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ECONOMIC ANALYSES OF TRADITIONAL PROCESSING OF AFRICAN LOCUST BEANS (*Parkia biglobosa*) (Jacq.) Benth. SEEDS IN KADUNA METROPOLIS, KADUNA STATE, NIGERIA

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Abstract
The research was conducted in Igabi Local Government of Kaduna State to carry out economic analysis of traditional processing of African Locus Bean Seed (ALBS). Multi-stage sampling technique was used to select 100 respondents from 4 wards within the study area. Primary data were collected from the processors with the use of well structure questionnaires. The data collected were analysed with descriptive statistics, budgetary analysis and profitability analysis such as gross ratio, operating ratio and return per capital invested. The results showed that females (74.49%) dominated the processing of ALBS, married with active age of 41-50 years and household size of 11-15 members. They are educated and having 6-10 years of experience. The result of budgetary analysis showed that the processing of ALBS is profitable with net profit margin of ₦28,990.80 per respondent per month. The profitability analysis revealed that the ALBS processing is a viable and worthwhile venture to embark upon by the adults and youths. The major constraints of ALBS processing were low technology (94.90%), insecurity (92.86%), inadequate capital (90.82%), high cost of locust bean seeds (84.69%), felling/ burning of locust bean trees (82.65%), high transportation cost (82.65%) and low patronage (78.57%). The study concluded that the processors should increase their operations from small scale to medium and large scale by processing more ALBS to earn more profit.

Key Words: *ALBS, Budgetary Profitability, Analysis, Net profit*

Introduction

The importance of Non- timber Forest Products (NTFPs) in the livelihood of the rural dwellers cannot be overemphasized. NTFPs play key roles in the economy of many forest dependent households and also crucial to the economy of many developing countries like Nigeria. A good example of such NTFP is African locust bean seed (ALBS). The tree known scientifically as *Parkia biglobosa*, it belongs to the group of family called "*Fabaceae*" sub family "*Mimosoidea"* and genus *"Parkia"*. African locust bean (ALB) as a wild growing tree in most cases is found between 5°N and 15°N,

from the Atlantic coast in Senegal to southern Sudan and northern Uganda. The belt is widest in West Africa (800km) as it narrows to the east. The tree was introduced to the Caribbean region more than 200 years ago; it also grows in São Tomé and Principe, and in Guyana, while trial plantations have been established in Tanzania (Sina and Traoré, 2002).

The Locust bean tree is indigenous to West Africa and it is also called by different local names in different localities; for instance, in Serria Leone, it is known as "c*kinda"*, it is called "*kpalugu"* among the residents of Northern Ghana, recognized as "*Nere*" in Burkina Faso. "*Igi Igba"* in Yoruba land and "*worku*" in Ghana (Odunfa and Adewuyi, 1985; Diawara *et al.,* 2000). It is an important multipurpose tree of West Africa Savannah land that is widely known in West Africa. It produces many large pods which surrounded the fruits, the fruit is brown in colour at ripen stage and contains several black seeds embedded in yellowish sweet tasting pulp. This yellowish pulp can be used to make colourful and refreshing drinks. Its seeds are used as a coffee substitute and in making local doughnuts, while its leaves are used as vegetables in combination with other foods. Also in the dry area, locust bean trees serve as potential sources of food, edible oil, fodder, lumber, fire wood and green manure. The bark, leaves, flowers and root of the ALB tree is used medicinally to manage and cure illness and diseases. Also, the young flowers are mixed with salads. Furthermore, the fruit pulp and seed residues are used in making animal feeds. Indeed, the ALB tree is a multipurpose tree that is as highly valued as the Shea butter tree, *Vitellaria paradoxa,* (Shao, 2002; Sina and Traoré, 2002). The most important part of the tree is found in its seeds and the processed seed is a basic and therapeutic condiment for soup and source of wealth (Akintan *et al*., 2013).

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 fermented seed is known under different names throughout West African countries: as *iru* (Yoruba), *dawadawa* (Hausa), *ogiri or ugba* (Igbo), *soumbala* (Mali and Guinea), *netetou* (Senegal), *iru or sonru* (republic of Benin). Fermentation makes the food condiment palatable by enhancing its organoleptic properties; aroma, textures and flavour (Chelule *et al*., 2010). It makes food safe for consumers in terms of stability, transportation and storage (Chelule *et al.,* 2010).

Traditional processing of ALB seed among the processors is 'tedious, time-consuming, and energy-sapping for the women and children involved' (Olaoye, 2011). The process involves labour-intensive stages such as harvesting, de-podding, removal of the yellow pulp, cleaning, boiling, de-hulling, rewashing, and fermentation (Akande *et al*., 2010). In spite of the heavy labour involvement, especially during the dry season that is usually associated with water scarcity, ALBS processing has remained attractive to rural households in Nigeria, perhaps due to the fact that little financial outlay is involved since most processors harvest from wild-growing ALB trees (Campbell-Pratt, 1980, Rashid *et al*., 2014). However, the processors from urban and semi-urban areas mostly purchase the raw ALBS for processing.

According to Olapade-Ogunwole *et al*. (2011), a lot of challenges has been facing locust bean processing despite the advent of science and technology, traditional and crude method are usually employed by the processor, this limit substantial production due to problems associated with production processes, thus reducing profit margin from the business. Besides, very little or no information are available about the profit margin of urban and semi urban processors. It is against this backdrop the research was conceived with the following objectives: (i) to describe the socio-economic characteristics of the processor (ii) determine the profit margin of the processor (iii) analyse the profitability of locust bean processing and (iv) identify the constraints of locust bean processing in the study area.

Methodology

This study was conducted in Igabi Local Government of Kaduna State. The state is located between latitude 10°N and 12°N and Longitude 6°E and 10°E of the prime meridian. The state shares boundaries with Abuja in south-east, Katsina, Kano, Zamfara, Nassarawa, Plateau state in the North-East and Niger in the North-West. The climate varies from north to southern part of the state. The mean annual temperature varies between 24°C and 28°C. The length of rainfall varies from 150 day to 180 days with annual rainfall ranging between 1500mm and 2000mm north and south respectively. Relative humidity is low ranging between 20% and 40% in January rising to between 60% and 80% in July. The vegetation is divided into northern guinea savanna in the north and southern guinea savanna in the south. One of the major economic activities of the people is processing and marketing of agricultural products. The major crops processing and marketing are rice, guinea corn, millet, maize, groundnut, pepper and soya-beans.

Multi-stage sampling technique was employed in the study. In the first stage, Igabi Local Government was purposively selected because it is well known for the production of ALB seeds. In the second stage, four wards were randomly selected. The selected wards are Rigassa, Sabon birnin, Rigachikun and Mando. Then, from each ward twenty (20) processors were randomly selected to make a total number of one hundred (100) processors as sample size.

The Primary data used for this study were collected from the processors by personal interview method with the aid of well-structured interview schedule. The questionnaires were prepared in line with the objectives of the study and consist of open ended and closed ended questions. The questionnaires were pretested among fifteen (15) processors who are not included in the main survey. This was done to have clue to the time it took to get the questionnaire completed and to make necessary adjustment to the wording of the questions, note and gets more responses to different categories of questions by the respondents and other issues that may arise before drawing up the final questionnaire. The pre-test of questionnaire was done to ascertain the reliability of the instrument. The final questionnaires were administered to the respondents and responses were recorded.

The data collected from 98 processors whose responses were found worthy for analysis were analysed with descriptive statistics, budgetary techniques and profitability analysis. Descriptive statistics such as mean, frequency

distribution, tables and percentages were used to achieve specific objectives i and iv. Budgetary analysis was used to determine the profit margin of the processor that is specific objective ii. The model for budgetary techniques is given below:

$\pi = TR - TC$ ..... equation i

$TR = Q_{LB} \times P_{LB}$ ..... equation ii

$TC = TVC + TFC$ ..... equation iii

Where;

π = Net profit (₦), TR = Total Revenue (₦), Q_{LB} = Quantity of processed locust beans (condiments) in kg, P_{LB} = Price per kg of processed locust beans (condiments) in naira

TVC = Total Variable Cost of processing ALB (₦), TFC = Total Fixed Cost of processing ALB (₦)

The fixed assets used in the processing of ALB were depreciated by using straight line method of depreciation.

$$D = \frac{Oc - Sv}{N}$$

Where,

D = Depreciation, Oc =Original cost the assets (₦), Sv = Salvage value of the assets (₦)

N = Life expectancy of the assets

Profitability analysis of ALBP, specific objective iii was evaluated with gross ratio, operating ratio, expense structure ratio and return per capital invested following Olukosi and Erhabor (2005), Alabi and Abdulazeez (2018) and Ariyo and Usman (2020). Gross ratio is used to evaluate the overall financial success of the business. The lower or the smaller the value of gross ratio, then the higher the return per naira invested. The rule says a gross ratio less than one (< 1) can be said to be desirable or good for any business. An operating ratio that is less than one (< 1) in this case indicates that the total processing income (Gross income) can off-set the cost of variable input used in the processing of ALBS (Olukosi and Erhabor, 2005, Alabi and Abdulazeez, 2018, Ariyo and Usman, 2020). The ratios are estimated as follows:

GR= TPC/ GI, Where, GR= Gross Ratio (Unit), TPC= Total Processing Cost (₦), GI= Gross Income (₦).

OR= TVC/ GI, where OR= Operating Ratio, TVC= Total Variable Cost of processing (₦), GI= Gross Income (₦)

ESR= TFC/ TVC, where ESR= Expense Structure Ratio, TFC= Total Fixed Cost of processing (₦), TVC= Total Variable Cost of processing (₦)

RNI= NMP/ TPC where, RNI= Return per Naira Invested, NMP= Net Marketing Profit (₦), TPC = Total Processing Cost (₦)

Results and Discussion

Socio- Economic or Demographic Characteristics of African Locust Bean Processors

The socio-economic or demographic variables of the respondents on Table 1 showed that 74.49% of the processors were female and 25.51% were male. This revealed that females are more in the traditional processing of ALBS in the study area than female. This corroborates the reports of Farayola *et al*. (2012) which found that female (88.30%) dominated the processing and marketing of locus beans processing in Ilorin, Kwara State. Also, this finding agreed with Rashid *et al*. (2014) which stated that ALB processing is seen as a feminine occupation in most parts of Nigeria.

Age is one of the factors that determine the maturity and seriousness of an individual in a business. From the table, mature people seem to be more involved

in the processing of ALB, having 54.08% and are within the active age of 41-50 years. 25.51% and 11.22% are within age range of 31-40 and 21-30 respectively. Only 9.18% of the processors are within 10-20 years of age. The marital status revealed that 56.12% of the ALB processor are married, 32.65% are single while 8.16% and 3.06% are widow and widower.

The highest household size of the processors was found in 11-15 members, this accounted for 46.94%, this was followed by 32.65% which had household size of 6-10 members, 17.35% of the processors had household size of 1-5 members. Only 3.06% had the least household size of 15-20 members. This showed that the processors had a large household size which could translate to labour during processing of the ALBs and thereby reduce the cost of hired labour by the respondents. Rashid *et al*. (2014) stated that the processing of ALBS is labour intensive and most processors make use of family labour only to reduce processing cost. He further stated that women provide over 70 percent of the labour required in processing ALBS, indicating that ALBS processing is a female-dominated occupation both in number of processors and supply of labour in Nigeria.

The educational level of the respondents revealed that 74.49% of the respondents had education at all levels ranging from primary to secondary and tertiary. Similar report was made by Farayola *et al*. (2012). Majority (40.82%) of the processors in this study had secondary education, 28.57% had primary education while 5.10% had tertiary education. The percentage of processors with non-formal education was put at 25.51%. Rashid *et al*. (2014) opined that young men and well-educated people are less attracted to the business of ALB processing. Though majority of the respondents are educated but do not keep records of their processing activities bud depends on memory recall in answering questions that were asked. Some of them are reluctant, afraid and not willing to give out information about their bio- data and processing activities because they felt the study cannot benefit them.

The highest years of experience (65.31%) was found in the group of 6-10 years. This is in line with the finding of Rashid *et al*. (2014) which stated that three-quarters of his sampled respondents had been involved in ALB processing for over ten years. 25.51% of the processors in this study had 1-5 years of experience while only 9.18% had 11-15 years of experience. This showed that the processors have adequate years of experience and can give reliable information in the processing of African Locust Beans Seed.

In terms of access to credit facilities, only 10.20% of the processors had access to credit while a larger proportion of 89.80% do not have access to credit facilities. Non accessibility to credit by the processors of ALBs will limit the expansion of the business and affects the level of profit generated by the processors.

Table 1: Distribution of socio- economic or demographic characteristics of sampled ALBP

Variable	Frequency	Percentage
Gender		
Male	35	25.51
Female	73	74.49
Age		
10-20	9	9.18
21-30	11	11.22
31-40	25	25.51
41-50	53	54.08
Above 50		
Marital status		
Single	32	32.65
Married	55	56.12
Widow	8	8.16
Widower	3	3.06
Household size		
1-5	17	17.35
6-10	32	32.65
11-15	46	46.94
16-20	3	3.06
Educational level		
Primary education	28	28.57
Secondary education	40	40.82
Tertiary education	5	5.10
Non-Formal education	25	25.51
Years of experience		
1-5	25	25.51
6-10	64	65.31
11-15	9	9.18
Access to credit facilities		
Yes	10	10.20
No	88	89.80

Budgetary Analysis of African Locust Bean Processor

The budgetary analysis of African Locust bean processor was presented on Table 2. The table revealed that the average variable cost incurred per respondent was ₦56,435.59 and average fixed cost of ₦3,194.33. The average total cost of ₦59,629.92 was incurred per processor. Cost of raw African locust bean seeds constituted the highest variable cost of 85.06%, followed by labour cost which formed 6.42%. According to Rashid *et al*. (2014), traditional ALB processing is labour intensive and the total labour cost amount to 38% of the total variable cost and 31% of the total cost of processing ALB seeds in their study area. In this present study, transportation cost, cost of packaging and firewood had their share of variable cost of 4.08%, 2.19% and 1.62% respectively while cost of salt formed the

lowest variable cost of processing with 0.82%.

Among the fixed cost of processing African locust bean, cost of cooking pots had the highest value of 26.09%, followed by cost of buckets 21.13% and bowl 15.34%. Cost of knife, sieve, bags and calabash had 12.40%, 12.00%, 9.39% and 3.65% respectively. In terms of the average total cost of processing, cost of raw African locust bean seeds formed the highest cost, constituting 80.50%, this was followed by labour cost which accounted for 5.91%. This showed that the traditional method of ALB employed by the processor is labour intensive. Similar report was made by Rashid *et al*. (2014). The cost of bags and calabash formed the least average total cost of processing ALB, having 0.50% and 0.20% respectively. Total variable cost constituted the highest average total cost of processing (94.64%) and 5.36% accrued to fixed cost. This implies that increase the total variable cost of processing most importantly, the cost of raw African locust bean seeds by purchasing more quantity will increase the level of output of processed locust bean. The quantity of ALB processed (condiment by the respondent was 104.18kg with a price of ₦850.65/kg this gives gross income of ₦88,620.72 and a net profit margin of ₦28,990.80 per respondent per month. This showed that the processing of African locust bean in the study area is profitable. Generally, the analysis of inputs and output of the business showed that the investment in the processing of ALBS is very low and this explained the low profit generated. Low investment will always bring low return.

Table 2: Budgetary Analysis of African Locust Bean Processor in the study area

Variables	Quantity (Kg)	Unit price	Gross income (₦)	Cost (₦)	% VC	% TMC
A. Gross Income	104.18	850.65	88,620.72			
B. Variable cost						
Cost of raw seeds	106.36	451.33		48,003.46	85.06	80.50
Transportation cost				2,300.40	4.08	3.86
Labour cost				3,523	6.24	5.91
Cost of packaging				1,234.03	2.19	2.07
Cost of firewood				912.80	1.62	1.53
Cost of salt				461.90	0.82	0.77
C. Total Variable cost (TVC)				**56,435.59**	**100**	**94.64**
D. Fixed cost					**% FC**	
Knife				396	12.40	0.66
Bowl				490	15.34	0.82
Sieves				383.33	12.00	0.64
Bags				300.00	9.39	0.50
Buckets				675	21.13	1.13
Cooking pots				833.33	**26.09**	1.40
Calabash				116.67	3.65	0.20
E. Total Fixed Cost				**3,194.33**		**5.36**
Total Processing Cost (TPC)= C +E				**59,629.92**		**100**
Net Marketing Profit (NMP)				**28,990.80**		

Profitability Analysis of African Locust Bean Processing

The profitability analysis of ALBS processing was achieved using gross ratio, operating ratio, expense structure ratio and return per naira invested (Table 3). This was done to know the financial position and strength of the business (ALBS processing) that is, if the business is worthwhile or not to embarked upon. From Table 3, 0.67 and 0.64 was obtained for gross ratio and operating ratio while expense structure ratio and return per capital invested gave a value of 0.05 and 0.49 respectively. The overall financial success of ALBS processing was determined by the gross ratio. The gross ratio is expected to be low for higher return per naira invested. The gross ratio of 0.67 indicates that 67% of gross income of ALBS processors went to offset total processing cost. It also implies that for every ₦100 return in the processing of ALBS, ₦67 has been spent, this is appropriate. Olukosi and Erhabor (2008) stated that the lower the value of gross ratio, the higher the gross income on naira invested. The 0.64 value of operating ratio implies that 64% of the gross income goes to cover the total variable cost of processing. The expense structure ratio of 0.05 signifies that 5% of the cost of processing ALBS constituted the fixed cost components. This makes the enterprise desirable since increase the variable inputs such as ALBS will increase the variable cost and output leaving the fixed cost unchanged. The return per capital or naira invested signify that for every ₦1.00 invested in ALBS processing, ₦0.48k profit will be obtained. The above indices indicates that ALBS processing business is a worthwhile business to embarked upon.

Table 3: Profitability Analysis of African Locust Bean Processing

Profitability variables	Ratio
Gross ratio	0.67
Operating ratio	0.64
Expense structure ratio	0.06
Return per naira invested	0.49

Constraints of Traditional Processing of African Locust Bean Seeds

The constraints of traditional processing of locust bean seeds are presented on table 4 in order of their magnitude. Ten constraints were reported by the processors militating against the traditional processing of African locust bean. These are low technology, insecurity, inadequate capital, high cost of locust bean seeds and low patronage. Other includes high transportation cost, felling/ burning of locust bean trees, bad road, inadequate/ unavailability of labour and storage problem. Low technology of processing the locust bean had the highest constraint of 94.90%. This could be due to the fact that the processors depend mainly on conventional method of processing which is tedious, time consuming and labour intensive, however, 5.10% of the processors stated that low technology is not a problem. Insecurity in the nation is another constraint which accounted for 92.86%. This hindered the processor from either travelling to purchase the ALBS or collecting the seeds from the wild. Inadequate capital as in any other business ventures is a constraint faced by most of the processors, having 90.82%. This limits the expansion of the business and reduces the scale of operation of the processors. Only 9.18% of the processor do not have capital problem. High cost of locust bean seeds had 84.69%, this could be due to

scarcity of the seed caused by felling/ burning of locust bean trees which had 82.65% and because some of the processors depend on collection of seeds from wild- growing locust bean trees which is gradually dwindling. The trees of locust bean are being gradually felled/ burnt by the firewood and charcoal merchants all over because of their suitability of hard wood. On the other hand, 15.31% and 17.35% of the processors are not faced with the problems of high cost of locust bean seeds and felling/ burning of African locust bean trees. High transportation cost which could emanate from bad road network (76.53%) accounted for 82.65% of the constraint while 17.35% and 21.43% of the processors do not have problem of high transportation cost and bad road network. High transportation cost added to the cost of processing ALBS and increase the cost of production of the condiments which in turn reduces the profit margin of the processor. 78.57% of the processors complained of low patronage from customers. This could be caused by civilization of the people. African locust bean is an ancient spice which may not be known by majority of the people and competition from other foreign food spices and industrial manufactured seasonings products coupled with the crude method of processing could reduce its marketability and profitability. 21.43% of the processors do not have problem of low patronage. Majority (66.33% and 68.37%) of the processors does not have problem of inadequate/ unavailability of labour and storage problems. This is because they have large family size and depend on family labour for the processing operations. The processors have devised a cheap method of preventing the ALBS condiments from deteriorating by salting, this preserves the condiments from spoilage for some period before marketing.

Table 4: Distribution of Constraints of Traditional Processing of African Locus Bean Seeds

S/N	Constraints	Yes	No
1	Low technology	93 (94.90)	5 (5.10)
2	Insecurity	91 (92.86)	7 (7.14)
3	Inadequate capital	89 (90.82)	9 (9.18)
4	High cost of locus bean seeds	83 (84.69)	15 (15.31)
5	Felling/ burning locus bean trees	81 (82.65)	17 (17.35)
6	High Transportation cost	81 (82.65)	17 (17.35)
7	Low patronage	77 (78.57)	21 (21.43)
8	Bad road network	75 (76.53)	23 (23.47)
9	Inadequate/ Unavailability of labour	33 (33.67)	65 (66.33)
10	Storage problem	31 (31.63)	67 (68.37)

Figures in parenthesis are percentages

Conclusion and Recommendations

The study concludes that females (74.49%) are more involved in the processing of African locust bean, with the highest age range of 41-50, married having the highest household size of 11-15 members. They had secondary school education and years of experience of 6-10 years. Generally, the revenue obtained from the processing of ALBS is higher than the cost of processing, thus the processing of African locust bean seeds is lucrative, viable, worthwhile and profitable with net profit of ₦28,990.80 per respondent per month in the study area. Though the net profit obtained is a bit lower than the minimum wage of ₦30,000.00, however the net profit obtained by the processor from the business are used to take cares of their pressing needs but may have little or nothing left for saving. This account for the perceived vicious of poverty the processors find themselves and low standard of living in the study area. The processing of ALBS in the study area is a small-scale business which contributes to its low return. It can further be established that the processing of ALBS in the study area is crude, labour intensive and time consuming and are associated with constraints such as low technology, insecurity, inadequate capital, high cost of locust bean seeds, felling/burning of locust bean trees, high transportation cost, low patronage and bad road network.

The following recommendations were made;

i. The processing of ALBS is profitable, adults and youths are encouraged to venture into the business instead of been idle and looking for the white collar job which is not available.
ii. The farmers and processors should be encouraged by the government to give attention to the planting and cultivation of locust bean trees; this will ease the scarcity of the locus bean seeds and make it available to the processors and also increase their revenue.
iii. Research should be embarked upon by various research institutes, universities and non-governmental organisations into high yielding varieties of ALB trees to ensure more seeds availability. Over- reliance on collection of seeds from the wild-growing locust bean trees should be discouraged. Also, research into machines and equipment that will be efficient for modern processing of ALBS thereby eliminating fatigue, time wasting and energy-sapping associated with traditional method of processing should be given attention
iv. Rules and regulations against felling/ burning of locust bean trees for firewood and charcoal and any other use apart from fruits and seeds production should be put in place and enforced to prevent the felling of the locust bean trees for alternative uses
v. The ALBS processors should be encouraged to scale up their processing activities from small scale to medium and large scale by investing more into the business to earn more profits thereby improving their standards of living.
vi. The ALBS processors should synergies and form cooperative society where they can collect resources together and obtain loan from it at lower interest rate. Also, commercial bank should provide loan to the ALBS processors at lower

interest rate to finance and expand their business to earn more profit.

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