

BUSINESS BENEFIT CONCERNS OF WOMEN PROCESSORS OF AFRICAN LOCUST BEAN SEEDS FOR POVERTY REDUCTION IN ENUGU STATE-NIGERIA**F.O. Ifeanyieze^{1*}, G. Nwapakadolu² & F. Nwareji³**

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ABSTRACT : *The study was carried out to find solution to the business benefit concern of women processors of African locust bean seeds for poverty reduction in Enugu state-Nigeria. Three research questions guided the study. Survey and Quasi-experimental design was adopted by the study. The sample for the study was 326 made up of customers from Ogbete (150), Obollofor (80 and Ogige (96) markets all in Enugu state. The instruments for data collection were interview schedule, counterfactual questionnaire items, interest inventory and experimental records. Data were collected by the researchers with the help of two assistants selected based on their familiarity with the study area and ability to interpret the questionnaire items in local dialects of the respondents. Percentage was used for quality analysis of the interview schedule (phase 1A), mean was used to answer research questions one (phase 1B) and three while market record was used to answer research question two. The study found out that customers rejected machine processed locust bean because of sour taste, low keeping quality and contamination among others. The study also showed that when the limitations of machine processed locust bean were eliminated through experiment, customers' demand for the product increased which was indicated by the interest inventory data. The study therefore recommended that workshop should be organized at the local levels by extension officers for re-training of women processors and machine operators using the identified steps in the experimented processing of locust bean seeds to help overcome the business concerns of the women for poverty reduction in the Enugu state.*

KEYWORDS: business, processing, poverty, locust bean, counterfactual factors

INTRODUCTION

In many parts of Nigeria, African Locust Beans (ALB) is a popular delicacy especially as there is a growing interest in natural food ingredients as additives in consumer diets. The African Locust Beans (*Parka biglobosa*) is a perennial leguminous tree plant that bears elongated round flowers (fig a), which develops into sweet flavoured yellow-pulpy pods enclosing the seeds (fig b-d). The tree is often planted by peasant farmers and rural dwellers for its multipurpose benefits (Yusuf & Rhaji, 2012). Under the Nigerian climatic and edaphic factor, the tree begins flowering from December to May and fruits from February to July depending on the variety and prevailing weather conditions (Dejumo, Azeez, Geply & Oboite, 2013). There are two species of ALB in Nigeria, these are *Parka* biocolor and *Parka* biglobosa (Keay in Yusuf & Rhaji, 2012). The tree of either species is widely recognized as an important indigenous multipurpose fruit plant whose uses include as condiment in soup or stew, medicine (sight and digestion), control of

hypertension/stroke and diabetes, source of tannin, bee food, livestock feeds, fuel, fibre, and other uses (Sadiku,2010; Alarape in Oladele, 2016; Oladele, 2016). In Enugu Nigeria, these two species are commonly called *locust bean tree*. The seeds are processed into local cooking ingredient called *ogiri*, *okpeyi* or *locust bean*(in the various Igbo speaking dialect), *iru* in Yoruba and *dawadawa* in Hausa language all in Nigeria.

A good processing of any product is aimed at altering the shape, size and texture of the raw material to suit demand taste and improve quality (Ihekoronye in Maduka, 2016). In this case, locust bean processing involves cleaning, de-hulling, washing, boiling, separating and fermenting the cotyledon and finally mashing to obtain valuable product that meets the taste of the consumers. The processing of the bean is often valued as a lucrative business especially for the indigent rural dwellers. Processing of bean seeds as a business serves as an organised economic system which exchanges goods for profit (money) for the processor (Sullivan, 2016). Majority of the individuals that engage in the processing of seeds of locust bean as a business in Enugu are women. These women exist in agrarian communities where they perform multiple roles of homemaking, working in the farm with their household as well as processing of farm produce for extra income aimed at reducing dependency on the male as well as increasing purchasing capacity and reducing poverty.

Processing of *dawadawa*, *iru* or *locust bean* is still a traditional family art carried out by rural women with inconsistency in quality (Akande, Adejumo, Adamade& Bodunde, 2010; Sadiku, 2010; Yusuf & Rahji, 2012) but with an increasing demand for the processed seed. A clear case of high demand for the processed locust bean seeds always occurs during celebration periods. With increase in demand, price always goes up. To meet up with the increasing demand, the women begun involving technology (machine) in processing of the bean. However, to their surprise, their customers from urban to rural, were not favouring the machine processed locust bean. The compliant for refusing the industrially processed locust bean (which is moulded into cubes) as a substitute for the locally processed one is because the natural flavour and aroma is lost in the machine processed one. This issue of rejection has become business benefit concern of the processors as sales are low and returns declining.

Business benefit concern of the women was that they could not achieve their objective for the use of machine to increase output as customers preferred the manual processed locust bean. The manual processing is very tedious and time consuming, and with modernization, there is a need for automated method. A search on how to help solve the problem of these processors and the consumers induced the study. Specifically, the study sought to:

- (1) find out the factors (counterfactual) for rejecting machine processed locust beans in Enugu state.
- (2) experiment on minimizing the limitations of machine processed locust bean to increase demand for locust bean..
- (3) determine the interest of customers on the improved machine processed locust bean.

Research Questions

1. what are the counterfactual for rejecting machine processed locust beans?
2. How could the limitations of machine processed locust bean be minimized through experimentation to increase demand for locust bean?
3. What constitutes interests of customers in patronizing the improved machine processed locust bean?

MATERIALS & METHOD

Materials

questionnaire for the customers, 40 mudus of locust bean seeds (10control & 30 treatment), machine facilities, bag, basins, fire source, water, pots and other utensils, market records on production cost, quantity produced, quantity sold, profit/loss.

Method

The study began with a preliminary investigation on the costs and sales of locust bean seeds processed manually and those processed mechanically. The result of the preliminary study was presented in Table 1. The study was carried out in Enugu state. The state has three major markets where processed locust bean is sold in large quantity. The markets are Ogbete in Enugu North Local Government Area; Obollo-afor in Udenu Local government area and Ogige in Nsukka Local Government Area. The study had three research objectives. The study adopted quasi-experimental design (Jack & Norman, 2002) with 30 mudus for experiment and 10 mudus for control in addition to the use of questionnaires and two item interview guide.

In this study, the already manual processed locust bean constituted the control group while improved machine processed locust bean constituted the experimental group and the customers provided information on the counterfactual factor questionnaire and interest inventory.

The population for the study was all customers of locust bean from Ogbete market; Obollo-Afor market and Ogige market. The sample for the study was 326 made up of 150 customers from Ogbete market, 80 customers from Obollo-afor market and 96 customers from Ogige Nsukka market. The three markets were considered because processed locust bean attract customers in these markets more than other parts of the state. Incidental sampling technique was used to select the respondents that served as the sample size that was studied in each of the phases. That is, 15 respondent were interviewed in phase 1A while 281 respondents were studied in phase 1B to provide answers to research question 1 and 30 respondents responded to interest inventory in phase 3

Four sets of instrument were used to collect data for the study. They were interview schedule, counterfactual factor questionnaire, interest inventory and sales records from the experimented processing of locust bean. The interview schedule sought information from 15 respondents on three major items. The instrument on counterfactual factor questionnaire with seven items sought information from the respondents (281) in the three markets on their reasons for the rejection of

machine processed locust bean. The interest inventory with seven items sought information from 30 respondents (from Obollo-afor where the experiment was conducted) on their continual interest on patronizing improved machine processed locust bean. Data were collected by researchers with the help of two assistants that were selected based on their familiarity with the study area and the ability to interpret the items in the local dialects. The study was carried out in phases

Phase 1 A&B

Reasons for Rejection of Machine Processed Locust Bean Seeds (Research Question 1)

Phase 1A; In this phase, fifteen customers from Ogbete market that has the highest customers who were patronizers of both manual and machine processed locust bean were interviewed on three major areas (a) Manual and machine processed locust bean which one do you prefer? (b) Give reason for your answer. The aim was to find out their reasons for rejection of machine processed locust bean to confirm or contradict the findings from the literature. The answers supplied by these respondents were analyzed using percentage. Any items with percentage value of 40% or above was considered a counterfactual item. Seven items that had percentage values of 40 or above were counterfactual factors and converted to questionnaire items.

Phase 1B

The questionnaire items generated from phase '1A' were administered on 281 customers with the help of two assistants selected based on their familiarity with areas and the ability to interpret the items to the respondents in their dialects. The copies of the questionnaire were distributed and retrieved the same day for analysis. The data collected in this phase were analyzed using mean and the result presented in Table Two.

Data in Table 2 revealed that all the seven items on counterfactual factors of processed locust beans had their mean values ranged from 2.51–3.80 and were above 2.50; indicating that the seven items were the reasons for rejecting machine processed locust bean.

Phase 2 Experiment to eliminate the limitations of machine processed locust bean

The researchers studied the problems as presented by the customers in Table 2 and experimented on the machine processing in order to control the limitations of mechanically processed locust bean. To carry out the experiment, the researchers purchased 40 mudus of locus beans.

For control, 10 mudus were given to a woman within the locality to process following the usual method while the researchers carried out experiment with 30 mudus following the procedure in steps A-C.

Step A – preparation of beans by the researcher before processing

In order to prepare the beans for processing, the researchers carried out the following activities:

- removed impurities (stones, husks and others) from the 30 mudus of locust bean seeds by winnowing
- washed the bean seeds thoroughly with cold clean water
- boiled the bean seeds until dehiscent point

- air-dried the boiled bean seeds until crispy.
- took the boiled bean seeds to machine operator within the environment for removal of the test coat.

Step B Removal of test coat with machine

The researcher carried out the following activities with the machine operator

- Swept the environment of the machine
- Cleaned the machine thoroughly of oil or previously processed product like cowpea to get rid of contaminants.
- Maintained adequate ventilation within the machine environment by opening the windows
- Prevented any inlet of smoke from exhaust by setting the exhaust away from room environment to eliminate contamination
- The operator put on the apron.
- Started the machine engine for operation
- Used small plate to wage the flow of beans into the grinding section when feeding the machine with locust bean through the funnel.
- Poured in the air-dried beans into the machine funnel for separation of the cotyledon from the test-coat (de-hulling).
- Regulated the grinding speed of the machine to avoid grinding the beans into powdering form
- The operator inserted small clean stick to drive the beans into the grinding section of the machine.
- Collected the de-hulled beans flow with a bag.

Step C: Further Processing of locust bean seeds outside the machine operation

The researchers carried out the following activities after the machine has removed the test coat:

- Winnowed the beans to separate the cotyledon from the chaff
- Washed the separated cotyledon with clean cold water to remove any contaminant or bleacher
- Removed the cotyledon from water
- Re-boiled the cotyledon until they were soft
- Drip-dried the re-boiled beans
- Packed the cooled beans into an air-tight container to ferment under room temperature for 3days.
- Taste for fermentation (pleasant flavour with ash coloured beans indicated fermentation)
- Spread in open container to air for 15-20 minutes
- Packaged the product for market by setting them in rows of 25 x 20 per mudu (500 pieces per mudu) with some rip offs.
- The manually processed and improved machine processed locust bean were compared and there was no difference between them. The products (both manual and improved) were then sent to market for sale.
- Sold each at N20 (20 x 500 =10,000 per mudu)
- Gave each customer who purchased locust bean a copy of the interest inventory to answer and return within two weeks.

- Collected the address of each customer that was given interest inventory.
- Observed demand in the local market
- All the products were sold as the consumers could not detect any difference between the two products.

The results of both processed beans were reported in Table 3

Data in Table 3 revealed that the researchers processed locust beans using improved machine method to process 30 mudus of locust beans at the cost of ₦9,750 (\$27,86) with income sales of ₦30,000 (\$85,71) and a gross profit of ₦21,269 (\$60,77). The manual processed locust bean of 10 mudus remained the same as in table one. The result indicated that if the women follow the improved machine processing steps, their objectives of higher income could be achieved as the customers patronized the improved machine processed locust bean like they did with the manual processed one.

Phase 3 Retrieval of interest inventory questionnaire by the researchers

At the end of two weeks, the researchers and the assistants utilized the address provided by the customers that purchased the improved machine processed locust beans to trace them. Out of 30 copies of interest inventory questionnaire randomly distributed, 26 were returned and analyzed using mean. The result of the analysis was presented in Table 4.

Data in Table 4 revealed that all the seven items had their mean values ranged from 2.75–3.73 and were above 2.50; indicating that the respondents were interested in the improved machine processed locust bean. The interest was because both could not be differentiated due to improvement in the process.

DISCUSSION OF RESULT

The result of the study revealed that the reasons for the rejection of machine processed locust beans were alteration of flavor and aroma, low keeping quality, rejection of menu prepared with the machine processed locust bean by family members among others. The findings of the study in these direction were in line with the findings of Sadiko (2010) in a study on processing methods influencing quality of fermented African locust Bean(Iru/ogiri/dawadawa) where it was found out that even urban dwellers, refused to accept industrially processed locust bean because of the loss of natural flavour and aroma.

The study further revealed that customers were satisfied with the improved machine processed locust bean based on its acceptance. The acceptance was because of the elimination of the limitations of counterfactual factors by the researchers. The result of the interest inventory helped to remove the business concern of the women as the result of the improved machine processed locust bean increased demand by customers, turnover by suppliers in addition to high profit margin and income of the women to meet other needs and build confidence of these women processors.

CONCLUSION AND RECOMMENDATION

It was concluded that women processors in the area of the study processed locust bean manually with little profit. These women changed from manual to machine processing for quick turnover and profit maximization but recorded loss because of rejection of the product by customers. The Reasons for the rejection (counterfactual factors) of machine processed locust beans resulted from alteration of flavour, sour taste, low keeping quality, and contamination among others. The reasons for rejecting machine processed locust bean were used to influence the machine processing in the experiment (treatment group) and it was found out that elimination of the factors drastically increased demand, and sales. The interest inventory questionnaire revealed that customers were satisfied with the improved machine processed locust bean based on its acceptance in the family menus

The study therefore recommended that workshop should be organized at the local levels by extension officers for re-training of women processors and machine operators using the identified steps in the experiment.

Table 1

Cost Analysis of manually and mechanically processed locust bean (preliminary study)

Item for consideration	Production Cost in ₦	Sales in ₦	Profit Realized in ₦	Expected Profit in ₦	Difference In ₦
Manually processed (10 mudus)	3,832. 50	10,000 (all sold)	6,167. 50	6,167. 50	-
Machine processed (30 mudus)	8,580	15,000 (half sold)	6,400	21,420	15,020

Table 2

Mean ratings and standard deviations of customers on counter-factual factors of machine processed locust bean (ogiri)

N = 281

S/N	Counterfactual factors for Ogiri	Mean	Standard deviation	Remark
	Machine processed ogiri has:			
1	alteration of flavour	3.38	0.50	Agree
2	decayed taste	3.65	0.52	Agree
3	sour taste	2.97	0,93	Agree
4	different odour/smell from manually processed one	3.47	0.53	Agree
5	traces of oil and smoke contamination	2.51	0.98	Agree
6	low keeping quality	3.52	0.60	Agree
7	resulted in rejection of menu prepared by family members	3.80	0.48	Agree

Table 3

Cost Analysis of manually processed and improved machine processed locust bean

Item for consideration	Production		Realized	Expected	Difference
	cost in ₦	Sales in ₦	Profit in ₦	Profit in ₦	in ₦
Manually processed (10 mudus)	3,832. 50	10,000 (all sold)	6,167. 50	6,167. 50	-
Machine processed (30 mudus)	9,750	30,000 (all sold)	20,250	20,250	-

Table 4

Mean ratings of customers on their interest on the improved machine processed ABLs

N = 26

S/N	Interest inventory on improved Processed ABLs	X	SD	Remark
1	I now like the flavour of machine processed ABLs	3.46	0.58	Agree
2	I want to use machine processed ogiri in most of my menu for seasoning because it tastes good	3.73	0.54	Agree
3	I will like to patronize machined processed ogiri because of its flavor	2.75	0.96	Agree
4	The machine processed ogiri real worth its cost	3.54	0.55	Agree
5	I am interested in machine processed ogiri is free from oil or smoke contaminants	2.94	1.14	Agree
6	My family members could not differentiate between the manually processed ogiri from machine processed ones	3.38	0.51	Agree
7	I can help to advertise machine processed ogiri if this standard is maintained.	3.52	0.60	Agree
8	I will continue to patronize machine processed ogiri if the present quality is retained	3.65	0.71	Agree

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Fig a flower of ALB



Fig b. a cluster of the pods of ALB





fig c pods of African locust bean



fig,d Yellow pulp of ALB