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A Review of the Effect of Post-harvest handling on the Shelf life of selected indigenous Agricultural Products: a case study of yam

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Abstract: Both quantitative and qualitative losses occur at all stages in the post-harvest handling system of the distribution chain of yam (from harvesting, through handling, packing, storage and transportation to final delivery of the fresh produce to the consumer). 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 m anagement of yam would ensure better value addition on yam. (Revieved).

Keywords: post-harvest spoilage and losses, post-harvest handling of yam, transportation of harvested yam. .

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INTRODUCTION

All fruits, vegetables and root crops are living biological organisms, having a respiratory system, similar to that of humans. They continue their living processes after harvest. Respiration is the process by which plants take in oxygen and give out carbon dioxide. On the basis of their respiration rate and ethylene production patterns during maturation and ripening, fruits can be classified in two groups: climacteric fruits (they exhibit a large increase in carbon dioxide and ethylene production rates coincident with their ripening) and non-climacteric fruits(which exhibit no changes in their generally low carbon dioxide and ethylene production rates during

ripening). In accordance with the respiration rate most horticultural commodities can be classified as follows:
• Low respiration rate. Nuts, dates, dried fruits and vegetables, apples, citrus, grape, garlic, onion and sweet potato.
• Moderate respiration rate. Banana, cherry, plum, cabbage, carrot, lettuce, pepper and tomato.
• High respiration rate. Cauliflower, avocado, berries and green onion.
• Extremely high respiration rate. Yams broccoli, peas, spinach and sweet corn.
All tissues of higher plants naturally produce ethylene as a byproduct of plant metabolism. It is considered the natural aging and ripening homone and it is active even at small traces. Based on the amount of ethylene they produce we can classify horticultural commodities as follows:
• Low ethylene production. Cauliflower, cherry, citrus, leafy vegetables, root vegetables, potato, cucumber, eggplant, pepper, pineapple, pumpkins and watermelon.
• Moderate ethylene production. Banana, guava, honey dew melon, mango, plantain and tomato.
• High and very high ethylene production. Yams, apples, avocado, cantaloupe, papaya, kiwi, pear, plum, passion fruit, sapote and cherimoya. Fruits, vegetables and root crops contain 65 to 95 percent of water and their post-harvest life depends on the rate at which they use up their stored food reserves and their rate of water losses. When food and water reserves are exhausted the produce dies and decays[1]

METHODOLOGY

Population and sample size selection: This study considered all yam farmers in Kogi and Benue States as its population. We selected a sample size of 346 respondents using multi-stage sampling technique. 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[2]. 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 administering the interview schedules, we recovered a total of 240 interview schedule for yam farmers, out of the expected 246 respondents. Some could not
be retrieved, while others were with incomplete information that may lead to the distortion of the
analysis.
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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. We used the interview schedule 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.

Harvest and post-harvest handling Operation for selected root crops:

Most of the well-known root crops are well established in Nigeria. Others have a good potential for increased cultivation. This work provides details on the harvesting and handling of root crops. Special emphasis are laid on post-harvest handling such as preservation, drying, storage and/or transportation[3].
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is has to be based on careful observation and long experience since there is a difference in the maturity period of the various cultivars to handle and, when dropped, cause heavy damage to the roots[4].
In many countries in these regions, the problem of under nutrition has actually been increasing. The use of bio fortified orange sweet potato (OFSP) rich in beta-carotene, when introduced along with nutrition education at the community level, is a proven cost-effective strategy for providing vitamin A at high levels of bioavailability to vulnerable populations, in particular young children and pregnant and lactating women. OFSP production from 500 m can provide sufficient vitamin A for a family of five and is a good source of energy, a number of B vitamins, and vitamins C and K. Builds on this evidence, CIP, NARS, and research and development partners at national, regional and global levels are working together to bring the economic and nutritional benefits of sweet potato to African farmers and consumers. Over the past five years, at least 1.1 million small older farmers in Africa have adopted nutritious and resilient tuber varieties. With further support, this success can be scaled up to a further 10 million households over the coming 10 years . We urgently need agricultural technologies that can produce nutritious and marketable food in agro-ecologies and socioeconomic contexts. In several countries and regions affected by micronutrient deficiency, sweet potatoes offer strategic opportunities to improve nutrition and rural incomes. It is already an important component of the cropping systems in Africa because of its robustness to produce under difficult conditions. It will become more important in the face of a changing climate. In many settings, it is also considered a “women’s crop” reflecting the relatively strong control women have in decision making in production and marketing. While this often provides particular opportunities to use root crops as an entry point to strengthen nutrition and economic outcomes for women and their children, cultural and gender-defined roles need to be addressed to improve outcomes at household and community levels. At the core of the approach is an increasing range of nutritious, productive, and locally adapted[5].
The main purpose of yam cultivation are subsistence and internal marketing

Harvesting method: Yams is normally harvested by carefully scraping the soil away from the tubers in order to avoid damaging them. Wooden digging sticks or spades are less likely to cause damage to the tubers than are metal forks or hoes.

Post-harvest:

Selection and grading: Heavily damaged or decaying yams should be discarded. Those which are slightly damaged may be consumed immediately or subjected to a curing process before storage. Size-grading is not always practiced. It is mainly done when there is an advantage to be gained in the packaging for marketing[6].

Post-harvest treatments: Where yams are cut or deeply injured, a new skin can be formed on the damaged surfaces by curing the tubers at high temperature and humidity. Curing has been shown to be effective in Yellow and White Yams, but its effectiveness in other types is not known. Injuries caused by skin abrasion or bruising tend to dry out rather than form replacement skin. A method recommended in West Africa for curing yams which are to be stored is given below. This provides the necessary conditions for raising the temperature and moisture content of the air to suitable levels by restricting ventilation.

Packaging: Yams being sent to local markets may be carried in bulk by vehicle, in ordinary baskets or in plastic or wooden field crates. When they are carried in bulk, the floor and sides of the vehicle should be padded with sacks loosely packed with straw, or with grass mats or plastic foam covered with polythene sheet. Whether the yams are carried in bulk, in crates or in baskets, the vehicle must not be overloaded and should be driven with care. For internal urban markets the tubers are best packed in wooden or plastic field crates or ventilated cardboard boxes. These containers should not be over-packed and must be handled and transported carefully[7].

Storage Greater and White Yams in good condition can be stored for several months under appropriate conditions. Yellow yams have poor storage potential due to their very short dormancy period. Although yams may keep in storage for several months, they shrink over such a period owing to water loss and to natural living processes which use up stored dry matter (starch). There may also be additional losses because of decay caused by moulds. There are many different storage practices in various countries. Owing to the generally non-commercial nature of yam production and limited resources of growers, most storage uses low-cost methods.
Yams are generally stored during the hot dry part of the year when the provision of ventilation and other conditions which help to reduce their temperature are key factors. Yams kept in the ground and harvested progressively when needed are subject to attack by insects and other pests. They are also exposed to attack by moulds. Yams kept undug may also tie up limited land resources. The tubers can be piled in small numbers in shaded situations or in well ventilated huts built of local materials, in which case they are best stored on racks or shelves. In West Africa, yam "barns" are a common method of storage. They are vertical frames to which individual yams are tied. The uprights supporting the frames are bush poles up to two or more meters in height. The use of poles which will take root and provide a protective canopy of leaves to shade the yams is of benefit[8]

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%) 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.
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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

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. 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[9].
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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 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[8].

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 (%).

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[11, 12],

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 iba), 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 postharvest information need by yam farmers were recorded[13].

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 postharvest management technologies to yam farmers

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[11, 12],

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. **Table 3**: The study identifies the source 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 other researcher's works[14.] This reported that 46.00% of the farmers claimed they sourced their post-harvest management information from their friends/neighbors

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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.

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 organizations like the Catholic Men Organization (CMO), Catholic Women Organization (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 noncontact 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 Cocoa 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). 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 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.

Table 4: Access to Information on Improved Post-Harvest Management Technologies of Yam n=154. 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

CONCLUSION

In a good post-harvest handling of tuber crops, little or nothing is wasted because some slightly bruised crops are always selected for consumption and others are cured and packaged and subsequently transported to the

market. Others are stacked for future multiplication.

We considered all the biomaterial properties in post-harvest handling of our tuber crops.

Conclusively, all the primary operations of our biomaterials were taken into account

account

REFERENCES

1.Adisa, R.S, Adefalu, L.L, Olatinwo, L.K, Balogun, K..S, & Opeyemi, O.O. (2015) Determinants of adoption of yam production technologies in South-South Nigeria. Global J Agri Sci 10: 145-150.

2.Eboh, E. C. (2009) Social and economic research, principles and method. Enugu. African Institute for Applied Economics. Pp. 12.

3.Oxford Advanced Learner's online Dictionary, 2023

4.Okoedo-Okojie, D. U.& Onemolease, A. E. (2009) Factors affecting the adoption of yam storage technologies in the Northern ecological zone of Edo State, Nigeria. J Hum Ecol 27:155-160

5.Nnadi, F.N, & Akwiwu, C.D. (2007) Farmers' discontinuance decision behaviour of yam mini set technology in Imo State, Nigeria. Int J and Rural Dev 9:80-84

6.Reuben, J., & Barau, A..D. (2012) Resource use efficiency in yam production in Taraba state, Nigeria. J of Agr Sci 3:71-77

7.Tinsley, R. L. (2009) Post-harvest handling and seed quality evaluation for selected value chain commodity in Nigeria CNFA-WASA/seeds USAID/MARKETS, Nig. P. 8.(reviewed)

8.Ofem, N.I., Ndifon, H.M., Kalu, I. O., & Ntui, O.E. (2011) Extension communication and farmers' adoption of yam production technologies in South-South Nigeria. Global J Agr Sci 10:145-150

9.Osunde, Z..D. (2008) Minimizing post-harvest losses in yam (dioscorea spp): Treatment Policy Research Institute. Abuja, Nigeria

10.Martey, E., Annin K, Nimo W, & Attoh C. (2012) Does access to market information determine the choice of marketing channel among smallholder yam farmers in the Brong Aghafo region of Ghana? A multinomial logit regression analysis. J Econ Sustain Dev 3: 21-28.

11. Webster online Dictionary, 2023.

12. Centre for Technology and Economic Development CTED, (2013)

13.Adereti, D.T. & Fasina,O.O. (2017)." Gender Analysis of Food Security Status of Rural Households in Ondo State. Nigeria" Russian Agricultural Science, Russia. Vol 43 (4) pp 353-360.

14. Akinsanmi, O. (2000). Senior Secondary Agricultural Science: Longman Ltd. England