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PRE-HARVEST LOSSES AND STRATEGIES ADOPTED BY PLANTAIN FARMERS IN MITIGATING THEM IN BAYELSA STATE, NIGERIA

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ABSTRACT: *The study examined the pre-harvest losses and strategies adopted by plantain farmers in mitigating them in Bayelsa State, Nigeria. The specific objectives were to identify causes of pre-harvest losses and evaluate strategies adopted by plantain farmers in mitigating pre-harvest losses. Five (5) Local Government Areas (Yenagoa, Ogbia, Kolokuma-Opokuma, Sagbama, and Southern Ijaw) were purposefully selected using a multi-stage sample technique. These LGAs were selected based on the predominance of commercial plantain producers in each of the five (6) villages within each LGA. Additionally, there are eight (8) plantain farmers in each village, for a total of 240 plantain farmers. A structured questionnaire was employed to extract the necessary data from the selected farmers. The result indicates that theft, pest, flood, diseases and logging were the major causes identified affecting pre-harvest losses of plantain in the study area. Furthermore, planting of permanent crops as blockade, use of flood free zones for cultivation, use of improved varieties of sucker, practice of integrated pest management technique, better extension services and cultivating dwarfish breeds were strategies employed by plantain farmers to reduce pre-harvest losses. The recommendations made in light of the findings were for farmers to receive appropriate orientation and/or fundamental training in important farm management techniques, with a focus on plantain production pre-harvest losses. They will become more profitable as a result and become more effective.*

KEYWORDS: Strategies, Cost, Profitability, Pre-harvest losses, Mitigation.

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INTRODUCTION

The plantain, or *Musa paradisiaca*, is a member of the Musaceae family of banana plants. It is said to have originated in Southeast Asia and is closely related to the common banana, or *M. sapeintum* (Britanica, 2018). Plantains and bananas are not formally distinguished by botany. However there is a distinct difference between plantains and bananas in other nations, including Nigeria. For over 20 years, few studies (Bantayehu, Alemayehu, Abera and Bizuayehu (2018), Okonya *et al.* (2019), Cauthen *et al.* (2013) and Nkwain *et al.* (2022) have been published on pre-harvest losses of *Musa* spp (Nkwain *et al.,* 2022). However, little or nothing has been done regarding profitability. However, the losses from the few published studies vary from one country to another and are alarming. In Central Africa, Pierrot, Achard, Temple, Abadie and Fogain (2002) document an average loss of 30% before harvest of total plantain plants initially planted by smallholders in the South West region of Cameroon while Hauser and Amougou (2010) reported 50% losses of plantains in Southern parts of Cameroon as a result of poor agronomic practices and pests and diseases. According to Cauthen *et al.* (2013), in West and Central Africa, particularly in Nigeria, Ghana and Cameroon, 30-50% and sometimes up to 80% of plantains are lost at pre-harvest stages. This, in addition to the losses recorded by other producing countries reduces yields and renders millions of people who depend on plantain products food insecure in the continent.

In plantain, observation shows that losses at this stage are sometimes due to poor site selection, storm, poor stalking, theft and the variety of seedlings cultivated. Similarly, Verma *et al*. (2019) argue that the absence or inadequate participation of agricultural research institutes and extension services can lead to lack of adequate information and unavailability of crop varieties suitable to local conditions which is believed to affect the growth and maturity of the crop. This study considers pre-harvest losses of plantain as losses that occur during the lifespan of the crop in the field which reduces the quality and the quantity of harvest. These losses begin with site/seedlings/sucker selection and ends when harvesting begins. In a study on banana losses conducted in Cameroon by Nkwain (2022), farmers insisted that pre-harvest losses pose a higher effect on their social wellbeing most especially food availability. Chief among their rationale was that strong wind, theft, flood, pest and diseases as well as fire devastate their crops leaving them with little or nothing to harvest and consume on daily, weekly and monthly bases hence, threaten their food security status. The literature that was available indicated that although perishable food crops are very important and provide the main source of carbohydrates for meals in underdeveloped nations, not much research has been done on them. Even though the majority of these perishable staple foods are produced on a small scale for subsistence, the industry's economic growth has been negligible in comparison to other West African nations like Ghana, which saw a rapid industrial growth from low production to net exports. Additionally, exports of plantain fruits are still negligible and domestic demand for the fruit is scarcely supplied. Low yields are partially caused by the fact that smallholder farmers in rural regions still control the destiny of their output (Kainga & Seiyabo, 2012), and they typically have little access to extension services. According to a survey of the literature, there is either no information at all or very little about plantain pre-harvest losses in Bayelsa State in terms of profitability. For this reason, the knowledge gap this research stands to fill is to present a study to ascertain the causes of pre-harvest losses and strategies in mitigating these losses by improving plantain farmer’s net farm income.

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Objectives of the Study

The study aims to identify causes of pre-harvest losses, and evaluate strategies adopted by plantain farmers in mitigating pre-harvest losses.

METHODOLOGY

This study employed a multistage sampling technique. First, considering plantain farming is the primary industry in five (5) Local Government locations (Yenagoa, Ogbia, Kolokuma-Opokuma, Sagbama, and Southern Ijaw), these areas were purposefully selected. The second stage involves the purposive selection of six (6) communities each from the five LGAs due to the plantain industry's dominance. Additionally, a total of two hundred and forty (240) plantain farmers were selected at random from each community, comprising eight (8) plantain farmers per community. The x provided a list of farmers. Primary sources of data were used in the collection of this study. This was acquired through the use of a structured questionnaire. The study's objectives were sufficiently met by the questionnaire. Descriptive statistics were used to analyze the data.

RESULTS AND DISCUSSION

Causes of Pre-Harvest Losses of Plantain Farmers

Table 1 shows the distribution of causes of pre-harvest losses of plantain farmers. All the plantain farmers were of the view that theft, pest and flood were the major causes of pre-harvest losses of plantain farmers in the study area. The result indicates that 23.9% of the respondents were faced with high theft. This is not out of place with the current economic hardship in the study area recently increasing theft cases of plantain bunches making the enterprise unattractive. This could be controlled with parameter fencing. However, it is capital intensive and most plantain farmers could not afford it. The result is in link with banana losses conducted in Cameroon by Nkwain (2022), farmers insisted that pre-harvest losses pose a higher effect on their social wellbeing most especially food availability and the chief among their rationale was that strong wind, pests and diseases.

The second serious cause was the problem of pests (23.4%). The majority of the plantain farmers in the study area have been cultivating plantains in the same farm for more than 14 years without crop rotation and most farms are old. This could be as the result of accumulation of pests like nematodes and weevils which in turn prey on plantain roots and corms reducing yields causing pre-harvest losses reflecting adversely on output and the net farm income of the farmers. The results agree with the findings of Nkwain *et al*. (2022) who indicated that Western Highlands of Cameroon especially in the banana-coffee intercrop, *Musa* stools stay for 10-15 years and even more while producing suckers and extending the stools by increasing pre-harvest losses in Cameroon. Banana weevils, nematodes and white grubs are reported to feed on banana and plantain roots and corms while distorting the nutrients uptake and causing poor anchorage to the plants as they create tunnels on the corms and destroy the roots. This leads to stunted growth and toppling as the plants become very sensitive to wind. Also the movement of infected plant material is also a contributing factor of the spread of pests. Lorenzen *et al.*

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(2010) opined that the seasonal climatic changes have equally brought about different varieties of insects (e.g. the outbreak of desert locust in East Africa in 2020) which pose adverse effects on plantain profitability. On the other hand, Mealy bugs produce honey dews that, upon fermentation, transform into mold fungus (black soot), while feeding on the leaves, buds, and fruits of bananas and plantains (Okolle *et al.*, 2009). The fruits' green color turns black due to the black soot, which lowers fruit quality and causes the fruits to be rejected by buyers.

Additionally, 20.0% experienced floods. One of the natural limitations on plantain yields in the research region is flooding. This has a negative impact on profitability because it depletes the roots of oxygen, which alters how water and other necessary elements are absorbed. This leads to leaf yellowing and the eventual destruction of the entire farm, leaving little to nothing for the farmers. This outcome is also consistent with the findings of Chabi *et al*. (2018), which observed that some of the external or natural barriers to the production of bananas and plantains in Nigeria, Benin, and Ghana in West Africa are drought, wind, and flood.

The result also shows that 17.1% of plantain farmers in the study area suffer from spread of diseases as pre-harvest causes. The diseases affect different parts of *Musa* plants especially the pseudo-stem, leaves and fruits causing pre-harvest losses. Among these diseases are Banana Bacterial Wilt (BXW), *Fusarium* wilt (panama), black leaf streak (black sigatoka), Banana Bunchy Top Disease (BBTD) and cigar-end rot. Once the plantain is affected with this disease, the leaves turn yellow and collapse and this continues until all the leaves hang around the plant like a skirt and eventually dry-off. In-line with the findings, black sigatoka has been reported to cause significant losses to both plantains in most of the producing countries across Cameroon (Cauthen *et al.* 2013; SHEP PLUS, 2019).

Furthermore, plantain farmers indicated that 17.1% was faced with the problem of logging caused by strong wind. This could lead to the plantains to fold and topple, which would reduce productivity and cause shortages when they are being harvested. The result is in consonance with Rwubatse *et al.* (2018) opined that heavy wind does not only cause *Musa* plants to fold or completely fall-off, it also scatters the leaves of standing plants thus, reducing the rate of photosynthesis and therefore, resulting to poor quality of the fruits produced which result to drop in output.

Table 1: Causes Pre-harvest Losses of Plantain Farmers

Pre-harvest losses	Frequency	Percentage	Rank**
Stem breakage	128	15.6	5th
Theft	196	23.9	1st
Pest	192	23.4	2nd
Flood	164	20.0	3rd
Diseases	140	17.1	4th

Source: *Field survey, 2024*
** Rank in descending order
* Multiple responses recorded

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Strategies Employed by Plantain Farmer to Reduce Pre-Harvest Losses

Total 2 shows the distribution of plantain farmers according to strategies employed in reducing pre-harvest losses in the study area. All the plantain farmers were of the view that planting of permanent crops as blockade, use of flood free zones for cultivation, use of improved varieties of sucker, practice of integrated pest management techniques, better extension services and cultivating dwarfish breeds were the various strategies farmers could employ in reducing pre-harvest losses. The result indicates that 30.0% of the respondents were in the view of employing the use of flood free zones for cultivation and was ranked as 1st. This situation was equally the case of identifying the causes of pre-harvest losses, where floods constituted 20.0% of total and ranked third. The concurrent incidence of flooding for the past one decade due to climate change as the main reason of flooding in the study area, which affects plantain production as the crop, could not withstand such conditions, rendering most planting farmers with great losses. The second strategy plantain farmers could employ in reducing pre-harvest losses were the use of improved varieties of suckers (26.7%). By introducing improved varieties of planting material that adapt to current climatic conditions, pre-harvest losses could be reduced. This result agrees with the findings of Nkwain *et al.* (2022) which indicate that improved varieties with larger pseudo-stems and strong root systems are less sensitive to wind and minimize toppling. These would increase plantain output thereby improving on their net farm income.

Also, 21.3% are in the opinion of employing planting of permanent crops as a blockade in tackling the problem of logging as the result of strong wind. Planting of trees in strategic areas of the farm could serve as a blockade to strong wind for preventing plantain logging. The result also shows that 8.0% of plantain farmers in the study area are of the opinion that adopting the practice of integrated pest management techniques and cultivating dwarfish breeds could be a strategy of preventing pre-harvest losses in the study area. That is, applying multiple techniques to prevent pest attacks on plants. For instance, planting resistant varieties, practicing crop rotation, field sanitation, regular trimming of the leaves, de-suckering and proper spacing of the plants could be a way of preventing pre-harvest losses. Pest plays a significant role (23.4%) in causing pre-harvest losses. Also, the cultivation of dwarf breeds of plantain could reduce direct strong wind due to height and anchorage to prevent plantain logging. The result is in consonance with the findings of Okonya *et al.* (2019) who reported the aggregated effect of pests and diseases on Roots, Tubers and Bananas (RTB) losses on households in Rwanda and Burundi. According to these authors, insufficient food to feed families throughout the year was reported by 80% and 29% of the households in Burundi and Rwanda, respectively. Equally, these authors added that in Burundi, 90% of the households attributed the high prices of these food items to pests and diseases.

Furthermore, the result shows that 6.0% of plantain farmers are of the opinion that adopting better extension services could prevent pre-harvest losses in the study area. However, there are limited government employed specialized extension agents of plantains production in Bayelsa State to better educate and train the farmers on improved practices to improve their yields to increase their net farm income. This means that the chances of a farmer meeting an extension agent or an extension agent visiting a farmer in a month or a year are slim. Farmers therefore, rely on their indigenous strategies, which are equally limited and adulterated information from their colleagues thus leading to poor output as the result of pre-harvest losses. The result is in agreement with the findings of Ayanwale *et al.* (2016) blamed plantain yields in Nigeria to little or no change in cultural practices of the crop in the past 20 years due to inadequate knowledge of production, inefficient extension service system and research.

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Table 2: Distribution of respondents based on strategies employed by plantain farmers to reduce pre-harvest losses

Strategies	Frequency	Percentage	Rank **
- Planting of permanent crops as blockade	128	21.3	3rd
- Use of flood free zones for cultivation	180	30.0	1st
- Use of improved varieties of sucker	160	26.7	2nd
- Practice of integrated pest management	48	8.0	4th
- Better extension services	36	6.0	5th
- Cultivating dwarfish breeds	48	8.0	4th

Source: *Field survey, 2024*
** Rank in descending order
* Multiple responses recorded

CONCLUSION

Analysis of the result revealed that theft, pest and flood were the major causes of pre-harvest losses of plantain farmers in the study area. Furthermore, planting of permanent crops as blockade, use of flood free zones for cultivation, use of improved varieties of sucker, practice of integrated pest management techniques, better extension services and cultivating dwarfish breeds were the various strategies farmers could employ in reducing pre-harvest losses. Thus, it is imperative that farmers receive appropriate orientation and/or fundamental training in important farm management practices, with a focus on their involvement in initiatives aimed at reducing pre-harvest losses in plantain production. They will be more productive as a result of this helping to raise their profitability.

REFERENCES

Ayanwale AB, Fatunbi AO, and Ojo M. (2016). Innovation opportunities in plantain production in Nigeria. Guide Book 1. Forum for Agricultural Research in Africa (FARA), Accra Ghana. Pp. 40.

Bantayehu M, Alemayehu M, Abera M, and Bizuayehu S. (2018). Determinants and extent of pre- and postharvest losses of fruits in North-Western Ethiopia. *International Journal of Sustainable Agricultural Research*. 5(4): 68-75.

Britanica. (2018, July 24). *Plantain*. Retrieved July 24, 2018, from Britanica: http://www.britanica.com/plant/Plantain

Cauthen J, Jones D, Gugerty M. K, and Anderson C. L. (2013). Banana and plantain value chain: West Africa EPAR Brief No. 239. Prepared for the Agricultural Policy Team of the Bill & Melinda Gates Foundation. Pp 25.

Chabi M. C, Dassou A. G, Dossou-Aminon I, Ogouchoro D, Aman B. O, and Dansi A. (2018). Bananaand plantain production systems in Benin: ethnobotanical investigation, varietal diversity, pests, and implications for better production. *Journal of Ethnobiology and Ethnomedicine*. 14(78): 1-18.

Hauser S, and Amougou D. (2010). Plantain (Musa spp.) Cropping systems of Southern Cameroon.ActaHorticulturae. 879: 495-508.

Article DOI: 10.52589/AJAFS-VEIKSJSM
DOI URL: https://doi.org/10.52589/AJAFS-VEIKSJSM

Kainga, P. E. and I. T. Seiyabo (2012). Economics of Plantain in Yenagoa Local Government Area of Bayelsa State. *Journal of Agriculture and Social Research (JASR).*12(1):114-123.

Lorenzen J, Tenkouano A, Bandyopadhyay R, Vroh B, Coyne D, and Tripathi L. (2010). Overview of banana and plantain (Musa spp.) improvement in Africa: Past and future. Actahorticulturae. 879(879): 595- 604.

Nkwain K. T (2022). Assessment of banana losses and the wellbeing of farmers in Boyo Division, Cameroon. Doctoral Thesis, Benue State University, Makurdi, Nigeria.Pp 296.

Nkwain, K. T., E. C. Odiaka, A. A. Ikwuba, L. K. M. Fatty and A. T. Gam (2022). Pre-harvest Losses of *Musa* spp. and Food Security Situation of Households in Sub-Saharan Africa. *Asian Journal of Advanced Research and Reports.* ISSN: 2582-3248. 16(2): 28-40.

Okolle J. N, Fansi G. H, Lombi F. M, Lang P. S, and Loubana P. M (2009). Banana etymological research in Cameroon: How far and what next? *African Journal of Plant Science Biotechnology*. 3(1): 1-19.

Okonya J. S, Ocimati W, Nduwayezu A, Kantungeko D, and Niko N, (2019). Farmer reported pest and disease impacts on root, tuber, and banana crops and livelihoods in Rwanda and Burundi Sustainability. 11(1592): 1-20.

Pierrot J, Achard R, Temple L, Abadie C and Fogain R. (2002). Déterminants de la production de plantain dans le sud-ouest du Cameroun: Intérêt d'un observatoire, Fruits. 57(2): 75-85.

Rwubatse B, Kitinoja L, Mukantwali C, Kabayiza E, Chahine-Tsouvalaki H, Vasanthakaalam H, and Wheeler L. (2018). Postharvest loss assessment of green bananas in Rwanda. Feed the Future. The U.S Government's Global Hunger & Food Security Initiative. Pp 73.

Smallholder Horticulture Empowerment & Promotion Project for Local and Up-Scaling (SHEP PLUS) (2019). (eds). Banana Production. MOALF/SHEP PLUS, Kenya. Pp 31.

Verma M, Plaisier C, Wagenberg CPAV, and Achterbosch T. (2019). A systems approach to food loss and solutions: Understanding practices, causes, and indicators. *Journal of Sustainability*. 11(579):1- 22.

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