Effect of Knowledge, Attitude and Constraints on Postharvest losses among plantain farmers and wholesalers in south-western Nigeria

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Abstract: Postharvest losses have been a constraining factor in plantain production such that increase in yield brought about by advances in technologies through research did not make any significant impact on the economy of small scale farmers. The study examined the influence knowledge, attitude and constraints on postharvest losses among farmers and wholesalers in south-western Nigeria. A combination of multistage random sampling and Snowball techniques were used to select farmers and wholesalers respectively. Primary data was collected through pre-tested structured questionnaire and analysed using frequency counts, percentages and t-test. The result shows a significant relationship between knowledge and constraints to postharvest activities and postharvest losses among farmers and wholesalers. Similarly, significant differences were recorded in the attitude ($t = 4.04$, $p < 0.05$) and knowledge ($t = 2.23$, $p < 0.05$) and postharvest losses ($t = 3.98$, $p < 0.05$) among the respondents, while no significant differences was observed in the constraints they faced with ($t = 1.26$, $p < 0.05$). The result shows that there is need for an improved knowledge on the postharvest activities, an improvement in the constraints faced by them to reduce the post harvest losses incurred.

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1. Introduction

Plantain belongs to the family *Musaceae*. It descended from a wild ancestor *Musa balbisiana* (Samson, 1980). In sub-saharan Africa, plantain provides up to 25% of the required food energy to 70 million people (Swennen, 1990). Plantain constitutes an important source of revenue for the backyard producers and large scale farmers. This crop was one of the first to be domesticated as it requires no specialised tool for harvest or propagation (Chuckwu, 1996). The long association between man and this crop is also indicated by the many forms in which it is consumed. Plantain could be consumed in the unripe, ripe, and overripe forms, when raw or cooked. In Nigeria, it is grown in the southern states in the so called plantain belt by small peasant farmers in traditional farming system from backyard gardens to pure stand field (Noupadja, 1995; Akinyemi and Tijani Eniola, 2000). Nigeria is the largest producer of plantain in West Africa with annual production of about 2.4 million metric tonnes mostly from the plantain growing states which include; Edo, Delta, Osun, Ondo, Rivers, Cross-rivers, Akwa-Ibom, Imo, Abia, Anambra, Oyo, Lagos, and Enugu states.

Food preservation remains a major challenge in developing countries including Nigeria. The capacity to preserve food is directly related to the level of technological development. While affluent and industrialized countries are more concerned with the adverse health effects of excessive food or nutrient intake, leading to obesity, arteriosclerosis and hypervitaminosis, developing nations continue to grapple with food shortages and nutritional deficiency diseases. The perishability of plantain like other crops gives rise to the need to preserve it. One of the ways of ensuring good food preservation is through efficient postharvest handling.

Postharvest handling of crops is of great importance in food production. This is because it is one of the determinants of the quantum of the profit that the rural farmers will make on their harvested crops (Chukwu 1996). While research has shown that increased production is possible, it has however been discovered that the increase in crop yield brought about by the advances in technologies during the last decade did not make any significant impact on the economy of the small-scale farmers. This is because the increase is lost due in part to poor postharvest handling of the crops produced (Arowojolu, 2000).

Management of postharvest losses is therefore essential if these losses are to be minimised. Plantain is chosen for this study because of its perishable nature. Plantain is among the major food crops (Frison, 1997) that require proper postharvest handling. Also, it is in high demand by both the high and ″low income earners in the society and worldwide. Plantain is of high commercial value, available in the rural and urban areas, commands

usage diversity and is an important source of revenue for small farm holders (Dorosh, 1988; Tshiunza, et al, 2001).

The south western agro-ecological zone of Nigeria is the dominant zone for the production of plantain. The zone has heavy rainfall of 1200 – 1500mm, and well drained ground for plantain production. The production of plantain is scattered in farms all over rural areas in the zone and have to be gathered together before being transported to the ultimate consumers (Eboh and Ogbazi, 1990). Plantain is a seasonal crop, highly perishable, high in moisture content, and characterized by high postharvest losses (Olorunda and Aworh, 1988).

Aworh (2004) stated that the postharvest losses of fruits run into billions of Naira annually, while Khang (2003) opined that the losses not only affect output but reduce farmers' income all over the world. Postharvest loss has been a bane to food security in Nigeria. Even though increased yield has been found to be possible (Arowojolu, 2000), postharvest losses have prevented the effect of the increase to be felt on the income of the small-scale farmers. Many of the technologies wherein farmers invest time and money for higher yield are nullified by postharvest losses (Chukwu, 1996). Nigeria the largest producer of plantain in West Africa consumes all her production with nothing for export because of the decline in production in recent times. Postharvest loss has been found to be responsible for the decline in production of plantain in association with other factors such as poor road networks, constraints to postharvest activities, low soil fertility and non-maximisation of the processing potentials of plantain (Ladapo, 2010).

Eradication or reduction of postharvest losses is therefore important to bring about increased food security and reduce suffering to both rural and urban households. In order to ensure that every Nigerian has an unimpeded access to enough food for healthy living throughout the year, and that farmers have adequate financial reward for their efforts on the farm, special attention has to be paid to the postharvest handling of fruits like plantain that have high perishability. This is in order to identify the determinants of the losses in effort at reducing them to the barest minimum. The general objective of the study is to identify the determinants of post harvest losses of plantain among farmers and wholesalers in south-western Nigeria.

Materials and Methods

This study was carried out in South Western Nigeria using a multi-stage sampling technique. The first stage involved the selection of three states namely: Edo, Osun, and Ondo out of the eight in the south western ecological zone of Nigeria. The states were selected because of the high production of plantain. The second stage involved the selection of the Agricultural Development Programme (ADP) zones in each of the 3 states. Ten percent of the ADP zones were randomly selected from each state, to give one zone per state, making a total of 3 ADP zones. The third stage involved the random selection of 10% of the blocks to give five blocks from the forty-six in the selected zones. The fourth stage involved the random selection of one cell from each of the selected blocks to give 5 cells. Each cell has an average of one hundred and twenty farmers. The fifth stage involved the random selection of 40 percent of the farmers in the selected cells to give two hundred and fifty farmers (out of 600) which formed the sample size for farmers. There were no registered wholesalers in the selected states. The snowball technique; in which the researcher identified some wholesalers who have the required information and helped to identify other wholesalers was used. A total of one hundred and twenty wholesalers were identified, out of which ninety were randomly selected for the study using the systematic random technique.

Data were collected using structured interview schedule that included list of five postharvest activities, from which farmers and wholesalers indicated those they practiced, while a knowledge test on postharvest activities was provided on a 2 point scale of True (2) and false (1) containing eleven items on postharvest activities. Attitude to postharvest activities were determined with a Likert scale of SA, A, U, D and SD were containing developed 10 statements. Data were analysed through the use frequency and percentages, Pearson Product Moment Correlation and t-test.

2. Result

Table 2 shows the personal characteristics of plantain farmers and wholesalers, while Table 3 presents the post harvest activities among plantain farmers and wholesalers and Table 4 reveals the constraints of plantain farmers and wholesalers to postharvest activities. Table 5 and 6 presents the attitude of plantain farmers and wholesalers to postharvest activities and knowledge of postharvest activities of plantain by farmers and wholesalers respectively; while tables 7 and 8 shows the correlation analysis of post harvest losses and attitude of respondents and t-test statistics of difference in attitude, knowledge, constraints and post harvest losses of farmers and wholesalers respectively.

Table 1: Sampling procedure for the plantain farmers

States	Edo	Osun	Ondo	Total
No. of zones in each state	3	2	3	8
No. of zones randomly selected (10%)	1	1	1	3
No. of blocks in each zone	18	10	18	46
No. of blocks randomly selected (10%)	2	1	2	5
No. of cells in the blocks selected (8 cells = 1 block)	16	8	16	40
No. of cells randomly selected (10%)	2	1	2	5
No. of farmers/cell at an average of 120	240	120	240	600
No of randomly selected respondents	96(40%)	60 (50%)	94 (40%)	250

Table 2: Personal characteristics of plantain farmers and wholesalers

Demographic characteristics	Farmers	Wholesalers
Variable		
Age (years)		
31 – 40	22 (8.8)	23 (25.5)
41 – 50	60 (24)	50 (55.6)
51 – 60	142 (56.8)	17 (18.9)
61 – 70	26 (10.4)	----
Mean	52.6	44.8
Sex		
Male	204 (81.6)	25 (27.8)
Female	46 (18.4)	65 (72.2)
Marital Status		
Married	232(92.8)	84(93.3)
Widowed	18 (7.2)	6 (6.6)
Level of Education		
No formal Education	162 (64.8)	14 (15.6)
Adult Education	32 (12.8)	19 (21.1)
Primary Sch. Leaving Cert	20 (8.6)	44 (48.9)
Attempted School Cert.	36 (14.4)	13 (14.4)
Family Size		
1 – 4	63 (25.2)	35 (38.9)
5 – 8	132 (52.8)	46 (51.1)
9 – 12	55 (22.0)	9 (10.0)
$\bar{x}$	8.6	5

*Percentage in parenthesis.

Table 3: Post harvest activities among plantain farmers and wholesalers

Activity	Farmers	Wholesalers
Storage mode using Traditional methods	250 (100)	90 (100)
Processing	210 (84.0)	64 (71.1)
Marketing	250 (100)	90 (100)
(a) farm-gate	158 (68.2)	61(67.8)
(b) urban market	42 (36.8)	90(100)
(c) on the farm	42 (36.8)	20(22.2)
Sorting		
Sorting by number	200(80.0)	72(80.0)
by bruises	198 (79.2)	72(78.9)
by stage of ripeness	186(74.1)	83(92.2)
Transport involvement	36 (14.4)	90(100)
non-involvement	214 (85.5)	--
	214(85.6)	--

* Percentages in parentheses.

Table 4: Constraints of plantain farmers and wholesalers to postharvest activities

Constraints to various post-harvest activities	Farmers	Wholesalers
Transportation and Marketing Bad roads	244 (97.6)	77 (85.6)
High cost of transportation	245 (98.0)	90 (100)
Poor state of vehicles	234 (93.6)	81 (90.0)
Storage and Processing Lack of technological know-how	232 (92.8)	12 (13.3)
Lack of knowledge of improved storage/processing equipment	240 (96.0)	87 (96.7)
Non-affordability of the equipment	242 (96.8)	81 (90.0)
Lack of infrastructural facilities	242 (96.8)	82 (91.1)
High cost of maintenance	186 (86.0)	87 (96.7)
Government Policy	214 (85.6)	41 (45.6)
Social and Political instability	188 (75.2)	66 (73.3)
Poor hygiene of warehouses/packs	62 (24.8)	68 (75.6)

*Percentages in parentheses

Table 5: Attitude of plantain farmers and wholesalers to postharvest activities

Attitude	Farmers Mean	Wholesalers Mean
Post harvest handling of plantain is not necessary.	1.98	3.03
Post harvest handling of plantain is a waste of time.	2.79	3.80
Post harvest handling of plantain is expensive	2.61	2.90
It is necessary to float harvested banana in water immediately after harvesting	2.40	---
Processing is additional labour cost	2.23	3.70
Storage is additional labour cost	2.24	2.30
High cost of processing equip. prevent respondents from processing Plantain and Banana	2.74	4.20
Long distance of market to farms encourage sales at the farm gate.	2.11	4.1
Fruits infected with disease have no markets value	2.42	0.99
It is important to maintain strict hygiene or sanitation in the plantain/banana pack houses to minimize infection.	2.06	1.70
Dehandling bunches will allow for max transportation of plantain/banana.	2.57	2.75
Overall Mean attitude scores	2.45	3.03

Figures in parenthesis are percentages

Table 6: Knowledge of postharvest activities of plantain by farmers and wholesalers

Items	**Farmers**	**Wholesalers**
Locating a cottage industry close to your farm/close to where you buy will encourage you to process plantain.	58 (23.2)	46 (51.1)
Do you think sorting of diseased/damaged plantain is a waste of time.	98 (39.2)	25 (27.8)
Damaged fruits are not useful.	176(70.4)	81(90.0)
Packaging your fruits properly will prevent mechanical damage to your plantain.	200 (80.0)	89 (96.7)
Do you know that you should not pack ripe and unripe plantain together	188 (75.2)	81 (90.0)
Selling your fruits at the farm gate attracts more income than in the local markets.	166(67.0)	67 (74.4)
Both mature and immature fruits should be harvested/purchased.	94 (38.0)	4 (13.3)
Processing enhance better storage.	166(67.0)	79 (63.3)
Processing of food crops is essential	238 (95.2)	90 (100)
Use of bad roads contribute to loss of plantain	242 (96.8)	90 (100)
Breakdown of vehicles causing delay in getting to destination encourage deteriorating of plantain	242 (96.8)	90 (100)
It is financially more rewarding to sell in the urban markets than in rural markets.	226 (90.4)	8 (26.6)
Bruised plantain can be waxed to prevent further deterioration	238 (95.2)	90 (100)
You should prevent plantain from getting bruised	240 (96.0)	90 (100)

Percentages in parentheses.

Table 7: Correlation analysis of post harvest losses and attitude of respondents

	Variables	r	df	p	Decision
Attitude	farmers	0.14	248	0.13	Not Significant
	wholesalers	0.022	88	0.73	Not Significant
Constraints	farmers	0.62	248	0.01	Significant
	wholesalers	0.75	88	0.04	Significant
Knowledge	farmers	-0.34	248	0.00	Significant
	wholesalers	-0.22	88	0.03	Significant

Table 8: t-test statistics of difference in attitude, knowledge, constraints and post harvest losses of farmers and wholesalers

Variables	Groups	N	Mean	SEM	MD	t	df	p
Attitude	Wholesalers	90	18.21	1.18	5.8	4.04	414	0.00
	Farmers	250	13.70	0.88				
Knowledge	Wholesalers	90	14.22	0.91	0.42	2.23	414	0.00
	Farmers	250	13.32	0.56				
Constraints	Wholesalers	90	14.51	0.94	0.91	2.26	414	0.00
	Farmers	250	14.59	0.94				
Postharvest	Wholesalers	90	360.77	38.02	161.71	3.98	414	0.00
loss	Farmers	250	158.98	14.21				

3. Discussion

The table below reveals the age distribution, sex, marital status, level of education and family sizes of the farmers and wholesalers. The farmers had mean age of 52.6 ± 7.5 years, 81.6% were males and 64.8% had no formal education. Seventy-two percent of the wholesalers were females with mean age of 44.8 ± 6.7 years and 48.9% had primary school certificate. The age distribution among the farmers agree with Onanamadu (2000) and Akinsorotan (2004) which confirmed that majority of the farmers in the rural areas were within the age bracket of 41 – 60 years. Large percentage (81.6%) of the farmers were men while greater percentage (72.2%) of the wholesalers were women. This implies that there are define roles for the different gender in postharvest handling of plantain (Ladapo 2010). These results are in agreement with that of Igben (1998) and Ajayi (2000) who opined that relatively younger women are likely to be more dynamic and willing to take risks associated with plantain marketing activities with the hope of improving their living standard. Ninety-three and seven percent of both farmers and wholesalers were married and divorced respectively. The wholesalers were found to be relatively more educated with smaller family size than the farmers with an average family size of 9. Many of the families (64.8%) had no formal education while 49.1% of the wholesalers had primary school leaving certificate.

From Table 3, both farmers and wholesalers engage in similar postharvest activity which include storage, processing, marketing, sorting and transportation. While all farmers and wholesalers engage in storing plantain using the traditional method of placing or raised platform and covering only 84 percentage of the farmers and 71.1 percent of the wholesalers process plantain, this reveals that more of the farmers process plantain. Also all the farmer and wholesalers engaged in sorting as a post harvest activity. The parameters for sorting are however different while the size and the number of fingers is the most important for the wholesalers. While all the wholesalers (100%) also engage in transporting plantain only a small fraction (14.4%) of the farmers are involved in transporting plantain. The reasons adduced by the farmers are high cost of transportation.

Both farmers and wholesalers engaged in marketing of plantain while most of the farmers sell at the farmgate (63.2%), the wholesalers sell at the urban (100%) while (67.8%) also sell at the farm gate. Some of the farmers (36.8%) also sell on the farm when the need arises. Both farmers and wholesalers identified similar constraints to post harvest activities as revealed by Table 4. Majority of the farmers and wholesalers identified high cost of transportation (98%, 1000%) bad roads (97.6%, 85.6%) lack of knowledge of improved storage equipment (96.6%, 96.7%) and lack of infrastructural facilities (96.8%, 91.1%) . Poor hygiene and warehouse packs has identified as a constraints by seventy-five point six percent of the wholesalers only twenty-four point eight percent of the farmers see it as a constraints. However lack of technical know how pm storage was observed as a constraint by 92.8 % of the farmers and only 13.3 percent of the wholesalers. This may be as a result of the fact that more farmers process plantain (Table 3). Constraint was found to have a positive

correlation with postharvest which implies an increase in the constraint will bring about a corresponding decrease in postharvest losses which will result in increase income for the farmers.

The responses of the farmers to twelve attitudinal statements with mean score of 2.45 is shown in Table 5. Many of the farmers score lower mean values when compared with the overall mean except for statements Post harvest handling of plantain is a waste of time, post harvest handling of plantain is expensive; high cost of processing equipment prevents respondents from processing plantain and banana and dehandling bunches will allow for max transportation of plantain/banana. The overall distribution showed that 57.6% and 35.6% of farmers and wholesalers have unfavourable attitude towards postharvest handling respectively. The unfavourable attitude of farmers may be as a result of their poor educational background, inadequate information on the value addition potentials of plantain. However, the wholesalers showed more favourable attitude to postharvest activities than the farmers. This may also be as a result of their better educational background when compared with the farmers. Dubois (2008) reported similar findings among banana farmers. Responses of both farmers and wholesalers indicating their level of knowledge of various post harvest activities of plantain is shown in Table 6. Majority (54.4%) of the farmers and wholesalers (53.5%) have low knowledge of various improved post harvest activities. The farmers are however found to be rich in indigenous knowledge (locally developed skills) which is used in storing ripening and processing of plantain. This agrees with the findings of Ekunwe and Atalor, (2007).

Table 7 reveals the relationship between the respondents' attitude to postharvest activities and the postharvest losses they incur. There exist no significant relationship between the farmers' attitude to improved postharvest activities and the losses they incur. A correlation value of $r = 0.14$; $p = 0.13$ was obtained. Thus, the attitude of farmers does not significantly dictate the level of losses they incur. Similarly the result for wholesalers in their attitude to improved postharvest activities and the losses incurred by them. A value of $r = 0.22$; $p = 0.73$ was obtained. Thus, the attitude of respondents was not significantly correlated with the postharvest losses they incur. A positive and significant correlation of $r = 0.62$; $p < 0.05$ was observed for the farmers. This r value indicates a strong positive correlation between the constraints faced by the farmers and the postharvest losses they incur. This implies that the more the constraints, the higher the losses. Thus, farmers that have more constraints to contend will incur more losses. A positive and significant correlation was also observed for the wholesalers between their constraints to improved postharvest activities and the losses incurred by them. A correlation value of $r = 0.75$; $p < 0.05$ was significant and high. This implies that the more the constraints encountered by the wholesalers, the more the losses they incur, just like the farmers. The relationship in the case of the wholesalers is however stronger. The table further reveals a significant relationship between knowledge of post harvest activities and the postharvest losses incurred by the farmers with a value of $r = -0.34$ ($p < 0.05$). The result implies that an increase in the knowledge of farmers on postharvest activities will bring about a decrease in the post harvest losses incurred, that is, the more knowledgeable they are on effective storage of plantain and modern processing technologies, the lower the losses they will incur. The table also reveals a significant relationship between knowledge of post harvest activities and post harvest losses incurred by the wholesalers. A correlation coefficient of $r = -0.22$; $p < 0.05$ was obtained. This implies that wholesalers with low knowledge of improved postharvest activities were unable to process plantain into various utility forms that would enhance the shelf life, hence the high losses incurred. Thus, the more knowledgeable respondents are, the more they are able to reduce losses. Even though wholesalers have a higher mean knowledge score than the farmers, they yet record higher losses than the farmers. This could be because the wholesalers are always on the move from one place to another and therefore have no time to utilise their knowledge of the various product potentials of plantain Ladapo (2010).

In Table 8, significant differences were recorded in the attitude, knowledge, and the postharvest losses incurred among plantain farmers and wholesalers in the study area with t=4.04; 2.23; and 3.98 respectively at $p = 0.00$. However, no significant difference was observed in the constraints faced by the farmers and wholesalers with $t = 1.26$ (Table 5.19). The higher means of attitude and knowledge of the wholesalers was a reflection of the relatively higher educational attainment of the wholesalers. However, the lower mean losses of farmers (90 bunches/annum) compared while those of the wholesalers (251.71 bunches/annum). implies that the postharvest losses incurred by the wholesalers are more than those of the farmers**.**

Conclusion

A major conclusion in this paper is that while knowledge of postharvest activities of farmers and wholesalers to and constraints faced by them are positively correlated to postharvest losses, their

attitude is not. Also, there is significant difference in the attitude, and knowledge. There is therefore the need to develop scientific evidence that will ensure reduced postharvest losses, improve knowledge and attitude through the provision of adult literacy and home-economics classes on the processing potentials of plantain. Constraints faced by the respondents should also be looked into with a view to improving on them, thereby reducing postharvest losses greatly. It will also increase income of farmers/wholesalers, encourage farmers to increase plantain production and subsequently bring about food security.

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