Economic analysis of locust bean processing and marketing in Iwo local government, Osun state.

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Abstract

This study was designed to estimate the economic analysis of locust bean processing and marketing in Iwo Local Government Area of Osun State, Nigeria. Primary data was used and purposive sampling technique was adopted to select the respondents used for the study. A total number of 60 respondents were interviewed. The data collected were analyzed using inferential statistical tool such as regression analysis. Budgetary analysis technique was also used to analyze the profitability of locust bean processing and marketing in the study area. Majority (78.3%) of the processors and marketers were making profit; 95.0% operate above break even point while 3.3% operate at break even point this indicates that they neither gain nor loss. The regression analysis result shows that quantity processed and years of experience in processing were significant at 1% and 10% respectively, while stall rent was significant at 5%. F-test also explained that independent variables are jointly significant at 1% probability level with an adjusted R^2 of 79.8%. It was therefore concluded that locust bean enterprise is profitable and attention should be focused on boosting quantity of locust bean seeds available for processing and the revenue from its' sales through cultivation and planting of more locust bean trees.

Keywords: *Locust bean, processing, marketing, Iwo, Budgetary techniques, Regression analysis.*

Introduction

African locust bean tree "*Parkia biglobosa*" belongs to the family "*Fabaceae*" sub family "*Mimosoidea*" and genus *"Parkia"*. The plant was named after Mungo Park by Robert Brown in 1826. The tree is widely recognized in West Africa as an important multipurpose tree of West Africa Savannah land. The most important part of the tree is found in its seeds and the processed seed is used as condiment for soup. It is a source of natural nutritious condiment which features frequently in the traditional diet of the people (Fagbemi, 1989). Apart from the flavoring attribute of the processed locust bean "Iru", it also contributes significantly to the intake of protein, essential fatty acids, particularly Vitamin B, riboflavin and Vitamin A (Odunfa and Adewuyi, 1985). Locust bean is native to West Africa and it is also called by different local names in different localities; for instance, it is referred to as *"kinda"* in Serria Leone, *"kpalugu"* among the inhabitants of Northern Ghana, "*Nere*" in Burkina Faso. "*Igi Igba*" in Yorubaland and "*worku*" in Ghana. (Odunfa and Adewuyi, 1985; Diawara *et al.*, 2000). The tree produces many benefits, it produces

fruits which are enclosed in numerous large pods, and it tolerates a wide range of alluvial, sandy and lateritic soil, and also resists pest and diseases, survives fires and strives in full sun and tropical heat. Within Africa, clearly its prospects are greatest in West Africa, where the trees are planted and its products are known and loved. The fruit is brown in colour when ripe; it contains numerous black seeds embedded in yellowish sweet tasting pulp. This yellowish pulp can be made into colourful and refreshing drinks. Also in the dry area, locust bean trees serve as potential sources of food, edible oil, fodder lumber, fire wood and green manure. It was estimated that about 200,000 tons of Africa locust beans seeds are gathered each year in Nigeria alone, as well as large quantities are produced in the savannah region of Oyo, Osun and Kwara States of Nigeria (Onnyi *et al*., 2004). The seeds are the most valued product of the tree. It generates reliable and dependable income for the farmers and women who are involved in its processing and marketing. The processed bean known as "Iru" is a popular food condiment common in West African countries. It adds flavor and taste to soup, sauces and stew. It also serves as a source of protein supplements in the diet of a poor family especially in rural areas

(Diawara *et al.,* 2000). It is unfortunate that locust bean is fast losing its popularity to some other flavoring agents whose nutritive value cannot be compared with that of Dawadawa. The Federal Office of Statistics in 2003 reported that about $200 million is spent annually on imported food flavor in Nigeria with a projection of 15% annual future increase despite the fact that, traditionally procedure flavoring products have lower caloric value and higher dietary protein content than imported food flavor. This situation may be a result of short life of the product, the product odour and the poor product quality due to the poor manufacturing practice. Locust bean processing and marketing has been facing a lot of challenges despite the dawn of science and technology. Processing is still largely done in a traditional and crude way by women; the production has not increased substantially due to problems associated with production processes; there is no standard measurement or grading of the condiment for sale so as to know whether the condiments are properly utilized for profit maximization. It is therefore necessary to examine the factors affecting productivity level of locust bean in the area of study, cost and returns associated with its' processing and marketing.

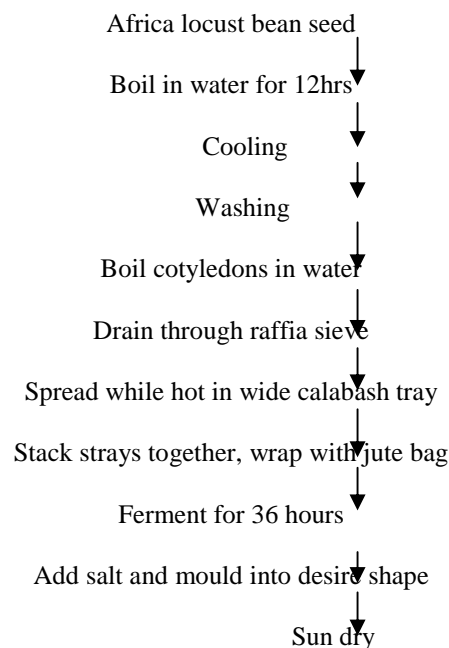**Table 1: Nutritional composition of locust bean seed**

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

Source: Odunfa and Adewuyi, 1985.

Processing and Fermentation of Locust Bean

The production of locust bean condiment, "Iru" is essentially practiced as a rural cottage industry mainly by women. The harvested bean seeds are mainly sold in markets to women who processed them. Seven stages of locust bean processing operation were described by Oni (1997); these stages are: shelling, pre-drying, pounding, winnowing or sieving, washing, drying and visual sorting. Furthermore, the chart below presents the traditional method of processing locust bean as stated by Odunfa and Adewuyi (1985).

Africa locust bean seed

↓

Boil in water for 12hrs

↓

Cooling

↓

Washing

↓

Boil cotyledons in water

↓

Drain through raffia sieve

↓

Spread while hot in wide calabash tray

↓

Stack strays together, wrap with jute bag

↓

Ferment for 36 hours

↓

Add salt and mould into desire shape

↓

Sun dry

Source: Odunfa and Adewuyi, 1985

Modern Method of Processing Locust Bean

Studies have been conducted on reducing the cooking time. However; the improved way of processing locust bean has removed the boring routine practices and has been able to produce a better product. The use of pressure cooker has reduced the rigor of boiling for 2hours. Dehuller and seperator – Dual purpose equipment has drastically reduced the traditional method of production of between 4days-6days to 4hours; having production capacity of 1500kg (Audu *et al.,* 2004).

Fermentation: The use of an incubating material set up at optimum temperature and relative of $350^{o}c$ has been discovered to reduce the time and also have better sensory properties than the one fermented locally (Adewumi and Igbeke, 1992). The physical properties of the incubating material used to determine the rate of fermentation the higher the porosity the higher the rate of fermented organ and faster the rate of fermentation. (Onnyi *et al*., 2004).

Table 2: Comparative Proximal Chemical Composition of Iru Produced Locally and sample from FIIRO.

Components (%)	Unfermented locust bean sample	Fermented locust bean	FIIRO
Crude protein	30	44.2	45.3
Fat	15	28.4	31.2
Carbohydrate	4.9	16.4	15.9
Crude fiber	3.1	6.9	4.6
Ash	2.9	4.1	3.0

Source: Onnyi *et al*., (2004).

Preservation of Fermented Locust Bean

Iru may be preserved by grinding in a thick paste before mould into ball or circular platelet followed by sun dry. Spices, additives such as salt are incorporated before molding the final product while sun drying is undertaken, to facilitate its stabilization. Also, humectants, sugar, salt create unfavorable condition for micro organism and they retain nutrients to a desirable extent. Iru is very rich in protein and used as a meat substitute in many poor home of West Africa, since it proved meaty flavor in addition to stew and soup (Campbell-platt, 1986). The average daily intake in northern Nigeria is about 1.4% if the daily calories and 5% of the total protein and is the single largest source of protein in the average diet of the inhabitant of Zaria in the Northern Nigeria (Odunfa and Oyewole, 1981); its decline in popularity especially among the growing urban population has lead to rapid increases in the import of foreign soup flavor and its efficient preservation method has lead to the necessity to modernize production technique and optimize preservation method by the addition of preservatives.

Objectives of the Study

The main objective of the study was to determine the economic analysis of locust bean processing and marketing in Iwo Local Government Area of Osun state, Nigeria. However, the specific objectives are to:
-       identify the personal and socio-economic characteristics of the respondents in the study area.

-       identify the indigenous way as well as the modern or improved ways of processing locust bean.
-       determine the profitability of the locust bean enterprise.

Hypothesis of the study

Null hypothesis (H_0): There is no significant relationship between the quantity processed by processors and the net revenue.

Materials and Methods
The Study area

The study was carried out in Iwo Local Government Area (L.G.A) of Osun State. The area is situated at the western part of Osun State with headquarter located at Iwo. Iwo is situated at a distance of about 36km away from Oyo, 48km away from Osogbo and 44km away from Ibadan. It lies on latitude $7^0 3^1$ and longitude $4^0 9^1$. It shares boundaries with Lagelu Local Government in the west, Ayedire Local Government in the east. Iwo Local Government falls between the vegetation zone of dry forest savannah and having the cover of long grasses with trees especially Acacia. Iwo Local Government Area covers a large hectare of land and was recorded as the Local Government with highest population in Osun State in the year 2006 census. The inhabitants of this area are predominantly Yoruba with few Hausa, Igbo, Fulani and their major occupations are farming and trading. The major market in Iwo is Odo ori where the research was carried out; though there are other markets like ologunebi, owode, ogburo, Oja oba, Oja Oluwo. But Odo ori market is the major place where marketing

of Iru usually takes place; other markets are mainly for farm produce sale.

Sampling procedure and sample size

A purposive sampling technique was used to select 60 respondents for this study. Odo-ori market was chosen out of the markets in the local government; because it is the major market where its' marketing usually takes place.

Research Instrument

Majority of the respondents (processors and marketers) are illiterates; hence, structural interview schedule was used to collect the information on personal and socio-economic characteristics, processing and marketing as well as cost and returns.

Data analysis

Regression analysis was used to estimate the relationship between selected socio-economic variables and the net revenue. Also, enterprise budgetary analytical approach was used to estimate cost and return in Locust bean processing and marketing so as to be able to know the net profit of the processors/marketers. According to Adegeye and Dittoh (1985), Profit is defined as the net flow of income. Thus, how profit is measured depends on what measure chosen to be used; in essence, profit indicates whether a business is worthwhile doing or not. Benefit Cost Ratio and Rate of Return were used to measure the profitability and determine the worthwhileness of locust bean enterprise.

Profit = Total Revenue – Total cost; i.e π = TR – (TFC + TVC), The Gross margin equation is given as: GM = TR – TVC = P.Q – TVC; where: GM = Gross margin (N), TR = Total Revenue (N), P = Price of processed locust bean (N), Q = Quantity of locust bean processed (kg), TVC = Total Variable cost i.e. cost incurred in processing and marketing locust bean e.g cost of raw materials, transportation cost, TFC= Total fixed cost i.e expenditure incurred on fixed assets used in processing and marketing e.g calabash, pot-sieve e.t.c

Benefit Cost Ratio (BRC): is another measure of profitability. It was used to evaluate and confirm the profitability of each respondent of locust bean processors and marketers. The formula is stated as;

BCR = Total Revenue (Benefit) ÷ Total cost

Investment criteria require that BCR should be greater than [BCR > 1] before a business can be termed profitable (Adegeye and Dittoh, 1985).

Rate of Return (ROR): This is another measure used to determine the worth-whileness of a business.

Rate of Return = TR – TC ÷ TR; hence, the higher the rate of return, the more profitable the business is.

Regression Analysis: This is used to predict the value of the dependent variable given the values of the independents variables; thus, it measures the degree of association between two or more variables. The model for this analysis is given below as: Y = f (X$_1$, X$_2$, X$_3$, X$_4$, X$_5$, X$_6$) where:

Y = Estimated Net Revenue (N), X_1 = Age (yrs), X_2 = Marital status, X_3 = Stall rent (N), X_4 = Quantity processed (kg), X_5 = Years of experience, X_6 = Transportation Cost (N).

Results and Discussion

Regression analysis showing the relationship between selected personal and socio-economic characteristics of the respondents and the net revenue.

Regression analysis result as presented in Table 3 shows that, the coefficients of quantity processed and years of experience in the enterprise are positive and significant at 1% and 10% level of significance respectively while the coefficient of market stall rent is negative and significant at 5%. The implication of all these is that, the higher the quantity processed, the larger the net revenue obtained; then, the more the years producers spend in business, the more the net revenue. Stall rent is significant but has an inverse relationship with the net revenue as expected; all these are in conformity with a-priori expectation. The co-efficient of determination of 0.789 implies that, the independent variables explained 78.9% of the total variation in the dependent variable which is the net revenue, while the remaining 21.1% is attributed to other factors not included in the model i.e. error term. The F-value was found to be significant at 1%; this implies that all the explanatory variables taking together have significant effect on the net revenue. Therefore, the null hypothesis is hereby rejected.

Table 3: Regression analysis result

Model	Variable	Beta	t-Test	Significance
	Constant	4.788	5.039	.000
X_1	Age	0.248	1.039	3.03
X_2	Marital status	3.208	0.402	.689
X_3	Stall rent	-4.6	-2.065**	.509
X_4	Quantity processed	.957	11.376***	.000
X_5	Years of experience	.174	1.761*	.099
X_6	Transportation cost	-6.35	-.067	.34

a. Dependent Variable: Net Revenue
n = 60
R^2 = 0.803 = 80.3%
Adjusted R^2 = 0.789 = 78.9%
F-value = 37.742
 * - Statistically significant at 10% probability level
** - Statistically significant at 5% probability level
*** - Statistically significant at 1 % probability level.

Cost and Return Analysis

The profitability of locust bean processing and marketing enterprise was assessed using cost and return analysis. Total cost of each respondent was computed and Total revenue was estimated to determine the profitability of the processed locust bean enterprise. From the result of the analysis, the annual total cost of 60 respondents of the locust bean processors and marketers was calculated (using straight line depreciation method to compute the total fixed cost) and the total revenue was estimated to be:

TFC = ₦ 50,604.78, TVC = ₦ 3,040,357.08, TC = ₦ 3,090,961.86, TR = ₦ 5,435,150

Therefore, the profitability of the enterprise is calculated as $\pi = TR - TC$

₦ (5,435,150 - 3,090,961.86) = ₦ 2,344,188.14

Gross margin = Total revenue – Total variable cost; i.e GM = TR – TVC = ₦ (5,435,150 – 3,040,357.08)

= ₦ 2,394,792.92,

Investment Analysis

In order to further test for the profitability of the marketers and processors in the enterprises, the benefit cost ratio analysis and rate of return to naira analysis were computed. It could be observed from Table 4 that 95% of the processors and marketers operate above the break even point while only 1.7% operates below break even point and 3.3% operates at break even point i.e. they neither gain nor lost. This shows that the business is profitable since majority of the respondents are making profit.

Table 4: Benefit cost ratio analysis

BCR	Frequency	Percentage
<1	1	1.7
1	2	3.3
>1	57	95
Total	**60**	**100**

Source: Field survey, 2009.

The result in Table 5 shows that, larger percentage 70% of the respondents realized between 60k - ₦1 as profit on every ₦1 invested in processing and marketing and 8.3% realizes more than ₦1 on every ₦1 invested, and only 1.7 run the business at lost. This shows that locust bean enterprise is a worthwhile business.

Table 5: Return on Investment analysis

Return on investment	Frequency	Percentage
<0	1	1.7
0 - 0.5	12	20.0
0.6 - 1	45	70
>1	5	8.3
Total	**60**	**100**

Source: Field survey, 2009.

Conclusion

The study concludes that Locust bean processing and marketing forms an essential compound of the rural cottage industry as the processors and marketers consider the net revenue derived from the enterprise as being sustainable to cater for their immediate needs; but in actual fact, the net revenue respondents consider as being sustainable only cater for their immediate needs with little or nothing left for saving; this accounts for the perceived vicious circle of poverty the respondents find themselves in; because low investment brings about low returns. In carrying out this study, it was observed that majority of the respondents could not read nor write which accounts for the use of memory estimate in answering some of the questions being asked and as such felt reluctantly in answering the interview questions, some respondent were afraid to give some of their personal bio-data and some perceived the survey to be a time wasting exercise. Hence, the result of the research revealed that locust beans processing/marketing enterprise in Iwo L.G.A is a small scale enterprise which contributes to its low net revenue. It is therefore concluded that profit made by the processors and marketers can be improved on by increasing the quantity of locust bean being processed through adoption of the following recommendations:

Recommendations

- Planting and cultivation of locust bean tree needs to be given adequate attention and encouraged by government so as to boost availability of the locust bean seeds since quantity of locust bean processed and offered for sale was found to be positively significant to the revenue.
- Dual purpose equipment (dehuller and seperator) suggested by Audu *et al.,* (2004) should be made available in the markets at affordable and subsidized price by government so as to reduce the time spent on locust bean processing and improve on the quantity produced because the equipment has a very high production capacity; this will ultimately affects the revenue positively.
- There is need for provision of more markets in strategic locations across the L.G.A where marketing of locust bean can take place as against its' concentration in one market; this will reduce the transportation cost incurred from the point of production to the particular market where its' marketing takes place in the study area.

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