# Assessment of Household Demand for Locust Beans (*parkia biglobosa*) in South West, Nigeria

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***ABSTRACT***

*This study assessed household demand for locust beans in the south western zone of Nigeria. Oyo and Osun states were purposively chosen in the zone, two local government areas were also selected randomly in each state. One hundred and eighty (180) household heads were sampled systematically in the four Local Government Areas (LGAs). Copies of structured questionnaire were used to collect data from the respondents. The Linear Approximate of Almost Ideal Demand System (LA/AIDS), regression analysis and descriptive statistics were the analytical tools used. The AL/AIDS model results revealed that the household budget share of locust beans increases with an increase in price of maggi (1%), price of knorr (5%) and price of onions (1%), but it decreases with an increase in price of curry (1%), thyme (5%) and total household expenditure (5%). The estimated own price elasticity was less than one and negative (-0.5743) meaning that its demand was inelastic, the positive signs of cross-price elasticity indicated a substitute relationship between locust beans and other condiments (maggi, knorr, curry and thyme) except onions. Expenditure elasticity of locust beans was less than one (0.2244), this confirmed that it is inelastic and a normal good. The result from the ordinary least square regression analysis showed that amount spent on other condiments (-42.85), age (14.140) and household size (16.05) had effects on household demand for locust beans at various levels of significance. Respondents preferred to use locust beans because of medicinal (60%), and nutritional (40%) values, while others rejected it because of offensive odour (68%). Improvement on locust beans processing is needed in order to eliminate the offensive odour.*

***Key Words:*** *Locust beans, household demand, prices, elasticity*

## INTRODUCTION

The natural range of the African locust beans (*parkia biglobosa*) tree covers a broad area extending from Senegal in the West to Uganda in the East and includes Sudanians as well as Guinea-Congolese zone (Janick, 2008). The genius; *parkia biglobosa* belongs to the *mimosaceae* family (leguminous) which contain about 30 species. The genus is of considerable evolutionary interest because its species are pollinated by different groups of bats in different area. Only two of the genus *Parkia* is found in Nigeria namely: *Parkia bicolor* and *Parkia biglobosa* (Oyewole, 2004). *Parkia biglobosa* is common around villages in savannah areas of West Africa.

The African locust beans (*parkia biglobosa*) come from a para-tropical tree and it is one of the Non-Timber Forest Products (NTFPs). The tree is about 7-20cm high and bears

pods that occur in large bunches and vary between 120-300m in length (Odunfa, 1985). The girth is about 3m, the bole is usually short with twisted spreading branches forming a wide crown (Oyewole, 2004). The bark is dirty brown in colour and rough with leaflets which are elongated with more or less parallel margins (Oyewole, 2004). The locust beans tree normally flowers between December and March appearing with new leaves or slightly before the leaves. The flowers are deep red with head dangling downwards whereas the individual flowers are tightly packed. It normally fruits between Feburary to July, the fruits range between 15-30cm long and 2-50cm broad. When ripe the fruit is brown in colour containing numerous black seeds embedded in yellowish sweet tasting pulp (Oyewole, 2004). In West Africa, particularly Nigeria, the most common use of the tree is the fermentation of its seeds to make condiments for soups and foods (Appiah, et al, 2012). The process involves labor-intensive stages such as harvesting, de-podding, removal of the yellow pulp, cleaning, boiling, de-hulling, rewashing, and fermentation (Akande, et al, 2010). The tedious labour during dehulling of locust bean seeds can be reduced without adversely affecting the slightly acidic status and nutritional quality; thus enhancing quality and overall acceptability. Adoption of boiling raw locust bean seeds for two hours under pressure prior to de-hulling is a valuable procedure to eliminate long hours of boiling and tedious labour during local and industrial production (Olaniran et al., 2020). The seed, which is a grain legume, has other food and non-food uses. When processed, the end product becomes a black, highly aromatic, tasty paste that has high protein content and it is used as a spice or condiment in the entire savannah region of West Africa and beyond.

The name of the condiment varies depending on the country and local language, this include '*dawadawa'* in Niger and northern Nigeria and Ghana, ' *iru'* in southern Nigeria and '*soumbala'* in Burkina Faso, Mali, Cote d'Ivoire and Guinea, '*afitin'* in Benin, '*kinda'* in Sierra Leone, '*nététou*' in Gambia (Sacande and Clethero, 2007). Locust bean which is also known as carob, is one of the common cooking condiments that is gradually disappearing from dinning tables of many families.

Findings from research has shown that locust bean helps to promote good sight and drives away hypertension and disease conditions like stroke and diabetes. Locust bean also contains tannins, astringent substances found in many plants. Foods rich in tannins are often recommended for treatment of diarrhoea. The portion of carob that is made into locust bean gum contains soluble fibre in the galactomannan family. Like other forms of soluble fibre, it has shown potential benefit for enhancing weight loss and controlling blood sugar levels (Sacande and Clethero, 2007). The African locust bean tree is highly valued and is commonly left standing when woodlands are cleared, the pulverised bark of the tree, for instance, is employed in wound healing and serves as one of the ingredients that are used in treating leprosy. From root to fruit, the tree is edible and used in a variety of different ways. The bark is rich in tannins and used for tanning hides; boiled pods are used to dye pottery black; the leaves can be used in soups and stews; and the fruit, whose pulp is rich in carbohydrates, is eaten raw or mixed with water as a sweet and refreshing drink (Adjonyoh, 2021). Many parts of locust beans are used in the treatments of various ailments such as arterial blood pressure, asthma, diabetes, diarrhea, eye defects, ulcer, amongst others (Aderounmu *et al.*, 2020). Locust beans is added to everything – not only because it tastes good and can serve as a tastier alternative to other spices cubes, but also due to its health benefits among which are vision improvement, digestion aid and much more (Alabi et al,. 2005).

On a moisture-free basis, the fermented locust bean contains about 40% protein, 32% fat and 24% carbohydrate (Campbell-Platt, 1980). Thus, apart from being a food condiment the fermented bean also contributes to the calorie and protein intake. According to Diawara *et al*; (2000), it has essential acids and vitamins and serves as a protein in the diet of poor

families. *Dawadawa* is used in soups, sauces and stews to enhance or impart neatness (Klanjcar *et al.,* 2002). According to Omafuvbe *et al (* 2004) the fermented Africa locust bean has the following composition at different stages of fermentation period (in hours) as shown in Table 1.

**Table 1: Composition of Fermented Africa Locust Bean at Different Stages of Fermentation Period (In Hour).**

| Fermentation Period (Hr) | Moisture Content (%) | Ash (%) | Ether Extract (%) | Crude Protein (%) | CHO (%) | PH (%) | Total Tocopherol | Acid Value | Iodine Value |
|---|---|---|---|---|---|---|---|---|---|
| 24 | 55.7 ±0.8 | 3.6 ±0.1 | 32.6 ±0.7 | 31.7 ±0.4 | 25.1 ±1.1 | 8.3 | 17.2 ±0.0 | 1.46 | 134.5 |
| 48 | 55.5 ±0.4 | 3.5 ±0.1 | 35.2 ±0.1 | 31.3 ±0.2 | 21.0 ±0.4 | 8.4 | 17.1 ±0.0 | 1.57 | 131.7 |
| 72 | 52.0 ±5.0 | 3.6 ±0.1 | 37.2 ±0.2 | 32.9 ±0.1 | 16.3 ±0.8 | 8.4 | 17.2 ±0.0 | 1.63 | 125.2 |

Source: Omafuvbe *et al* (2004)

These values recorded in the Table 1 were higher than the values reported for cowpea (Ojimelukwe, 1999). The condiment is also known to contribute to the calorie intake (Umoh and Oke, 1974), more so the nutritive value of 'iru' is also compared to that of monosodium glutamate based salts (Omafuvbe *et al.*,2004).

**Demand for Locust Beans in Nigeria**

African locust beans as one of the non-timber forest products (NTFPs) plays central role in the socio-economic life of Nigerians (Osemeobi and Ujor, 1999). Because locust bean condiment 'iru' is a low-cost meat substitute by low-income families in parts of Nigeria (Odunfa, 1985). And it is affordable by the general public. The condiment 'iru' after processing can be kept for months when common salt is added to it and sun-dried (Kitchikeesic, 2002). This makes it available all-year round despite the fact that *Parkia biglobosa* is a seasonal plant crop. It has attained national acceptance status (Osemeobi and Ujor, 1999) which enables it to have high consumption rates. Unfortunately, increasing importation of foreign seasonings and the manufacture of local ones have continued to undermine the traditional processing of African locust beans seeds (Akande *et al.*, 2010). The demand for locust beans in Nigeria is generally influenced by the price of the close substitutes like seasonings (maggi, knorr, onga, curry, thyme etc), among other variable factors like taste, cultural heritage, market, geographical location and so on. Most of the ultra-modern markets in some part of Nigeria do not encourage the sale of locust beans which in turn affect the demand of locust beans in the urban region in Nigeria, because locust beans is still widely processed and marketed traditionally in Nigeria. (Adisa, *et al*, 2014)

**PURPOSE FOR THE STUDY**

Household demand for locust bean has often been under-rated or neglected. The reasons for the negligence probably may be because it is an indigenous food processed using traditional innovation, sold at local markets that are traded through traditional routes. More so, there is an increasing realization that household demand studies should go beyond the realm of mere academic exercises to having an impact on people (Yusuf and Rahji, 2012). It is worth noting that Nigerian households experienced large increases in prices of food and non-food products which led to the reduction in the household purchasing power and relative

price effect that forced the poor household to seek substitutes for more expensive household goods. Locust beans serve as low-cost condiment substitute for the relatively expensive condiments like seasonings. This product has the potential for commercial development both at national and international levels if there is favourable market condition that can create allowance for its export.

Proper current study is therefore needed to record the household demand pattern of locust beans in order to note the demand influence on its own price changes and prices of other substitutes.

Main objective is to assess the household demand of locust bean in the study area.

The specific objectives of the study are to;

- investigate the household income and the proportion used in purchase of locust bean by different households in the study area,
- ascertain the household demand pattern on locust bean in the study area,
- estimate own price, cross price and income elasticity of demand for locust beans in the study area,
- identify the determinants of household demand for locust beans.

## METHODOLOGY

The sample of this research study was taken from the population of households in south western zone of Nigeria. Oyo and Osun states were purposively chosen in the zone. Two local government areas were also selected randomly in each state: Osogbo and Olorunda Local Government Areas (LGAs) were chosen from Osun state and Ogbomoso North and Ogbomoso South LGAs from Oyo state. Systematic sampling procedure was used to select one hundred and eighty (180) household heads in the four LGAs. This means that forty five household heads were sampled from each LGA. Structured questionnaire were used in the collection of primary data from the sampled household heads. The data from the survey were analysed and discussed using descriptive, ordinary least square technique and the Linear Approximate of Almost Ideal Demand System (LA/AIDS).

The analytical tool (LA/AIDS) is written as follows:

LA/AIDS was used to estimate own price, cross price and income elasticity of demand for locust beans in the study area.

Own price elasticity $= -1 + (\alpha ij / \omega i) - \beta i$

Cross price elasticity $= (\alpha ij / \omega i) - \beta i\ (\omega j / \omega i)$

Expenditure elasticity $= 1 + (\beta i / \omega i)$

Where $\alpha ij$ = expenditure coefficient of the *ith* commodity

$\omega i$ = geometric means of the budget share (dependent variable)

$\omega j$ = geometric means of price of each of the other condiments

$\beta i$ = coefficient of the household expenditure.

## RESULT PRESENTATION AND DISCUSSION

### Socio economic Characteristics of the Respondents

The results showed that majority of the respondents were male (80%), middle aged (40%), that is, between 31- 40 years old and married (68%). Larger percentage (65%) of the

household heads had average of 8 members in the family and 86% had one form of formal education or the other, with about 40% of them having secondary school certificate. Concerning their occupation, 60% of the respondents were traders, 10% were artisans, 15% farmers. About 22.2% had an average of ₦ 40,000.00 as their monthly income, while 40% had up to ₦ 80,000.00 as their monthly income. Only 10% had above ₦ 140,000. The results indicate that many of the respondents sampled are male household heads, middle-aged, married and educated. They have large household size and they are involved in various types of occupations but they still earn low income.

**Table 2: Socio-economic Characteristics of the Household Heads in the Study Area**

| Variables | n(180) | % (100) |
|---|---|---|
| **Gender** | | |
| Male | 144 | 80.0 |
| Female | 36 | 20.0 |
| **Age** | | |
| ≤ 30 | 10 | 5.6 |
| 31-40 | 72 | 40.0 |
| 41-50 | 36 | 20.0 |
| >51 | 62 | 34.4 |
| **Marital status** | | |
| Single | - | |
| Widowed | 18 | 10.0 |
| Divorced | 10 | 5.6 |
| Separated | 30 | 16.7 |
| Married | 122 | 67.7 |
| **Educational status** | | |
| No formal education | 24 | 13.3 |
| Primary Education | 36 | 20.0 |
| Secondary education | 72 | 40.0 |
| Tertiary Education | 45 | 25.0 |
| Others | 03 | 1.7 |
| **Household size** | | |
| ≤ 5 | 45 | 25.0 |
| 6-10 | 117 | 65.0 |
| ≥ 11 | 18 | 10.0 |
| **Occupation** | | |
| Farming | 27 | 15.0 |
| Trading | 108 | 60.0 |
| Artisans | 18 | 10.0 |
| Others | 27 | 15.0 |
| **Monthly income** | | |
| ≤ ₦20,000 | 14 | 7.8 |
| ₦ 20,001 – ₦ 60,000 | 40 | 22.2 |
| ₦ 60,001 – ₦ 100,000 | 72 | 40.0 |
| ₦ 100,001 – ₦ 140,000 | 36 | 20.0 |
| ≥ ₦140,001 | 18 | 10.0 |

Source; Field survey, 2022

**Purchase of locust beans and other condiments**

Apart from the household head's monthly income, it was discovered that other members of the household contributed some amount of money for the upkeep of the household. About 40% of the respondents did not collect any money from the household members. Only 1.7% collected more than ₦ 30,000 from other household members. The finding further revealed that 90% of the respondents spent some amount on locust beans monthly; 40% of the respondents spent ₦ 400 on locust beans in a week, 10% did not spend any money at all while 2.8% spent over ₦800 on the same product per week. This indicates that most people in the study area regardless of their income spent at least considerable amount of money on the locust beans in a week. The respondent also spent some amount of money on other condiment apart from locust bean, such condiments are maggi, knorr, curry, thyme, onions, garlic and ginger. About 60% of the respondents used locust beans as their main condiment, they also used other condiments in combination with locust beans. Some of the respondents preferred to use locust beans as part of cooking recipe because of its taste (30%) medicinal (60%), and nutritional values (40%), while others rejected it because of odour (68%), taste (54%), storage (45%) and appearance (59%). The multiple responses were also revealed in Table 3.

**The household demand pattern on locust bean**

The Almost Ideal Demand System was derived by Deaton and Muellbauer (1980) from an expenditure or cost function and is not based on an explicit consumer utility function. Using this model, the demand equation for locust beans was estimated without imposition of any restriction. From Table 4, the result of the test showed that in locust beans consumption, homogeneity condition was significantly violated, Durbin Watson statistics was within the plausible region. The adjusted $R^2$ is 76%. The budget share of locust beans (Lb) was taken as dependent variable and budget share of other selected condiments such as maggi $\mathbf{X_1}$, knorr $\mathbf{X_2}$, curry $\mathbf{X_3}$, thyme $\mathbf{X_4}$, onions $\mathbf{X_5}$, as independent variables.

The findings revealed that there is a direct and significant relationship between the prices of maggi (1%), knorr (5%), onions (1%) and budget share of locust beans (1%) while there is significantly indirect relationship between the total household expenditure (5%), curry (1%), thyme (5%) and budget share of locust beans. The statement means that the budget share of locust beans increases with an increase in price of maggi, price of knorr and price of onions, but the indirect relationship indicates that the budget share of locust beans decreases with an increase in price of curry, thyme and expenditure. In actual fact the budget share of locust beans has little or no significant effect on the total household expenditure, in the sense that small quota of the household budget is used for the purchase of locust beans which in turns makes its demand to be consistent.

**Table 3: Proportion of income used in Purchase of locust beans and its preferences**

| Variables | n(180) | % (100) |
|---|---|---|
| **Contributions from other members of household/ month** | | |
| None. | 72 | 40.0 |
| ≤ ₦2,000 | 27 | 22.2 |
| ₦ 2,001 – ₦ 10,000 | 36 | 30 |
| ₦ 10,001 – ₦ 20,000 | 08 | 4.4 |
| ₦ 20,001 – ₦ 30,000 | 03 | 1.7 |
| ≥ ₦30,001 | 03 | 1.7 |
| **Amount spent on locust beans/week** | | |
| None | 18 | 10.0 |
| ≤ ₦200 | 58 | 32.2 |
| ₦ 201 – ₦ 400 | 72 | 40.0 |
| ₦ 401 – ₦ 600 | 18 | 10.0 |
| ₦ 601 – ₦ 800 | 09 | 5.0 |
| ≥ ₦ 801 | 05 | 2.8 |
| **Amount spent on other condiments/week** | | |
| None | 30 | 16.7 |
| ≤ ₦200 | 72 | 40.0 |
| ₦ 201 – ₦ 400 | 54 | 30.0 |
| ₦ 401 – ₦ 600 | 18 | 10.0 |
| ₦ 601 – ₦ 800 | 06 | 3.3 |
| ≥ ₦ 801 | | |
| ***Condiments used** | | |
| Locust beans | 108 | 60.0 |
| Maggi | 90 | 50.0 |
| Knorr | 72 | 40.0 |
| Curry | 68 | 37.8 |
| Thyme | 54 | 30.0 |
| Onions | 153 | 85.0 |
| Garlic | 32 | 17.8 |
| Ginger | 18 | 10.0 |
| ***Reasons for using locust beans** | | |
| Taste | 54 | 30.0 |
| Medicinal value | 108 | 60.0 |
| Nutritional values. | 72 | 40.0 |
| ***Reasons for not using locust beans** | | |
| Appearance | 42 | 23.3 |
| Taste | 54 | 30.0 |
| Odour | 72 | 40.0 |
| Storage | 23 | 12.8 |
| Others | - | - |

Source; Field survey, 2022

**Table 4: Unconstrained parameter estimate and test of homogeneity for household demand for locust beans**

| Commodity | Constant | Locust Beans.. $L_1$ | Maggi $X_1$ | Knorr $X_2$ | Curry $X_3$ | Thyme $X_4$ | Onions $X_5$ | Expenditure | $R^2$ | DW |
|---|---|---|---|---|---|---|---|---|---|---|
| **Locust Beans** | 0.1532** (12.470) | 0.0002* (3.541) | 0.007** (4.116) | 0.032* (2.252) | -0.004** (-3.025) | -0.006** (-2.652) | 0.12** (2.945) | -0.0159* (-2.316) | 0.763 | 1.9873 |

Source: Computed from field survey, 2022

* represents 5% level of significance
** represents 1% level of significance
Values in parenthesis represent t-values

**Estimation of own price, cross price and income elasticity of demand for locust beans in the study area**

Table 5 reveals the estimation of own price elasticity of locust beans. The value which was -0.5743, was less than one and negative. This implies that locust beans has inelastic own price elasticity, an increase in the price of locust beans by 1% will decrease its demand by 0.57%, The changes in price of locust beans do not affect its demand. The negative sigh conforms to the law of demand and it's in line with the findings of Adetunji and Rauf (2011) who reported that own price elasticity of beef was -0.827, Ogunniyi et al, (2012) reported -0.68 for processed fruit. This indicates that households in this study area are insensitive to locust beans price changes because they consider the product as an essential one.

The positive sign of cross price elasticity shows that there exists a substitute relationship between locust beans and other condiments except the onions which has a negative sign. Expenditure elasticity has a value of 0.2244 which is also less than one and positive. When the figure is less than one it shows that the expenditure elasticity is inelastic and the sign indicates whether the product is a luxury (if negative) or necessity good (if positive). This implies that locust beans is a normal good (necessity) and expenditure inelastic, meaning that as the price of locust beans increases, consumers tends to spend proportionately less on it.

**Table 5: Own price, cross price and expenditure elasticity for locust beans demand**

| Elasticity | Locust Beans | Maggi | Knorr | Curry | Thyme | Onions |
|---|---|---|---|---|---|---|
| **Own- price** | -0.5743 | - | - | - | - | - |
| **Cross Price** | | 0.3683 | 0.0948 | 0.1924 | 0.2899 | -0.234 |
| **Expenditure** | 0.2244 | - | - | - | - | - |

Source; Computed from field survey, 2022

**Determinants of Household Demand for Locust Beans**

The result from the OLS regression analysis in Table 6 showed the influence of some variables such as age (AG), marital status (MS), household size (HS) and amount spent on other condiments (AC) on the household demand for locust beans (HD). Household demand for locust beans which is the dependent variable is measured by the amount spent on locust beans monthly. The findings revealed that the amount spent on other condiments (5%) and

the household size (5%) and age (1%) had effects on household demand for locust beans. This means that as the amount spent on other condiments increases, the demand for locust beans decreases and vice versa, this is because the variable carries negative sign. Meanwhile, as the age of the respondent and household size increase, the demand for locust beans will increase. All these are presented in Table 6.

**Table 6: Regression Results On Determinants Of Household Demand For Locust Beans**

| Variables | B | t-ratio | Significance |
|---|---|---|---|
| Constant | -153.34 | -0.23 | 0.981 |
| Age (AG) | 14.140 | 3.139 | 0.001** |
| Marital status (MS) | 3.86 | 0.319 | 0.75 |
| Household size (HS | 16.05 | 2.211 | 0.041* |
| Amount spent on other condiments. (AC) | -42.85 | -2.476 | 0.038* |
| | | | |

Source: Computed from field survey, 2022

Adjusted R-squares= 62.02%
Significant level at 5%----- *
Significant level at 1%----- **

## Conclusion and Recommendations

In conclusion, the findings revealed that most households in Oyo and Osun states demand for locust beans by spending substantial amount of money on it monthly. They preferred to use locust beans because of its flavour/taste, medicinal and nutritional values while others rejected it because of offensive odour, taste, storage and appearance.

It was discovered in the study areas that the amount of money allocated for the purchase of locust beans usually increases with an increase in prices of maggi, knorr and onions, but usually decreases with an increase in prices of curry and thyme. Its demand was inelastic and created a substitute relationship with other condiments except onions. Household demand for locust beans is also affected by the age of the household heads, household size and the amount spent on the selected condiments.

It is therefore recommended that more awareness should be created about the nutritional and health benefits of locust beans. There should be improvement on locust beans processing and packaging in order to eliminate offensive odour, add value to the taste and improve the appearance.

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