# Analysis of Postharvest Losses Management among Cassava Farmers in Nigeria

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**Abstract:** Food wastage through poor postharvest loss management has contributed to food scarcity and massive importation of food items in Nigeria. The research was mainly carried out to determine the factors influencing postharvest loss management among cassava farmers. The study was conducted in Southwest geopolitical zone of Nigeria. Descriptive statistics and fractional regression model were used to analyse the data collected. The results revealed that most (65.8%) of the farmers were below 41 years of age, while 77.5 percent of the household heads were married with the mean household size of about 8 persons. Also the majority (76.3%) were male, while the respondents' average farm size was 2.3 hectares and 61.3 percent had no access to loans. Most of the farms were far from the markets with the mean distance of 9 kilometers. Those who had formal education were 75 percent while the majority (66.3%) were in contact with extension agents. Those that belonged to farmers groups were 90.8 percent while just 15.4 percent had formal postharvest handling training. In addition, 75 percent got information on postharvest handling practices from friends and relatives while in order to reduce postharvest loss, the majority (67.5%) processed the cassava roots to garri. The main significant determinants of postharvest loss management among the cassava farmers were age, farming experience, farm size, distance of farm to market and educational level. Based on the results of the study, it is recommended that the farmers should be trained formally on postharvest management practices and procedures involved in accessing loans from banks should be reviewed by Central Banks of Nigeria in such a way to attract farmers to bank loans.
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## 1. Introduction

Postharvest loss is one of the problems facing the agricultural sector in the developing countries. Farm produce postharvest losses remain a major challenge to farmers in Nigeria due to inadequate agro storage and processing facilities, non establishment of produce sales points and lack of access roads. Most of the farms in Nigeria are located in the rural areas, due to non availability of access roads in these areas, it is very difficult for farmers especially the small scale holders to transport their farm produce smoothly to the urban centers for sale. Every year farmers in this part of the world do work very hard to plant crops and harvest them but most of the time could not guarantee that the harvest would make it to the market. In the recently released Nigeria Agricultural Promotion Policy (2016-2020), Nigeria post harvest loss rate of perishable crops was put at 60 percent (Federal Ministry of Agriculture and Rural Development, 2016). Perishable produce, in Nigeria, such as pepper, tomatoes, other fruits, yam, and cassava are sold, at times, at ridiculous low prices to middlemen by farmers due to lack of moderate scale agro- processing factories.

The wastage of locally grown crops notably, tubers, fruits and vegetables is a major challenge in Africa most populated country - Nigeria. The Federal Ministry of Agriculture and Rural Development (FMARD) in Nigeria has put the actual quantity of tomatoes harvested at 1.5 million tons but 700,000 tons are lost to post-harvest bottlenecks (FMARD, 2016). It has been seen over the years that inadequate processing and storage facilities have posed great impediments to Nigeria's agricultural value chain, rather than have a value chain, what the country with the largest economy in Africa has is chain of losses and wastage of farm produce. Nigeria with over 180 million people (NPC,2014), due to postharvest losses, has unable to attain self sufficiency in terms of food production thereby relying on importation of food from other countries of the world. Central Banks of Nigeria (2016) observed that Nigeria spent $7.4billion (₦1.5trillion) on the importation of food between 2014 and 2015. The use of limited foreign currency earnings to import vast quantities of food, due to postharvest losses of most of our perishable crops, has adversely affected our foreign reserves. If Nigeria will be food secured, proper attention must be paid to the postharvest losses of most of our perishable products such as cassava roots.

Cassava (Manihot esculenta Crantz) has traditionally played an important role as household

food security for millions of people all over the world. In addition, its cultivation and processing provide employment opportunities and income for both men and women. The crop is tolerant of drought, low soil fertility and most pest and diseases with no critical date of harvest. These attributes have made cassava into a crop of primary importance for the food security of small scale farmers living in fragile ecosystems and socially unstable environments (FAO, 1999).

In many developing countries Nigeria inclusive, cassava is rated as one of the most efficient source of energy. It ranks second among cultivated food crops in terms of edible energy produced per unit area per unit time (138 MJ/ha/day), after sweet potato (194MT/ha/day) (Nanda et al., 2010). Despite its importance, cassava is mostly grown by smallholder farmers on small plots of land in the rural areas. Since cassava tuber starts to spoil (highly perishable) within 48 to 72 hours after harvest, it is usually processed immediately after it is taken from the ground.

Food wastage through poor postharvest loss management has contributed to food scarcity in most of the developing countries of the World. However, in order to maintain the balance between the ever increasing population in Nigeria and the supply of food, and to have 100 percent access to adequate food all the year round and to have zero loss or waste of food as stated by Goal 2 of the United Nations Sustainable Development Goals, crop like cassava must be retained within the cropping system of marginal farmers for food security through better post harvest loss management. It is against this background that this study analyses various cassava post harvest practices. In addition, apart from examining the farmers socioeconomic characteristics, the factors influencing the cassava postharvest loss management would be determined.

## 2. Material and Methods

Study area

The study was carried out in the Southwest Geo-Political Zone of Nigeria which comprises of Ekiti, Osun, Oyo, Ondo, Ogun and Lagos States. The area lies between longitude $2^0$ $3^1$ and $6^0$ $00^1$ East and latitude $6^0$ $2^1$ and $8^0$ $37^1$ N with a total land area of about 77,800 $km^2$ and a projected population of 46,568,600 (NPC, 2014). The zone is bounded in the East by Edo and Delta States, in the North by Kwara and Kogi States, in the West by Republic of Benin and in the South by the Gulf of Guinea. The climate of the area is tropical in nature; it is characterized by wet and dry seasons. The temperature ranges between $21^0$C and $34^0$C while the annual rainfall is between 1500mm and 3000mm. The Zone is characterized with high temperature during the dry season (November to March) and heavy rainfall during the rainy season (April to October). There are good soils favourable to cassava production in the study area. The major occupation of the people in the Zone is farming.

Method of data collection

Multistage sampling method was used. The first stage involved a purposive selection of 3 States, namely; Ekiti, Osun and Ondo States while at the second stage, four Local Government Areas (LGAs) were randomly selected from each of the States. At the third stage, four communities well known for cassava cultivation were purposely selected from each LGA while the last stage involved random selection of five cassava farmers from each community to make a total of 240 respondents. Structured standard questionnaire was used to collect information on the respondents' socio-economic characteristics, and postharvest management practices.

Data analysis

Both descriptive statistics such as means, frequency and percentages and regression analysis were used to describe the data collected from the respondents in the study area.

Model specification

Fractional Regression Model (FRM) was used to determine the factors influencing postharvest loss management among the respondents. The FRM, a strategy for handling proportions data in which zeros, ones and intermediate values may appear was proposed by Papke and Woolridge (1996) as an alternative to the Ordinary Least Square (OLS), beta regression and binary logit regression models. FRM chooses functional form for dependent variable in such a way that constraints are imposed on the response variable in order to ensure that predicted values lie within the interval 0 and 1. This gives the model stated by equation 1.

$$E(Y/X) = \gamma(X\beta) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

$\gamma$ signifies a non linear distribution function which allows the predicted value of the dependent variable, Y, to lie between 0 and 1. Xs are the independent variables, $\beta s$, the parameters to be estimated. The parameters in equation 1 are estimated with quasi-likelihood estimators such as generalized linear model (GLM). Following Ansah and Tetteh (2015), this method was adopted in this study.

The method involves specification of a distribution function and a link function. The parameters are estimated by maximizing the Bernoulli quasi log likelihood function for the FRM stated in Equation 2.

$$lnL(\beta) = \sum_{i=1}^{N} w_i\, PHLM_i ln\{\gamma(X_i'\beta)\} + w_i(1 - PHLM_i) ln\{1 - \gamma(X_i'\beta)\} \ldots\ldots\ldots (2)$$

Where, $PHLM_i$ represents the postharvest loss management index, N is the sample size, $X_{is}$ are the independent variables for farmer i and $w_i$ is an optional weight. It is assumed that the link function $\gamma(.)$ follows a logit distribution with the function shown in equation 3.

$$\gamma(X_i'\beta) = \frac{e^{X_i'\beta}}{1 + e^{X_i'\beta}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Equation 3 leads to empirical specification of the FRM as shown in equation 4.

$$E(PHLM_i/X_i) = \gamma(\mu_i) = \beta_0 + \sum_{k=1}^{9} \beta_k X_{i,k} + e_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The E(.) denotes the variance operator, $\beta_k$ is the unknown parameters which must be determined from the data and $X_i$ are the independent variables.

Definitions of variables

The dependent variable PHLM could be derived as:

$$PHLM = \frac{Value\ of\ cassava\ roots\ sold(₦)}{Value\ of\ cassava\ roots\ harvested(₦)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

The postharvest loss management (PHLM) index is a proportion that takes value between 0 and 1 ($0 \leq$ PHLM $\leq$ 1). The index indicates how efficient a farmer is in the management of postharvest losses. Higher value shows better management while lower value signifies poor management of postharvest losses by farmer. PHLM of zero shows that all the harvested cassava roots were wasted while PHLM of one means that the farmer was able to sell all the harvested roots.

The independent variables are stated as: $X_i$= Age (Years); $X_2$ = Household income (₦); $X_3$= Farming experience (Years); $X_4$ = Household size (Number); $X_5$ = Farm size (Ha); $X_6$ = Distance of farm from the market; $X_7$ = Educational level (Years); $X_8$ = Access to loan (yes=1, no=0); $X_9$= Gender (male=1, female=0).

## 3. Results and Discussion

Table 1 shows that the majority (65.8%) of the respondents were below 41 years of age while some (34.2%) were above 40 years. The minimum and maximum ages were 24 years and 77 years respectively while the mean age was 39 years. This implies that young, economically active and highly innovative individuals are into production of cassava in the study area. This negates the findings of Kisaka-Iwayo (2012) cited by Maremera (2014) that in most African rural settings, the younger generation does migrate to the urban areas in search of white collar jobs while farming is left in the hands of older generation. It has been argued over the years that at younger ages, farmers are with more strength and zeal to undertake more effective strategies that minimize postharvest losses. The implication of this result in the study area is that, respondents will be able to manage postharvest losses effectively.

Distribution of respondents by marital status in Table 1 indicates that 77.5 percent of the household heads were married while just 16.6 percent were single. Just 4.2 percent and 1.7 percent were divorced and widowed respectively. This implies that in the study area most of the cassava farmers are married and one expects them to have advantage with regards to labour availability, if family labour is needed, for their farming and postharvest activities.

According to Table 1, the majority (76.3%) of the respondents were male while only 23.7 percent were female. This is an indication that cultivation of cassava is dominated by men in the study area. It shows that men livelihood is mostly affected when postharvest losses occur. Also, Table 1 shows that 56. 7 percent of the respondents used less than 3 hectares for cassava cultivation while 3 to 6 hectares of farm land were put into cultivation of cassava by 35 percent. Just few (8.3 %) cultivated more than 6 hectares. The minimum and maximum farm sizes were 0.5 and 15 hectares respectively while the mean was 2.8 hectares. This implies that most of the respondents are small scale farmers and that in the study area cassava is cultivated on a small scale.

In addition, Table 1 reveals that 42.1 percent of the respondents had 5 persons or less as household size while 46.7 percent had between 6 and 8 persons. Also, just 11.2 percent had above 8 persons. The minimum and maximum household sizes were 1 and 15 respectively while the mean was 7.5 persons. This shows that the cassava farmers in the study area have relatively large household size. It has been argued that large household leads to high poverty level among the

small scale farming households (Oluwatusin, 2012). According to Martey et al., (2012) large family signified availability of labour for production and postharvest handling activities. Also, large household size may lead to more spending on family consumption than production and postharvest activities.

Table 1: Socio economic characteristics of respondents

| Variable | Frequency | Percentages |
|---|---|---|
| **Age** | | |
| ≤30 | 43 | 17.9 |
| 31-40 | 115 | 47.9 |
| 41-50 | 42 | 17.5 |
| 51-60 | 21 | 8.8 |
| Above 60 | 19 | 7.9 |
| **Marital status** | | |
| Single | 40 | 16.6 |
| Married | 186 | 77.5 |
| Divorced | 10 | 4.2 |
| Widowed | 4 | 1.7 |
| **Gender** | | |
| Male | 183 | 76.3 |
| Female | 57 | 23.7 |
| **Cassava farm size** | | |
| <3 | 136 | 56.7 |
| 3-6 | 84 | 35 |
| Above 6 | 20 | 8.3 |
| **Household size** | | |
| ≤5 | 101 | 42.1 |
| 6-8 | 112 | 46.7 |
| Above 8 | 27 | 11.2 |
| **Access to loan** | | |
| Yes | 93 | 38.7 |
| No | 147 | 61.3 |
| **Sources of loan** | | |
| Friends & relatives | 41 | 44.1 |
| Cooperative societies | 33 | 35.5 |
| Money lenders | 9 | 9.7 |
| Banks | 10 | 10.7 |
| **Distance of farm to market(Km)** | | |
| < 2 | 30 | 12.5 |
| 2-6 | 68 | 28.3 |
| Above 6 | 142 | 59.2 |
| **Educational qualification** | | |
| No formal education | 60 | 25 |
| Quranic education | 23 | 9.6 |
| Primary education | 83 | 34.6 |
| Secondary education | 50 | 20.8 |
| Tertiary education | 24 | 10 |

The results in Table 1 shows that the majority (61.3 %) of the respondents interviewed had no access to loans while 38.7 percent was able to collect loans for both cassava production and postharvest activities. This may be one of the reasons while majority of the cassava farmers operate on small scale in the study area. On the other hand, most (44.1%) of the farmers got their loans from friends and relatives while 35.5 and 9.7 percents had access to loan through cooperative societies and money lenders respectively. Very few (10.7%) collected loan from banks. Despite, the Central Bank of Nigeria directives to banks on loans for agricultural purposes, few farmers still patronize the banks. This implies that farmers in the study area prefer friends, relatives and cooperative society's loans to banks loans. This may be due to the procedures involved in collecting bank loans. This may have negative effects on postharvest loss management since loans from these sources apart from banks are very small. This result is in line with the findings of Adekunle, Omoare and Oyediran (2014) that banks loans are not readily available to farmers.

According to the results of distance of farm to market in Table 1, most (59.2%) of the farms were above 6 km to the nearest market while few (12.5%) were below 2 km. The minimum and maximum distances were 0.5 and 20km while the mean was 9 km. This shows that most of the farms in the study area are far from the markets. There is possibility of increase in postharvest losses of cassava roots since most of the roads linking the farms to markets in the study area are bad. Babalola et al., (2010) opined that the longer the distance it takes to move any agricultural produce (perishable) to market, the more the postharvest losses of such produce.

Table 1 indicates that 75 percent of the respondents went for formal education while just 25 percent did not attend any school. The majority (66.4%) percent were able to complete at least primary education. This shows that most of the farmers can read and write. An indication that they can read written materials on cassava tubers postharvest management practices which will in turn enhance their postharvest managerial ability. Also, with the level of education, the farmers could appreciate available postharvest technologies on management of harvested cassava roots.

In addition, if the farming experience is considered, Table 2 shows that 70.8 percent of the respondents had over 5 years farming experience while few (29.2%) went into farming not more than 4 years ago. The minimum and maximum years were 1 and 30 years respectively while the mean farming experience was 10 years. The results show that the respondents are experienced farmers. This is an

indication that the farmers will have better knowledge of handling cassava roots during and after harvesting.

Table 2: Distribution of respondents by farming experience

| Farming experience (years) | Frequency | Percentage |
|---|---|---|
| <5 | 70 | 29.2 |
| 5-10 | 80 | 33.3 |
| 11-15 | 63 | 26.3 |
| Above 15 | 27 | 11.2 |
| **Total** | **240** | **100** |

Table 3: Distribution of respondents by access to extension agents

| Access to extension agents | Frequency | Percentage |
|---|---|---|
| Yes | 159 | 66.3 |
| No | 81 | 33.7 |
| **Total** | **240** | **100** |

Table 3 records that the majority (66.3%) of the respondents had access to extension agents while 33.7 percent were not visited by extension agents in the production year under consideration. This shows that most of the farmers will have access to good information on how to produce and handle the harvested roots. Extension agents are regarded as the links between the experts and the farmers.

Table 4: Distribution of respondents by farmers groups membership

| Membership | Frequency | Percentage |
|---|---|---|
| Yes | 218 | 90.8 |
| No | 22 | 9.2 |
| **Total** | **240** | **100** |

Also, in Table 4, 90.8 percent were members of one or more farmers groups while just 9.2 percent did not belong to any farmers group. This implies that the majority of the farmers would have access to useful information on production, postharvest management practices and marketing of harvested tubers from their associations.

Table 5: Distribution of respondents by formal postharvest handling training

| Formal postharvest handling training | Frequency | Percentage |
|---|---|---|
| Yes | 37 | 15.4 |
| No | 203 | 84.6 |
| **Total** | **240** | **100** |

Distribution of respondents by training on postharvest handling in Table 5 shows that 84.6 percent of the farmers were not formally trained on how to handle cassava tubers during harvest and after harvest while few (15.4%) of them were trained formally. This implies that most of the postharvest management skills displayed by the farmers were learnt from their friends and associations.

Table 6: Distribution of respondents by main source of information on postharvest handlingPractices

| Main source of information | Frequency | Percentage |
|---|---|---|
| Friends & relatives | 180 | 75 |
| Farmers groups | 30 | 12.5 |
| ICTs | 10 | 4.2 |
| Extension agents | 20 | 8.3 |
| **Total** | **240** | **100** |

Moreover, if the main source of information on postharvest handling practices is taken into consideration, Table 6 shows that 75 percent of the farmers got their information mainly from friends and relatives while 25 percent got theirs mainly from farmers groups, Information Communication and Technologies (ICTs) such as radio, television and mobile phone and extension agents. The result indicates that the majority of the cassava farmers in the study area do receive information on postharvest handling of cassava roots mainly from friends and relatives. The findings reflect the scale of production (small scale) of cassava in the study area. This result is not in line with what Adekunle et al., (2014) noticed that farmers mainly rely on information from farmers groups.

Table 7: Distribution of respondents by the main cassava postharvest loss management practices adopted

| Practices | frequency | percentage |
|---|---|---|
| Cut stems and leave roots in the soil | 16 | 6.7 |
| Processed immediately to garri | 162 | 67.5 |
| Processed immediately to chips | 23 | 9.6 |
| Processed immediately to fufu | 15 | 6.2 |
| Do nothing | 24 | 10 |
| **Total** | **240** | **100** |

The bulkiness and short shelf life of the harvested cassava roots pose a big problem to farmers especially the small scale cassava growers. This problem necessitates the need to adopt postharvest management practices that will reduce losses of cassava roots. According to Table 7, respondents were asked about the practices adopted to reduce postharvest losses of cassava roots. The majority (67.5%) of the respondents said they usually process the cassava roots to garri in order to guide against losses after harvest while 6.7 percent did cut the stems and allowed the roots to remain in the soil for 3-4 months. Also just 10 percent did nothing while 9.6 percent and 6.2 percent always process the roots to chips and fufu respectively to reduce postharvest losses. This implies that most of the farmers in the study area are also processors.

Table 8 shows the estimates of the fractional logit regression model used to identify the variables that determined the postharvest loss management among the cassava farmers. The coefficients of the model were estimated with GLM. The Akaike Information Criterion (AIC) estimate of 1.08481 signifies a good measure of the relative quality of statistical model used for the data collected.

Table 8: Fractional logit model estimates of determinants of postharvest loss management

| Variable | Coefficient | Standard error | Marginal effects |
|---|---|---|---|
| Age ($X_1$) | 0.0761*** | 0.0161 | 0.095*** |
| Household income ($X_2$) | 0.1642 | 0.1071 | 0.532 |
| Farming experience ($X_3$) | 0.4037** | 0.2030 | 0.794** |
| Household size ($X_4$) | 0.0915 | 0.0586 | 0.502 |
| Farm size ($X_5$) | -0.2863** | 0.1357 | -0.052** |
| Distance of farm to market ($X_6$) | -0.0311* | 0.0172 | -0.741* |
| Educational level ($X_7$) | 0.7500* | 0.4136 | 0.330* |
| Access to loan ($X_8$) | 0.0039 | 0.0032 | 0.779 |
| Gender ($X_9$) | -0.0081 | 0.0052 | -0.116 |
| Akaike Information Criterion (AIC) | 1.08481 | | |

*,**and *** signify 10%, 5% and 1% level of significance respectively.

Out of the nine independent variables used in the model, six (age, household income, farming experience, household size, educational level and access to loan) had positive effect on the dependent variable (postharvest loss management), while just three (farm size, distance of farm to market and gender) had negative effect on the dependent variable. Those with significant effects at the various levels of significance used were age (1%), farming experience (5%), farm size (5%), distance of farm to market (10%) and educational level (10%).

The age ($X_1$) of the household head had positive effect on the postharvest loss management capability of the cassava farmer and this effect was significantly different from zero at 1 percent level of significance. The marginal effect of 0.095 shows that when the age of the farmer is increased by 1 year, the capability to manage the postharvest loss effectively is increased by 0.10 percent points. This implies that as the age increases, ability to reduce postharvest losses among the cassava farmers also increases. This also signifies that older farmers are more efficient at managing post harvest losses. This is in contrary to what Ansah and Tetteh (2016) found out that older farmers are less effective in managing postharvest loss effectively.

Also, farming experience ($X_3$) of the farmers had a significant (5%) effect on the postharvest loss management. The marginal effect of 0.532 signifies that 1 year increase in farming experience leads to 0.532 percent points increase in the farmer's ability to manage postharvest loss effectively. The result implies that experienced farmers are better than their inexperience counterparts in handling postharvest losses of cassava roots. This corroborates the findings of Babalola, et al., (2010) that experienced farmer has good knowledge of technologies required to manage postharvest losses effectively.

Farm size ($X_5$) had a negative effect at 5 percent level of significance on the postharvest loss management. The marginal effect of - 0.052 indicates that when the farm size is increased by 1 hectare, the ability to manage postharvest losses effectively is reduced by 0.05 percent points. This implies that small scale farmers are better at postharvest loss management than their large scale farmers counterparts. This is in line with Babalola, et al., (2008) that as scale of production increases, farmers

will be faced with the problem of storage and transportation and where the facilities are not available or adequate post harvest losses are inevitable. This is because the larger the area put into cultivation of cassava the higher the quantity of cassava roots harvested and chances of losses due to poor handling.

In addition, distance of farm to market ($X_6$) was significantly (10%) and negatively related to the postharvest loss management. The marginal effect of -0.741 shows that as the distance of farm increases (decrease) by one kilometer, ability of farmer to manage post harvest loss effectively reduces (increases) by 0.74 percent points. This may be due to the bad roads linking the farms to the nearest markets. The result indicates that, the further the farms are from the markets, the longer it takes to transport the harvested cassava roots to the markets and hence the reduction in the capability of the farmers to reduce postharvest losses.

Educational level ($X_7$) of the farmers also played a significant role in the ability of farmers to manage postharvest losses effectively. This variable was positively significant at 10 percent level of significance. The marginal effect of 0.330 signifies that as the number of years spent in school increases by one year, ability of a farmer to improve on his postharvest loss management increases by 0.33 percent point. This may be so because education increases human intellectual capacity. This result implies that educated farmers are more effective than their uneducated counterparts in the management of postharvest losses. It also means that farmers with higher levels of formal education (secondary and tertiary) will have lower postharvest losses than those with lower educational levels.

## 4. Conclusion and Recommendations

At present in Nigeria, agriculture has been earmarked as the most important sector which has the potentials to transform the country's ailing economy. In order to enhance food security and end economy recession currently ravaging Nigeria, it is of importance to embark on aggressive management of postharvest losses of agricultural produce.

Descriptive statistics were used to analyse the socio-economic characteristics of the respondents while fractional regression analysis model was used to empirically analyse the determinants of postharvest loss management among cassava farmers in the study area.

The study finds out that young, economically active and highly innovative individuals are into production of cassava and most of them are married while most of their households are headed by male individuals. Also the majority are small scale farmers with large household size. Very few of them have access to loan while most of the loans are sourced from their friends, relatives and cooperative societies. The results show that most of the farms are far from the markets. The farmers are well experienced and few of them have no access to extension agents. Also, most of them are members of farmers group.

Very few have formal training on postharvest handling of cassava roots. The main sources of information on postharvest handling practices are from friends and relatives. In order to reduce postharvest loss of cassava roots most of the respondents do process the roots to garri, chips and fufu. Also the main significant determinants of postharvest loss management are age, farming experience, farm size, distance of farm to market and educational level. The results indicate that older, experienced, and educated farmers are more effective in the management of postharvest losses of cassava roots. The farm size and distance of farm to market affect postharvest loss management negatively.

When the findings of this study are taken into consideration, the followings recommendations are made for policy actions to improve the postharvest loss management among cassava farmers in Nigeria.

- Since training is an extremely important element in technology adoption, there is need to formally train the farmers on better postharvest management practices involving storage, processing and marketing of cassava roots. This is required in order to improve their knowledge and capacity to observe, experiment and implement certain postharvest handling practices.
- The procedures involved in accessing loans form banks by farmers should be reviewed by the Central Bank of Nigeria in order to attract farmers to banks loans.
- Since the distance of farms to markets is far, there is need for the government to rehabilitate most of the bad roads so as to reduce the postharvest losses of farmers in the study area.
- The use of ICTs in disseminating information on postharvest handling practices of cassava roots should be encouraged.

## References

1. Adekunle, A. A. Omoare, A. M. and Oyediran, W. O. (2014). Rural women's skill acquisition in the processing of locust bean in Ipokia Local Government Area of Ogun State, Nigeria. World Academy of Science, Engineering and Technology (WASET) 85, 531 – 536.
2. Ansah, I.G.K. and Tetteh, B.K.D. (2016). Determinants of yam postharvest management in the Zabzugu District of Northern Ghana. Advances in Agriculture. Volume 2016, pp 1- 9.

3. Babalola, D.A., Megbope, T.A. and Agbola, P.O. (2008). Postharvest losses in Pineapple production: A case study of Ado-Odo Otta Local Government Area of Ogun State. *Bowen Journal of Agriculture 5(2),* 55-62.
4. Babalola, D.A., Makinde, Y.O., Omonona, B.T. and Oyekanmi, M.O. (2010). Determinants of post- harvest losses in tomato production: a case study of Imeko – Afon Local Government Area, Ogun state. *Journal of Life and Physical Sciences*, 3(2),14 - 18.
5. FAO, (1999). Cassava post-harvest operations. Post-harvest Compendium. FAO Report.
6. Federal Ministry of Agriculture and Rural Development, (2016). Agricultural Promotion Policy (2016-2020). Building on the Successes of the Agricultural Transformation Agenda (ATA), closing key gaps. Policy and strategy document.
7. Kereth, G.A., Lyimo, M., Mbwana, H.A., Mongi, R.J. and Ruhembe, C.C. (2013). Assessment of post-harvest handling practices: knowledge and losses of fruits in Bagamoyo district of Tanzania. *Food Science and Quality Management*, Volume 11.
8. Kisaka-Lwayo, M. **(**2012). Risk preferences and consumption decisions in organic production: the case of KwaZulu-Natal and Eastern Cape provinces of South Africa. Unpublished PhD Thesis. University of Fort Hare.
9. Maremera, G. (2014). Assessment of vegetable postharvest losses among smallholder farmers in Umbumbulu Area of Kwazulu-Natal Province, South Africa. Unpublished M.Sc. Thesis. University of KwaZulu-Natal, Pietermaritzburg.
10. Martey, E., Al-Hassan, R.M. and Kuwornu, J.K.M. (2012). Commercialization of smallholder agriculture in Ghana: A Tobit regression analysis. *African Journal of Agricultural Research, 7(14),* 2131-2141.
11. Nanda, S.K., Balagopalan, C., Padmaja, G., Moorthy, S.N. and Sajeev, M.S., (2010). Post harvest management of cassava for industrial utilization in India.
12. Oluwatusin, F.M. (2011). Poverty Status among Households in Nigeria. Publisher, VDM Verlag Dr. Muller Gmbh & Co.KG Dudweiler Landstr. 99,66123 Saarbrucken, Germany. 221 Pp.
13. Papke, L. E. and Wooldridge, J. M. (1996). Econometric methods for fractional response variables with an application to 401 (k) plan participation rates. *Journal of Applied Econometrics*, *11(6),* 619–632.
14. Papke, L. E. and Wooldridge, J. M. (2008). Panel data methods for fractional response variables with an application to test pass rates. *Journal of Econometrics*, *145,(1-2),*121– 133.

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