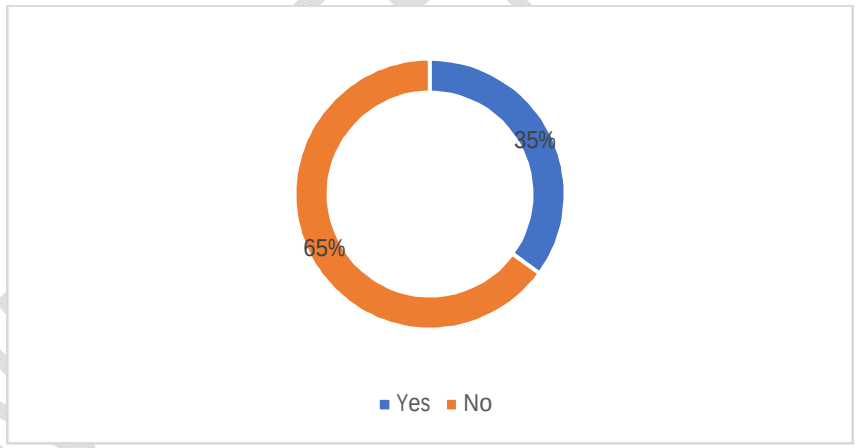

Fig. 1: Willingness to pay for modern processing equipment
Source: Field Survey, 2021

Factors influencing willingness to pay for the services of centralized modern locust bean processing equipment

Table 3 displays the regression results of the Logit model for determining the factors that influence the propensity to pay for the use of centralized modern locust bean seed processing equipment. Age, processing experience, household size, and income had been identified as variables with an inverse relationship to the propensity to pay. This suggests that older, more experienced processors with large household sizes and high incomes are typically averse to

paying for the services of modern locust bean processing equipment. Instead of relying on centralized equipment, processors with high revenues may purchase or fabricate equipment that can process their desired quantity of locust legumes. Access to institutional credit and extension services, level of education, and marital status are variables that had a positive relationship with propensity to pay. This suggests that access to credit and extension services that educate processors on the benefits of modern processing increases their propensity to pay. Significant variables that influence willingness to pay for the service of centralized modern locust bean processing equipment were household income and processing experience (1%), level of education and age (5%) and household size (10%).

Table 3: Logit model result estimates

Variables	**Coefficient(Z-value)**
Constant	0.640**(2.621)
Age	-0.345**(1.981)
Marital Status	0.873 (1.345)
Processing Experience	-0.923***(5.196)
Household Size	-0.274* (1.732)
Access to Institutional Credit	0.398(1.143)
Level of education	0.245**(2.602)
Access to Extension Agent	0.492(1.475)
Household Income	-0.439***(3.409)
No. of observation	240
Log-likelihood	-13. 727
Pseudo R2	0.743
Prob > $\chi 2$	0.0007
LR $\chi 2(8)$	143.651

Source: Field Survey, 2021

*,**and *** means significant at 10%, 5% and 1% levels of significance respectively.

Factors influencing the quantity of locust bean processed

Table 4 displays the ordinary least square regression results on the variables influencing the quantity of processed locust bean seed in the study area. The coefficient of determination (R^2) indicates that the explanatory variables accounted for 85% of variations in the processed quantity of locust legumes. Age and processing experience have been observed to have an inverse relationship with the quantity of locust beans processed. This indicates that older processors with

great experience process a smaller quantity of locust legumes. This could be due to the labour-intensive nature of the traditional refining phase. Positive relationships existed between marital status, household size, access to credit, level of education, access to extension services, household income and the amount of locust legumes processed. This implies that the quantity processed tends to increase as these variables increase. This may be the effect of these variables on market information and marketing for locust legumes. Significant variables that influenced the amount of locust legumes processed include household size and level of education (1% level), age and marital status (5%) and processing experience (10% level).

Table 4: Regression analysis result estimates

Variables	**Coefficient(Z-value)**
Constant	0.330(0.391)
Age	-0.582**(2.410)
Marital Status	0.981**(2.611)
Processing Experience	-0.925*(1.710)
Household Size	0.926***(7.763)
Access to Institutional Credit	0.425(1.361)
Level of education	0.824***(4.891)
Access to Extension Agent	0.760(1.287)
Household Income	0.042 (0.217)
No. of observation	240
R^2	0.852

Source: Field Survey, 2021

*,**and *** means significant at 10%, 5% and 1% levels of significance respectively.

Conclusion and Recommendations

The majority of locust bean processors (65%) are unwilling to pay for centralized modern processing apparatus, according to the study's findings. The variables of household income, processing experience, and education level are significant determinants of processors' propensity

to pay. Significant factors such as household size and level of education, age, marital status, and processing experience influence the quantity processed.

The study suggests that processors prepared to pay should form a formidable cooperative to secure grants or loans to establish a centralized, contemporary locust processing cottage. The government should educate processors on modern food processing and safety at all levels.

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