UTILIZATION OF POST HARVEST TECHNOLOGIES AMONG YAM FARMERS IN SELECTED LOCAL GOVERNMENT AREAS OF NIGER STATE, NIGERIA

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ABSTRACT

Yam is an important tuber crop in Nigeria. However, its availability is affected by rate of deterioration arising from poor postharvest handling. Hence, farmers use various techniques to minimize the loss. Therefore, this study examined the utilization of post harvest technologies among yam farmers in selected local Government areas of Niger state, Nigeria. Data were collected from 195 respondents and analyzed with descriptive statistics. The result revealed that, the mean age of the respondent was 35.0 years and highly experienced in food crops production with mean of 18.0 years experience. Majority of the respondents (79%) had formal education. However data analysis reveals that yam barn storage technique ranked first in terms of types and level of utilization by the farmers with the highest weighted mean (WM=3.87) while, open sided shelve was the least (WM=1.43). It is therefore recommended that extension agents should actively disseminate information on improved storage techniques to yam farmers in the study area as well as the need to use such techniques.

KEYWORDS: Technology, Storage technique, Postharvest losses, Yam barn, Utilization.

INTRODUCTION

Agriculture is the most important economic sector of any Nation saddled with the responsibility of meeting the food requirements of the rather fast growing global population (Andersen, 2010). The situation is direr with the projected world population expected to reach 10.5 billion by the year 2050 as stated by the United Nation (UN, 2013) thereby, adding to the global food security concerns. This projection, translates into 33% more human mouths to feed, with the greatest demand growth in the poor communities of the world. Food supplies would therefore need to increase by 60% as estimated at 2005 food production levels in order to meet the food demand in 2050 (Alexandratos and Bruinsma, 2012). To this end, food availability and accessibility can be increased by increasing production, improving distribution and reducing the losses by Food Agricultural Organization (FAO, 2010). Thus, reduction of post-harvest food losses is a critical component of ensuring future global food security.

Post harvest handling and storage of yam is an important aspect of economic development in Nigeria. Accurate financial worth of yam industry in Nigeria is hard to come by, but it was estimated at two hundred billion naira (200bl) per annum with estimated losses from storage over half the expected revenue (FAO, 2010). These losses were mostly attributed to rot caused by bacteria, fungi and nematode. The bulk of these pathogens causing yam tuber rots are soil borne but manifestation of the tuber disease are observable mostly during storage (Okigbo, 2004).

Similarly, weight loss during storage in traditional or clamp storage can reach 10-12% in the first three months and 30-60% after 6 months of storage and in West Africa alone; this amounted to an annual loss of one million tons of tuber (FAO, 2003). It is important to also point out that maximization of profit can only be achieved when farmers are well equipped with required technological knowledge and skills of yam storage. This act is necessary because one of the major constraints upon establishing effective storage and processing management approaches for smallholder farmers is the lack of adequate information sources to increase farmers' knowledge level in the practices of yam tuber processing and storage. In fact, the need to understand farmers' knowledge systems has been recognized as a basis for development of proper storage and processing technologies that are sustainable and adaptable to local farmer's environmental condition.

However, despite the necessity of producing more food to meet the ever-increasing global population, most of agricultural produce are lost during postharvest handling and that up to 50-70% losses are estimated between production area and consumption point because of lack of storage facilities, limited access to processing technologies, unstable market prices, poor market opportunities and non utilization of postharvest technologies (Olayemi*et al.,* 2012) and (Owolade, 2011). Post-harvest losses will lead to reduction in farmer's income, food insecurity, poor nutritional value and lack of input for the next production (Olayemi*et al*., 2012).

In recent times research on post harvest preservation has been given little support by both the government and the private sectors. To minimize post-harvest losses, improved methods of storage have therefore been developed. However, the poor economic status of most Nigerian farmers has inhibited the adoption and usage of most agricultural technologies (Alimi and Zango, 2016). It was hoped that farmers' usage of these technologies would lead to reduction in food losses, improved income and enhanced food security (Okoedo and Onemolease, 2009). Nevertheless, the widespread and continued use of traditional storage practices by small-scale farmers despite considerable losses usually associated with these methods need investigation.

Over the past decades, significant focus by researchers (such as: Gbemisola, 2009; shehu, 2010) and resources have been allocated to increasing food production. For instance, 95% of the research investments during the past 30 years were reported to have focused on increasing productivity, and only about 5% was directed towards reducing losses (Kader, 2005; Kader and Roller, 2004). Although, increasing agricultural productivity is critical for ensuring global food security but this may not be sufficient. The global food supply is currently being challenged by limited post-harvest preservation techniques as a result of a wide gap that exist between actual achievement and achievable potential in the yam farming industry. This study seeks to fill the identified research gap. In view of the above, this study is initiated to assess the utilization of post harvest technologies among yam farmers in selected areas of Niger state, Nigeria. The specific objectives are to:

i. describe the socio economic characteristics of yam farmers
ii. identify the types of post harvest technologies used by the yam farmers
iii. examine the level of utilization of post harvest technologies by yam farmers
iv. identify the constraints limiting the utilization of post harvest technologies by yam farmers in the study area.

METHODOLOGY

The study was conducted in Niger State of Nigeria. Niger State is located between latitudes 8º112 N and 11° 202 N and longitude 4° 302 E and 7° 202 E (Ojo*et al.,* 2013). The State is located in the North central zone along the Middle Belt region of Nigeria. The state has a population of about 3,954,772 individuals as stated by the National Population Commission (NPC, 2006). Niger state is classified as one of the largest states in the country spanning over 86,000km2 in land area with 80% of the land mass conducive for agriculture (Tologbonse, 2008). With 9.30% of the total land area of the country, Niger state is not only divided into three agricultural zones under climatic features containing nearly all classes of soils of the savannah regions of West Africa (Tologbonse, 2008). In order to achieve the study objectives, multiple sampling techniques were employed. This involves purposive selection of zone B of Niger state because of the preponderance of yam production in this zone. The second stage involved the purposive selection of three Local Government Areas known for higher yam production in the zone namely; Paikoro, Shiroro, and Bosso Local Government Areas. The third stage involved the random selection of two districts from the selected Local Government Areas. The fourth stage involved the random selection of two villages from each of the selected Local Government Areas. The fifth stage involved a proportionate random selection of 5% from the registered yam farmers in each of the selected villages. Therefore, a total of 195 yam farmers were considered as the sample size for this study. Interview schedule was used to elicit data from the respondents. The responses were analyzed using frequency counts, percentages and mean score to describe the socio economic characteristics and the types of post harvest technologies used by yam farmers. However a 4-point Likert type of scale was employed for objective (iii) and scored as follows: Always Used (AU) = 4, Frequently Used (FU) = 3, Sometimes Used (SU) = 2, Never Used (NU) = 1. A mean score of 2.5 was obtained and the decision rule is that any mean ($\bar{X}$) scores ≥ 2.5 indicate used, while scores < 2.5 not used. Similarly a 3-point Likert type of scale was employed for objective (iv) and scored as follows: Very Serious (VS) = 3, Serious (S) = 2, and Not Serious (NS) = 1.

The mean score was obtained and the decision rule is that any mean ( ) scores ≥ 2.0, indicate serious constraint while scores < 2.0 indicate Not serious constraint.

RESULTS AND DISCUSSION

Socio economic characteristics of the respondents

The results in Table 4.1 showed that majority (92.4%) of the respondents were between the age of 21 and 50 years, while only 3.1% were less than 20 years and 4.6% above 50 years. The mean age of the respondents was 35 years. The implication of the mean age on utilization of post-harvest technologies is that the young farmers can take risk by utilizing new technologies than the older farmers. This supports the findings of Jabil and Abdu (2012) who stated that young farmers are willing to use new technologies than the older ones and they are not aversive to risk. Similarly, (69.2%) of the farmers had been into yam production for over 20 years and all the respondents had an average farming experience of 18 years. This implies that the farmers are quit experienced in yam cultivation. This compares favorably with the findings of Falola*et al.*, (2017); Oluwatosin (2011) that indicated that the yam farmers had a significant level of expertise in yam production. Similarly, more than half (59.0%) of the respondents had a household size of about 3-6 members, while the mean of the household size was found to be five (5), implying a large household size. This is in agreement with Giroh*et al.* (2012) who reported that farmers with large household size tend to channel more of their income to food consumption expenditure rather than to save and invest in improved storage technique. The result further revealed that majority (79%) of the respondents had formal education. This implies that respondents are educated enough to know and understand the complexities involved in improved technology to adopt it. This assertion is in contrast to Tor *et al.* (2017); Onemolease (2005), who reported that a low educational background not exceeding primary education may impede acceptance of improved post harvest technologies, since education facilitates farmers' utilization of innovations.

Types of post harvest technologies used by yam farmers

Post harvest technologies are referred to as technologies commonly used for the purpose of storing and processing by the yam farmers in the study area. The comprehensive list of technologies was developed and farmers were asked to indicate the technologies they use. Tables 2 showed that majority of the respondents use the following post harvest technologies: Storage in barn (98.5%), Processing into pounded yam (97.4%), Processing into fried yam (96.9%) and Storage in mud hut (88.7%). While open sided shelf stores (32.3%) and ventilated pit (28.7%) are the least storage methods used. This result agrees with that of Akangbe *et al.* (2012) who stated that storage of yam tubers in barns was the major storage method utilized wile ventilated pit and open sided shelf stores were the least methods used by the respondents in the study area.

Level of utilization of post harvest technologies by yam farmers

Table 3 indicates that storage of yam tubers in barns was the major storage method used by the respondents in the study area (mean = 3.87). However, in terms of frequency of utilization, (91.3%) of the respondents always use yam barns, followed by processing into pounded yam (90.2%) with the mean of 3.85, then processing into fried yam (77.9) with (mean = 3.68). Storage in open sided shelf stores were the least used storage techniques with (mean = 1.43). This implies that majority of the respondents depend on manual or traditional technology to execute some vital processes. This result agrees with that of Falola*et al.* (2017); Okoedo and Onemolease (2009) who stated that storage of yam tubers in barns was the major storage method utilized by the respondents in the study area. It also tallies with the findings of Akangbe et al., (2012) who reported open sided store was the least adopted method by farmers in the storage of yam in Asa Local Government Area of Kwara State.

Summarily, level of utilization of post harvest technologies in the study area as shown in table 4 revealed that utilization level is low (51.3%) . This result may be attributed to lack of access and effective information on these improved technologies. Thus, respondents rely on traditional methods for yam storage and processing.

Constraints limiting the utilization of post harvest technologies by yam farmers

Analysis on table 5 revealed some of the constraints limiting the utilization of post harvest technologies. The result showed that the incidence of pest and diseases and lack of improved technology ranked first and third. This may be because of the quality deterioration ofyam as a result of poor storage strategy till thetime of sales. Most farmers in the study area use traditional method of storing yam. This result collaborated with the findings of Abubakar and Nasiru (2017) who stated that the yam barn are locally made or constructed which give room to micro-organisms and rodent to destroy yam tubers stored. High cost of labour has been identified to limit effective use of the local storage methods especially the storage barn. This is corroborated by Nwaigwe*et al.,* (2015) who reported that the construction of barn requires a lot of work and effort and is more expensive than other local storage methods. This finding agrees with that of Olayemi*et al.,* (2011) who stated that bruising and spoilage, high cost of transportation, inadequate storage facilities and menace of theft are responsible f or losses incurred by farmers and marketers. However the result seems to disagree with the research of Okoedo and onemolease (2009) that did not recognize theft of tubers as a significant cause of postharvest losses in yam production.

CONCLUSION AND RECOMMENDATIONS

The study examined the utilization of post harve st technologies among yam farmers in selected local government areas of Niger state, Nigeria. Based on the findings of this study, it was concluded that respondents use local post harvest technolog ies and utilization of modern postharvest technologies is l ow despite the losses due to the use of traditional techniques. It is therefore recommended that extension agents should actively disseminate information on improved post harvest to yam farmers in the study area as well as the need to use such technologies. New yam postharvest technologies should be made available to the farmers in the study area at subsidized rates so as to encourage them to use such technologies**.**

Table 1: Socio-economic characteristic of respondents

Variable	Frequency	Percentage	Mean

Age			
below 21 years	6	3.1	35
		34.9	
		27.2	
		30.3	
		4.6	
Farming experience			
below 11 years	46	23.6	18
11-20 years	89	45.6	
21-30 years	42	21.5	
31-40 years	15	7.7	
41-50 years	3	1.5	
Household size			
below 3 members	41	21.0	5
3-6 members	115	59.0	
above 6 members	39	20.0	
Level of education			
non formal	41	21.0	
Primary	43	22.1	
Secondary	58	29.7	
Tertiary	51	26.2	
Masters	2	1.0	

Source: ICAAT, 2018

Table 2 Types of post harvest technologies used by yam farmers

Technologies	Frequency	Percentage (%)
Storage in barn		
Storage in pit		
Curing method		
Storage in mud hut	173	88.7
Storage in open sided shelf stores	63	32.3

21-30 years	68
31-40 years	53
41-50 years	59

51-60 years	9	
	192	98.5
	115	59.0
	82	42.1
Storage in elevated store shed	70	35.9
Storage in ventilated pit	56	28.7
Storage in thatched roof pit	74	37.9

Processing into flour	181	92.8
Processing into chips	123	63.1
Processing into fried yam	189	96.9
Processing into pounded yam	190	97.4

Source: ICAAT, 2018

Table 3 level of utilization of post harvest technologies by yam farmers

Technologies	AU	FU	SU	NU	WM	Rank
Storage in barn	178(91.3)	12(6.2)	2(1.0)	3(1.5)	3.87	1st
Processing into pounded yam	176(90.2)	13(6.7)	1(0.5)	5(2.6)	3.85	2nd
Processing into fried yam	152(77.9)	30(15.4)	7(3.6)	6(3.1)	3.68	3rd
Processing into flour	130(66.7)	44(22.6)	7(3.6)	14(7.2)	3.49	4th
Storage in mud hut	110(56.4)	49(25.1)	14(7.2)	22(11.3)	3.27	5th
Processing into chips	19(9.7)	30(15.4)	74(37.9)	72(36.9)	1.96	6th
Storage in pit	13(6.7)	36(18.5)	66(33.8)	80(41.0)	1.91	7th
Storage in thatched roof pit	17(8.7)	19(9.7)	38(19.5)	121(62.1)	1.66	8th
Curing method	6(3.1)	15(7.7)	61(31.3)	113(57.9)	1.56	9th
Storage in elevated store shed	5(2.6)	10(5.1)	55(28.2)	125(64.1)	1.46	10th
Storage in ventilated pit	4(2.1)	23(11.8)	29(14.9)	139(71.3)	1.45	11th
Storage in open sided shelf stores	5(2.6)	10(5.1)	48(24.6)	132(67.7)	1.43	12th

Source: ICAAT, 2018
Note: Always Used (AU); Frequently Used (FU); Sometimes Used (SU); Never Used (NU) WM=Weighted Mean

Table 4 categorization of respondents' level of utilization of post harvest technologies

Utilization level	Frequency	Percentage
Low utilization (0 - 0.33)	100	51.3
Moderate utilization (0.34 - 0.66)	63	32.3
High utilization (0.67 - 1.00)	32	16.4

Total	195	100.0

Source: ICAAT, 2018

Table 5 constraint faced by yam farmers

Constraints	VS	S	NS	WM	Rank
Pests and diseases	161(82.6)	30(15.4)	4(2.1)	2.81	1st
	146(74.9)	49(25.1)	0(0)		2nd
Lack of improved technology	150(76.9)	33(16.9)	12(6.2)		3rd
Long distance to market	140(71.8)	49(25.1)	6(3.1)		4th
Insufficient working capital	141(72.3)	47(24.1)	7(3.6)		4th
High cost of transportation	141(72.3)	41(21.0)	13(6.7)		6th
Lack of credit	123(63.1)	53(27.2)	19(9.7)		7th
High cost of labour	121(62.1)	66(33.8)	8(4.1)	2.58	7th
Theft of yam	121(62.1)	65(33.3)	9(4.6)	2.57	9th
Low government support	116(59.5)	58(29.7)	21(10.8)	2.49	10th
Limited land	94(48.2)	67(34.4)	34(17.4)	2.31	11th
Labor unavailability	83(42.6)	85(43.6)	27(13.8)	2.29	12th
Injury on yam	64(32.8)	104(53.3)	27(13.8)	2.19	13th
Poor storage facilities	60(30.8)	109(55.9)	26(13.3)	2.17	14th
Illiteracy	65(33.3)	93(47.7)	37(19.0)	2.14	15th
Lack of storage/ Processing facilities	65(33.3)	88(45.1)	42(21.5)	2.12	16th
Poor management skill	68(34.9)	77(39.5)	50(25.6)	2.09	17th
Poor buyers	50(25.6)	83(42.6)	62(31.8)	1.94	18th
Over storage	40(20.5)	98(50.3)	57(29.2)	1.91	19th
Lack of extension contact	59(30.3)	59(30.3)	77(39.5)	1.91	19th

Source: ICAAT, 2018

Note: VS-Very Serious; S-Serious; NS-Not Serious; WM=Weighted Mean

Poor transport network	2.75
	2.71
	2.69
	2.69
	2.66
	2.58

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