

## Perception of Processors about Value Chain Approach for Minimizing Plantain (*Musa Spp. L.*) Post-Harvest Losses in Akure South Local Government Area of Ondo State, Nigeria

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### Abstract

This study was carried out to assess the perception of processors about value chain approach for minimizing plantain (*Musa spp. L.*) post harvest losses in Akure south Local Government Area of Ondo State, Nigeria. Simple random sampling technique was used to select ninety (90) respondents for the study. Data were collected using pre-tested interview schedule. Descriptive statistics was used to analyze the data while Pearson Product Moment Correlation was used to test the hypotheses of this study. Results showed that the key actors in Plantain Value Chain were input suppliers, producers, marketers, and consumers. The predominant plantain product forms were plantain chips (80.0%) and dried plantain flakes (20.0%) in the study area. The common marketing strategies were hawking (76.70%) and displaying of dried plantain flakes (23.30%). Majority (90.00%) of the respondents strongly agreed that well coordinated plantain value chain reduced spoilage and deterioration of plantain products, minimized post-harvest losses, and improved quality of plantain products. Results of correlation showed that positive and significant relationships existed between inadequate processing facilities ( $r = 0.68, p = 0.00$ ), epileptic power supply ( $r = 0.83, p = 0.04$ ), inadequate rural infrastructure ( $r = 0.91, p = 0.00$ ) and perception of respondents on reduction of post-harvest losses through plantain value chain at  $p < 0.05$ . It was therefore recommended that improved processing facilities should be provided for the processors as this will assist in the processing of plantain. Financial institutions should also provide affordable loans to the processors.

**Keywords:** plantain; value chain; post-harvest losses; perception; processors

### Introduction

Nigeria is the highest producer of plantain in West Africa with annual production figure of about 2.4 million metric tonnes mostly obtained from the southern states of the country. The nation ranked first in Africa and fifth in the world (FAO, 2013). Plantain is one of the most important horticultural crops and it is among the ten most important food security crops that feed the world (USDA, 2012). It is an important staple food for both rural and urban populace (CBN, 2003). Plantain is a

major starchy staple in the sub-Saharan Africa, providing more than 25% of the carbohydrates and 10% of the daily calorie intake for more than 70 million people in the continent (IITA, 2009). Plantain is a versatile food in the kitchen as well as a raw material for many popular delicacies and snacks (Aina *et al.*, 2012). It is among the foremost sources of carbohydrates in humid tropical Africa and contained fats, protein, and ash (IITA, 2009). Plantains have the potential to contribute to strengthening national food security and

decreasing rural poverty (Adejoro *et al.*, 2010).

Value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production, delivery to final consumers, and final disposal after use (Kapslinky and Morris, 2000; Miller and Jones, 2010). Value chain approach presents a good picture of the process of creating value. Value chain analysis helps in understanding of connection among actors in the chain and the way trade takes place in the chain. An agricultural value chain is considered as an economic unit of analysis of a particular commodity or group of related commodities that encompasses a meaningful grouping of economic activities that are linked vertically by market relationships (Getachew, 2012). This study aims at assessing the post-harvest losses in plantain (*Musa spp. L.*) value chain. With regard to plantain, the major factor is the overall amount of production and this has a significant implication on the total volume of fresh and processed plantain affected by losses (either physical or economic) and on the quantity of wastes produced during the processing. Another major factor affecting the extent of losses and the volumes of wastes is the utilization pattern of plantain, in particular whether it is produced for industrial uses or for human consumption and, in the latter case, whether it is consumed in the fresh or processed form. Very different levels of post-harvest losses occur in the uncoordinated plantain value chain. Typically these losses occur at all stages of the plantain value chain. However the extent of losses at each stage of the value chain substantially differs. Therefore

it is important to assess plantain value chain and linkages in order to effectively reduce losses and maximize the economic, social and environmental benefit of the intervention. It has been reported that one of the major problems limiting the expansion of plantain production in West and Central Africa is high post harvest losses. In Nigeria, up to 40% of the harvested crops are lost during distribution (FAO, 2011). Post harvest losses result not only in the loss of the actual crop but also losses in the environment, resources, labour needed to produce the crop and livelihood of individuals involved in the production process. When 30 percent of a harvest is lost, it implies that 30% of all the factors that contributed to producing the crop are also wasted (Parfitt and Barthel, 2011). Too much of the world's food harvest is lost to spoilage and infestations on transit to consumers. In developing countries, where tropical weather and poorly developed infrastructure contribute to the problem, losses are sometimes of staggering proportions. Losses occur in all operations from harvesting through handling, storage, processing and marketing (FAO, 2011). Most often, post harvest losses are symptom rather than the problem. Knowledge of their cause is, therefore, essential for deciding measures to prevent them. Such measures may have to be taken by the small farmer, the private trader, the cooperatives, the marketing board or other operators, handlers and transporters, wholesale and retail markets (Lynam *et al.*, 2002).

Traditionally, the growing of plantain has been left in the hands of subsistence farmers who accounted for about 80% of Nigeria agricultural output. In Nigeria,

four main types of plantain are available with distribution strictly based on their bunch characteristics. These are; the Horn type, French type, False type and False horn type (Oladejo, and Sanusi, 2008). There is a great potential for the processing of plantain into diverse product forms. It could be processed to food/foodstuffs such as breakfast cereals, baby food (soymusa) and snacks food. Industrial product of plantain processing includes wine/beer, syrups, vinegar, biscuit, among others (Ogazi, 1995). It can be boiled and consumed directly or taken in convenient forms like *Dodo* (fried ripe pulp), Chips (fried unripe pulp) or processed to produce such as plantain flour, local beer (plantain baby food), as well as *Dodo Ikire* (produced from over-ripped plantain). Plantain also possesses medicinal properties. Fermented plantain can be used as a source of alcoholic drink. Furthermore, dried plantain can be made into flour, which can be eating with soup (Saturday Punch, 2007). Due to the nutritional importance of plantain, venturing into its enterprise holds promising potentials. However, the relatively little attention given to plantain is focused on its production technology while only a few is done on its processing and marketing. It is obvious that increased production without corresponding increase in processing and marketing may amount to wastage of resources leaving people on the same platform of poverty, food insecurity and malnutrition. Plantain is a seasonal crop with relative short shelf life hence, it is available for a limited period and post harvest losses are very high. During the peak season of production, the level of returns to investment at production level has been reported to be low. This may be due to high level of supply which cannot

be absorbed by the market. This indicates low level of processing of the commodity; the excess fresh fruits are not being converted to processed products with longer shelf life. These situations necessitate a well coordinated value chain. In view of the significant contributions of plantain to the economic development and food security of both rural and urban households in Nigeria, it is imperative to understand the network, linkages, flow, volume and value added among actors in the Plantain Value Chain and it's importance in minimizing post-harvest losses in Akure south Local Government Area of Ondo State.

#### **Specific Objectives are to:**

- i. describe the personal characteristics of the small-scale plantain processors in the study area
- ii. identify key actors in plantain value chain in the study area;
- iii. identify various product forms of plantain in the study area;
- iv. examine the marketing strategies for plantain chips in the study area;
- v. examine perception of respondents on reduction of post-harvest losses in plantain through value chain; and
- vi. identify constraints to plantain processing in the study area

#### **Hypotheses**

- H<sub>01</sub>: There is no significant relationship between the personal characteristics of respondents and perception of respondents on reduction of post-harvest losses through plantain value chain.
- H<sub>02</sub>: There is no significant relationship between the constraints to plantain processing and perception of

respondents on reduction of post-harvest losses through plantain value chain.

**Methodology**

**Study area**

The study was carried out in Akure South Local Government Area (LGA) of Ondo State Nigeria because of the intensity of plantain processing in the area (Fig 1). The LGA has an area of 331 km<sup>2</sup> and a population of 353,211 at the 2006 census (NPC, 2006). It is located within the tropical rainforest zone with an estimated land mass of about 1,514km<sup>2</sup> in area, and it

is bounded by Ijesa on the western side, Ondo on the southern side, Benin on the eastern side and Ekiti State on the northern side. The temperature ranges between 27 – 32°C. The Local Government Area comprises Akure, Oda, Okuta Ekan, Irese, Aule, Aponmu, Ita Oniyan, Ologede, Omi eye, Olokuta, Aladodo and Agogolu. The major occupation of the villagers is farming. They are also involved in hunting, bricklaying, bicycle repairing as their secondary occupation. The major language spoken by the people is Yoruba dialect which is also interspersed with the dialects of some ethnic groups (Ibira,



Figure 1: Map of the Ondo State showing Akure South Local Government Area.

Igede) dwelling in the villages. The major religions of the people are Christianity, Islam and traditional religion.

### **Sampling technique and sample size**

Akure south was selected based on the prominence of plantain production in the area. Five villages (Ologede, Omi eye, Aponmu, Okuta Ekan and Aladodo) were randomly selected from the list of 17 communities in Akure South Local Government Area in Ondo State, Nigeria. Eighteen small-scale plantain processors were selected from each of the five selected villages using simple random sampling techniques thereby making a total of 90 small-scale plantain processors selected out of 156 plantain processors. Ninety small-scale plantain processors were used as the sample size for this study.

### **Data collection method**

Data were collected with the aid of interview guide. This instrument was subjected to face validity by consulting experts in the field of Agricultural Extension and Rural Development. Items found ambiguous were removed. Test re-test was carried out with twenty-five small-scale plantain processors who were not part of this study to ascertain the reliability of the instrument.

### **Measurement of variables**

Age, household size, and plantain processing experience, were measured at interval level while sex, educational level and marital status and various product forms were measured at nominal level. Marketing strategies for plantain chips were measured as hawking and displaying. Perception of respondents on reduction of post-harvest losses in plantain through

value chain were measured on 4-point likert scale type of Strongly Agree, Agree, Disagree and Strongly Disagree with scores of 4, 3, 2 and 1 respectively. The aggregate scores was calculated as  $(x_1 + x_2 + \dots + x_n)$  while the perception mean score was obtained as  $(fx)/n$ .

Where;

$x_1 \dots x_n$  = perception scores

$n$  and  $f$  = number of respondents

The perception of the respondents was ranked according to the perception mean score.

Constraints to plantain processing were measured on 3-point indicator as: not serious, moderately serious, and extremely serious assigned 1, 2 and 3 scores respectively.

### **Data analysis**

Simple descriptive statistics (percentage, mean and frequency) were used to describe the data while Pearson Product Moment Correlation was used to analyze the hypotheses tested.

### **Results and discussion**

The data in Table 1 show that the average age of the respondents was 30.8 years and the standard deviation was 7.3. About sixty percent (58.9%) of the respondents were less than 30 years old while 28.9% were between 31 - 40 years old. The result revealed presence of young individuals among the processors who are known to be active and innovative. This result supports the previous findings that most young and enterprising people in the world are in this age bracket and they are economically active part of the population (Oyediran and Omoare, 2014). Most (92.2%) of the respondents were females while only

(7.8%) were males. This indicates dominance of female in the processing of plantain in the study area. The findings support Mayokun and Fisayo (2010) who stated women are predominant in food stuff processing and marketing in Nigeria. Majority (70%) of the respondents had secondary school education while 16.7 % of the respondents attended primary school and 13.7% went through tertiary education. This shows that the respondents had one form of formal education or the other. In addition, the findings showed that average household size was 3 persons. Majority (71.1%) of the respondents had 1-4 people while 28.9% had 5-8 people in their households. This indicates that the

household size of respondents was relatively small. The results also show that 63.3% of the respondents had spent 6 – 10 years in the plantain processing while 5.6% of the respondents had stayed in plantain processing for more than 11 years. This means that plantain processors are not new in the plantain value chain enterprise.

**Importance of key actors in plantain value chain**

The results in Table 2 showed that 95.5% and 67.8% of the respondents indicated that input suppliers and assemblers respectively are important components of plantain value chain. Meanwhile, all the respondents (100%) indicated that the key

**Table 1: Distribution of respondents according to their personal characteristics (n = 90)**

Variables	Frequency	Percentage	Mean	S.D.
Age				
Below 30	53	58.9	30.8	7.30
31-40	26	28.9		
41 and above	11	12.2		
Sex				
Male	07	7.8		
Female	83	92.2		
Educational status				
Primary education	15	16.7		
Secondary education	63	70.0		
Tertiary education	12	13.3		
Household size				
1-4	64	71.1	3	2
5-8	26	28.9		
Processing experience (years)				
Below 5	28	31.1	8.1	3.0
6-10	57	63.3		
11 and above	05	5.6		

Source: Field survey, 2015. S.D. – Standard Deviation

actors in plantain value chain are producers, marketers (wholesalers and retailers), and consumers. The producers, processors, marketers and consumers were ranked 1<sup>st</sup> as the most key important players in the plantain value chain while input suppliers and assemblers ranked 5<sup>th</sup> and 6<sup>th</sup> respectively. The result is in accordance with the findings of Grant *et al.* (2012) in traditional marketing channels for banana and plantain in Central Africa. They found that the Plantain Map in Central Africa consist a number of actors which also include input suppliers, producers, rural assemblers, two levels of wholesalers. It implies that all these actors play different but mutual roles at ensuring the effectiveness of plantain value chain. For instance, the input suppliers procure herbicides, pesticides, fertilizers, plantain suckers and farm tools inputs and sell them to farmers. The producers are farmers that cultivate suckers to produce plantain fruits. The assemblers are intermediaries between farmers and the wholesalers. They are classified as Farm-Gate Assemblers and Market-Arena assemblers. The Farm-Gate

Assemblers buy bulk Plantain from individual farmers at lower prices and convey it to the market. The Market-Arena Assemblers purchase plantain from Farm-Gate Assemblers in the market place and sell to the wholesalers. The processors transformed the plantain to diverse products to increase its shelf-life, acceptability and consumption. The marketers (retailers) make the products available to the final consumers. Different values are added by the different actors in the plantain market chain. The obvious one is the activities undertaken by the processors that engaged in transformation of plantain to products, packed and sometimes give it label. This enhances its acceptability and distribution beyond the area of its production.

#### **Prevailing product forms of plantain**

Plantains are processed into different types of products such as plantain chips, plantain flour, plantain ball, plantain wine, plantain flakes amongst others. The result in Figure 2 revealed that plantain chips (80.0%) type were predominant plantain product in the

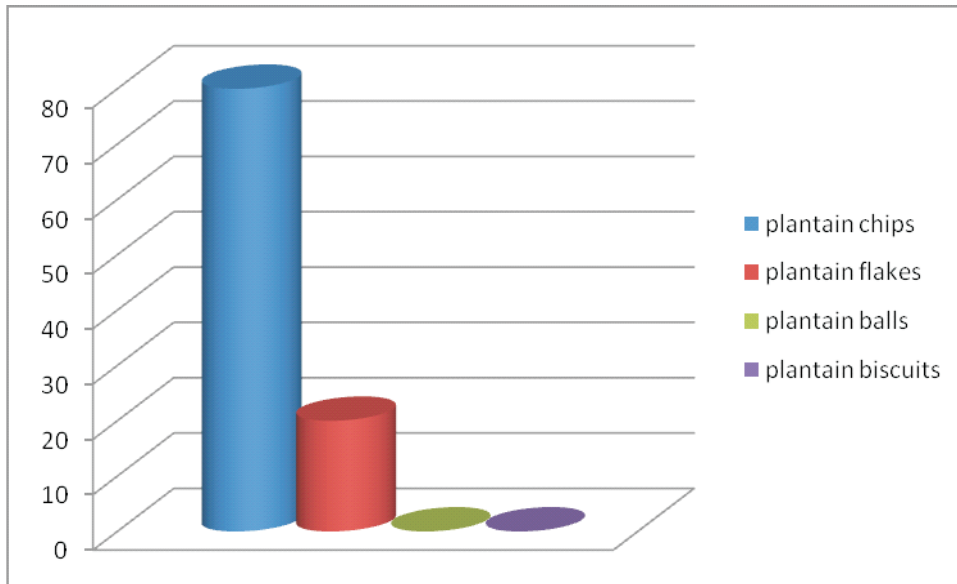
**Table 2: Distribution of respondents based on importance of key actors in plantain value chain (n = 90)**

Key actors	Yes	Percentage	Rank
Producers	90	100	2.5
Processors	90	100	2.5
Marketers	90	100	2.5
Consumers	90	100	2.5
Input Suppliers	86	95.5	5 <sup>th</sup>
Assemblers	61	67.8	6 <sup>th</sup>

*Source: Field survey, 2015*

study area. Twenty percent of the respondents reported that plantains were also made into dried plantain flakes which could be further ground to make plantain flour. This implies that the most popular plantain products are plantain chips and

plantain flakes in the study area. Plantain processors engaged in processing activities in order to generate additional income from the raw plantain purchased from the markets.



**Figure 2:** Common product forms of plantain  
*Source: Field survey, 2015*

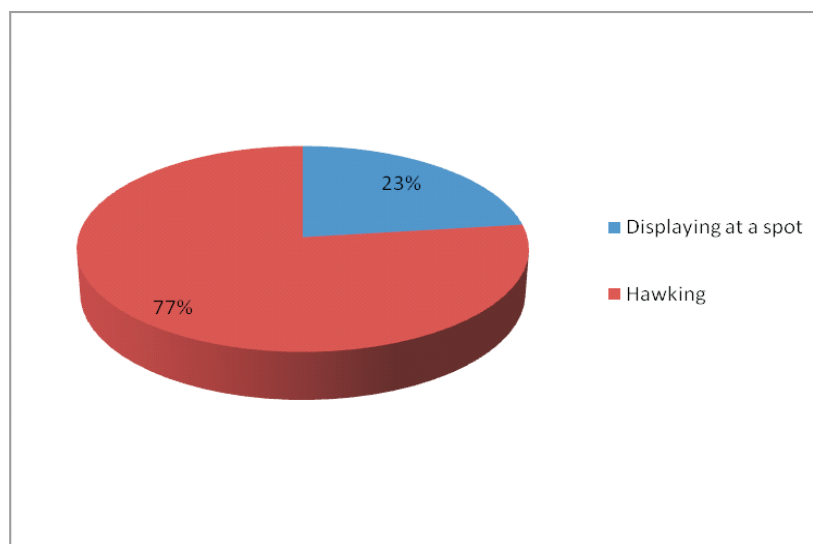
### Marketing strategies

Most (76.7%) of the respondents hawked plantain chips while 23.3% displayed dried plantain flakes in bowls and transparent polythene along the major roads in the study area as shown in Figure 3. Production is not complete until products get to the final consumers. Marketing is the management process whereby the needs of customers are met efficiently and profitably as possible. An efficient marketing system allows perishable products to reach consumers in good quality (Omoare *et al.*, 2013).

### Perception of the respondents on plantain value chain

The results in Table 3 show that most (90.0%) of the respondents strongly agreed that plantain value chain reduced spoilage

and deterioration of plantain products, 73.3% of the respondents strongly agreed that post-harvest losses are minimized through well coordinated value chain while 65.6% of the respondents strongly agreed that quality plantain products are achieved through value chain. Also, majority (86.7%) of the respondents strongly agreed that plantain value chain extends shelf-life and 83.3% reported that fresh and quality plantain products are made available in the markets all year round. Similarly, 77.8% and 67.8% of the respondents strongly agreed that plantain value chain increases processors' income and enhances household nutrition and food security respectively. Kapinga *et al.*, (2007) opined that food processing lengthens the period of availability of a food, creating the potential for income generation and provides a way of using



**Figure 3:** Marketing strategies  
*Source: Field survey, 2015*

surplus produce. Plantain is found in the diet of many Nigerian families. It is a good source of carbohydrate no matter what form it is consumed. It is also a good source of protein, mineral and vitamins (Adejoro *et al.*, 2010). The respondents also indicated that value chain facilitates increased job creation and empowerment (88.9%), encourages interaction and team work among the value chain actors (81.1%) and increases customers' acceptability (93.3%). The respondents ranked increased customers' acceptability (1<sup>st</sup>), reduced spoilage and deterioration (2<sup>nd</sup>), increased job creation and empowerment (3<sup>rd</sup>), extended the shelf-life of plantain (4<sup>th</sup>), availability of quality plantain products in the markets all year round (5<sup>th</sup>), and increases income (6<sup>th</sup>) as the perceived

benefits of plantain value chain in the study area.

**Constraints to plantain processing**

Almost ninety-five percent of the respondents ranked lack of financial support from commercial bank as the extremely serious problem inhibiting plantain processing and entire value chain in the study area. This finding is in line with Oyediran, (2013) that credit is an important input for agricultural growth and development in Nigeria. Ekunwe and Atalor, (2007) also reported that the major constraints of plantain processors were financial, labour and marketing constraints. Epileptic power supply (91.1%) and inadequate processing

**Table 3: Perception of the respondents on value chain for reducing post-harvest losses (n = 90)**

S/N	Statement	SA	A	D	SD	Mean	Rank
1.	Reduced spoilage and deterioration of plantain products	81(90)	9(10)	0(0.0)	0(0.0)	3.90	2 <sup>nd</sup>
2.	Post-harvest losses are minimized through well coordinated value chain	66(73.3)	14(15.6)	10(11.1)	0(0.0)	3.62	8 <sup>th</sup>
3.	Quality plantain products are achieved	59(65.6)	19(21.1)	12(13.3)	0(0.0)	3.51	10 <sup>th</sup>
4.	It extends shelf-life of plantain	78(86.7)	12(13.3)	0(0.0)	0(0.0)	3.85	4 <sup>th</sup>
5.	Fresh and quality plantain products are made available in the markets all year round	75(83.3)	10(11.1)	5(5.6)	0(0.0)	3.74	5 <sup>th</sup>
6.	Processors' income increases	70(77.8)	17(18.9)	3(3.3)	0(0.0)	3.73	6 <sup>th</sup>
7.	Household nutrition and food security are enhanced through increased productivity	61(67.8)	20(22.2)	6(6.7)	3(3.3)	3.54	9 <sup>th</sup>
8.	It facilitates increased job creation and empowerment across the value chain	80(88.9)	10(11.1)	0(0.0)	0(0.0)	3.87	3 <sup>rd</sup>
9.	It encourages interaction and team work among the value chain actors	73(81.1)	9(10)	4(4.4)	4(4.4)	3.72	7 <sup>th</sup>
10.	It increases customers' acceptability	84(93.3)	6(6.7)	0(0.0)	0(0.0)	3.93	1 <sup>st</sup>

Source: Field survey, 2015 SA – Strongly Agree, A – Agree, Disagree, SD – Strongly Disagree

facilities (90.0%) were ranked second and third respectively. Other serious constraints include poor pricing and standardization (88.9%), inadequate extension support and training (86.7%), poor rural infrastructure (84.4%), and high cost of processing materials and ingredients (81.1%).

### Hypotheses testing

#### Hypothesis 1

H<sub>01</sub>: There is no significant relationship between the personal characteristics of the respondents and perception of respondents on reduction of post-harvest losses through plantain value chain.

The result of hypothesis showed a positive and significant relationships between age ( $r = 0.85$ ,  $p = 0.00$ ), household size ( $r = 0.65$ ,  $p = 0.01$ ), processing experience ( $r = 0.63$ ,  $p = 0.03$ ) and perception of post-harvest losses at  $p < 0.05$ . This means that the age, household size and experience of the respondents had influence on the perception of post-harvest losses. Hence, the null hypothesis that “*there is no significant relationship between the personal characteristics of the respondents and perception of respondents on reduction of post-harvest losses through plantain value chain*” is rejected.

**Table 4: Distribution of respondents based on constraints to plantain processing (n = 90)**

S/N	Constraints	Extremely serious	Moderately serious	Not serious	Mean	Rank
1.	Inadequate processing facilities	81(90.0)	9(10.0)	0(0.0)	2.90	3 <sup>rd</sup>
2.	Epileptic power supply	82(91.1)	8(8.9)	0(0.0)	2.91	2 <sup>nd</sup>
3.	Inadequate rural infrastructure	76(84.4)	14(15.6)	0(0.0)	2.84	6 <sup>th</sup>
4.	Lack of financial support from commercial banks	85(94.4)	5(5.6)	0(0.0)	2.94	1 <sup>st</sup>
5.	Inadequate extension support and training	78(86.7)	12(13.3)	0(0.0)	2.87	5 <sup>th</sup>
6.	High cost of processing materials and other ingredients	73(81.1)	12(13.3)	5(5.6)	2.76	7 <sup>th</sup>
7.	Poor pricing and standardization	80(88.9)	10(11.1)	0(0.0)	2.89	4 <sup>th</sup>

Source: Field survey, 2015

Figures in parenthesis are percentages

**Table 5: Relationship between selected personal characteristics and perception of plantain post-harvest losses**

Variables	r	p-value	Decision
Age	0.85	0.00	S
Household size	0.65	0.01	S
Processing experience	0.63	0.03	S

Source: Field survey, 2015

S – Significant at  $p < 0.05$

**Hypothesis 2**

H<sub>02</sub>: There is no significant relationship between the constraints to plantain processing and perception of respondents on reduction of post-harvest losses through plantain value chain.

The result of hypothesis showed positive and significant relationships between inadequate processing facilities ( $r = 0.68, p = 0.00$ ), epileptic power supply ( $r = 0.83, p = 0.04$ ), Inadequate rural infrastructure ( $r = 0.91, p = 0.00$ ), lack of financial support from commercial banks ( $r = 0.69, p = 0.00$ ), inadequate extension support and training ( $r = 0.91, p = 0.01$ ), poor pricing and standardization ( $r = 0.89, p = 0.02$ ) and perception of respondents on

reduction of post-harvest losses through plantain value chain at  $p < 0.05$ . But, high cost of processing materials and other ingredients had an inverse relationship with perception of respondents on reduction of post-harvest losses through plantain value chain at  $p < 0.05$ . This means that the constraints to plantain processing had bearing on the perception of respondents on reduction of post-harvest losses through plantain value chain. Therefore, the null hypothesis that “there is no significant relationship between the constraints to plantain processing and perception of respondents on reduction of post-harvest losses through plantain value chain” is rejected.

**Table 6: Relationship between the constraints to plantain processing and perception of respondents on reduction of post-harvest losses through plantain value chain**

Variables	r	p-value	Decision
Inadequate processing facilities	0.68	0.00	S
Epileptic power supply	0.83	0.04	S
Inadequate rural infrastructure	0.91	0.00	S
Lack of financial support from commercial banks	0.69	0.00	S
Inadequate extension support and training	0.91	0.01	S
High cost of processing materials and other ingredients	-0.19	0.00	S
Poor pricing and standardization	0.89	0.02	S

Source: Field survey, 2015

S – Significant at  $p < 0.05$

#### 4.0 Conclusion and Recommendations

It can be concluded that plantain processing in the plantain value chain helped to minimize post-harvest losses. However, the constraints impeded the effective plantain processing in the study area. It is hereby recommended that financial institutions should grant affordable loans to the plantain processors. Stable electricity supply should be made available by the government and improved processing facilities at subsidized rate should be supplied by the government to encourage the plantain processors.

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