

CONSTRAINTS TO USE OF IMPROVED TECHNOLOGIES ON LOCUST BEAN PROCESSING IN AYEDADE LOCAL GOVERNMENT AREA OF OSUN STATE, NIGERIA

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ABSTRACT

This study was carried out to identify the constraints to use of improved technologies on locust bean processing in Ayedaade Local Government Area of Osun State, Nigeria. Specifically, the study described the Socio economic characteristics of the locust bean processors, identified the improved technologies used by the respondents in locust bean processing, determined the level of farmers awareness of improved technologies on locust bean processing, analyzed the cost and returns from the processing of locust beans, identified the benefits of using improved technologies in locust beans processing and identified the constraints affecting the respondents in using improved technologies on locust beans processing. Multi stage sampling technique was used to select one hundred and twenty (120) respondents used for the study. Descriptive statistics were used to achieve objectives: i, ii, iii, iv and vi, while inferential statistics such as gross margin was used to realize objective v and chi square analysis was used to test the hypothesis. The result of Socio economic characteristics showed that the majority (90.8%) of the respondents were female, 36.7% were within the age range of 31 and 40 years, majority (87.5%) were married, majority (83.3%) had spent 1-6 years in school, 42.5% had no formal and primary education, above average (56.7%) had 6-10 household size, 46.7% sourced their income from farm activities, majority (76.7%) earned 500001-1500000 naira annually from locust bean processing, above average (52.4%) had 1 and 10 years of processing experience. Result on the processors awareness of improved technologies on locust bean processing shows that majority (96.7%) were aware of using tap water for separation of the locust bean, closely followed by depulping machine (85.8%). Result on improve technologies used in locust bean processing revealed that tap water (97.7%) was used most for separation of the locust bean, closely followed by hydrocyclone separation (77.5%). Result on the benefits of using improved technologies for locust bean processing showed that it reduces drudgery (mean=2.90) and improves quality of locust bean (mean=2.80). Result on Costs and Returns of locust bean processing showed positive gross margin of ₦472,877 per annum. The constraints affecting the respondents in using improved technologies on locust bean processing were high cost of machine (mean=1.98), lack of government support (mean=2.90), high cost of processing equipment (mean=2.83) among others. Chi square analysis showed that there is a significant relationship between the Farmers awareness of improved technologies on locust bean processing and Constraints affecting the respondents in using improved technologies on locust bean processing. Among all, the study recommends that Locust bean processors should organize themselves and form an association which will enable them as a group purchase some processing equipment they may not afford individually due to the high cost of the machines.

Key words: Improved Technologies, Locust Bean, Processing

1. INTRODUCTION

The African locust bean tree, *Parkia biglobosa* is perennial leguminous trees which belong to the sub-family mimosoideae and family leguminosae (now family fabaceae). They grow in the savannah region of West Africa up to the southern edge of the Sahel zone (Akande *et al.*, 2010). The most important use

of African locust bean is found in its seed, which is a grain legume. Although it has other food and non - food uses, the seeds serve as a source of useful ingredients for consumption (Campbell-platt, 2015). The multipurpose tree has seeds with a hard testa and these seeds are large with a mean weight of about 0.3 g/seed and the cotyledons form about

70% of the weight. These seeds are borne in pods that may carry up to 30 seeds embedded in a yellow pericarp and the colour of these pods change from pink brown to dark brown as maturity sets in. The tree also bears alternate, dark green bipinnate leaves and hermaphrodite flowers. The seeds are brown-blackish. Each seed has a 0.5–1 cm funicle, spherical-ovoid and slightly compressed laterally. The testa is hard, smooth and glossy. Seed size varies within pod, with those at the centre being largest. It is widely used for its remarkable nutritional value and the dietary value it contains (Audu et al. 2004).

Adewumi and Olalusi (2012) reported that the processing of locust beans is mainly done locally by women in Africa. Processing of locust beans involves shelling of matured pods, boiling, dehulling, separation of the hull from the beans and fermentation into various forms of condiments. Women are the key player in locust bean processing. Traditional Boiling is carried out for cooking the beans with the hull for eight (8) to ten (10) hours using firewood as fuel (Oyewole and Odunfa, 2016).

The applications of various evolving technological methods have resulted in modern methods of processing the African locust bean (Audu et al., 2004). Boiling units such as steamers and pressurized vessel are employed in order to enhance good dehulling characteristics and high quality of the final product. The use of gas and charcoal as fuel has also been embraced since this provides clean operation and sustained heat input during boiling. However, due to the impact loading and rubbing action against the wall of the mortar carried out traditionally on boiled seeds, dehullers are used to achieve the same purpose with rubbing action (force) against the wall of the dehulling chamber. Audu et al. (2004) reported that the guiding principles are very much the same as that of the traditional process; abrasion. This is usually accomplished with a mild steel rotating auger (conveyor) with coils of the same material (mild steel) wound about the perimeter with a gap of 6.5 mm clearance between the coil and the abrasive wall of the dehulling chamber. This is to allow the shear force act on the seeds whose average thickness is about 8 mm, thereby obtaining dehulled seeds. Separation of the hulls from the edible seeds has constituted a challenge due to the sticky nature of the seeds with the testa (Ademosun et al., 2006). Hydrocyclone separation has been used in separating locust bean from the hull but only 37% efficiency was recorded and therefore has not been adopted. Steaming and dehulling are still being handled by separate device and this induces a lot of

handling and hence longer processing time is recorded. There is no information in literature on the combination of the key unit operations such as boiling, dehulling and separation. The need for technological intervention that can handle these three operations as a component will go a long way to facilitate the seamless processing of locust bean. Several constraints are identified in the processing and consumption of the locust bean. These include, among others, low processing due to the use of rudiment equipment, high wood consumption and poor manufacturing practices. Dehulling and cooking of the locust bean seeds are time consuming, laborious and inefficient. Consequently, the processing of this condiment has not increased substantially (Beaumont, 2002). Most of the constraints faced by the locust bean processor indicated above need urgent attention so as to improve on the quality and quantity of locust bean condiment produced. However, in order to increase supply, it is necessary to use modernized processing techniques to optimize locust bean processing. This informed the basis for this study which is to identify the constraints to the use of improved technologies on locust bean processing in Ayedaade Local Government Area of Osun State, Nigeria. Specifically, the study described the socio economic characteristics of the locust bean processor in the study area; identified the improved technologies used by the respondents in locust processing in the study area; determined the level of farmers awareness of improved technologies on locust bean processing in the study area; analyzed the cost and returns in processing of locust bean in the study area; identified the benefits of using improved technologies for locust bean processing in the study area; identified the constraints affecting the respondents in using improved technologies on locust bean processing.

1.2 Hypothesis of the study

Ho: There is no significant relationship between the socio economic characteristics of the respondents and the constraints affecting the respondents in using improved technologies on locust bean processing.

MATERIALS AND METHOD

Ayedaade is a Local Government Area in Osun State, Nigeria. Its headquarter is located at Gbongan which is situated in the northern part of the area at 7°28'00"N 4°21'00"E. It has an area of 1,113 km² at the 2006 census. . Ayedaade Local Government Area is found in Osun state which is situated in the Southwest geopolitical division of Nigeria. The headquarters of Ayedaade LGA is in the town of Gbongan while the area consists of several towns

and villages which include Orile-Owu, Gbongan, Araromi-Owu, Motako, Mokore, Ode-Omu, and Ajebandele. The population of Ayedaade LGA is put at 96,084 inhabitants with the overwhelming majority being members of the Yoruba ethnic group. The Yoruba and English languages are widely spoken in the area. Ayedaade local government falls under the Irewole federal constituency. The major occupation of the people in the area is agriculture which provides employment and income for over 80% of the population. The Local Government Area is one of the major producers of locust bean and cassava in the State.

2.1 Sampling procedure

Multi stage random sampling was used for this study. In the first stage, purposive sampling was used to select Ayedaade Local Government for this study because of the predominance of locust bean processors in the Local Government Area. In the second stage, ten (10) villages were randomly selected from Ayedaade Local Government Area which include: Gbongan, Ogbagba, Wakajaiye, Ode-Omu, OrileOwu, AbinuAlakinde, Adam, Afonle, Alagbede and Alakan out of fifteen (15) villages in the area. In the third stage twelve (12) locust bean processors were selected, from each villages selected making a total number of one and hundred and twenty (120) respondents used for the study.

2.2 Source of data

Data for the study were obtained mainly from primary source using structured questionnaires to elicit information on the constraints to use of improved technologies on locust bean processing in Ayedaade Local Government Area of Osun State.

2.3 Model specification

The chi-square formula:

$X^2 = \sum (O_i - E_i)^2 / E_i$. Where O_i is the observed value and E_i is the expected value

2.3.1 Gross Margin Analysis

Gross Margin Analysis was used to determine the profitability of locust bean in the study area:

$$GM = TR - TMVC \dots \dots \dots (3)$$

Where GM = Gross Margin

TR = Total Revenue

TMVC = Total processing Variable Cost

2.4 Data Analysis

Both descriptive and inferential analytical statistics were used to analyze data in this work. Objectives i, ii, iii, v and vi were captured using percentage, mean and frequency count. Objective iv was realized using gross margin, while hypothesis was tested using chi-square.

RESULTS AND DISCUSSIONS

3.1 Socio-economic Characteristics of the Household Heads.

The result in Table 1 showed that the majority (90.8%) of the respondents were females, while 9.2% of them were males. This implies that most of the respondents that engage in locust bean processing are females and this is in line with Abiona, (2010), who opined that women partake in the processing of locust beans.

The result in Table 1 revealed that 36.7% of the respondents were within the age range of 31 and 40 years, 35.0% of the respondents were between 51 and above years of age, 23.3% were within 51-60 years of age while 5.0% of the respondents were within the age of 21-30 years of age. The mean age of the respondents was found to be 40years. This shows that the respondents were youth who have the strength in carrying out the most tedious part of processing the locust beans.

The result in Table 1 shows that majority of the respondents 87.5% were married, 9.2% were divorced while 3.3% were single. This implies that married women are more involved in processing of locust beans than unmarried.

The result in Table 1 also revealed that 47.5% of the respondents were Muslim, closely followed by Christian 45.0% while 7.5% were traditionalist. This shows that adherents of the two major religions of islam and Christianity dominated the study area. It is also an indication that there is no religion bias against locust bean processing.

The result in Table 1 indicate that majority 83.3% of the respondents spent 1-6 years in school, 13.3% spent 7-12 years in school while 3.3% spent 13-18 years in school. This shows that majority of the respondents had primary education, meaning that it will be difficult for them to adopt modern means of processing locust bean.

The result in Table1 shows that 42.5% of the respondents had no formal and primary education, 10.0% had secondary education, 3.3% had tertiary education while 1.7% had adult education. This implies that farmers in the study area are illiterate and this may hindered them in adopting new technologies on locust bean processing.

The result in Table 1 further shows that above average 56.7% of the respondents had 6-10 household size, 30.0% of the respondents had 1-5 household member, 11.7% had 11-15 household members while 1.7% had 16 and above household members. The average household size was found to be 7 persons. This implies that the respondents will have more family labour to help them in the processing of locust beans and this will reduce cost on hired labour in processing locust bean.

The result in table 1 also shows that 46.7% of the processor sourced their income from farm activities, 37.5% sourced theirs from others activities, 12.5% sourced their own from off farm activities while 3.3% sourced their own form their salary as a civil servant. This is an indication that farming is a major source of income and this is not surprising as the respondents primary occupation was farming activities.

The result in Table 1 indicates that majority (76.7%) of the respondents earned 500001-1500000 naira annually from locust bean, 14.2% earned 1 -500000 naira annually from locust bean, 6.7% earned 1500001 – 2000000 naira annually from locust bean processing while 2.5% earned 2000001 and above naira annually from locust bean processing. The mean annual income is 7634001 naira annually

Table 1 also shows that above average (52.4%) of the respondents had between 1 -10 years of processing experience, and 1.7% of them had above 21 years of processing experience. The average years of processing experience was found to be 8 years. This implies that the respondents have much experience in locust beans processing in the study area.

The result in Table 1 shows that most (63.3%) of the respondents processed locust bean daily, 35.0% processed it weekly while 1.7% processed locust bean

monthly. This implies that most of the respondents processed locust bean daily, this might be due to the fact that respondents processed large quantity of locust bean.

The result in Table 1 shows that majority (85.0%) of the respondents belonged to cooperative society while 15.0% did not belong to cooperative society. This implies that majority of the respondents belong to cooperative society and this will help them in having access to credit facilities

The result in Table 1 revealed that majority (86.7%) of the respondents belonged to locust bean processing association while 13.3% did not belong to locust bean processing association. This is an indication that majority of the respondents were into locust bean processing association and this will help them in benefiting from associations' assistance when need be.

The result in Table 1 finally shows that majority (90.0%) of the respondents have access to extension services while 10.0% had no access to extension services. This implies that majority of the respondents have access to extension services and this will facilitate new innovation on locust bean processing

Table 1: Socio economic characteristics of the respondents

Variable	Frequency	Percentage	Mean
Age			
21 - 30	6	5.0	
31 - 40	44	36.7	
41 - 50	28	23.3	40
51 and above	42	35.0	
Sex			
Male	11	9.2	
Female	109	90.8	
Marital status			
Single	4	3.3	
Married	105	87.5	
Divorced	11	9.2	
Religion			
Muslim	57	47.5	
Christians	54	45.0	
Traditional	9	7.5	
Years of formal education			
1 - 6	100	83.3	5
7 - 12	16	13.3	
13 - 18	4	3.3	
Level of education			
No formal education	51	42.5	
Adult education	2	1.7	
Primary education	51	42.5	
Secondary education	12	10.0	
Tertiary education	4	3.3	

Household size			
1 - 5	36	30.0	
6 -10	68	56.7	7
11 - 15	14	11.7	
16 and above	2	1.7	
Source of income			
Farm activities	56	46.7	
Off farm activities	15	12.5	
Civil servant	4	3.3	
Others	45	37.5	
Size of locust bean in bags			
1 – 100kg	37	30.5	30kg
101 – 150kg	34	28.3	
151 – 200kg	43	35.8	
Annual income from locust bean			
1 -500000	17	14.2	
500001 – 1500000	92	76.7	7634001
1500001 - 2000000	8	6.7	
2000001 and above	3	2.5	
Ownership of land			
Purchased	6	5.0	
Inherited	37	30.0	
Rented	27	22.5	
Gifted	23	19.2	
Lease	27	22.5	
Years of experience			
1 -10	63	52.5	8
11 -20	46	38.3	
21 and above	11	9.2	
How many times do you process locust bean in a year			
Daily	76	63.3	
Weekly	42	35.0	
Monthly	2	1.7	
Cooperative society			

Source: field survey, 2020

No	18	15.0
Yes	102	85.0
Locust bean processing association		
No	16	13.3
Yes	104	86.7
Access to extension services		
No	12	10.0
Yes	108	90.0

4.2 Level of Farmers awareness of improved technologies on locust bean processing

The result in figure 1 revealed the farmers' awareness of improved technologies on locust bean processing. The result shows that most (18%) are aware of using tap water for separation, closely followed by depulping machine (15%), hydrocyclone separation (14%), dryer (12%), steamer/pressurized vessel (11%) and pressure tank (11%). This implies that respondents in the study

area were aware of tap water, depulping machine, hydrocyclone separation, dryer, steamer/pressurized vessel and pressure tank as an improved technologies. This is an indication that majority of locust bean processors are aware of the improved technologies which can help them in processing their locust bean.

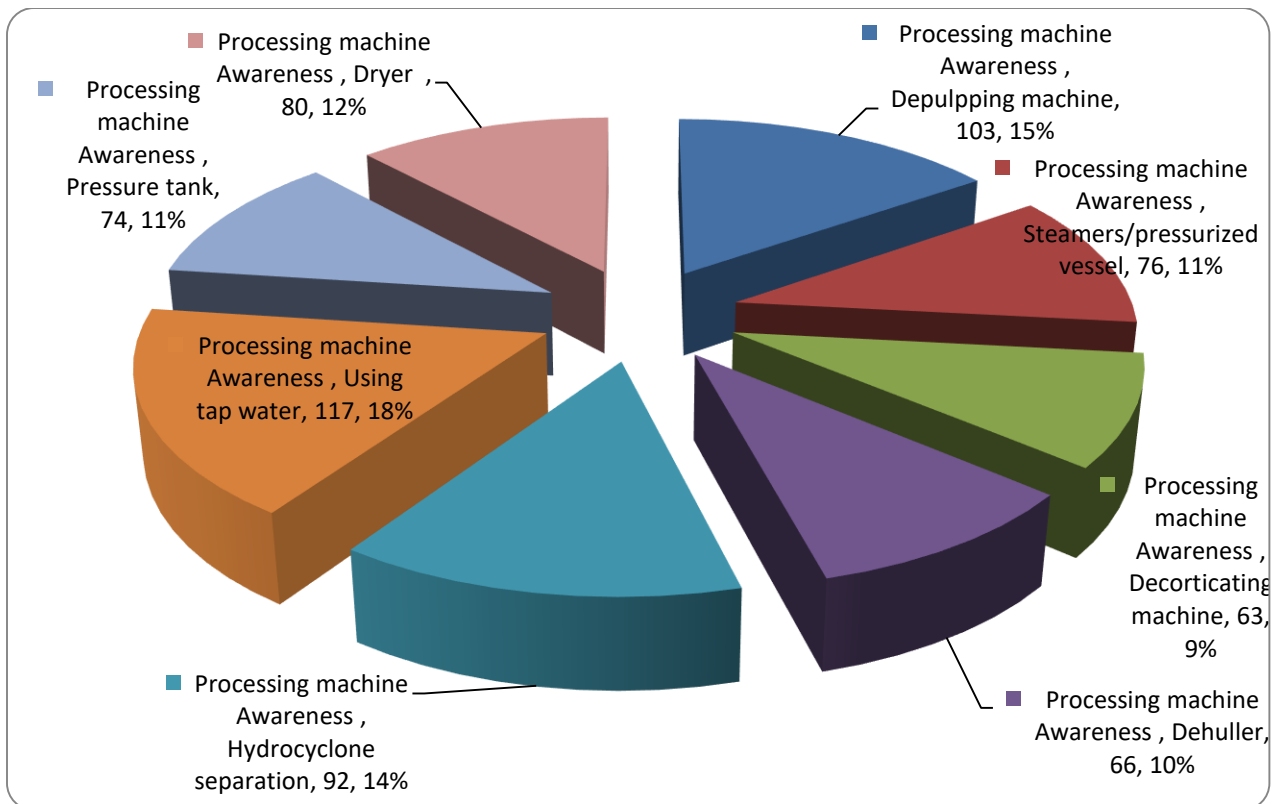


Figure 1: Level of Farmers awareness of improved technologies on locust bean processing (computed from the result of the Field Survey, 2020 Multiple Responses)

4.3 Improved technologies used by the respondents in locust processing

The result in Table 3 revealed the improved technologies used by the respondents in locust bean processing. The result revealed that tap water (97.7%) was used most for separation of the locust bean, closely followed by hydrocyclone separation (77.5%). Furthermore

steamers/pressurized vessel (16.7%), pressure tank (18.3%), decorticating machine (25.8%) were not used by the respondents.

This implies that tap water is the improved technologies mostly used by the respondents and this might be due to the fact that tap water/borehole is generally available in many rural areas in the study area

Table 3 Improved technologies used by the respondents in locust processing

Methods	Yes	No
Depulping machine	46(38.3)	74(61.7)
Steamers/pressurized vessel	20(16.7)	100(83.3)
Decorticating machine	31(25.8)	89(74.2)
Dehuller	45(37.5)	75(62.5)
Hydrocyclone separation	93(77.5)	27(22.5)
Using tap water	117(97.5)	3(2.5)
Pressure tank	22(18.3)	98(81.7)
Dryer	52(43.3)	68(56.7)

Source: Field survey, 2020

Multiple responses taken

4.4 Benefits of using improved technologies for locust bean processing

The result in Table 4 shows the benefits of using improved technologies for locust bean processing. The result shows that it reduces drudgery (mean=2.90) had the highest mean and was ranked first as the most important benefit of using improved technologies for locust bean processing, closely followed by improve quality of locust bean (mean=2.80); It also increases the processing of locust bean (mean=2.76), contribute to processor food security (mean=2.69) and is not time

consuming (mean=2.68) were ranked 2nd, 3rd, 4th and 5th. More so, Increases the profitability on locust bean processing (mean=2.59) and Acceptability of condiments by consumer (mean=2.57) were ranked 10th and 11th respectively. This implies improved technologies reduces drudgery in locust bean processing. This is an indication that adoption of improved technologies for locust processing will help in reducing drudgery, increases processing and also contribute to food security.

Table 4: Benefits of using improved technologies for locust bean processing

Benefits	Highly beneficial	Beneficial	Not beneficial	Mean	Rank
It reduces drudgery	108(90.0)	12(10.0)	0(0.0)	2.90	1
Improve quality of locust beans	96(80.0)	24(20.0)	0(0.0)	2.80	2
Acceptability of condiments by consumer	71(59.2)	46(38.3)	3(2.5)	2.57	11
Enhance rural economy	75(62.5)	42(35.0)	3(2.5)	2.60	9
Reduces labour in processing locust bean	79(65.8)	40(33.3)	1(0.8)	2.65	7
Increases farmers income	77(64.2)	42(35.0)	1(0.8)	2.63	8
Increases the profitability on locust bean processing	71(59.2)	49(40.8)	0(0.0)	2.59	10
It contribute to processor food security	86(71.7)	31(25.8)	3(2.5)	2.69	4
Reduces cost of labour	82(68.3)	36(30.0)	2(1.7)	2.67	6
It is not time consuming	82(68.3)	38(31.7)	0(0.0)	2.68	5
It increases the processing of locust bean	94(78.3)	23(19.2)	3(2.5)	2.76	3

Source: Field survey, 2020

Multiple response

4.5 Costs and Returns of locust bean processing

Table 4 shows the total variable cost incurred and total returns of the respondents in the locust bean processing, in the study area. The table indicates that ₦64,121.5 was total variable cost of locust bean processing while ₦536,998.5 was obtained as revenue (which was quantity of locust bean processed multiplied by price per bag). The gross margin made by the respondent was ₦472,877

$$GM = TR - TVC$$

$$TR = ₦536,998.5$$

$$GM = ₦536,998 - ₦64,121.5$$

$$= ₦472,877$$

Since gross margin (₦472,877 per annum) is positive, therefore locust bean processing is profitable in the study area.

Table 5: Costs and Returns of locust bean processing

Variable	Average Quantity and cost /naira/year
Cost of maintaining the machine	₦12,375
Cost of transportation	₦11,541.6
Cost of fuel	₦12,283.3
Cost of labour	₦26,066.6
Market taxes	₦1,855
Total Variable cost	₦64,121.5
Quantity of locust bean processed	₦45
Selling price per bag	₦11,933.3
Total revenue (TR)	₦536,998.5
Gross margin (GM)	₦472,877

Source: Field survey, 2020

4.6 Constraints affecting the respondents in using improved technologies on locust bean processing

The result in Table 6 revealed the constraints affecting the respondents in using improved technologies on locust bean processing. The result revealed that high cost of machine (mean=1.98) was the very severe constraints affecting the respondents in using improved technologies and was ranked first. Others include lack of government support (mean=2.90), high cost of processing equipment (mean=2.83), non-availability of equipment (mean=2.80) and high maintenance cost (mean=2.75) were ranked 2nd,

3rd, 4th and 5th respectively. Furthermore, lack of cooperative society (mean=2.46) and Scarcity of Ogiri for producing locust bean (mean=2.34) were ranked 10th and 11th respectively as the least constraints affecting the respondents in using improved technologies on locust bean processing.

This is an indication that high cost of machine, lack of government support, high cost of processing equipment, non-availability of equipment and high cost of maintenance were the constraints faced by the respondents

Table 6: Constraints affecting the respondents in using improved technologies on locust bean processing

Constraints	Very severe	Severe	Not severe	Mean	Rank
High cost of machine	117(97.5)	3(2.5)	0(0.0)	2.98	1
Non availability of equipment	96(80.0)	24(20.0)	0(0.0)	2.80	4
Inadequate technical know how	67(55.8)	53(44.2)	0(0.0)	2.56	7
Scarcity of Ogiri for producing locust bean	59(49.2)	43(35.8)	18(15.0)	2.34	11
Inadequate finance	63(52.5)	56(46.7)	1(0.80)	2.52	9
Lack of cooperative society	64(53.3)	47(39.2)	9(7.5)	2.46	10
Lack of extension contact	68(56.7)	44(36.7)	6(5.0)	2.55	8
Unavailability of land	80(66.7)	31(25.8)	9(7.5)	2.59	6
High maintenance cost	86(70.8)	33(27.5)	1(0.8)	2.72	5
High cost of processing equipment	99(82.5)	21(17.5)	0(0.0)	2.83	3
Lack of government support	108(90.0)	12(10.0)	0(0.0)	2.90	2

Source: Field survey, 2020

4.7: Chi square analysis showing the significant relationship between the Farmers awareness of improved technologies on locust bean processing and Constraints affecting the respondents in using improved technologies on locust bean processing

The result in Table 7 shows the Chi square analysis showing the significant relationship between the Farmers awareness of improved technologies on locust bean processing and Constraints affecting the respondents in using improved technologies on locust bean processing. The result shows that depulping machine (X=22.470; P=0.008), Dehuller (X=28.164,

P=0.001) and hydro cyclone (X=17.204; P=0.046) were significant to the Constraints affecting the respondents in using improved technologies on locust bean processing. More so, steamer/pressurized vessel, decorticating machine, using tap water, pressure tank and dryer were not significant related to constraints affecting the respondents in using improved technologies on locust bean processing

This implies that depulping machine, dehuller and hydro cyclone have effect on the constraints affecting the respondents in using improved technologies on locust bean processing

Table 7: Chi square analysis showing the significant relationship between the Farmers awareness of improved technologies on locust bean processing and Constraints affecting the respondents in using improved technologies on locust bean processing

Methods	Chi square value	Df	p-value	Decision
Depulping machine	22.470	9	0.008	Significant
Steamers/pressurized vessel	16.365	9	0.060	Not significant
Decorticating machine	13.008	9	0.160	Not significant
Dehuller	28.164	9	0.001	Significant
Hydrocyclone separation	17.204	9	0.046	Significant
Using tap water	3.420	9	1.000	Not significant
Pressure tank	13.466	9	0.143	Not significant
Dryer	14.426	9	0.108	Not significant

Source: Field survey, 2020

CONCLUSION AND RECOMMENDATIONS

This study concluded that high cost of machine, lack of government support, high cost of processing equipment, non-availability of equipment and high cost of maintenance were the major constraints faced by the locust bean processors in the study area.

Based on the findings of this study, the following recommendations were made:

1. Locust bean processors should organize themselves and form an association which will enable them as a group to purchase some processing equipment they may not afford individually due to the high cost of the machines.
2. Government should subsidize the cost of machine for the processors so that they can easily acquire the machine for processing their locust bean

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