



Food Safety Practices in Locust Bean Processing: Implication for Well-Being Attainment of Locust Bean Processors in Ogun State, Nigeria

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Abstract

African locust bean (*Parkia biglobosa*) is very rich in food nutrients like protein and vitamins which make it a healthy source of food in the rural areas. Locust bean product (*iru*) has however been facing a lot of challenges particularly the non-compliance to food safety procedures despite the dawn of science and technology. Interview guide was used for data collection from 320 respondents whom were randomly selected. Data collected were analyzed with regression analysis. Results of this study showed that compliance to food safety practices was very poor by 6.2%. In addition, more than 60% of the respondents cannot cater for clothing, children's education and health care with their monthly income, hence the well-being of 75% of the respondents was regarded poor. Results of regression showed that significant relationship exist between washing of hands before and after locust bean processing and well-being ($\beta = 1.42$). Also, results of regression showed that proximity of processing units to refuse dump sites, scarcity of raw locust seeds, and lack of modern processing facilities are most serious problems that affect the rural women's well-being by 94%, 48%, and 34% respectively. This study concludes that food safety practices are determinants of well-being of locust bean processors. It is therefore recommended that Community Health Workers and Agricultural Extension Agents should intensify efforts on training and enforcement of food safety practices as this is very important for the quality, safe locust bean product and well-being of rural women in the study area.

Keywords: Compliance, food safety, locust bean, nutritious, rural women, well-being

Introduction

Over the years, food safety has become a significant and growing public health problem in Nigeria. This is because illness resulting from consumption of infected food is one of the widespread health problems. It causes significant losses in human productivity and population. Enlightenment on food borne infections and safety practices cannot be over-emphasized with the alarming rate of outbreaks of food borne diseases. Despite the culinary, medicinal, social and economic importance of locust bean to the rural women in Nigeria, processing of the seeds to diverse food condiments is very tedious and unwholesome due to the use of traditional methods of steaming in clay pots, washing with bare legs and cleaning in the streams. Akinbami and Momodu (2013) noted that food processing is predominantly engaged in by women and children in Nigeria; most of these processes are done using traditional methods. The conventional methods results in time-wasting and food losses. It also accounted for the dirt and pathogens that

are found in the locust bean products; this affects quality, shelf-life, and safety of the products for human consumption. Poor and unsafe food causes food poisoning, illness and human death. Mudey *et al.* (2010) noted that food safety practices are necessary during the production, processing, storage, distribution and preparation of food to ensure that it is safe, sound, and wholesome and fit for human consumption. Also, food safety is critical to human nutrition and food security. Poor nutrition and food-borne diseases often combine to a vicious cycle of worsening health (WHO, 2013). Onyeneho and Hedberg (2013) noted that although Nigeria has no official food borne disease surveillance system, cases of food poisoning resulting in deaths and hospitalizations have often been reported. The people who are mostly affected are children, the poor and the rural dwellers. Consumption of unwholesome food accounted for 70% cases of diarrhoea in developing countries (Mukhopadhyay *et al.*, 2012; Annor *et al.*, 2011). Apanga *et al.* (2014) gave the statistics of the

number of food borne disease in Africa to be 3.3 to 4.1 episodes per child per year accounting for 450,000 to 700,000 deaths in children annually. The deaths were caused by contaminated foods through improper food processing, preservation, storage and food preparation.

Locust beans have provided income for many women, especially in the rural areas, the production has not increased substantially and the products contain stones, debris and dirt. The processing operations to obtain this condiment are unhygienic, which has given rise to this study. Thus, earnings, livelihood sustainability and well-being of rural women in locust bean business are threatened. There is dearth of empirical literature on the implication of poor processing practices on the livelihood and well-being of women locust bean processors. Therefore, this study becomes very important to look at food safety practices in locust bean processing and its implication for rural women's well-being in Ogun State, Nigeria with the aim of providing fact-findings to upgrade processing methods and achieve safe locust bean condiments.

Hypotheses of the study

H₀₁: There is no significant relationship between food safety practices and well-being attainment of locust bean processors.

H₀₂: There is no significant relationship between constraints militating against locust bean processing and well-being attainment.

Methodology

This study was carried out in Ogun State, Nigeria. Ogun State is one of the six States in the South West Nigeria. The State lies between the latitudes 7°18'N and longitude 5°55'E. It is situated within the tropics covering 16,409.29km² with a population of about 4,054,272 (NPC, 2006). Most of the crops grown in Ogun State include; cassava, rice, maize, melon, cotton, cocoyam, cocoa, yam, and cowpea. The emphasis of traditional Agriculture in Ogun State is more on crops, while the livestock raised is supplementary. Processing of locust bean is very common in the rural areas of Yewa in Ogun State; the product (*iru*) is being sold in every part of the state as well as Lagos State.

Sampling Procedure and Sample size

Sample frame for this study was 3,204 locust bean processors from which 10% were randomly selected which gave rise to 320 respondents interviewed. Interview guide was used for the data collection. This instrument was validated by the agricultural extension experts. Test re-test was carried out to ascertain the reliability at interval of two weeks with different set of locust bean processors; the coefficient was above 0.70 which made the instrument adjudged to be reliable.

Variables measurement

Food safety practices of locust bean processors were measured using eighteen (18) statements. These statements are based on food safety principles and practices proposed by Hazard Analysis Critical Control

Point (HACCP). These statements were measured on a 4-point rating scale of never (0), rarely (1), sometimes (2) and always (3) to measure these items. The scores were plotted into graphs to depict good and poor food safety practices. The HACCP recommendation for principles and practices of food safety is based on these areas:

- i. Personal hygiene
- ii. Good sanitary practice
- iii. Good manufacturing practice

Constraints to locust bean processing were measured on 3-point rating scale: very severe (3), severe (2) and not severe (1). Revenue from locust bean was estimated in naira (₦/week) at ratio level and expenses on various domains of well-being calculated to establish well-being attainment. This was presented in graph.

Analytical Technique

Descriptive Statistics were used to describe food safety practices, well-being and constraints to the food safety practices. Ordinary Least Square (OLS) regression was used to test the hypotheses. The general model is given as:

$$W = \alpha + \beta_1F_1 + \beta_2F_2 + \beta_3F_3 + \beta_4F_4 + \beta_5F_5 + \dots + \beta_nF_n + e_i \dots (1)$$

Where, W represents the scores for well-being attainment of the locust bean processors, while scores for each of food safety practices statement were represented as F₁, F₂, F₃, F₄, F₅...F_n

β = Beta Coefficient of the regression

α = Constant; and

e_i = error term

$$W = \alpha + \beta_1C_1 + \beta_2C_2 + \beta_3C_3 + \beta_4C_4 + \beta_5C_5 + \dots + \beta_nC_n + e_i \dots (2)$$

W = Well-being attainment (Scores)

C₁... C_n = Constraints militating against locust bean

β = Beta Coefficient of the regression

α = Constant; and

e_i = error term

Results and Discussion

Personal Hygiene of the respondents of the respondents

Results in Figure 1 showed that 52.8% sometimes wash hands and 40.9% rarely wash hands before and after locust bean processing operations; 69.4% sometimes wash hands after visiting toilet, sneezing or the hand touches any part of the body. This is an indication that respondents did not comply with personal hygiene practices in relation to hand washing during locust bean processing. Non-compliance to hand washing opposes the recommendations of World Health Organisation (WHO, 2013) that every food processor should wash hand before and after food processing activities. The essence of these recommendations is to prevent food contamination through bacterial and virus and to save lives. Emphases on hand washing with clean water and soap for the food handlers was promoted by Centers for Disease Control and Prevention (CDC, 2011). Also,

67.8% sometimes processed locust bean when sick, which shows that apart from possible transmission of pathogens to the locust bean products the respondents might not have quick recovery from their ailments since they did not rest. However, all the respondents (100%) did not process locust bean when having deep cut/open wound on hands and legs in order to avoid contamination. These findings indicate that food practices of the respondents concur with the study of Abass *et al.* (2014) that food processors with cuts, wounds and serious illnesses (vomiting, diarrhea) should stay away from food processing environment.

Good Sanitary Practices of the respondents

Similarly, results in Figure 2 showed that 100% and 93.8% did not use apron and nose-guard, and cover hair during locust bean processing respectively. This implies that the good sanitary practice of the respondents is very poor, though 60.3% indicated cleaning of tools and items before and after locust bean processing operations. Taiwo and Fasoyiro (2015) canvassed for the cleanliness of food processing equipment and environment to achieve quality and safe food.

Good Processing Practices of the respondents

Results in Figure 3 show that the environment where locust bean is being processed is dusty as indicated by all the respondents (100%), 50.9% sometimes avoid much talking and splitting during locust bean processing operations, and 59.7% did not use clean and potable water to process locust bean. From these findings, it can be said that the food safety practices of locust bean processors are very poor, unhygienic and unwholesome which require urgent intervention by health experts and change agents in the study area. Unsafe food practices can transmit harmful microorganisms, virus, parasites or chemical substances that may lead to diarrhoea, cholera, vomiting, fever, cancer and meningitis (WHO, 2015).

Level of compliance to food safety practices

The magnitude of compliance to food safety practices presented in Figure 4 indicates that 7.1% sometimes practiced food safety ($R^2 = 0.071$), while 20.5% never abide by the food safety practices ($R^2 = 0.205$). By implication, more than 80% of the respondents rarely followed recommended food safety procedures, be it personal hygiene, good sanitary or processing practices. According to Oladoyinbo *et al.* (2015), this deficiency is accounted to inadequate knowledge of food borne diseases.

Well-being achieved through the revenue generated by the respondents

Results in Figure 5 showed that 89.4% of the respondents spent ₦6,000 – 10,000/month on food items which is an indication that food is given a priority by the locust bean processors. Almost all (93.8%) spent ₦1000 – 2000/month on clothing. Children's Education and Health Care were given less attention by 64.4% and 70.6% of the respondents respectively; the money spent on Education and Health care was very low, it ranges

from ₦1000 to 3000/month. Apart from feeding, other indices of well-being are not well catered for which implies that the well-being of the respondents is poor.

Relationship between the food safety practices and well-being attainment of locust bean processors was tested with linear regression

The coefficient of R^2 of linear regression presented in Table 1 was 0.99 which indicates that 99% variation in the dependent variable was influenced by the independent variables. Results further showed that significant relationship exist between washing your hands before and after locust bean processing and well-being ($\beta = 1.42$, $p = 0.00$) at $p < 0.05$ level of significance. Also, significant relationships are found in washing of hands after visiting toilet, sneezing or the hand touches any part of the body ($\beta = 2.22$, $p = 0.00$), processing locust bean when sick or allowing sick person to involve in the processing activities ($\beta = 1.51$, $p = 0.00$), covering hair during locust bean processing ($\beta = 0.39$, $p = 0.00$) and well-being at $p < 0.05$ level of significance. Similarly, cleaning of tools and items before and after locust bean processing operations ($\beta = 2.15$, $p = 0.00$), avoid much talking and splitting during locust bean processing operations ($\beta = 0.16$, $p = 0.00$) and use clean and potable water to process locust bean ($\beta = 0.93$, $p = 0.00$) are significant to well-being at $p < 0.05$ level of significance. The significant of F-value ($F = 5672.3$) affirmed the relationship between food safety practices and rural women's well-being. Therefore, the null hypothesis that “*there is no significant relationship between food safety practices and well-being attainment of locust bean processors*” is rejected. Fowora (2012) reported that the knowledge of food handlers about the safety practices and food borne infections is an important issue to prevent outbreaks of food borne infection and sustain good well-being.

Relationship between the constraints militating against locust bean processing and well-being attainment of locust bean processors was tested with linear regression

The results in Table 2 showed that the linear regression has coefficient of R^2 of 0.77 indicating 77% variation in the dependent variable as a result of explanatory variables. Results showed that significant relationships exist for inaccessibility of portable clean water ($\beta = 0.20$, $p = 0.00$), scarcity of raw locust bean seeds ($\beta = 0.48$, $p = 0.01$), lack of modern processing facilities ($\beta = 0.34$, $p = 0.00$), inadequate capital ($\beta = 0.14$, $p = 0.03$) and well-being at $p < 0.05$ level of significance. Moreover, results revealed that ineffective extension agents ($\beta = 0.20$, $p = 0.01$), ineffective food safety regulatory agencies ($\beta = 0.18$, $p = 0.02$), proximity of processing units to refuse dump sites ($\beta = 0.94$, $p = 0.00$), and lack of storage and packaging facilities ($\beta = 0.33$, $p = 0.00$) have significant relationship with the well-being at $p < 0.05$ level of significance. The implication for this study is that well-being of the locust bean processors is affected by the constraints they encountered in the cause of processing locust bean. The most serious problems to the rural women's well-being

are proximity of processing units to refuse dump sites (94%), scarcity of raw locust seeds (48%), and lack of modern processing facilities (34%). So also, F-value ($F = 133.2$) is significant which is an affirmation to the relationship between constraints militating against locust bean processing and rural women's well-being. Therefore, the null hypothesis that “*there is no significant relationship between constraints militating against locust bean processing and well-being attainment of locust bean processors*” is rejected.

Conclusion

This study shows that more than 50% of the respondents sometimes practiced hand washing with soap and clean water before and after processing operations, and after using toilet or blowing nose during locust bean processing. The respondents rarely avoid much talking and splitting, while processing locust bean. Clean and potable water are not available for use to process locust beans. Personal Hygiene, Good Sanitary practices and good processing practices of the respondents are very poor; it is shortfall of food safety recommendations of World Health Organization. Feeding was given utmost priority while clothing, children's education and health received less attention. Most of the respondents fell into poor well-being category of less than ₦6,000/month (below 1\$USD/day). Results of linear regression showed that food safety practices are determinants well-being attainment of locust bean processors. Finally, results of linear regression showed that constraints militating against locust bean processing have serious influence on well-being attainment of locust bean

processors. The study therefore call for the provision of clean portable for the livelihood sustainability of locust bean processors in the study area; this water will also serve other domestic uses like cooking, drinking and washing of clothes and cooking utensils, and prevention of diseases outbreak. Community Health Workers and Change Agents should intensify training and enforcement on food safety practices in the study area. Agro-allied company should not relent in their efforts to produce affordable equipment that can process locust bean at local levels. The women association is a good platform through which loans can be sourced from agricultural banks. Locust bean processors should take advantage of this platform to access credit facilities from commercial and agricultural banks.

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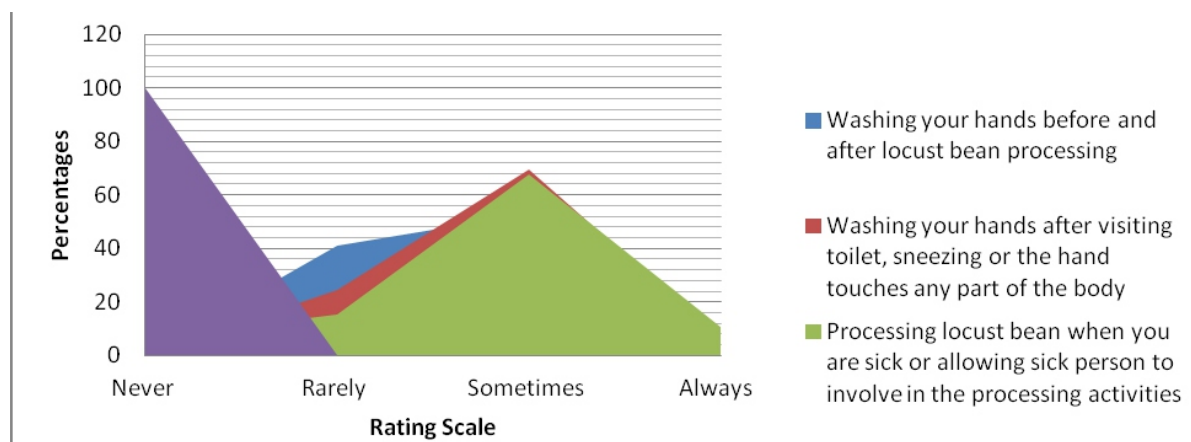


Figure 1: Personal Hygiene of the respondents

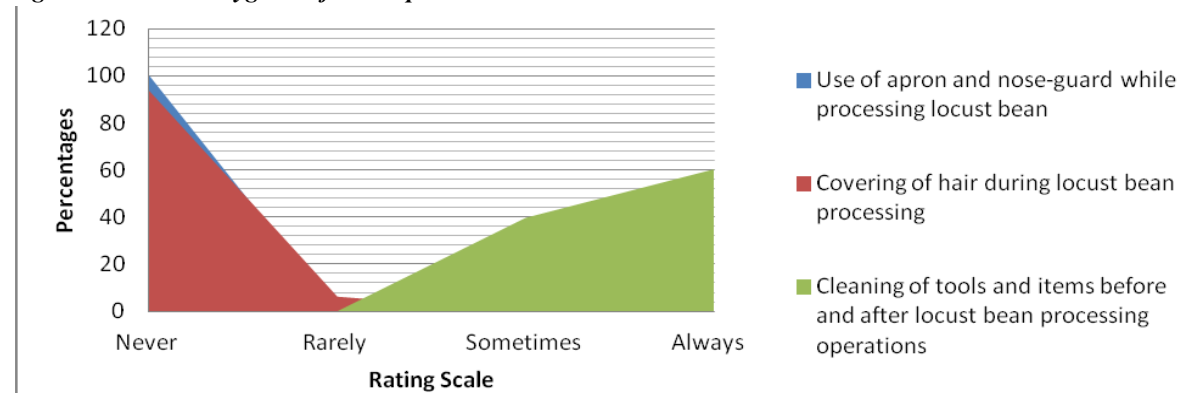


Figure 2: Good Sanitary Practices of the respondents

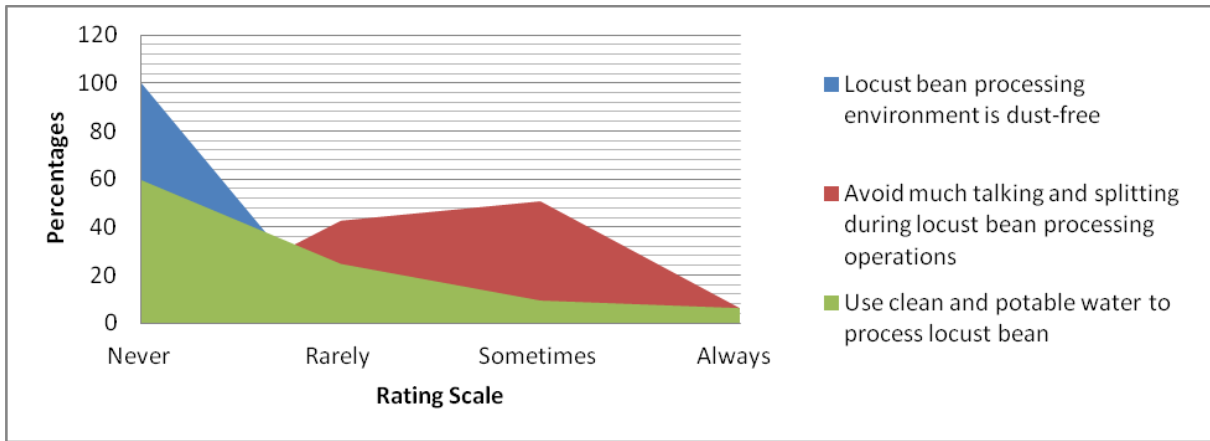


Figure 3: Good Processing Practices of the respondents

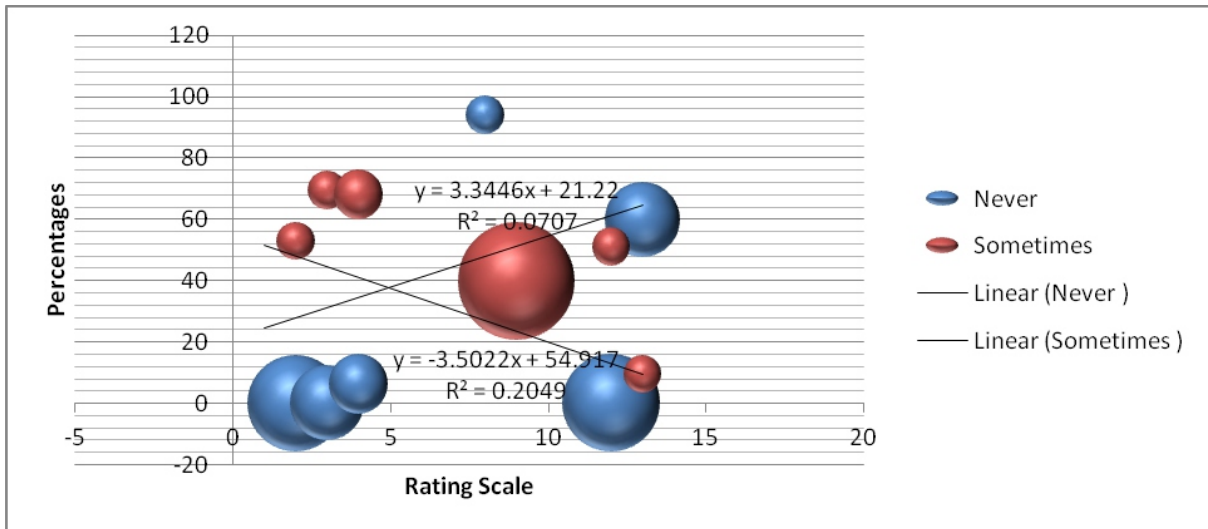


Figure 4: Level of compliance to food safety practices

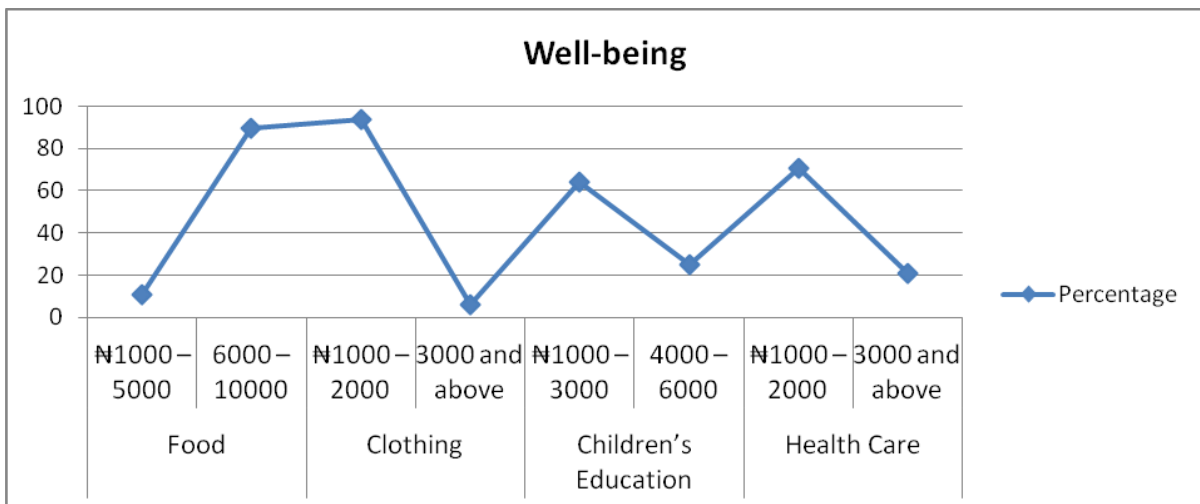


Figure 5: Well-being achieved through the revenue generated by the respondents

Table 1: Relationship between the food safety practices and well-being attainment

Model	R	R square	Adjusted R ²	Std. Error of the estimate		
	0.997	0.995	0.994	313.15		
	Change statistics					
		R ² Change	F Change	df1	df2	Sig.
		0.99	5672.3	10	309	0.00
Constraints	B	Std. Error	Beta	T	Sig.	
(Constant)	8468.85	197.13		42.96	0.00	
Washing your hands before and after locust bean processing	1000.00	92.43	1.42	10.82	0.00	
Washing your hands after visiting toilet, sneezing or the hand touches any part of the body	17729.3	101.99	2.22	173.83	0.00	
Processing locust bean when you are sick or allowing sick person to involve in the processing activities	9084.82	113.77	1.51	79.85	0.00	
Processing locust bean when you have exposed deep cut/open wound on your hands and legs	207.32	368.35	0.01	0.56	0.57	
Use of apron and nose-guard while processing locust bean	170.36	371.70	0.01	0.46	0.65	
Covering of hair during locust bean processing	3333.96	66.54	0.39	50.11	0.00	
Cleaning of tools and items before and after locust bean processing operations	18387.5	158.28	2.15	116.17	0.00	
Locust bean processing environment is dust-free	292.41	157.79	0.02	1.85	0.07	
Avoid much talking and splitting during locust bean processing operations	1132.11	43.45	0.16	26.06	0.00	
Use clean and potable water to process locust bean	3792.86	33.48	0.93	113.28	0.00	

Source: Authors' data. S - Significant at p < 0.05 level of significance

Table 2: Relationship between the constraints militating against locust bean processing and well-being attainment

Model	R	R square	Adjusted R ²	Std. Error of the estimate		
	0.88	0.77	0.76	2015.49		
	Change statistics					
		R ² Change	F Change	df1	df2	Sig.
		0.77	133.20	8	311	0.00
Constraints	B	Std. Error	Beta	t	Sig.	
(Constant)	25923.8	1537.09		16.87	0.00	
Inaccessibility of portable clean water	2000.0	521.58	0.20	3.83	0.00	
Scarcity of raw materials (locust seeds)	3333.33	1183.3	0.48	2.82	0.01	
Lack of modern processing facilities	2333.33	476.17	0.34	4.90	0.00	
Inadequate capital	102.38	721.73	0.01	0.14	0.03	
Ineffective extension agents	1666.67	476.17	0.20	3.50	0.01	
Ineffective food safety regulatory agencies	1333.33	426.15	0.18	3.13	0.02	
Proximity of processing units to refuse dump sites	4897.62	453.37	0.94	10.80	0.00	
Lack of storage and packaging facilities	2000.0	402.81	0.33	4.97	0.00	

Source: Authors' data. S - Significant at p < 0.05 level of significance

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