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A CRITICAL REVIEW OF POST-HARVEST LOSSES IN NIGERIA AND THIER SOCIOLINGUISTIC IMPLICATIONS FOR FARMERS, MARKETERS, AND THE NATIONAL ECONOMY

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Abstract
Post-harvest losses in Nigeria are frequently associated with inadequate knowledge of proper storage, processing and handling techniques, leading to sociolinguistic consequences. Post-harvest food loss can be reduced to the barest minimum in Nigeria but practical policy and highly dedicated and determined management is obligatory. Reduction in post-harvest loss in Nigeria will ensure enhanced food security which will pilot to the achievement of Sustainable Development Goal (SDG) 2. The study analysed the consequences of post-harvest losses in Nigeria for farmers, marketers and the national economy along with strategies to reduce them. Adopting a qualitative critical approach with an interdisciplinary analytical framework, the study synthesized, interpreted, and critically examined existing literature, reports, policy documents, media discourse, and observational linguistic patterns. Key findings show that losses lead to reduced income, reduced food availability for household consumption and discouragement from engaging in commercial farming for farmers, and consequently affects discourse. Effective copping strategies include building better storage technologies, improving harvesting techniques, utilizing advanced processing technologies and providing farmers training. The paper concludes that reducing these postharvest losses requires a strong public private partnership and collaboration and recommends that government and non-governmental organizations supply modern post-harvest management technologies across the Nigeria's food value chain.

Keywords: sociolinguistic consequences, Post-harvest, National-economy, Marketers, Farmers.

1. Introduction

Food is our common language and everyone should have the right to access enough food at any given time. The recurrent food losses contribute to discourses of frustration, risk and uncertainty often expressed through poverty, limited control via inadequate communication and lack of confidence in institutional support systems. Also, post-harvest losses influence not only agricultural productivity but also the sociolinguistics experiences of stakeholders within Nigeria's food system. It is estimated that among over 1.2 billion hungry and poor people of the world, more than 800 million suffer from chronic under nourishment (Aduba, *et al.,*2013). Food loss tends to reverse the gains made in producing enough food to achieve food security. Postharvest food losses are among the leading causes of food insecurity (FAO, 2006), thus an adequate food system is needed, together with efficient food distribution system from farm to consumer to reduce losses and improve income. According to Food and Agriculture Organization (FAO, 2014), food loss reduction complements effort to enhance food security. Reducing the incidence of

postharvest losses along the marketing chain will contribute to improving food availability among farming households by making more income available, resulting in an increased economic access to food through job creation and income generation.

The conceptual framework of this study is based on the relationship between post-harvest losses and the various factors that contribute to these losses in the supply chain. The framework illustrates the key elements that influence post-harvest losses, including communication barrier, pre-harvest factors, harvest and post-harvest activities, and market-related factors. These elements are interconnected and collectively contribute to the overall extent of post-harvest losses experienced by producers, marketers and national economy (Dos Santos *et al.,* 2020). The conceptual framework highlights the complex nature of post-harvest losses and emphasizes on the impacts of post-harvest losses for farmers, marketers and their interrelationships to national economy development and growth.

The theoretical framework employed in this study is the Systems Approach to post-harvest management. The Systems Approach recognizes that post-harvest losses are influenced by a series of interconnected factors and activities that form a system. This approach emphasizes the need to understand the entire supply chain as a system, considering the interactions between different components and their impact on post-harvest losses (Sharda & Sirohi, 2018). The Systems Approach provides a holistic perspective, considering not only the individual activities and processes within the supply chain but also the impacts and feedback mechanisms between them. It recognizes that addressing post-harvest losses requires a comprehensive and integrated approach, considering both technical and managerial aspects (Gardas, *et al*., 2018).By adopting this approach, our study considers the various impacts of post-harvest losses along the supply chain, from farmers, marketers and examines the interactions between variables to national economy. This approach enables the identification of critical points and consequences within the system (Ajayi, 2023).

To minimize post-harvest losses, it requires a well devised protocol to transform production policies to deliver proper market impact that would foster food accessibility as well as income of all players along all concerned value chains. It would however, make bigger impact if there are proper technologies appropriate to local conditions that enables small-scale farmers employed in agriculture to reap from farming activities (Atanda *et al.*,2011)

2. Justification for the Study

Efficient management of post-harvest losses is crucial for global food security and sustainable agricultural systems (Muhammad and Yakubu, 2023). These losses not only deprive citizens of nutritious food but also lead to increase in prices, making the produce less accessible to a large segment of the population. Moreover, the economic implications are substantial, as the efforts and investments made in production are undermined by the losses incurred during post-harvest handling and processing. Similarly, reducing post-harvest losses is not only imperative for food security and economic sustainability but also for minimizing the environmental impact associated with food waste. By curbing these losses, we can optimize resource use, increase standard of living of farmers and marketers, reduce greenhouse gas emissions, and alleviate the pressure to intensify agricultural production to meet future demands (Al-Amin *et al.,* 2021). It is distressing to note that much is being devoted to crop production, so many resources are spent on irrigation,

fertilizer application and crop protection measures only to be wasted in few days after harvest (Salisu, *et al*., 2021). It is estimated that about 50% of perishable food commodities including fruits, vegetables, roots and tubers and about 30% of food grains including maize, sorghum, millet, rice and cowpeas are lost after harvest. Agricultural losses are one of the greatest problems facing agricultural production in Nigeria and concern everyone from the research scientists to the extension workers in the field to the farmers on the farm to the marketers in the market and to the government policy formulators (Salisu, *et al*., 2021). Food losses take place at production, postharvest and processing stages in the food supply chain. Additionally, post-harvest losses will caused reduction in farm income as well as reduction of farm profit which is a disincentive to production; source farmers (young/inexperienced ones) leave (Oladimeji *et al*., 2019). Consequently, all efforts to reduce post-harvest losses provide an attractive opportunity to improve food security across the globe, particularly in Sub- Saharan Africa, hence the motivation for the paper. Moreover, food losses have a direct and negative impact on a nation's food supply as well as the income of both farmers and consumers, with the most vulnerable bearing much of the brunt. Post-harvest loss reduction offers the potential to ensure more food on the plate of the consumer without increasing resource demand (Lawi, *et al*., 2024). Therefore, there is need to review on the impacts of post-harvest losses on farmers, marketers and national economy growth and development with specific objectives to assess the impacts of post-harvest losses considering farmers, marketers and national economy and copping strategies of post-harvest loss in ensuring food security in Nigeria.

3. Methodology

As a critical review, the study does not generate new experimental data. Hence, it adopts a qualitative critical review approach with an interdisciplinary analytical framework. The study synthesizes, interprets, and critically examines literature, reports, policy documents, media discourse, and sociolinguistic patterns, to expose the sociolinguistic implications of post-harvest losses in Nigeria. The study describes patterns of post-harvest losses in Nigeria; analyzes their social, linguistic, and economic consequences; and interprets how language reflects hardship, negotiation, blame, and market relations among stakeholders. Finally, findings are presented under thematic headings that allow the study to coherently connect agriculture and sociolinguistics.

4. Findings and Discussion

4.1 Post-harvest Food Losses in Nigeria

Attention given to the concept of post-harvest food loss reduction as a significant means to increase food availability was drawn, for the first time, by the World Food Conference held in Rome in 1974 after the food crisis of that time. The 7th Special Session of the U.N. General Assembly in 1975 resolved to reduce PHL by 50 per cent by 1985 and declared that it should be undertaken as a matter of priority in developing countries (FAO, 1981). This was followed by ample development investment on post-harvest loss reduction for staple foods (World Bank, 2011).

Postharvest loss can be defined as the degradation in both quantity and quality of a food production from harvest to consumption. The degradation of food production from harvest to consumption in terms of both quantity and quality is known as post-harvest loss. The post-harvest covers the period that runs from exit from the field to the time of culinary preparation. Post-harvest loss exists throughout the supply chain, from

initial agricultural production down to final household consumption. Losses of food from farm to table through storage, transport, processing, and retail and in consumption are huge (Workineh and Enyew, 2021). Post-harvest system encompasses from crop harvesting to crop consumption with minimum loss and maximum efficiency and return for all involved. Postharvest losses emanate from poor pre-harvest and postharvest management including bad handling of produce during transit and storage leading to partial or total loss in produce quality. Around one-third (1.3 billion tonnes) of food produced for human consumption is wasted/lost globally each year (Ridolfi *et al*., 2018).

Bolarin and Bosa (2015) reported that physiological deterioration, mechanical injuries, diseases, and pests are the principal causes of loss after harvest. According to Totobesola *et al*. (2022) discovered that gender inequalities resulting in unequal access of women to key productive resources and opportunities contribute significantly to food loss in Sub-Saharan Africa. Barrett (2015) posited that post-harvest loss is the inevitable by-product of changing diets and food consumption patterns, elongating food supply chains, falling real food prices, and rising incomes.

Furthermore, the causes of food losses in developing countries may not be unconnected with a lack of knowledge about effective post-harvest management, lack of extension services to build skills in handling and storage, ineffective drying procedures, insufficient post-harvest handling facilities, and/or non-adoption of post-harvest technologies, and poor market access (Lawi, et al., 2024).

4.2 Impacts of Postharvest Food Losses on the farmers

4.2.1 Reduced Food Availability and accessibility for Household Consumption

Post-Harvest losses affects household food consumption and demand patterns (Oladimeji *et al*., 2019). According to Kebede (2024) reducing post-harvest losses will thereby increasing the amount of food available for consumption by farmers and poor rural and urban consumers. The benefits to consumers from reducing losses include availability of food for household use, lower prices and improved food security. As a result, reducing post-harvest loss clearly complements other efforts to enhance food security through improved farm-level productivity. Also, Victor (2014) reported that postharvest technologies can contribute to food security in multiple ways. Moreover, GFSI (2014) revealed that food loss has positive relationship with overall food security. Lower levels of food loss were correlated (correlation = -0.59) with a higher overall score given the negative impact of food loss on food availability. Therefore, food availability and accessibility can be improved by reducing food losses. Post-harvest loss implies the decrease in the quantity or quality of products which was originally intended for human consumption (FAO, 2013).

4.2.2 Income Loss: Reduction in volume of saleable produce

According to Atanda *et al*. (2011), post-harvest losses have several adverse impacts on farmer income, consumer prices and nutritional quality of the produce. Addressing the postharvest loss problem can improve the incomes of poor farmers while making more food available for poor people thereby improving nutritional outcomes (Brander, 2021). Postharvest losses reduce the availability of food crops and income that could be gained by selling these products, thus in terms of quantity is linked to food security (World Bank, 2010). A significant portion of harvested crops lost due to poor post-harvest handling directly

translates to reduced income for farmers, limiting their ability to reinvest in their operations and potentially pushing them into poverty. Post-harvest losses will caused reduction in farm income as well as reduction of farm profit which is a disincentive to production; source farmers (young/inexperienced ones) leave (Oladimeji *et al*., 2019). Reduction in these losses would increase the amount of food available for human consumption and enhance global food security by increasing the real income for all the consumers and producers alike (Musa, 2020).

4.2.3 Discouragement from Commercial Farming

Consistent post-harvest losses can discourage farmers from investing in increased production, as they may perceive it as a futile effort due to potential losses. A postharvest loss in general term for all the wastage of resources that goes into the production and harvesting of farm produce. These include the land, labor, energy, water, fertilizer and so forth (James and Zikankuba, 2017).

4.2.4 Poor of Investment and Productivity

Oladimeji *et al*. (2019) stated that post-harvest losses are making Nigeria farmers poorer. For a very long time, Nigerian farmers have lamented this situation without getting meaningful assistance. In Nigeria, despite producing adequate quantities, they become inadequate on account of losses in the field as well as in storage. This situation has compelled farmers in the rural setting to sell their produce at give-away prices on several occasions because there are no facilities where they could be stored Mohammad and Usman, 2023). This situation has over the years affected the rural farmers as many often time find it difficult to meet their family needs and to reinvest in production.

4.2.5 Waste of Inputs and Labour

Poor post-harvest management leads to wasted resources, including labor, land, and water, which can hamper overall economic efficiency in the agricultural sector. Though, proper post-harvest management strategies can enable farmers to store high quality produce which can fetch high prices in the global market (Kebede, 2024). It is also observed that it is stressful to note that much is being devoted to planting crop, so many resources are used up on irrigation, fertilizer application and crop protection measures only to be wasted in few days after harvest. Reducing post-harvest losses may efficiently and sustainably increase the volume and quality of available food. According to Kebede (2024) who reported that due to poor post-harvest management strategies in the sub-Saharan region, there has been a repeated cycle of food production and post-harvest losses which have thoroughly depleted the mineral quality of the farms leaving substantial food insecurity in the region.

4.3 Impacts of Post-harvest Food Losses on Marketers

4.3.1 Reduced Profit Margins

Downgrade in quality leads to loss of consumer appeal and is frequently described by comparison with locally accepted standards for premium quality such as appearance, taste, texture and nutritional value. Losses in quality are evidenced by a decrease in the market value of the product (Ladaniya, 2008). A Study by Yahaya and Mardiyya, (2019) showed that consumers always prefer fresh, properly matured, insect and disease free produce of attractive appearance. Also, according to Kebede (2024) who reported that postharvest handling is the final stage in the process of producing high quality fresh produce. Consumers

strongly reject decayed crops, foreign materials on products or inside packages, such as dirt, animal feces, grease or lubricating oil, human hairs, insects and plant debris thereby reducing the profit from the produce.

4.3.2 Unpredictable Supply and Quality

Quantitative food loss can be defined as reduction in weight of edible commodity available for human consumption. Quantitative post-harvest loss or physical loss as measured by decreased weight or volume which can negatively affect the supply chain (Workineh and Enyew, 2021). The quantitative loss is come due to factors such as spillage, consumption by pest and also due to physical changes in temperature, moisture content and chemical changes thereby affecting the supply (FAO, 1980). Poor post-harvest handling can lead to both weight and quality losses (Sarwar, 2020)). Reducing the postharvest losses especially in developing countries, could be a sustainable solution to the problem of food availability, elimination of hunger and improving livelihoods and in general providing food security (Bukar *et al*., 2022). Forward supply agreements not only drive consistent supply for off-takers but also help Smallholder farmers' to secure consistent incomes (Yahaya, *et al*., 2015). Reduction of quantitative losses is a higher priority than qualitative losses in developing countries like Nigeria. Loss of quantity is more common in developing countries while loss of quality is more common in developed countries (Lawi, *et al*., 2024).

4.3.3 Increased Handling Costs and Price

Higher postharvest losses not only reduce the availability of fresh produce but also result in increase in per unit prices of the produce due to increase in handling cost and thus limit the accessibility by the majority of community segments (Workineh & Enyew, 2021). Post-harvest loss implies the decrease in the quantity or quality of products which was originally intended for human consumption (FAO, 2013). Gradually the quality fresh produce deteriorates and the produce fetches lesser prices in the market and to commensurate the cost, the price of the produce have to increase (Workineh & Enyew, 2021). It directly consequences poor producers through foregone income and impacts poor consumers by reduced food availability, increased prices and decreased nutritional content (Musa, 2020). Reduced losses increase supplies and lower prices along the agricultural produce supply chain and vice versa (Sarwar, 2020). Also according to the benefits to consumers from reducing losses include lower prices and improved food security and vice versa (Victor, 2014).

4.3.4 Discourages Investment in Perishables and Nutritional Loss

Post-harvest losses have the potential to discourage marketers and farmers from venturing into commercial production and marketing of fresh produce and thus affecting the availability and consumption of fresh produce in mostly urban areas (Miller *et al*., 2017). Qualitative losses such as loss in edibility, nutritional quality, caloric value, wholesomeness and consumer acceptability (unwanted changes to taste, color, texture or cosmetic features of food) of the fresh commodity and much more difficult to assess and measure (Buyukbay *et al.,* 2010; Buzby and Hyman, 2012). The qualitative losses are related directly to nutritional and they are more complicated to measure (Humble and Reneby, 2014). Qualitative deterioration makes food unfit for human consumption and is rejected, this contributes to post harvest food loss (Aulakh *et al*, 2013). In most cases, the quality deterioration goes along with a significant loss of nutritional value, which might affect the health and nutrition status of the whole community (FAO, 2014).Reducing

postharvest losses helps to improve the quantity and quality of relatively nutritious crops sold, while reducing toxins that reach the market from spoiled and infested crops (Musa, 2020).

4.4 Implications of Post-harvest Food Losses on the Economy and Development

4.4.1 Strain on National Food Security Policies

High post-harvest losses can contribute to food insecurity by reducing the overall food supply, especially during lean seasons. According to (Oladimeji *et al*., 2019), post-harvest losses will bring about shortage of food and raw materials in the Nigeria. To achieve self-sufficiency in food, there is an urgent need to match all efforts at increasing crop production with equal if not greater efforts of post-harvest technology to save the crops that are produced from deterioration and wastages (Kughur*, et al., 2015).* Post-harvest loss is a global problem but it is more critical in developing countries. The food and agriculture organization of the United Nations (FAO) estimated that one-third of food produced for human consumption is wasted globally, which is equivalent to about 1.3 billion tons per year. This loss leads to significant losses of resource used for food production (FAO, 2011).

4.4.2 Loss of Agricultural GDP Contribution

Nigeria is a country that is rich in the supply of agricultural products but post-harvest losses continue to reduce its impact on the socioeconomic life of the rural farmers and to some extent Nigerians thereby creating food insecurity as being witness presently (Mohammed and Usman, 2023). The potential boost in the availability of produce due to post harvest loss reduction will have an appreciable impact on national GDP and the economy through a rise in exports as an increase in the volume of exports will result in a direct increase in export revenue generated. This additional financial inflow is valuable to the Nigerian government in its attempts to improve its balance of trade. Reduced food wastage will also improve Nigeria's trade deficit (PA-NPSP, 2022).

4.4.3 Reduced Export Potential and increased importation

Significant post-harvest losses can limit the quantity and quality of agricultural products available for export, impacting a country's ability to generate foreign exchange. Post-harvest losses leads to reduction in Nigeria export commodities and result in high importation of foreign food as locally produced foods are not available during off-seasons due to lack of storage facilities to prevent the perishability of the local foods during their seasons (Oladimeji *et a*l., 2019). They also reported that Nigeria records over 40% post-harvest losses, which has led to an unprecedented hike in food importation in the country. Also, this shift could lead to increased reliance on imports, potentially destabilizing local markets and undermining food sovereignty (Ifeanyi, 2024). Therefore, solutions aimed at preserving the freshness of produce are all the more crucial since the reduction in food loss directly results in an increase in the amount of food available, thereby reducing the overreliance on imports as well as the level of undernourishment in the country (World Bank, 2020).

4.4.4 Causes sub-standard agricultural products

It is obvious that the low quality of the agro-products is due to poor postharvest facilities, technologies and processing practices. Ethylene (C2H4) is the commonest organic compound identified to influence the physiological processes in crops. Ethylene is naturally formed by all crop tissue, triggers quite a lot of

effects at very low concentrations (ppm or less) and regulates many aspects of development and senescence (Workineh and Enyew, 2021). Existence of ethylene results in premature ripening of certain crops. Abnormal physiological deterioration occurs when fresh produce is subjected to extremes of temperature, of atmospheric modification or contamination. This may cause unpalatable flavours, failure to ripen or other changes in the living processes of the produce, making it unfit for use (Atanda *et al*., 2011). According to Oladimeji *et al*. (2019) reported that post-harvest losses heightening the taste for foreign food (e.g. foreign rice, fruit juice). However, due to poor post-harvest management strategies in the sub-Saharan region, there has been a repeated cycle of food production and post-harvest losses which have systematically depleted the mineral quality of the farms leaving substantial food insecurity in the region (Kebede, 2024).

4.4.5 Higher Food Prices

When a large portion of agricultural produce is lost to post-harvest loss, the available supply in the market shrinks, leading to higher prices for consumers, especially impacting vulnerable populations. As local producers struggle with rising costs, they may be forced to either absorb losses or pass on the increased costs to consumers, leading to higher food prices and further strain on household budgets. As food prices escalate, households experience increased expenditure on essential items, diminishing their disposable income for other goods and services (Boulanger and Goh, 2023).

4.4.6 Environmental Impacts

The solid wastes originating from postharvest of crop in Nigeria, can create drainage problems and cause flooding, as well as invite stray animals near garbage dumps. These bio-wastes also deteriorate very swiftly causing unhygienic conditions, increasing atmospheric pollution and provide a proliferation ground for pests (Atanda *et al*., 2011). Spoiled produce that is discarded can contribute to environmental issues like methane emissions from landfills. Similarly, reducing post-harvest losses can have momentous impact on relieving pressure on the environment by reducing the volume of food wastages as well as land and water pollution (FAO, 2013). Reducing post-harvest losses is not only critical for food security and economic sustainability but also for minimizing the environmental impact linked with food waste. By curbing these losses, we can optimize resource use, reduce greenhouse gas emissions, and alleviate the pressure to intensify agricultural production to meet future demands (Al-Amin *et al.,* 2021). Decreasing food losses offers an opportunity to reduce the pressure on the land and still deliver the same quantity of food to the table, thus reducing to some extent environmental damage caused by agricultural practices.

4.4.7 Wastage of National Resources

The food and agriculture organization of the United Nations (FAO, 2011) estimated that one-third of food produced for human consumption is wasted globally, which is equivalent to about 1.3 billion tons per year. This loss leads to significant losses of resource used for food production. Post-harvest losses cause not only the loss of the economic value of the food produced but also the waste of scarce resources such as labour, land, and water, as well as non-renewable resources such as fertilizer and energy, all of which are used to produce, process, handle, and transport food (FAO, 2011). A postharvest loss in universal term for all the wastage of resources that goes into the production and harvesting of farm produce such as the land, labor, energy, water, fertilizer and so forth (James and Zikankuba, 2017). According to victor (2014) postharvest activities such as processing and marketing can create employment (and thus income) and better food

security in the agricultural sector. Hence, reducing post-harvest loss clearly complements other efforts to enhance food security through improved farm-level productivity. Also, adding value to existing agricultural and food value chains has a strong potential to create jobs and income opportunities, and thus counteract poverty and hunger in rural areas (Kebede, 2024).

4.5 Coping Strategies for Reducing Post-harvest Losses

4.5.1 Building improved storage facilities

The lack of proper storage facilities in developing countries is seen as the main cause of post-harvest losses. Inadequate storage facilities at the producing or marketing centers, exposes the produce to the natural causes of losses that is damage by micro-organisms, respiration, transpiration and other biochemical reactions ((Workineh & Enyew, 2021). Poor warehouse and storage facilities that expose agricultural produce to high humidity, poor ventilation, microbial and pathogenic attacks often result in great post-harvest losses (SATNET, 2014). Implementing proper storage technologies like cold rooms and warehouses can significantly extend the shelf life of perishable produce. Heat is one of the primary causes of spoilage when there is a lack of cold chain equipment and infrastructure. Supporting farmers and traders in acquiring cooling equipment can substantially reduce losses of fresh produce (Yahaya & Mardiyya, 2019).

4.5.2 Better harvesting practices

Proper harvesting techniques, including timely harvest and careful handling, can minimize damage to crops. Poor farmers sometimes harvest crops too early due to food deficiency or the desperate need for cash. In this way, the food incurs a loss in nutritional and economic value, and may get wasted if it is not suitable for consumption. Quality cannot be improved after harvest, only maintained; therefore, it is important to harvest at the appropriate time. Provision of the proper tools and equipment for harvesting and training workers in their correct use should be a priority prevention of food loss activity. If harvesting operations are correctly undertaken there is greater scope for later introduction of improved methods (Yahaya and Mardiyya, 2019).

4.5.3 Chemical Treatment

Apart from fungicides there are a number of chemicals which increase the storage life of fruits and vegetables by delaying the process of ripening and senescence. Post-harvest treatment with gibberellic acid noticeably delayed the ripening of fruits (Elias, *et al*., 2010). Potassium per magnate is used as an ethylene absorbent to maintain the ethylene below the threshold level. The maleic hydrazide has been found to be very effective on the on the ripening process of different fruits (FAO, 2011). The application of post-harvest plant hormones has been found to extend the shelf life of vegetables. While the effect of cytokinin is conspicuous, especially in leafy vegetables, but post-harvest application of gibberelins slowdown the tomato ripening. Also sprays of Maleic Hydrazide (MH) before harvest reduce sprouting of onion and potato in storage (Elias, *et al*., 20210).

4.5.4 Waxing and Advanced Processing Technologies

Promoting the embracing of suitable loss-reducing technologies to enhance crop handling, storage, and processing should be encouraged in minimizing postharvest losses (Rockefeller Foundation, 2015). Causes of post-harvest loss include limited availability of suitable varieties for processing, lack of appropriate

processing technologies, inadequate commercialization of new technologies and lack of basic infrastructure, inadequate facilities and infrastructure, and insufficient promotion of processed products (Vicor, 2020). Also, the main importance of wax coating is to reduce evaporation and respiration (Alao, 2000). Also, in a situation of refrigerated storage facilities are not accessible or are inadequate, shielding skin coating with wax is one of the ways use for extending the shelf life of fresh produce (Elias, *et al*., 2010).

4.5.5 Training and education for the farmers

High postharvest losses can be as a result of ignorance in scientific and technological techniques associated with the conservation of food products (Workineh & Enyew, 2021). They reported the need to assemble farmers and train them in postharvest management, adoption of post-harvest technologies and how to standardize their crops to meet buyer quantity and quality requirements can reduce drastically postharvest losses of crops (Musa, 2020). Similarly, the researcher noted that information is fundamental for farmers, middlemen, buyers and other stakeholders in the market value chain. Provision of such information can facilitate market operations; improve efficiency on sales and price stabilization operations and smallholders' returns and in turn reduced postharvest loss. Providing farmers with knowledge about post-harvest handling techniques and best practices can significantly reduce losses. Due to the lack of knowledge on commodity compatibility, farmers often times transport ethylene sensitive commodities together with ethylene generators (Atanda *et al.,* 2011).

4.5.6 Linking farmers to market and strengthening value chains

It is a known fact that lack of access to market for their produce is one of the reasons for high post-harvest losses by smallholder farmers in Nigeria. By making this supply-demand link, the various actors in the value chain each plays a part in this integrated system (Musa, 2020). By reducing the need for storage, the combination of on-farm processing and selling to anchor buyers has the potential to reduce crop losses by as much as 80% (Monitor, 2015). Therefore, effort should be made to avoid glutting and the loss should be reduced to the highest minimum (Yahaya, *et a*l., 2015). Linking producers to marketers' means they have a steady stream of buyers while reducing food loss.

4.5.7 Accessing finance

Income is very important as it affects basically the level of capital investment of farmers or marketers. The income got from farm to off-farm sources would determine whether the farmer or marketer is financially able of reducing postharvest losses through investment on better packaging materials or storage facilities (Workineh & Enyew, 2021). Participating financial institutions can make available loans to finance farmers or marketers' acquisition of post-harvest technologies, using anchor buyers' sourcing commitments as collateral will go long ways in reducing postharvest losses (Rockefeller Foundation, 2015). With better access to fund, small-scale farmers, marketers and cooperatives can invest in post-harvest facilities and technologies, like a packing house helping them to reduce post-harvest losses.

4.5.8 Strengthening transport

Greater losses in developing countries like Nigeria is due to non-availability of proper transportation facilities and improper handling methods, resulting in greater levels of injuries or wounds during harvesting

and transit (Workineh & Enyew, 2021). Inappropriate means of transporting agricultural produce such as human labour, donkeys, public transports (Arah *et al.,* 2016) leads to both primary and secondary post-harvest losses. Transportation delay is reported as causing 20% of post-harvest losses in Africa (Babatola, 2008). Poor transportation procedures, practices and means contribute to post-harvest losses. Therefore, government in Nigeria should make available adequate infrastructure in form of good roads, railways and power supply in order to ease transportation and accessibility of cold chain stores for effective and preservation of perishable crops in order to reduce postharvest loses (Musa, 2020). In Nigeria, the transportation of perishable commodities is in the most precarious stage. Therefore, good and efficient transport system can go a long way, not only in reducing the post-harvest loss of fresh produce but also will assist in stabilizing the price fluctuations of various commodities available in different markets of the country (Yahaya and Mardiyya, 2019).

4.5.9 Developing Policies

Long-term political obligation to reducing food losses can be achieved by integrating policies aim into national agricultural strategies. This may necessitate governments providing technical expertise through friendly policies gearing toward reducing postharvest losses (Workineh & Enyew, 2021). However, the above can hardly succeed if farmers and other stakeholders are not aware of it. For example, most of the smallholder farmers in Nigeria are not aware about the existence of Nigeria Stored Products Research Institute (NSPRI), let alone the various equipments it developed for post-harvest management of agric produce. The research activities of NSPRI involve the design, construction and evaluation of various structures, systems and equipment used in post-harvest technology in order to reduce post-harvest losses (Musa, 2020; Arc Nigeria, 2016). Some of the technologies of NSPRI include, Ventilated Yam Barn, Diffuse Light Store (DLS), Inert Atmosphere Silos, Evaporative Coolers, Fish Smoking kilns, Parabolic Sharp Solar Dryer.

5. Sociolinguistic Implications of Post-harvest Losses for Farmers, Markers, and the National Economy

Post-harvest losses in Nigeria goes beyond economic and agricultural concerns. It has significant sociolinguistic implications for farmers, marketers, and for the national economy. Language is critical in agricultural production, transportation, marketing, preservation, and policy dissemination. For example, inability to effectively propagate agricultural innovations, market information, storage techniques, and government interventions contributes to recurring post-harvest losses and their accompanying social consequences. On the part of farmers, persistent post-harvest losses can influence language attitudes and patterns of communication within farming communities. Farmers experiencing repeated economic setbacks may develop distrust toward official agricultural discourse, government campaigns, and institutional communication. This may weaken participation in cooperative societies, agricultural workshops, and extension programs, thereby limiting knowledge sharing and community interaction.

Post-harvest losses also affect the communicative reputation of marketers. Spoiled or poor-quality produce may reduce consumer trust, weaken customer relationships, and negatively affect verbal branding practices common in local markets. In many Nigerian markets, reputation is sustained through interpersonal communication, oral recommendations, and social networks. Frequent losses can therefore damage the social identity and credibility of marketers within trading communities.

In addition, food scarcity resulting from post-harvest losses can influence public discourse, media narratives, and social interactions surrounding food security and economic hardship. Increased food prices may intensify tensions among social groups, encourage blame narratives, and shape public perceptions of government effectiveness. Such discourses contribute to broader sociolinguistic patterns in which language becomes a tool for expressing frustration, resistance, or social exclusion. Also, the decline in agricultural productivity caused by post-harvest losses may encourage rural-urban migration, especially among youths seeking alternative livelihoods. This migration often leads to language shift, reduced use of indigenous languages, and gradual erosion of local agricultural vocabularies and cultural expressions tied to farming practices. Consequently, post-harvest losses do not only threatens food security but indirectly contributes to the weakening of linguistic and cultural heritage in rural communities.

6. Conclusion and Recommendations

Accomplishing the food demand of an increasing population is a major global concern. Most of the effects of post-harvest losses on farmers include reduction in food availability and loss in investment and production. Also, post-harvest losses to the marketers result in reduced profit margin, increased handling cost, unpredictable supply and quality, and discouragement from high investment. While the effects of post-harvest losses on national economy and development include loss of agricultural contribution to GDP, reduced export potential, strain on national food security and wastage of national resources. Reducing the post-harvest losses especially in developing countries like Nigeria, is a sustainable solution to the problem of food availability, elimination of hunger and improving livelihoods and in general providing food security. It can also increase the real income of both consumers and producers as well as more judicious use of scarce resources.

In addition, the sociolinguistic consequences of post-harvest losses in Nigeria reveal that agricultural challenges are deeply connected to communication practices, language accessibility, and social interaction. Farmers experience barriers in accessing agricultural knowledge, marketers face communicative disadvantages in multilingual markets, and the national economy suffers from ineffective policy dissemination and social inequality. Addressing post-harvest losses, therefore, requires both technological and economic solutions as well as inclusive language policies, culturally sensitive communication strategies, and improved dissemination of agricultural information in indigenous languages.

Therefore, the paper recommends that appropriate communicative strategies should be employed to increase awareness among farmers, extension officers, non-governmental organizations (NGOs) working with farmers, technology developers, and other stakeholders about the extent of post-harvest losses and what these losses imply in terms of lost revenue and food security. Also, investment in development of affordable modern storage technologies and promotion of usage of these technologies should be emphasized.

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