Global Journal of Agricultural Research, 12, (1), 37-50 2024
Print ISSN: 2053-5805(Print),
Online ISSN: 2053-5813(Online)
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK

Agricultural Productivity and Postharvest Loss Among Cassava Farmers, In Anambra State, Nigeria

Nwankwo, Eucharia Chijindu [1] (PhD) and Chiekezie, Njideka Rita PhD[2],

1. Department of Agricultural Economics and Extension, Chukwuemeka Odumegwu Ojukwu University, Igbariam, Anambra State, Nigeria
2. Department of Agricultural Technology, School of Agriculture and Related Disciplines, Anambra State Polytechnic, Mgbakwu, Nigeria, West Africa

doi: https://doi.org/10.37745/gjar.2013/vol12n13750 Published Febuary1, 2024

Citation: Nwankwo, E.C. and Chiekezie, N.R. (2024) Agricultural Productivity and Postharvest Loss Among Cassava Farmers, In Anambra State, Nigeria, *Global Journal of Agricultural Research*, 12, (1), 37-50

ABSTRACT: *Postharvest loss is one of the greatest challenges of agricultural productivity and its reduction is a key pathway to food security. Using Cassava production, this study tends to examine the socioeconomic characteristics of the cassava farmers; determine the effect of postharvest loss on cassava production; analyse the financial implication and mitigation strategies employ by the cassava farmers in the study area. Data were collected through a structured questionnaire administered to a random sample of 120 cassava farmers in the state. Descriptive statistics, mean threshold from five points Likert scale, Logit model, and inferential statistics were used to analyse the data. Results showed that female farmers (51.7%) dominated the sector, with an average age of 41.91, 10.73 level of education, and 13.18 farming experience with 5.58 household sizes. The farmers have a 68.0% postharvest losses management index, and 32.0% postharvest loss among cassava farmers. The study found that the determinants of postharvest loss in the area are age, marital status, education, farming experience, household size, cooperative membership, access to credit, and extension contact. Postharvest losses come with a load of financial implications, and in that regard, the farmers designed a number of mitigation strategies like good agronomic practice adoption, processing immediately to chips, gari, and fufu among others. The study concluded that cassava farmers in Anambra State have high postharvest losses (32.0%). The study recommends the introduction of improved storage facilities and the provision of incentives to the farmers to increase their agricultural productivity and reduce postharvest losses.*

KEYWORDS: productivity, postharvest loss, determinants, cassava

INTRODUCTION

Agricultural productivity is an integral part of food security. As population continues to grow, Scholars argued that consented efforts should be made towards increasing agricultural production, especially in the regions of the

World where population growth poses a threat to the food security (Almed, 2017). This calls for a sustainable food production that would guarantee food availability both in quantity and quality. Increasing productivity depends on the ability of farmers (producers and processors) to adopt new and sustainable agricultural practices that would increase agricultural productivity and at same time sustain human and the environment (Otu et al, 2014) This is possible with an efficient food functioning system, where farmers can boast of return on their labour, reduce food importation, food prices and consequently combat hunger. This affirms the position of Karolina and Małgorzata (2020), that Agriculture has a much greater impact on reducing poverty and improving food security than any other sector of the economy.

While there has been a clarion call for increased agricultural transformation on food and nutrition security, there is uncertainty surrounding global agriculture's capacity to service this call. With an expected global population increase of more than 2 billion (from 7.6 to 9.8 billion) by 2050; the natural resource depletion, and a changing climate which are further exacerbated by recent Covid 19 pandemic which is still putting pressure on an already stretched food supply, according to Rupa, Helvelta and Rafael (2018), a concerted effort must be made to apply zero tolerance for food waste in this twenty first century. Accordingly, Sawicka, (2019) was of the opinion that postharvest loss remains a threat to attaining global food security. Thus the position of World Bank (2011) remains valid and critically important that reduction of postharvest loss (PHL) is a key response to global food availability as this would not only zero hunger, but critical in achieving the global development agenda.

In Nigeria postharvest loss has been estimated to range between 5 and 20 percent for grains; 20 percent for fish, and as high as between 50 and 60 percent for tubers, fruits, and vegetables (Okojie, 2021). The post-harvest losses for roots and tubers, with particular emphasis on cassava roots were at about 35% of the national post-harvest losses ((Oyewole, 2019). Cassava (Manihot esculenta) is the third most important source of calories in the tropics, after rice and maize; and the second one in Africa (FAO, 2004). According to the FAO, as of 2018, world cassava production stood at about 278 million tonnes; Africa total production was about 170 million tons (about 56% of world production) (FAOSTAT, 2019), making Nigeria the largest producer of cassava in the world with an annual production of over 40 million metric tons (mt) (Adegboyega 2013). It is grown and consumed across all the agro-ecological zones of Nigeria. According to sources, the major growers are the southern and Middle Belt states of the Country. Cassava is very important component in the diet of an average Nigerian. Findings revealed that the most popular and readily marketable food products of cassava, in Anambra and Nigeria as a whole are Gari, Fufu and Abacha and according to Nweke,(2004), has principally contributed to the economy of the smallholder farmers who produced cassava primarily for the traditional food market and now transiting for industrial end-users. It is a staple food with comparative productive advantage. Its ability to produce high yields under poor conditions and storage of its harvestable portion underground until when needed, gives it an edge. This has made it a classic` food security crop` and encourage its cultivation by a resource-poor farmer (Temitope, Babatunde and Animashaun (2019). In addition, the starchy roots produce more food energy than any other staple crop, and accounts for about 70% of the total calorie intake of more than half of Nigerians (Nweke and Enete, 1999). Unfortunately, millions of cassava tones are wasted annually and constitutes a significant nutritional, health, and financial impacts for both consumers and farmers.

These losses can be of physical nature and/or economic nature (loss of value due to bad storage facilities or information systems). Losses in food value chains are highly variable, ranging from 5% to 30% depending on the crop and the stage in the value chain. Once harvested, cassava root is highly perishable and according to Iyer et al (2010) its postharvest deterioration can limit its storage potential to two to three days. In the rural household of Anambra State, where cassava farmers are predominantly located, the storage of roots is rare and the farmers are left with only an option to consume or process the tubers as soon as possible after harvesting. Unfortunately, this does not always happen and as such, significant amount of roots spoil or incur various degrees of quality deterioration. These losses have serious negative impacts on income and quality food intake and constitute a bottle neck for transforming cassava from subsistence to a cash crop. Booth & Coursey, (1974) outlined two types of postharvest deterioration: primary physiological deterioration that involves internal discoloration and secondary deterioration due to microbial spoilage as well as direct physical loss of the crop.

Postharvest loss is an attribute of inefficient food functioning system. The deterioration of cassava roots causes a reduction in quality, which has implications on marketing of cassava leading to price discounts. Transportation of harvested roots through terrible bad roads to the market, sometimes result to break down of vehicles. Rural markets have designated days for market activities so that most often majority of the farmers hardly meet up with stipulated time, hence there is periodic wastage of cassava roots. The use of locally fabricated and inefficient Cassava processing equipments have not helped in any way, their processes record a tremendous food looses due to poor processing practices and inefficient Technology. The postharvest diseases, crumbling infrastructure and sketchy power supply are contributing factors. Affognon et al. (2015) added that non-standard bags could lead to loss of grain quality by permitting exposure to moisture, insects, and contaminants. However, achieving food sufficiency in Nigeria has continued to remain a mirage as postharvest loss continues to rear its ugly head in our agricultural system. It is against this background that this study tends to investigate the agricultural productivity and postharvest loss among cassava farmers in Anambra State. Specifically, the study sought to

1) examine the socio-economic characteristics of cassava farmers,
2) determine the effects of postharvest losses on cassava production;
3) analyze the financial implications; and
4) mitigation strategies deployed by the farmers in the study area.

CONCEPTUALIZING AGRICULTURAL PRODUCTIVITY AND POSTHARVEST LOSS

Agricultural productivity is defined as a measure of efficiency in an agricultural production system. It can be measured as ratio of agricultural output to agricultural inputs. According to Egli (2008) the main drivers of agricultural productivity are agricultural techniques or improved technology. When farmers adopt new techniques and engage in sustainable agricultural practices, cost of production is reduced as well as food prices and consequently leads to increase in income of the farmers Mundlak (2007). Accordingly, increasing agricultural productivity implies a more efficient distribution of scarce resources, which could lead to a more productive farm that would guarantee farmers` adequate returns. Reducing food loss along the supply chain can be used to

strengthen food security, reduce agricultural farmland, increased food availability, reduce pressure on natural resources, and improve farmers` living standard.

Theoretically the view of Malthusian theory of population was used to drive home the message of agricultural productivity and postharvest loss as it affects food availability. Malthusian principle postulates that population growth is often, potentially geometrical while the food supply is linear, which according to Malthus can result to a situation called `Malthusian trap`. The trap occurs when population growth outpaces agricultural production, thereby causing hunger, poverty, crisis, unemployment etc. From the political economic thought, Malthus argued that technology advancement could increase a society`s supply of resources such as food and thereby improving the standard of living. On the other hand the resource abundance in turn would enable population growth, which would eventually bring per capita supply of resources back to its original level.

Although Malthus faced several criticism but his argument continues to remain a major discourse in our society. In the context of developing countries of the World like Nigeria, Malthusian trap appears to continue to operate. Food security is not only facing the challenges of low production but more challenging is the ability to reduce waste and ensure steady supply. As affirmed by Andrey (2015), the continuation of extreme poverty in some region of the world indicates that Malthusian trap is still in operation. Some other scholars further argued that due to lack of food availability coupled with excessive pollution, developing countries show more evidence of the trap and Nigeria is not out of it. Malthus had not only propagated the use of right technology and practices to increase agricultural productivity but also techniques to reduce waste and ensure sustainability. When limited resources such as land are properly managed and crops are effectively used with the right technology, it goes a long way to reduce postharvest loss.

METHODOLOGY

Study area

The study was carried out in Anambra state in the South-Eastern part of Nigeria. There are four agricultural zones in the state: Awka, Anambra, Aguata, and Onitsha. It was reported to have a total land area of 4,865 sq km with an estimated population of 5,846,198 (Anambra State Agricultural Development Programme (ASADEP, 2011). Vegetation is tropical rainforest. The major occupation of the people are trading and farming. Majority of the farmers are small scale farmers and are majorly known for growing such crops as rice, cassava, yam, cocoyam, okro, palm oil and melon. Agricultural produce is widely sold in assembled markets in the villages, communities and cities. Each assembled market is identified with one of the four Igbo market days namely Eke, Oye, Afor and Nkwo.

Population, sampling technique and data collection

The study population comprised of all cassava farmers in Anambra state. Multi-stage, purposive and random sampling techniques were used to select 120 respondents for the study. In stage 1, two agricultural zones (Anambra and Awka zones) were purposively selected from the four zones in the state. The selection was based on the concentration of rural farmers (farming, processing and food marketing) activities. In stage 11, two Local Governments areas were randomly selected from each zone making a total number of four LGAs. In stage 111, two communities were randomly selected from each four LGA to obtain eight communities. Finally, 15 farmers (farmer =5, processors =5 marketers=5) were randomly selected from each of the 8 communities to obtain a total of 120 respondents for the study.

Method of data analysis

Primary source of data was used for the study. With the aid of research assistants, structured questionnaires were administered personally to the respondents and their responses recorded. This was to quicken the process and maximum return. . Descriptive statistics (mean threshold from five points Likert scale, frequency and percentage) and inferential statistics (Logit model) were used to analyse the data.

RESULTS AND DISCUSSION

4.1 Socioeconomic characteristics of cassava farmers

Understanding the socioeconomic profile of cassava farmers in the study is important because the knowledge influences the quality of life, life expectancy, and access to services and resources. It gives an insight to how they handle postharvest issues in the study area. The result of Table 1 represents the information about the socioeconomic characteristics of farmers.

Sex: the table shows that more than half (51.7%) of the cassava farmers are female while the rest 48.3% are male. The implication is that cassava production is a dominant profession among female farmers. Also, the study revealed that a greater proportion (40.0%) of the respondents are less than 35 years old, while the remaining 26.7% are 55 years old and above, 20.8% are 45 – 54 years old, and 12.5% are 35 – 44 years old. The average age of the farmers was 41.91 (approximately 42 years old). This implies that the cassava farmers in the study are within their active farming age. Equally, it was found that 35.8% of the farmers are single, 32.5% are not currently married or are separated from their spouse, and the last 31.7% are married. 31.7% of the married farmers will benefit from the shared responsibility of marriage in terms of farm labour supply.

It was clearly revealed that a greater proportion (42.5%) of the farmers spent 7 – 12 years (secondary school) in formal education, 36.7% spent above 12 years in school, and the last 20.8% spent 1 – 6 years. The average year spent in formal education was 10.73 (approximately 11 years), confirming that cassava farmers barely completed their secondary education in the study area. Though fairly educated. Uchemba *et al*. (2021) reported that education

has a great influence on the adoption of agricultural technology. This is also in line with the report of Temitope *et al.* (2019) who reported that most of their respondents spent 7 – 12 years in school. Again, 41.7% of the farmers have been in the business of cassava production for the past 1-10 years, 37.5% spent 11 – 20 years of cassava production experience and 20.8% had 20 years (21 years and above) experience in the business of cassava production. the average farming experience was 13.2 (13 years). Meaning that the farmers have spent more than a decade in the enterprise to understand the rudiments of cassava farming in the area. The average experience is high enough to enhance sustainability and provide a competitive edge to farmers.This average experience is in agreement with the 13.1 reported byAboajah*et al.* (2018) on the socio-economic determinants of cassava production in Benue State, Nigeria.

Similarly, 40.8% of the respondents have a household size ranging from 1 – 4 people, 37.5% have 5 – 8 people, and 21.7% have 9 people and above. The average household size in the study is 5.58 which is approximately 6 people per household. Household size is crucial because it affects how scarce farm resource is allocated.

Furthermore, Table 1 revealed that 52.5% of the sampled farmers belong to a farming association, while the remaining 47.5% are not members of a cooperative association. This result is very important because farmer's associations can play a vital role in helping to improve the livelihoods of farmers by providing crucial services such as access to credit, information, and technical advice among others. On access to formal credit, the study revealed that 52.5% of the farmers do not have access to formal and quality credit, while the remaining 47.5% have access to credit. Accessing agricultural credit will help farmers to expand their production. To further understand the farmers and their production enterprise, the study found that many (40.8%) of the farmers were visited by the extension agents 3 – 4 times, 30.0% have 1 – 2 visits, and 29.2% had 5 visits and above. The average extension contact in the study was 3.33. lastly, 50.0% of the respondents have 1 – 2 ha, and the remaining 50.0% had 3 – 4 ha of farmland. The average farm size was 2.44 ha. This is a confirmation that cassava farming is dominated by smallholder farmers in the study.

Table 1: Socioeconomic characteristics of cassava farmers

Socioeconomic variables	**Frequency**	**Percentages**	**Mean**
Sex:			
Female	62	51.7	
Male	58	48.3	
Age:			
Less than 35	48	40.0	
35 - 44 years	15	12.5	41.91
45 - 54 years	25	20.8	
55 years and above	32	26.7	
Marital status:			

Single	43	35.8	
Not currently married/separated	39	32.5	
Married	38	31.7	
Level of education:			
primary (1 - 6)	25	20.8	
Secondary (7 - 12)	51	42.5	10.73
tertiary (above 12)	44	36.7	
Farming experience:			
1-10 years	50	41.7	
11-20 years	45	37.5	13.18
21 years and above	25	20.8	
Household size:			
1 - 4 people	49	40.8	
5 - 8 people	45	37.5	5.58
9 people and above	26	21.7	
Cooperative association:			
No	57	47.5	
Yes	63	52.5	
Access to credit:			
No	63	52.5	
Yes	57	47.5	
Extension contacts:			
1 - 2 times	36	30	
3 - 4 times	49	40.8	3.33
5 time and above	35	29.2	
Farm size:			
1 - 2 ha	60	50	
3 - 4 ha	60	50	2.44

Source: Field Survey, 2023.

Cassava Postharvest management index

Cassava postharvest management index is an important tool that can help smallholder farmers make necessary improvements to their postharvest practices. By assessing their practices and identifying the areas in need of improvement, farmers can better manage their postharvest resources and increase their overall production. From Table 2, it was evident that the average weight of produce at harvest was 46.63 tonnes, and the weight at the market was 31.73 tonnes, this showed that the farmers recorded 32.0% postharvest loss in the area. This is huge and needs to be addressed. The value of standard deviation is high enough to show serious variation among respondents. Furthermore, the mean postharvest management index (PHMI) was 0.68 which implies that cassava farmers in the area are 68.0% efficient in managing the cassava produce. There is an urgent need to reduce the volume of postharvest loss incurred in the sector if food security must be a reality in the area.

Table 2: Cassava postharvest management index

Item	Weight at harvest (ton)	Weight at the market (ton)	Postharvest management index
Min	11	5.64	0.45
Max	120	102	0.9
Mean	46.63	31.73	**0.68**
Std. dev.	24.96	18.37	0.13
Postharvest loss		**32.0%**	

Source: Field Survey, 2023.

Determinants of postharvest loss among cassava farmers

Table 3 is a reflection of postharvest loss determinants; a logistic regression technique was used to achieve this process. The aim of using this approach is to produce a model that best predicts the probability of an event (postharvest loss) occurring. Diagnostically, the Log-likelihood value was -31.342, Obianefo *et al.* (2021) argued that the more negative the Log-likelihood; the better the model. The Likelihood ratio test value of 103.14*** was significant at a 1% level of probability, this implies that at least, one of the independent variables is having a significant impact on the dependent variable. Also, the Pseudo R^2 value of 0.622 is an indication that the independent variables explained 62.2% variation in outcome, while the unexplained 37.8% was a result of external influences like weather, climate, and transportation facilities among others.

The coefficient of age, farming experience, and cooperative membership were negatively significant at a 1% level of probability. Thus, a unit increase in the age and farming experience of the farmers will exponentially reduce postharvest loss by 0.7% (age) and 1.8% (experience). It is expected that over the years, the farmers have accumulated enough expertise to devise indigenous techniques that will help avert postharvest loss or improve postharvest handling of produce. The result of age is in agreement with Temitope*et al*. (2019) who found a negative and significant relationship between age and postharvest loss along cassava value chain in Kwara State.

Also, a unit increase in the number of corporators in the area will exponentially reduce postharvest loss by 28.9%. This result was expected in *a priori* because farmers are expected to be trained on postharvest handling of farm produce. The coefficient of marital status, household size, access to credit, and extension contacts were positively significant at a 1% level of probability, these implied that a unit increase in the number of married farmers will exponentially increase postharvest loss by 13.9%. This is an indication that marriage comes with additional responsibility which may demand other attention from the farmers. Sadly, a unit increase in household size exponentially increased the odd ratio of postharvest loss by 5.0%, increase in household size was supposed to create additional labour but at this point increase in household size in the area causes idleness. Again, a unit increase in the number of farmers with access to credit exponentially increased postharvest loss by 23.4%. This has clearly shown that farmers divert the money meant for agriculture to other businesses. Fund diversion has continued to be a problem in the agricultural sector. Equally, a unit increase in extension visits or contact increased the odd ratio of postharvest loss by 9.4%. This is a suggestion that the content of extension packages disseminated to the farmers should be checked to ensure correctness.

Similarly, the coefficient of education was negatively significant at a 5% level of probability, this implies that a unit increase in the educational qualification of the farmers will reduce postharvest loss by 2.0%. Just like expected, education will increase the farmer's sense of postharvest handling of farm produce. The study finally established that the determinants of postharvest loss in the area are age, marital status, education, farming experience, household size, cooperative membership, access to credit, and extension contact.

Table 3: Determinants of postharvest loss among cassava farmers

Determinants	**Coef.**	**Std. Err.**	**z-stat.**	**Marginal effect**	**Std. Err.**	**z-stat.**
Sex	0.046	0.718	0.06^{NS}	0.004	0.058	0.06
Age	-0.084	0.028	-2.96***	-0.007	0.002	-3.59
Marital status	1.721	0.513	3.35***	0.139	0.032	4.34
Educational level	-0.243	0.099	-2.45**	-0.020	0.007	-2.69
Farming experience	-0.222	0.065	-3.39***	-0.018	0.004	-4.54
Household size	0.616	0.158	3.89***	0.050	0.008	5.88
Cooperative membership	-3.572	0.939	-3.8***	-0.289	0.054	-5.39
Access to credit	2.888	0.784	3.68***	0.234	0.046	5.13
Extension contacts	1.165	0.308	3.78***	0.094	0.018	5.31
farm size	-0.456	0.323	-1.41^{NS}	-0.037	0.025	-1.46
Constant	1.275	2.197	0.58^{NS}			
Log likelihood	-31.342					
LR	103.14***					
Pseudo R-square	0.622					
Obs.	120					

Source: Field Survey, 2023.

Financial implication of postharvest loss

Table 4 shows the reflection of the financial implication of postharvest loss in Anambra State. In Africa, postharvest losses of cassava are estimated to be between 15 and 30 percent of total production, with an estimated annual loss of $2.4 billion (Affognon *et al.*, 2015). The researcher(s) captured the data on a five points Likert scale, the mean threshold of 3.0 was used to arrive at a particular decision, variables with a mean score of 3.0 and above were negatively impacted by postharvest loss, while those below this benchmark were not impacted. Based on the seven items captured, five were negatively impacted. The grand mean of 3.23 is an indication that most of the farmers reported the financial impact of cassava postharvest loss. Again, the grand standard deviation value of 1.36 is well above 0.5 to show serious deviation from each farmer's response.

The study revealed that postharvest loss reduces shelf life and creates scarcity (M = 3.21), cassava is an important source of food security and nutrition for many people in developing countries. However, one of the major problems faced by cassava farmers is the high rate of postharvest loss which is the loss of crop quality and quantity due to improper handling and storage techniques. Again, postharvest loss decreased or reduced yield (M = 3.49), at this time, it is important to ensure that the cassava is harvested and processed correctly. Improper harvesting and processing can cause significant damage to the crop, leading to reduced yield.

Postharvest loss leads to the high price of food for consumers (M = 3.63); the high price of food for consumers can be linked directly to postharvest losses. When the quantity of the crop is reduced due to losses, the price of food increases as the supply chain is affected. This can be particularly problematic in developing regions, as increases in food prices can put a strain on already limited resources. Additionally, the postharvest loss causes a high cost of input for processors and marketers (M = 3.16), this is because cassava is prone to physical damage due to the fragile nature of its roots. However, care must be taken when harvesting and transporting the crop to avoid bruising and other physical damage. Lastly, postharvest loss affects the livelihood of farmers (M = 3.24), the impact of postharvest losses on farmers is significant or can be very alarming. These losses reduce the amount of food that farmers are able to produce, which can lead to food insecurity, malnutrition, and even poverty. Additionally, farmers may be unable to earn the income they need to support their families.

This finding aligns with most of the strategies reported by Mbah et al. (2017) which include reduction in income generation, reduction in the quality of the produce, loss of farm input such as fertilizer, and herbicides, loss of scarce resources such as water used in production, unstable supply of produce, reduction in the market value of the produce, scarcity of the product, and loss of investment made by the farmer among others.

Table 4: Financial implication of postharvest loss

Sn.	Financial Implication of Postharvest loss	Mean	Std. Dev.	Decisions
1	Postharvest loss reduces shelf life and creates scarcity	3.21	1.47	Negative impact
2	Postharvest loss decreased yield	3.49	1.03	Negative impact
3	Postharvest loss leads to low-quality produce	2.98	1.44	Not impacted
4	Postharvest loss leads tothe high price of food for consumers	3.63	1.13	Negative impact
5	Postharvest loss decreases the income of farmers	2.89	1.46	Not impacted
6	Postharvest loss causes a high cost of input for processors and marketers	3.16	1.44	Negative impact
7	Postharvest loss affects the livelihood of farmers	3.24	1.59	Negative impact
	Grand mean	**3.23**	**1.36**	**Negative impact**

Source: Field Survey, 2023.

Mitigation strategies of postharvest loss by cassava farmers

Considering the huge financial impact of postharvest loss on farmers, it is necessary to design a number of strategies to minimize the losses. All the strategies should be tailored to improve postharvest handling of the produce. However, figure 1 below revealed that 97.5% of the farmers cut the stem and leave the root in the ground. This technique is used as storage till the crop is needed by processors. 75.8% of the respondents process the produce to gari immediately after harvest to retain the quality, while 55.0% convert their produce to chips (*Abacha*). As the most common product from cassava among the locals, 72.5% of the sampled farmers convert to fufu immediately after harvest. 51.7% noted that they ensure proper handling of the produce from the farm to the point of use. With the understanding that planting techniques have a great impact on the quality of produce, 64.2% of the farmers ensure the adoption the good agronomic practices; this is the best way to ensure sustainable agriculture. It includes the selection of appropriate crop varieties, efficient soil management, proper irrigation and drainage, adequate nutrient management, and pest and weed control.Among the few that has the capacity to introduce technology during processing, 13.3% uses flash dryer in place of direct sunlight. 41.7% store their products in a cool and well-ventilated warehouse. Finally, 63,3% of the farmers ensure they practice hygienic processing methods. Many of these strategies revealed are in agreement with the study by Oluwatusin (2017) on the analysis of postharvest lossmanagement among cassava farmers in Nigeria who reported Cutting the stems and leavingthe roots in the soil, processing immediately to garri, processing immediately to chips, processed immediately to fufu as their strategies.

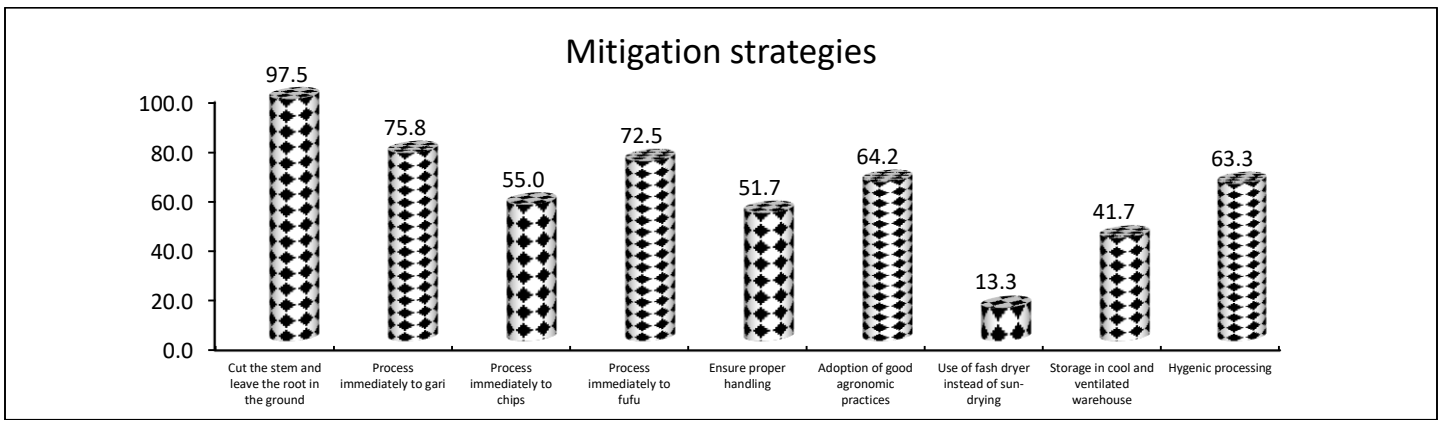

Figure 1: mitigation strategies for cassava postharvest loss

CONCLUSION AND RECOMMENDATIONS

In conclusion, the Agricultural Productivity and Postharvest losses among Cassava Farmers in Anambra State is an issue of great concern. The study recorded very high (32.0%) postharvest loss which does not spell good for the sector in terms of food security. Haven found that age, marital status, education, farming experience, household size, cooperative membership, access to credit, and extension contacts are the determinants of postharvest losses among the farmers, effort should be geared towards improving cassava productivity and reducing postharvest losses, the state government and other stakeholders need to increase awareness among farmers about modern agricultural practices, provide access to improved storage facilities, and increase access to markets and credit. Furthermore, research should be conducted to understand the challenges and opportunities of cassava farming in the state. With the implementation of these measures, the agricultural productivity of cassava farmers in Anambra State can be improved and postharvest losses can be reduced. Additionally, the government should create awareness among farmers on proper post-harvest handling techniques, and create an enabling environment for private sector investment in the agricultural sector.

REFERENCES

Aboajah, F.N., Onjewu, S.S., Chia, J.I. and Okeme, S. (2018). Socio-economic Determinants of CassavaProduction in Benue State, Nigeria.International Journal of Environment, Agriculture and Biotechnology, 3(2): 550-557

Adegboyega E. O. (2013). Food losses in cassava and maize value chains in Nigeria Analysis and recommendations for reduction strategies Published by GIZ Retrieved 28/06/2022

Affognon, H., Mutungi, C., Sanginga, P. and Borgemeister, C. (2015). Unpacking Postharvest Losses in Sub-Saharan Africa: A Meta-Analysis,World Development, 66, 49-68

Ahmed, U.I.; Ying, L.; Bashir, M.K.; Abid, M.; Zulfigar, F (2017) Status and determinants of small farming households' food

security and role of market access in enhancing food security in rural Pakistan. PLoS ONE 2017, 12, e0185466. [CrossRef] [Pub

Anambra State ADP (ASADEP) (2011). End of year report

Andrey, K. &Julia, Z.V (2014). East Africa in the Malthusian Trap? *Journal of Developing Societies*, 31(3). Pp 385 - 420

Araullo, B. Nestel, & M Campbell (Eds). Casava processing and storage, An Interdisplinary Workshop (pp, 43 49). IDRC, Ottawa

Barbara, S, (2019). Postharvesst Loss of Agricultural Produce Sustainable Development 1(1). Pp 1 – 6 Doi: 10.1007/978-3-319 – 69626-3-40-1

Booth, R. H & Coursey, D. G (1974). Storage of Cassava roots and related postharvest problems In E.V.

FAOSTAT (2019) F. FAOSTAT Food and Agriculture Data. htt://www.fao.org/faostat/en/data

Food and Agricultural Organisation (FAO) (2018). The state of food security and nutrition in the World 2018: Building Climate Resilliance for food security and nutrition

Iyer, S, Mattinson, D.S & Fellman, J.K (2010). Study of the Early events leading to Cassava root postharvest deterioration. Tropical Plant Biology, 3(3), 151 – 165

Karolina P., & Małgorzata K (2020) The Role of Agriculture in Ensuring Food Security in Developing Countries:

Considerations in the Context of the Problem of Sustainable Food Production Sustainability 2020, 12, 5488; doi:10.3390/su12135488 www.mdpi.com/journal/sustainability

Malthus, M. (1803). An essay on the Principles of Populatione. (4th edition). London: J.M, pp 1- 24 passim

Mbah, E.N., Okeke, M.N. and Onwusika, A.I. (2017). Assessment of Causes of Post-Harvest Losses of VegetableCrops among Farmers in Benue State, Nigeria. Innovative Techniques in Agriculture 1.4 (2017): 180-188, Science, 15(1): 114-121.

Nweke, F.I & Enete, A.A, (1999). Gender Surprises in food production, processing and marketing emphasis on

Cassava in Africa: Collaborative Study of Cassava in Af.rica (COSCA). Working paper No 19. COSCA, IITA, Ibadan, Nigeria

Obianefo, C.A., Ng'ombe, J.N., Gbughemobi, O.B. and Okoroji, N.O. (2021). The effect of Anambra state value chain development programme partnership with Nigerian Agricultural Insurance Corporation (NAIC) on farmer's production security and risk management. *International Journal of Agriculture Extension and Social Development*, 4(2): 51-58.

Ogundele, F (2022). Postharvest Losses and Food security in Nigeria: An empirical Review. *African Journal of Agricultural Science* 5(3). Pp 77 - 89

Oluwatusin, F.M. (2017). Analysis of Postharvest Losses Management among Cassava Farmers in Nigeria. *Nature and Science*, 15(1): 114-121.

Otu, W.; Ibok, L.;Idiong, C.; Idiong, T.,Nsikan, E.; Bassey, O.; and Ekaette S. U. (2014). Food Security andProductivity of

Urban Food Crop Farming Households in Southern Nigeria, *Journal of Agricultural Science*, 2 (3): 01-12

.Oyewole O. (2019). Combating post-harvest losses; my experience with cassava farming communities in Nigeria. Available online http://www.linkedin.com

Rupa, M.H & Rafael, F (2018). Improved postharvest management- a key contributor to SDG successes. Online at htts://www.helvetas.org/en/Switzerland

Temitope, S. D., Babatunde, R. and Animashaun, J. (2019). Extent and financial cost of cassava postharvest loss along the cassava value chain in Kwara State, Nigeria. Acta agriculturae Slovenica, 114/2, 149–155.

Uchemba V.U., Nenna GM. &Obianefo C.A. (2021). Adoption of Improved Cassava Production Technologies among small-scale Farmers in Anambra State, Nigeria. *Journal of Plant Sciences*, 9(4): 119-127.

World Bank (2011). Missing Food: The case of postjarvest grain losses in Sub-Saharam Africa. Report No 60371 AFR.