Post-Harvest Management Practices of Yam and Farmers' Information Needs in the North-Central of Nigeria

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Abstract

The study investigated the post-harvest handling of yam and needed information by farmers in Kogi and Benue States, Nigeria. The population of this research comprise of all the yam farmers in the two states. Data were collected from 240 yam farmers who were randomly selected from the four agro-ecological zones of Kogi State (Zone A, B, C and D) and three zones of Benue State (A, B and C) using interview schedule. Descriptive statistics were used to analyse the data collected. Results show that most (78.75%) of the farmers were engaged in transporting of yam from farm to home, home to markets or farm to markets. Analysis on the level of information needs shows that 50.00% of the yam farmers were highly in need of information on storage of tubers in the study area. Analysis on the access of yam farmers to improved post-harvest management technologies shows that majority (77.50%) of the yam farmers had access to improved transportation system and 14.28% had least access to storage of yams in the warehouse. It is recommended that farmers should have access to information on improved post-harvest management, and the practices of some effective indigenous post-harvest management of yam would ensure better value addition on yam.

Keywords: Post-harvest losses; Post-harvest management; Yam farming

Introduction

Yam (*Dicorea spp*) is one of the staple crops which thrive well in the North-central and Southern regions of Nigeria. There has been advocacy to develop the post-harvest sector of agriculture in the country due to inherent post-harvest losses in the production of crops like yam. Nigerian government has recently put in place a yam export policy to reduce post-harvest losses and improve farmers' income [1]. Postharvest loss reduction has received attention in many policy documents across nations to ensure global food security, particularly in developing countries [2]. More than 95% (2.8 million) of the current global area under yam cultivation is in Sub-Saharan Africa, where the mean gross yield is 10 t/ha. About 90% to 95% of world yam production is from West Africa and Nigeria is rated the largest producer [3]. Nigeria produced over 65% (38 million metric tons) of the global yam production followed by Ghana (6.6 million metric tons) and Côte D'Ivoire (5.8 million metric tons) in 2012 [4]. An average profit per yam in Nigeria was calculated at over US$13,000 per hectare

harvested [5]. According to KSADP (201) report, Kogi State produced 1286.96 MT in 2008 and rose minimally to 1290.73 MT in 2010; the area under cultivation 2008 was 104.56 Ha and in 2010 an area of 111.20 ha was cultivated. Benue State with 396.45 ('000 ha) area under cultivation, had an output estimated to be 3,914.17 metric tons [6]. Several yam literatures in West Africa acknowledge that yam has a key role in the culture of the people in major producing areas in the region [7]. On the account of post-harvest losses, about 30% to 40% of agricultural produce is not reaching the consumer. These losses are largely caused by factors such as insect pests, poor logistics, fungal and bacterial diseases, poor management and inadequate storage facilities, mechanical damage. About 10% to 15% of storage losses in yam were recorded and after the first three months, it approached 50% after six months storage was reported [3,8]. Yams are largely grown in only three parts of the world: West Africa, Caribbean Islands and Southeast Asia. The world production is 25.5 million tonnes excluding the people's republic of China [9]. By far the largest acreage and greatest amount of yam production is in the

Sub-Saharan African where 97% of the total global production abounds. Within West Africa, yam production is confined to the region stretching from the Ivory Coast to Cameroon. The major yam producing countries in this region, in order of importance, are Nigeria, the Ivory Coast, Ghana and Togo. Nigeria alone accounts for 78% of World production [10]. The major problems of yam production globally were affirmed as postharvest rot [11]. Access of farmers to both technical and economic information allows them to make good decisions and sound opinion in selecting probable solution from alternatives.

The post-harvest activities peculiar to yam can be categorized into three classes of which the first set is that of collecting the mature crops which covers operations such as harvesting, transporting to farm gate and storing. Second, is distribution which entails transporting to farm gate/local markets, sorting, grading and merchandizing? The third, is the task of making commodities ready for consumption which involves processing for timely utility, packaging and preparing into various forms of food items or consumer dishes. Moreover, proper storage also helps to ensure household and community food security until the next harvest and helps producers to avoid selling at low prices during the glut period that often follows harvest.

Researchers have innovated production technologies for different crops in the last two decades without necessary post-production technologies that will preserve these crops [12]. As a result of high levels of investment in crop production, post-harvest losses, in the form of quantity or quality, should be kept at a minimum. Many key functions like information, promotion, negotiation, ordering, financing, risk-taking, physical possession, payment and title add value to the marketing of commodities [13].

Nigerian government at various stages has found it needful to prevent post-harvest loss of crops produced by farmers. This has become imperative to help the small-scale farmers who are always at the mercy of the buyers of their commodities at every production season for lack of storage facilities. A probable solution to overcome these constraints is by strengthening the post-harvest sector at national level through the improvement of the indigenous agro-industries. Processing of food crops to a form which has a longer shelf life and at the same time adding value to the original crop help the farmer not only to overcome the spoilage and losses, but also earn more money due to the newly added value of the product [14].

Despite the necessity of producing more food to meet the ever-increasing global population, African farmers are often discouraged from increasing their production because of unstable market prices, lack of storage facilities, limited access to processing technologies, and poor market opportunities [15]. The United Nations Economic Commission for Africa (UNECA) noted that the African food crisis had developed over some decades causing widespread hunger and these results in the gap in food production. Losses in crop production in the Sub-sahara Africa continue to grow high due to inadequate post-harvest technologies. Farmers, therefore, grow what they can easily sell or store and new production technologies remain unused.

Nigerian administrations have long focused on strengthening the links along the chain from fork to farm in several commodities of key importance to Nigerian smallholder farmers/marketers [16]. The presidential initiatives on some commodities are cases in point. However, imperfections along the chain continue to widen the disparity between farm gate and retail prices, leaving poor farmers with the least value. The widening disparity continues to worry the government, which is working to reduce poverty and increase the income of poor farmers [17].

Improved livelihood of small-scale farmers can be ensured through the development of post-harvest technologies compatible with the indigenous practices of the farmers and enhanced value chain. Nigerian government over some years took cognizance of this fact and has established programmes, agencies and projects with the mandates to carry out research on post-harvest management and technologies in order to add value to crops. Notable among these agencies include Nigerian Stored products Research Institutes (NSPRI) established in 1954 to conduct research in all aspects of post-harvest handling of crops and their products, pesticide development, residue analysis and mycotoxin survey on food items in Nigeria as stated in Decree 5 of 1977. Raw Materials Research and Development Council (RMRDC), Abuja has a mandate to carry out research on post-harvest management of agricultural commodities and a way of reaching the farmers through extension. Kogi and Benue States' yam farmers like most farmers in other parts of Nigeria are faced with the problem of seasonal post-harvest losses.

In view of the foregoing, the following research questions are pertinent for this study:

1. What are the critical post-harvest management practices of yam in the study area?

2. What are the post-harvest information needs of yam farmers?

3. What are the sources of post-harvest information available to yam farmers?

4. Do farmers/traders readily have access to information on how to handle their harvested yam?

Objectives of the Study

The objectives were to:

1. Identify post-harvest management practices among yam farmers in the study area;

2. Assess the areas and level of post-harvest information needs of yam farmers;

3. Identify information sources on improved post-harvest management technologies of yam among the respondents in Kogi State;

4. Ascertain the access of farmers to information on improved post-harvest management of yam in the study area.

Methodology

Study area

The study was carried out in Kogi and Benue States North-central of Nigeria. Kogi State was created on August 27th 1991 from Kwara and Benue states with the capital at Lokoja. Geographically, it is located between latitude 60301N and 80481N and Longitude 50231E and 70481E sharing boundaries with Kwara, Ondo, Ekiti, Niger, Benue, Nassarawa, Anambra, Enugu, Edo states as well as the Federal Capital Territory.

Kogi State has population of about 3,278,487 people and consists of 1,691,737 males and 1,586,750 females with an estimate of 172,000 farm families [18]. About 1.2 million farmers grow root and tubers crops including yam [17]. The confluence of rivers Niger and Benue creates alluvial fertile soil which is very good for crop production.

Benue State was carved out of the former Benue-Plateau State in 1976. The State lies between longitude 7° and 10° East and between latitude 6°251 and 8°81 North of the equator. It has a total population of 4,219,244 according to FRN in 2007. The State is basically an agrarian area and one of the largest producers of yam in the country. Over 2.1 million people grow yam in Benue State. The State is made up of 23 local government areas.

The agricultural sector provides a very wide opportunity for investment as the major occupation of the people. The two states are marked with two distinct seasons in a year; these are wet and dry seasons. The wet season spans between middle of March and October and the dry season is usually experienced between the months of October and March. The common crops grown in the area include maize, cassava, yam, rice, guinea corn, cowpea, citrus, oil palm, cocoa, coffee, cashew and kolanut. The people of these states also rear animals like cattle, pig sheep, goats, swine, poultry and fish.

Population and sample size selection

This study considered all yam farmers in Kogi and Benue States as its population. A sample size of 346 respondents was selected using multi-stage sampling techniques.

The first stage is the purposive selection of six local government areas from the stratified four agro-ecological zones of Kogi State (A, B, C and D) and the three agricultural zones of Benue State (A, B and C) in the study area based on the concentration of yam farmers in these areas. These were summed up to eight (12) Local government areas which include: Ijumu, Kabba/Bunu, Dekina, Bassa, Adavi, and Ibaji respectively from Kogi State and Agatu, Guma, Gwer-west, Logo, Katsina-Ala and Otukpo respectively from Benue State. Yam farmers in this State with a population of 9,653 households were the sampling frame of this study. According to the findings, sampling frame is a list of every member (or unit) of the population from which the sample will be drawn [18]. In the second stage involve use of proportional allocation of 3.5% of the contact farmers in all the Local Government Area. A total sample size of 246 was obtained. After the administration of the interview schedules, a total of 240 interview schedules for yam farmers were recovered from the expected 246 respondents. Some could not be retrieved, while others were with incomplete information that may lead to the distortion of the analysis.

Method of data collection

Primary data was collected using interview schedule since majority of the farmers were not literate and could not read or write. The enumerators helped in recording and interpreting to those respondents who could not read or write. The interview schedule was used to generate the following information:

1. Personal characteristics of the respondents such as age, gender, marital status, educational attainment, income level, household size and farm size.

2. Post-harvest operations peculiar to yam production in the study area.

3. Post-harvest information need of yam farmers in the study area.

4. Sources of information on improved post-harvest technologies of yam in the study area.

5. Farmers level of access to needed post-harvest information on yam.

Enumerators were trained to conduct the interview since majority of the respondents were not educated enough to be administered with questionnaire.

Measurement of variables

The level of post-harvest information needs of farmers: level of information needs of yam farmers was measured using a 4-point Likert scale ranging from "low" to "high, and not needed at all". The responses and the assigned points are:

Not needed at all=0

Just needed=1

Moderately needed=2

Highly needed=3

Techniques of data analysis

Data generated from the interview schedule were subjected to descriptive such as percentage, frequency distribution for the nominal data and pictorial presentation.

Results and Discussion

Post-harvest management practices of yam

The result on post-harvest management practices of yam by farmers is contained in **Table 1**. Most of the respondents (78.75%)

Table 1 Post-harvest management practices of yam (N=189).

Yam operations	Frequency	Percentage
Processing	90	37.5
Storage	174	72.5
Grading/sorting/packaging	122	50.83
Transportation	189	78.75
Note: Multiple responses; Field survey in 2014		

claimed that transportation (including loading and unloading) is one of the post-harvest management practices of yam they engaged in. Transportation of yam tubers is done by some of the farmers on their heads using a container like a basket, sack or tied together. Bicycles could also be used to transport the tubers. It could be done using improved transportation system like motorcycle, pick-up vans, Lorries and trucks in conveying their yam tubers from the farm to their homes or markets. The farmer may employ extra hands for the job of loading or off-loading respectively where and when necessary.

It was indicated that 72.50% of the respondents mentioned storage as an important post-harvest management practice of yam. Yam tubers are stored using indigenous barns, burring in the ground or heaped under shade of trees as can be seen in **Figures 1 and 2**. About 50.83% of the respondents claimed that they carried out grading/sorting/packaging. Sorting/grading was normally done by selecting good tubers from the rotten ones, the big ones from the small and medium ones. Some of the respondents (37.50%) said that they carried out processing of yam by cutting/peeling, drying, grinding, boiling and pounding. Yam tubers are cut, peeled and boiled, then, eaten directly or further pounded (pounded yam) before eaten with soup. Yam tubers are sometimes cut into pieces before drying as slabs or chips and then, later grinded into flour as 'alebo'.

The implication for this is that majority of the yam farmers in Kogi and Benue States were mostly engaged in both indigenous and improved post-harvest management practices of yam. This result agrees with that of who identified the above-mentioned activities to be the post-harvest management practices common among farmers [3].

Post-harvest handling information needs of yam farmers

Table 2 indicates that 17.92, 28.75%, 50.00% and 3.33% of yam farmers said they just needed, moderate, high information on storage of yam tubers, and not needed at all. Emphasis on the needed information was in the area of access to warehouses in order to improve the shelf life of tubers and also, to protect them

Figure 1   Yam tuber stored under a shade by a farmer.

Figure 2   A typical yam barn (storage method) in Ibaji, Kogi State.

Table 2 Distribution of respondents according to their level of post-harvest management information needs on yam, n=154.

Variables	Just needed 1 (Freq)	Moderate 2 (Freq)	High 3 (Freq)	Not needed at all
Storage	43 (17.92)	69 (28.75)	120 (50.00)	8 (3.33)
Processing	85 (35.42)	40 (16.67)	36 (15.00)	79 (32.92)
Transportation	42 (17.50)	102 (42.50)	73 (30.42)	23 (9.58)
Markets/market prices	58 (24.17)	39 (16.25)	94 (39.17)	49 (20.42)
Weather	67 (27.91)	54 (22.50)	22 (9.17)	97 (40.42)
Pesticides/ insecticides	60 (25.00)	52 (21.67)	45 (18.75)	83 (34.58)
Credit availability	41 (17.08)	50 (20.83)	96 (40.00)	53 (22.08)
Drying	76 (31.67)	30 (12.50)	37 (15.42)	97 (40.42)

Note: Multiple responses; Field survey in 2014. The figures in parenthesis are in percentages (%).

from theft. This result agrees with that of who reported that the highly sought information by yam farmers was that of storage of yam tubers [19].

With respect to information on markets/market prices, 24.17%, 16.25%, 39.17% and 20.42 of the respondents said they just needed, moderate, high information and not needed at all respectively. The proportion of respondents who did not indicate need for the information at all may be due to fact that market integration among farmers is high in terms of getting information readily from neigbours/friends and fellow farmers and as such may not consider the response to this information necessary. This result does not agree with those who in their various respective studies identified yam marketing information to be highly sought for by yam farmers in Ghana [20,21].

In terms of information on credits, 17.08%, 20.83%, 40.00% and 22.08% claimed they just needed, moderate, high information and not needed at all, especially on the availability of credits in order to boost their post-harvest activities. With respect to pesticides/insecticides, 25.00%, 21.67%, 18.75% and 34.58%

of the respondents claimed the needed low, moderate, high information, and not needed at all respectively; on where and how to procure/apply them on yam.

In terms of processing of yam into forms like flour (alebo or ibe), boiled yam, fried yam, pounded yam and others, 35.42%, 16.67%, 15.00% and 32.92% of the respondents claimed they just needed, moderate, high information and not needed at all respectively. The farmers who did not respond to this area of information need might be tied to the fact that there was no improved method of processing yam available to them and too, the major product of yam is pounded yam and very few farmers processed the tubers into yam pellet or flour (alebo) and other forms.

With respect to transportation, 17.50%, 42.50%, 30.42% and 9.58% of the respondents just needed, moderate, high information and not needed at all respectively on how to transport their yams either from farm-gate to their homes/markets or from home to the markets.

This result implies that information on post-harvest handling of yam that was highly sought for was only in the area of storage by farmers in Kogi and Benue States. This means that information on storage of yam was the priority need of yam farmers as of the time of this research. This result agrees that high level of post-harvest information need by yam farmers were recorded [22]. This could also be deduced that the group of yam farmers who claimed just needed information for some of the post-harvest management technologies could be tied to the fact that they might be satisfied with the existing post-harvest practices they are used to or they information available to them might not satisfy their felt needs.

Sources of information on improved post-harvest management technologies to yam farmers

Table 3 indicated the sources of information on improved post-harvest management technologies available to yam farmers. The result shows that 81.67.87% of the respondents claimed they sourced their post-harvest information from their friends/neigbours (including fellow farmers). This result is different from that of Ibrahim et al. in 2009 who reported that 46.00% of the farmers claimed they sourced their post-harvest management information from their friends/neighbours.

The result shows that 41.67% of the respondents received their post-harvest information from community-based organizations in the study area. Example of these organizations are the youth, women and men organizations that operate under various names and umbrellas, age grade or peer groups and credits and thrift societies.

The result shows that 39.58% of the respondents obtained their source of post-harvest management information on yam from religious organisations like the Catholic Men Organisation (CMO), Catholic Women Organisation (CWO), and ANSAR'DIN of the Moslem Faith which create forum for both men and women farmers to meet and interact.

The result also reveals that 67.91% of the respondents sourced their post-harvest management information on yam from Kogi State Agricultural Development Project (KSADP) and Benue State Agricultural and Rural Development Agency (BNARDA).

The KSADP and BNARDA through the extension agents (village extension workers) relay post-harvest information to their contact farmers who also diffuse the information to the non-contact farmers in the study area.

About 2% of the respondents said they received their post-harvest information from the research institutes such as the sub-stations of the Coacoa Research Institute at Ochaja and that of National Institute for Oil Palm Research (NIFOR) at Acharu-Egume in Dekina Local Area of Kogi State which apart from their major research and extension mandates, engage in research into some food crops like maize, yam, cassava and others.

Access of yam farmers to information on improved post-harvest management technologies

Table 4 shows the result of the access of yam farmers to information on improved post-harvest management technologies. It reveals that majority of the respondents (77.50%) claimed that they had access to information on improved transportation system (motorcycles, pick-up vans, lorries and other trucks). **Figure 3** shows some of the transportation systems used in the study area. The result also shows that 32.08% of the respondents had access to information on pesticides/insecticides application; 42.08% of them said they had access to improved information on processing the yam tubers into yam slabs or chips, flour and pounded yam; 27.08% of the respondents had access to information on storage of yam in a warehouse found in and

Table 3 Distribution of respondents according to the sources of post-harvest information on yam available to them, n=154.

Source of information	Frequency	Percentage (%)
Research institutes	20	8.33
Universities	38	15.83
KSADP/BNARDA	163	67.91
NGOs	75	31.25
Colleges of education	13	5.42
Friends/neighbors	196	81.67
Religious organizations	95	39.58
Community meetings	100	41.67
Note: Multiple responses; Field survey in 2014.		

Table 4 Access to Information on Improved post-harvest management technologies of yam n=154.

Improved post-harvest management technologies	Access	No access	Total (%)
Transportation	186 (77.50)	54 (22.50)	100
Processing into yam flour	101 (42.08)	139 (57.92)	100
Pesticides/insecticides application	77 (32.08)	163 (67.92)	100
Storage of yam in warehouses	65 (27.08)	175 (72.92)	100

Figure 3 Yam being transported in lorries.

around the markets as earlier discussed in the case of maize. This means that majority of the yam farmers in Kogi State had little or no access to information on improved post-harvest management technologies.

Conclusion

This result agrees with those of that yam farmers had little or no access to information on improved post-harvest management technologies [20,23,24]. The findings on implication of inadequate access to information on improved post-harvest management technologies, especially in area of storage leading to losses of the order of 10% to 15% after the first three months and approaching 50% after six months of storage is applicable here [3,8].

The implication for this is that, yam farmers in Kogi and Benue States have suffered losses and were normally compelled to sell their yams at give-away prices. Yam farmers could not access the post-harvest management technologies probably due to the fact that these technologies were not available or they were not aware of their availability owing to inefficiency and ineffectiveness of the extension agents, and that if they were available, they were not affordable in terms of the cost-sharing approach of the KSADP and BNARDA. Opined that improving the ratio of extension agents to farmers will improve their access to information and subsequently improve their knowledge of postharvest activities of yam [25-28].

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