Advanced Food Science, Technology, and Nutrition Journal
ISSN 3065-0968
Volume 13 Issue 3
July-September 2025
Impact Factor: 7.88
Enquiry: contact@continentalpub.online
Published by Continental Publication | https://cspjournals.org/index.php/Science-Technology-Nutrition

FOOD INSECURITY AND SAFETY IN URBAN NIGERIA: THE ROLE OF FUNCTIONAL MARKET INFRASTRUCTURE

Tamunotonye Samuel Briggs
School of Agriculture, Food and Environment, Royal Agricultural University, Stroud Road Cirencester, Gloucestershire, GL7 6JS, UK

Abstract:
Food safety and food insecurity are key issues in developing economies; and an important concern is the poor infrastructural state of urban food markets. This critical review identifies key factors associated with market infrastructure that influence food insecurity, food safety and food quality in Nigeria. Generally, the food marketing situation in local markets is characterised by overcrowding, poor infrastructure, space deprivation, obstruction, litter including food waste, absence of, or poor standards of produce and product labelling, poor market infrastructure and p oor market governance. Findings from this research suggest that adherence to standards and environmental regulation by relevant authorities, while ensuring the need for continuous education of market users on food hygiene and food safety aspects, will support a reduction in urban food insecurity, reduce food waste and improve food safety and food quality. The originality of this study rests on the identification of those key elements or factors that are limiting the efficacy of many urban markets in Nigeria which can have serious implications for public health and environmental degradation if not adequately addressed.

Keywords: *Food Insecurity; Food Safety; Market Choice; Market Infrastructure; Waste people*

Introduction

It is therefore not surprising that with the continuous increase in the country's population, Nigeria is under serious challenge with food access and food availability, as a result of low employment rates, low household and individual income levels, poor food production levels and farmers' inability to store food on-farm and along the supply chain leading to increased food loss and food waste.[70]

Poverty as a socio-economic outcome, reflects a state of powerlessness, insecurity and the exclusion of individuals, households and communities from experiencing the best quality of life.[80] In 2020, the World Bank reported that 40% of the Nigerian population lived below the country's poverty line of ₦137,430 naira income ($381.75) per person per annum, or just over $1 per person per day. Factors contributing to the prevalence of poverty in Nigeria include lack of education, low household income, unemployment, unstable government policies, corruption, and political changes. [6-3-25] The effects of poverty are real, widespread and severe with a clear lack of food, clothing, security, education, basic living amenities and national infrastructure.[35] Poverty therefore is multidimensional, involving a lack of opportunity, security, access to infrastructure

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379
and empowerment,[74] resulting in a denial of choices and opportunities that may compromise livelihoods.[80] Although, poverty is subject to a multiplier effect on citizens of a given country from factors such as starvation, low income, insecurity, civil unrest etc., globally efforts to tackle poverty have continued to intensify through several regional and global policy interventions including the delivery of the Sustainable Development Goals (SDGs). The SDGs are a collection of 17 SDG goals (and targets within each SDG) that have been developed to deliver a better and more sustainable future for all. They are broad-based, target driven, and interdependent, and emerged from the 2015 United Nations General Assembly with the aim of being achieved by 2030.[59] This review study interfaces with a number of SDGs (namely 1-No Poverty, 2-Zero Hunger, 3-Good Health and Well-Being, 6-Clean Water and Sanitation, 7-Affordable and Clean Energy, 8-Decent Work and Economic Growth and 9-Industry, Innovation and Infrastructure) developed to provide measurable targets to improve the living standards of people all over the World.[19-28]

The ineffectiveness of poverty alleviation policies and programmes has been linked to the high level of inequality in income distribution, corruption, poor leadership, political instability, poor skillsets and low literacy rates, with corruption having the greatest mediating effect.[35] Low literacy and skills levels suggest that there should be an increase in budgetary allocation for education, and the restructuring of the Nigerian political system which would ensure the stability of government and policies that will address the needs – economic; infrastructural etc., of the country's citizens. Studies have found that poverty was characterised by the international poverty margin of $1.90 per person per day (higher than the absolute value in Nigeria), focusing on rural poverty and poor access to infrastructure (water, electricity, housing, transportation etc.,), the deprivation of health care services and poor economic opportunities in rural areas.[57] In contrast, in urban areas,[5] conclude that poverty is characterised by child mortality and malnutrition. However, the factors of influence in urban and rural areas varied by geographic location i.e., poverty is situated in the geopolitical and socio-economic environment of a given community. Whilst various studies have tried to explain the root cause(s) of poverty in Nigeria and other parts of the world, poverty alleviation requires good governance, good education, employment opportunities and adequate renumeration for work done (income), good infrastructure in rural and urban locations and consideration of the impact of family size.[58]

It is important to understand how these socioeconomic elements interact and shape societal development, amidst the interventions that can occur to improve livelihoods at the personal, household, regional and national scale. Whilst poverty alleviation is the primary aim of almost all sectors in Nigeria, in this study the interaction of poverty and accessibility to affordable safe/wholesome food in food markets is of particular interest. The marketing of food involves satisfying human need(s) by linking people to food at a specific time, place and in a particular product form.[10] The location of food market(s) in addition to the price of the food items on offer are important marketing components that influence availability and accessibility of food.[8] Food prices can serve as a measure of food availability, at the same time influencing consumers ability to access food, depending on household budgets; food price in most cases determine which type of market consumers visit.[8] However, the effect of natural events on food supply (flood, pests, diseases etc.), the general price volatility of agricultural commodities in the Nigerian market, the variance in income and bargaining power of food consumers, and the price food sellers are willing to sell for, all influence food availability and accessibility on a wider community level.[2-81]

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379
This critical review aims to identifies key factors associated with market infrastructure that influence food insecurity, food safety and food quality in Nigeria. The review will characterise the food marketing situation in urban local markets and the infrastructural factors that influence food hygiene and food safety standards in food retail situations. The findings of this review study is hoped to inform empirical research on the role of market infrastructure in influencing food access and availability for urban populations in Nigeria.

2. Food safety and food fraud

In urban areas, the ability to produce food is limited, and as urbanisation of human populations gains pace, the larger retail markets for food commodities are located in these urban areas rather than rural locations.[70] The World Urbanisation Prospect Report, states that by 2050, over 70% of the world's population will reside in urban areas, suggesting a rise in migration and population levels which will see rural food production in its current form being abandoned.[82] This means that urban locations will see their food supply disconnected from the local rural areas in terms of what is purchased and consumed. The implication of this trend is that urban residents in developing economies, will continuously depend on their limited incomes to assure their access to food, if it is available, given the competition for the limited work opportunities and the available urban infrastructure that supports food supply, purchase, storage and consumption.[30] Low-income households in Nigeria spend up to 60% of their income on household food purchases alone, making them vulnerable to sudden changes in price.[7] Long-term food insecure situations occur when people can no longer afford their food requirement over a sustained period of time, and when this is the case, inadequate food purchasing choices can then be made e.g., purchasing low cost, low nutrient and unwholesome but filling food, which families can afford, but raising serious food safety and family health concerns,[38] especially if these behaviours continue for an extended period. Food safety is therefore a key element of food security, as safe and nutritious food must be sufficient to meet food preference and dietary needs for an active and healthy life.[32-71-13] Food safety challenges can lead to ill health or death (worst case scenario). Food safety is a complex concept influenced by geographical location, environment and culture.[21] According to the WHO,[87] over 600 million people (1 in 13 people) around the world become ill after eating contaminated food, and about 33 million people go on to die every year from food contamination. Economic costs related to foodborne disease in Nigeria are estimated to be in the region of US$ 3.6 billion per year.[27] In Nigeria, food poisoning accounts for the deaths of more than 200,000 people annually, resulting from inadequate farming practise, food processing/preparation, storage/preservation and other services.[52-27] As an example of the challenges faced in urban food markets, in Gauteng, South Africa, Adigun et al.'s [4] study revealed non-staphylococcus aureus staphylococci (NSAS) in chicken carcasses and staphylococcus aureus in samples of carcass drip of chickens sold at informal markets. A proportion of the water used to rinse chicken carcasses contained coliforms (62%) and bacteria (85%). In Lesotho, Letuka, Nkhebenyane and Thekisoe [50] found that over 90% of food consumers will buy street food even though street food vendors in the study were found to operate their business under unhygienic conditions where clean water and facilities for hand washing was scarce. In most cases, the underlying drivers of food safety include (a) changes in consumers' food consumption habits and food preference, (b) consumers' income threshold and how it affects the choices they can make, (c) provision of food in an environment that can lead to food

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379

contamination, (d) a change in food production, processing and supply leading to food adulteration, and (e) the prevalence of bacteria and toxins in food (Jenfa and Adebisi 2020).[38]

Several studies have further explored food safety in the Nigerian context, noting the key factors that could influence food safety outcomes. Kwol et al., [42] considered food safety knowledge as well as hygienic sanitary control. Data was collected from food handlers in hotels, hospitals and restaurants around the Jos metropolis in Nigeria. The study found that food handlers applied food safety measures and legislation to the best of their knowledge but the study recommended constant training of food handlers to improve standards. With regards to the effect of micro-organisms and food sold locally in Nigeria, Oku et al.,[62] assessed the microbiological safety of ready to eat fruits sold in the Yenagoa metropolis of Bayelsa State, Nigeria. Seventeen samples were collected (pawpaw (5); watermelon (6); Pineapple (6)) from three different local markets (Opolo, Tombia and Swali). The bacterial contamination ranged from $1.3x10^5$ to $2.4x10^6$ cfu/ml (pineapple); $1.9x10^5$ to $8.1x10^6$ cfu.ml (watermelon) and $3.7x10^6$ to $7.6x10^6$ cfu/ml (pawpaw) with the highest bacterial count observed in watermelon from Opolo market, and the highest fungi count obtained in pawpaw retailed at the same market. Among the fruits sampled from the three (3) markets, there was a 58.8% occurrence of *Escherichia coli* and *Staphylococcus* spp. *Klebsiella* spp and *Bacillus* spp showed a 47.1% occurrence, closely followed by *Staphylococcus aureus* (41.2%). The study suggests that ready to eat fruit may be responsible for the prevalence of *Staphylococcus* spp and *Escherichia coli* in the Yenagoa metropolis. The lack of storage facilities and poor market hygiene operated by food marketers in Nigeria may also contribute to this food safety concern. Other studies have found high levels of bacteria and fungi in street vended food in Nigeria.[37]

Chukwukere, Amah and Jabil [17] considered the potential causes of aflatoxin contamination of legumes and cereal grains produced by rural farmers in Jos, Nigeria. They showed the causes of aflatoxin contamination were the poor drying of seed products (73.8%), high humidity (67.2%), field contamination (63.1%), and poor timing of harvesting (60.1%). The study further identified mitigating strategies against aflatoxin contamination as follows; removal of the infected or infested seeds, the use of verified/or certified seeds, government and non-governmental organisations at all levels promoting greater awareness of aflatoxin contamination, and further enlightening consumers as to the health dangers associated with aflatoxin contamination on food produce. In subsistence farming communities in rural areas, food is produced, processed and consumed with little or no regulatory inspection for mycotoxins.[9]. In Southern Africa, chronic mycotoxin exposure has been linked to malnutrition, impaired growth, higher disease incidence e.g., hepatitis B virus, cancer, and neural tube defects amongst other health impacts.[45-41] In sub-Saharan Africa, around 250,000 hepatocellular carcinoma-related deaths are linked each year to aflatoxin toxicity.[85] With specific focus on Nigeria, aflatoxins and fumonisin are found in nearly all crops especially sorghum, maize and groundnuts.[36] Poor storage conditions, pest infestation and ineffective sorting of cereals, nuts and legumes mean that multiple aflatoxins can enter the food supply;[12] particularly in the case of maize.[55] Sirma et al., [75] considered the wide variation in aflatoxin standards across four African countries stating that this makes market standards unworkable when trading susceptible crops between countries.[40] The lack of information

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379
for consumers and food marketers, public health importance, prevention and control of mycotoxins [33] needs to be addressed across the whole food supply chain system,[48] especially in Nigeria.[36] Food safety issues can also be associated with food fraud.[47] Food fraud is defined by the United Kingdom (UK) Food Standards Agency (FSA) as: *"deliberately placing food on the market, for financial gain, with the intention of deceiving the consumer"*,[23] Economically motivated adulteration (EMA) is one type of food fraud, where food products, ingredients or packaging is done primarily for economic gain; this is further done either through undeclared addition or substitution with substandard or inferior products, misbranded or misrepresented, tampered with, or are the subject of counterfeiting.[78-44-43-41-53-83] The adulteration of food products could include: incorrect amount of chemicals used for food preservation, intentional manipulation of expiry dates, contamination through the unsanitary condition of the environment where food is being prepared or sold and the poor personal hygiene of the food handlers in illicit premises.[27] Opia [68] cites examples of fraud associated with adulterated, smuggled and misbranded sugar; illegal illicit alcohol production, honey, vegetable oil, palm oil, flour, rice with expired rice being repackaged and local rice being labelled as foreign rice. Other fraud associated with food cited as happening in Nigeria include: milk that does not contain animal protein, rice husk sold (together with rice) as high-quality rice etc.[39] and Palm oil has been found to be adulterated in Nigeria with water and colourant.[24]

The National Agency for Food and Drug Administration and Control (NAFDAC) in Nigeria has over time issued regulations on the proper labelling of pre-packaged edible items, with the latest regulation in 30th March, 2023[1]. The NAFDAC is given the regulatory responsibility of shutting down food suppliers and manufacturers that engage in the adulteration and/or repacking of expired food products/produce extending shelf-life on out-of-date food.[65] However, many food consumers remain unaware of the Nigerian government's (NAFDAC) legislation on the labelling of food.[46] This shows that there is public health concern in Nigeria associated with food fraud.

The level of food fraud has not been quantified which makes it difficult to estimate fully the scale of the problem or the potential public health impact. The influence of infrastructure on food hygiene practices and public safety is now considered in the next section of the paper.

3. Market infrastructure and its impact on food hygiene and public safety

In most developing countries, Nigeria inclusive, urban consumers buy food from street vendors because it is affordable and readily available.[67] Local food vendors, informal markets or retail food markets sell their goods using wheelbarrows, food-laden carts or specificallydesigned bicycles which assist them in moving from one location to another.[67] Street food vendors may sell food that poses a notable food safety and public health challenge to food consumers due to the lack of basic infrastructure and services such as poor availability of potable water, electricity, poor road network, poor knowledge of basic food safety measures/regulation/policies,[76] poor personal hygiene and a lack of food waste disposal facilities.[72] Thus, training in food hygiene related practices and food safety to develop knowledge that translates to appropriate behaviours is essential.[60-88-50]

The infrastructural (physical) aspects of the food market play an important role in food purchasing.[1] Poorly constructed Nigerian markets are characterised by the inadequacy of sanitary facilities such as potable water, toilets or refuse disposal bays as well as an absence of safe short term storage facilities. The resultant behaviour of food marketers and visiting food consumers includes open urination and defecation within or closely adjacent to the market,[66] and as a result, food and environmental

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379
contamination can lead to severe health problems and environmental contamination.[1] Additionally, poor supervision of markets by poorly trained, unequipped and corrupt market officials has resulted in over-crowding, and market indiscipline as marketers trade on market access roads and pavements within and outside the market.[11] In spite of this, markets attract large numbers of buyers and sellers, with little operational/management coordination in place, and their collective coming together in large numbers leads to over-crowding which is considered to be an increased risk in the spread of communicable diseases e.g., as in the case of COVID-19.[1] In the local markets it is very common to observe litter and mountains of refuse that provides an excellent breeding environment for vectors of communicable diseases. These include rodents and insects along with unseen (i.e., not seen with the naked eye) zoonoses and microorganisms, increasing the potential for the spread of infectious diseases[49], as well as the spread of diseases and their symptoms that can affect the general population (tuberculosis, typhoid, malaria, diarrhoea). These health issues are also linked to other urban factors of influence that include overcrowding and unhealthy environmental conditions (Nigeria National Planning Commission 2004).[51]

Heaped refuse is a source of unpleasant odour and could also pose fire hazard.[1] As an example, the Guardian [79] considered the "disturbing spate of market fires", noting that different markets in Nigeria have experienced incidents of fire outbreaks at various intervals and locations, and from Lagos to Maiduguri, Onitsha and Sokoto the story remains the same. Recently, Habib [89] of the Punch newspaper reported that across Nigeria from the period of January 2022 to March 2023, no fewer than 54 cases of market fires have been recorded with the Lagos state having the highest number of cases (n=8), Anambra State (5), Kwara State (5), Kano State (5); and Osun, Rivers and Yobe States all recorded 3 incidents each. The FCT-Abuja, Delta, Cross River, Ebonyi,

Abia and Taraba states each had 2 incidents of fire; while, Edo, Imo, Ibadan, Benue, Akwa Ibom, Jigawa, Ekiti, Kebbi, Borno, Enugu, Niger and Adamawa States all recorded 1 fire incident each.

This shows that fire incidents have occurred right across Nigeria.

Fire incidents ravage markets in Nigeria causing the loss of lives, goods, and property worth millions of Naira and all linked to poor market management and poor infrastructure (Table 1). Effiong [20] considered possible solutions for the Federal Government of Nigeria to adopt in preventing future outbreaks of fire in markets and they include: (a) organising the Nigerian markets better in terms of layout and degree of overcrowding, (b) investing in infrastructure to improve the locations in terms of fire risk, (c) equipping the market with fire extinguishers, (d) acquiring group fire insurance for market groups, and (e) encouraging a central power generation unit and banning the utilisation of individual generator sets.

Take in Table 1

The poor state of market infrastructure in Nigeria has prevented food marketers from being able to afford shops with common utilities such as potable water, electricity and adequate waste disposal.[56] In addition to this, marketers also lack knowledge of basic food preservation, safety measures or regulations that would otherwise enable them to deliver wholesome food to consumers. In the absence of this infrastructure, many food marketers may resolve to sell their commodities on the road side, hawking, or selling in locations where there is little or no cost incurred by them. This poses considerable levels of personal and public health risk to consumers.

4. Opportunities for improving infrastructure, food safety and food quality

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379

Food insecurity and food safety and food quality aspects in Nigeria are influenced by the market dynamics and its associated infrastructure. Urbanisation, migration, and increased demand for white collar jobs, has led to the continuous growth of the urban food market.[90-91] Limited incomes or resources and poor levels of urban infrastructure influence consumer accessibility to food.[91] Poorly constructed markets are generally characterised by the inadequacy of sanitary facilities (e.g., toilets, refuse disposal system etc).[1-92] In summary, the absence of such facilities may result in marketers and food consumers displaying unhygienic behaviour. [92] Additionally, such markets are generally over-crowded, and exists with little or no management coordination in place, and this may expose marketers and visiting food consumers to the risk of the spread of disease. [16]

However, there is a clear difference between street food, informal markets, the retail markets and supermarket provision in Nigeria. Supermarkets in Nigeria, are usually privately owned, with a manger on-site, and are equipped with better facilities that aid food preservation, and the marketing environment is better organised, supporting the welfare of customers, staff, and the business in general.[73] Supermarkets as a sector include a range of different formats such as hypermarkets, neighbourhood stores and convenience stores.[73] Store atmosphere, service, quality of product, price, brand image and convenience are key determinants of customer satisfaction in supermarkets.[80] In Nigeria, forms of retailing or retail markets (supermarkets included) are gradually growing, store formats are becoming larger and bigger, giving consumers more space and options [77] and higher product quality, price, and assurance, as well as, better links to regional and global supply chains that brings exotic food to shelves, these factors have a positive effect on customers' patronage.[64] However, in Kenya, whilst supermarket users found supermarkets to be a reliable and convenient source of food, both local and regulatory authorities expressed concern that supermarkets sell food items that are unhealthy (e.g., fatty foods) and easily accessible to consumers, which are then incorporated into local diets, implying that this may be the reason for the rising cases of diet related non-communicable diseases such as being overweight or obesity.[84] Equally, street food vendors often sell low price, energy dense and nutrient poor, filling foods that are poor for health.[77]

Food consumers patronise marketing channels and particular buy food products based on product availability, quality, packaging, and taste and their ability to afford them.[64-77] Additionally, food marketers may decide to sell in particular markets based on the ease of their ability to access the retail environment (from roadside hawking to market to supermarket), and the profit they can derive.[77] Food marketers may choose the retail environment based on the cost of storage, market distance, and the type and quantity of agricultural commodity they sell.[69] Several studies have explored these dynamics in Nigeria for sorghum,[10] cocoyam,[69] and bananas,[54] where marketing and business skills were important factors that influenced business success. Oputa [69] found that of the three potential marketing channels: either the local market (farmers selling directly to consumers and one intermediary), semi-urban market (farmers selling to retailers) or the urban market (farmers selling to urban markets and wholesalers), farmers preferred - from a profitability viewpoint - to sell to the urban market, perhaps for reasons of a better profit margin.

This paper has sought to elaborate on the poor state of infrastructure in many local markets in Nigeria and the impact on food insecurity and food safety and wider public health challenge(s). Food poisoning incidents and foodborne illness in Nigeria results from inadequate farming practises, food processing and storage.[52] The responsibility to resolve this problem rests on the shoulders of individual food

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379
consumers, markets, and the government (local, state & federal). Each category of individuals or groups will now be considered in turn.

As such, *food consumers* should observe the environment of the market they patronise, check for product/produce validity (expiry date), as well as the overall hygiene/condition of the food they have purchased. *Food marketers* should endeavour to seek adequate infrastructural measures to support their business and enable them deliver safe and wholesome food to consumers. In addition to this, it is important for food marketers to equip themselves with better knowledge of the latest government regulations and guidelines that are designed to ensure the health and wellbeing of food consumers and that their customers' health is not compromised or at risk from preventable health challenges associated with the food they sell. Further to this, and as highlighted in this paper, health and safety issues such as fires (see Table 1) must be addressed within the market environment to ensure the safety of marketers and customers. The marketers should ensure they purchase food from suppliers who are competent and the food is from a reputable source, thus reducing the risk of fraud or a food safety incident. In terms of the waste generated from the market (food, human and other materials), evidence from this review study (also see table 1.0) has suggested that unattended market litters and waste can led to (and have in the past led to) several market fires, encourages pest infestations, unpleasant odour, and environmental pollution. The market governing body could levy market users (marketers) to finance better waste management systems. Additionally, as part of the market infrastructural advancement, the market through the government can seek waste processing technologies, that would process waste into energy, which could be used by food storage facilities (such as cold rooms), and the nutrient or by-product from such processing facility could be used to service agriculture (used as manure) for further food production. In summary, addressing the issue of food fraud, weak infrastructure, knowledge gaps and the presence of market waste would ensure that food consumers are able to acquire wholesome and safe food, while the market operates a clean and healthy environment.

Government (local, state, & federal) needs to do more to enlighten food handlers and market users on the dangers associated with food safety and food fraud when they sell and/or buy food. The government (NAFDAC & SON [Standard Organisation of Nigeria]; market governing body, local authority) at all levels, must ensure that food marketers are educated, this could be arranged onsite at the market or organised as a workshop, on the latest regulations that guide against the sale of unwholesome food to customer. These workshops need to ensure they are interactive and support all marketers especially those with low literacy levels. Additionally, food safety measures and regulations that reflect appropriate food hygiene and food safety standards must also be enforced for food sold by marketers, as well as improving the environmental condition where such food is sold. This should be supported with the provision of adequate infrastructure that would encourage the sale of safe food to consumers and at the same time also protect the health and safety of marketers and customers alike.[93]

The government of Nigeria could potentially negotiate public-private partnership policies with relevant proactive private organisations to address food safety, quality and fraud challenges, and at the same time, promote awareness via regular television adverts, radio jingles and on-site market communication activities. Implementing policy to improve market infrastructure requires its mapping to enable appropriate development that would ensure the standardised construction of physical markets that meet the needs of marketers and purchasers across Nigeria. Government policy would

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379
need to have its funding mechanism for these interventions to be clearly determined. Such a policy could potentially be funded from tax charged across all sectors of the economy. The Nigerian Government could provide the land/funding for the construction of new markets, as well as the modification of existing markets, and then support the implementation of hygiene and food safety awareness within the market environment. Private-public partnerships could support training programmes for market managers and marketers within the local host community of the market. These programmes should focus on the consequences of bad hygiene, poor food quality and the potential for food fraud and the interventions that can be adopted.

It is however important to note that local markets in Nigeria are already regulated, mapped and organised by the relevant State government. These types of markets too have their own governing body that oversees the daily running of the market. Unfortunately, these governing bodies are not always operational or where they function, they do not function properly for reasons such as lack of sufficient funding, and poor access to infrastructure.[1-93] This has also impacted on the feedback systems that provide the government with information on the areas that need to be improved especially when it comes to infrastructure.[93] Infrastructurally, larger paved roads, modern retail facilities, market toilets and waste disposal areas [1-93-94] need to be constructed by the government in urban areas to address the findings of this study. The problems with infrastructure in rural street and mobile market situations are harder to address in order to improve the physical and personal hygiene of those selling food.[94] The rural mobile markets have minimal infrastructure and if patronage is low at one location, food may then be moved by marketers to other markets, because of the marketers limited means to preserve perishable foods.[94] This presents a problem that is difficult to address without significant investment in infrastructure. Inadequate infrastructure and poor knowledge of regulations and guidelines that govern food safety, hygiene and the handling of food has been highlighted in urban markets in Nigeria with the evidence presented in this paper (see figure 1.0).

Take in Figure 1

The factors identified are interconnected but the nature of their interconnections has not been fully studied and could form the basis of future empirical work.

5. Conclusion This review paper considered food safety, quality and the potential for food fraud, as evidenced in existing literature.[24-27-39-68] Weak governance of urban food markets has implications for public health, and also for marketers and the Government. Evidential sources suggests that food producers, food handlers and food marketers can be victims of multiple forms of food fraud, from misinforming consumers (poor labelling), to repacking outdated commodities and marketing them.[24-39] Poor hygiene standards in the markets, overcrowding and a lack of sanitation facilities all present problems for both food marketers and food purchasers. Addressing the findings of this study would support the agenda of delivering all the SDGs. Improving urban infrastructure will contribute to the alleviation of poverty, promote economic development and human empowerment. This critical review has highlighted the food marketing situation in local markets and the infrastructural factors that influence food hygiene and food safety standards in a typical food retail environment. The originality of this study rests on the identification of those key elements or factors that are classified as limiting factors in many local markets in Nigeria which can have serious implication for public health and environmental degradation if not adequately addressed.

Disclosure Statement:

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379

Authors had no potential conflict of interest to declare.

Funding:

Authors in this study have no funding to report.

Author Contributions:

The manuscript was written via the contributions of all authors involved. Approval have been given by authors to the final version of this manuscript.

References

Abejegah, C., Abah, S.O, Awunon, N.S, Duru , C.B., Eluromma, E., Aigbirmolen, A.O, &

Okoh, E.C, 2013. "Market Sanitaion: A case study of Oregbeni Market Benin-City, EdoState, Nigeria." *International Journal of Basic, Applied & Innovative Research (IJBAIR)*, pp. 25-31.

Adebusuji, B.S. 2004. *Stabilisation of Commodity Market of Interest of Africa*. Pretoria, South Africa: Paper Presented at the Workshop on Constraints to Growth in Sub-Saharan Africa.

Adekoya, O.D. 2018. "Impact of Human Capital Development on Poverty Alliviation in Nigeria." *International Journal of Economics and Management Science,* pp. 904-915.

Adigun, O., Fasina, F.O, Gcebe, N., & Adesiyun, A.A, 2020. "Prevalence and Risk of Staphylococcal and Coliform Carcass Contamination of Chickens Slaughted in The Informal Market in Gauteng, South Africa." *British Food Journal,* DOI 10.1108/BFJ-062020-0487, pp. 2-18.

Aguilar, R. G, & Summer, A., 2019. "Who Are the World's Poor? A New Profil of Global Multidimensional Poverty." *Centre for Global Development (Working Paper 499): CGD2055 L-Street NW, Washington, D.C*, pp. 1-34.

Ajisafe, A., 2016. "Corruption and Poverty in Nigeria: Evidence From Avd Bound Test and Error Corrction Model." *Journal of Emerging Trends in Economics and Management Sciences,* pp. 156-163.

Akerele, D., 2015. "Household Food Expenditure Patterns, Food Nutrient Consumption and Nutritional Vulnerability in Nigeria: Implications for Policy." *Ecology of Food and Nutrition,* pp. 1-26.

Akintunde, K.O., Akinremi, T.B., & Nwauwa, L.O.E., 2012. "Food Grain Marketing in Osun State, Nigeria: A study of Long-run Price Integration." *Continental Journal of Agricultural Economics*, pp. 1-9.

Alberts, J., Rheeder, J., Gelderblom, W., Shephard, G., & Burger, H. M. (2019). Rural

Subsistence Maize Farming in South Africa: Risk Assessment and Intervention models for Reduction of Exposure to Fumonisin Mycotoxins. *Toxins*, *11*(6), 334. https://doi.org/10.3390/toxins11060334.

Asogwa, B., & Okwoche, V.A., 2012. "Marketing of Agricultural Produce Among Rural

Farm Households in Nigeria: the Case of Sorghum Marketing in Benue State." *International Journal of Business and Social Science*, pp. 269-277.

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379
Avanenge, F., 2015. “Effects of Market Infrastructure and Poor Access to Markets on

Marketing of Grains in Selected States of Northern Nigeria, West Africa.” *Journal of Business & Retail Management Research,* pp. 110-118.

Ayeni, K. I., Atanda, O. O., Krska, R., & Ezekiel, C. N. (2021). Present status and future perspectives of grain drying and storage practices as a means to reduce mycotoxin exposure in Nigeria. *Food Control*, 108074.

Ayinde, I.A, Otekunrin, O.A, Akinbode,S.O, & Otekunrin, O.A., 2020. “Food Security in Nigeria: Impetus for Growth and Development.” *Journal of Agricultural Economics and Rural Development (AJAERD)*, pp. 808-820.

BBC News. 2021. *Fire guts Ladipo spare parts market: Fire burn Lagos main 'tokunbo' motor market*. 31 May. https://www.bbc.com/pidgin/media-57272218.

Behnassi, M., Pollmann, O., & Kissinger, G., 2015. *Sustainable Food Security in the Era of Local and Global Environment Change*. New York: Springer Dordrecht Heidelberg

Buheji, M., Cunha, K.C., Beka, G., Mavric, B., De souza, Y.L., Silva, S.S., Hanafi, M., &

Yein, T.C., 2020. “The Extent of COVID-19 Pandemic Socio-Economic Impact on Global Poverty: A Global Intergrative Multidisciplinary Review.” *American Journal of Economics,* pp. 213-224.

Chukwukere, V.C., Amah, N.E., & Jabil, I.Y., 2021. “Percieved Causes of Aflatoxin Contamination of Cereal and Legumes Graines on Rural Farmers Livelihood in Jos South

Local Government Area, Plateau State, Nigeria.” *International Journal of Science and Applied Research*, pp. 39-44.

CIA-World Fact Book. 2023. *Exploring All Countries-Nigeria*. Viginia, USA: CIA. [19] Danaan, V.V., 2018. “Analysising Poverty Poverty in Nigeria Through Theoretical Lenses.” *Journal of Suatainable Development,* pp. 20-31.

Effiong, E., 2019. *A Solution to Nigerian Market Fires-You Might not Like it*. 30 December.

https://editieffiong.medium.com/a-real-solution-to-nigerian-market-fires-you-might-likeit-fa308361e061.

EIU,. 2018. *Global Food Security Index: Building Resilience in the Face of Rising Food Security Risks*. London, United Kingdom: Economist Intelligence Unit.

Elegbede. I. 2017. “The Challenges of Food Security in Nigeria.” *Open Access Library Journal,* pp. 1-22

Elliott Review. (2014). Elliott Review into the integrity and assurance of food supply networks – final report a national food crime prevention framework. HM Government July 2014. London.

Everstine, K., Spink, J. & Kennedy, S. (2013). Economically motivated adulteration (EMA) of food: Common characteristics of EMA incidents. *Journal of Food Protection, 76*(4), 723-735.

DOI: https://doi.org/10.5281/zenodo.15855379
Ewubare, D.B., & Mark, T., 2018. "Human Capital Development and Poverty Reduction in Nigeria." *Journal of Economics Business,* pp. 150-163.

Eze. 2019. "A Survey of the Criminal Jurisprudence for Combating Food Adulteration in Nigeria and India." *African Journal of Criminal Law & Jurisprudence (AFJCLJ)*, pp. 5568.

Ezirigwe, J. (2018). Much ado about food safety regulation in Nigeria. *Journal of Sustainable Development Law and Policy (The)*, *9*(1), 109-132.

FAO, IFAD, UNICEF, WFP & WHO. 2020. *The State of Food Security and Nutrition in the World 2020: Transforming food systems for affordable healthy diets*. Rome: FAO.

FAO. 2015. *The State of Food Insecurity in the World 2015. Meeting the 2015 international hunger target: Taking Stock of Uneven Progress*. Rome: FAO in Conjunction with IFAD & WFP

FAO. 2010. *Bioversity International. In : Final Document: International Scientifi Symposium: Biodiversity and Sustainability Diet-United Against Hunger*. Italy, Rome: FAO, Head Quarters.

FAO. 2002. *The State of Food Security in the World*. FAO: Rome

FAO. 1996. *Rome Declaration on World Food Security and World Food Summit Plan of Action* . Rome: Food and Agriculture Organisation of the United Nations (FAO).

Gbashi, S., Madala, N. E., Adekoya, I., Adebo, O., De Saeger, S., De Boevre, M., & Njobeh, P. B. (2018). The socio-economic impact of mycotoxin contamination in Africa.

Online First Available at: DOI: 10.5772/intechopen.79328 (Accessed 13 July 2019).

Ifeoluwa. A. 2021. *Lagos Market Fire Caused by Explosives-Officials: The Lagos State Emergency Management Agency (LASEMA) attributed the fire incident to explosives and accelerants used by unknown individuals*. 7 May.

https://www.premiumtimesng.com/regional/ssouth-west/460080-lagos-market-firecaused-by-explosives-official.html.

Iheonu, C., & Urama, N.E., 2019. "Addressing Poverty Challenges in Nigeria."

Afriheritage policy Brief, pp. 1-5.

Imade, F., Ankwasa, E.M., Geng, H., Ullah, S., Ahmad, T., Wang, G., Zhang, C., Dada, O., Xing, F., Zheng, Y. & Liu, Y., 2021. Updates on food and feed mycotoxin contamination and safety in Africa with special reference to Nigeria. *Mycology*, pp.1-16.

Israel, O. G., & Samuel, C. B. (2020). Nutrient composition and microbiological evaluation of vended street foods in parts of Lagos State, Nigeria. *Asian Food Science Journal*, 1-14.

Jenfa, D.M., & Adebisi, K.A., 2020. "Impact of COVID-19 on Food Safety and Food Security in Nigeria." *Proceedings of the 2nd Internatonal Conference, The Federal Polytechic, Ilaro,* pp. 955-958.

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379

Jurica, K., Brčić Karačonji, I., Lasić, D., Bursać Kovačević, D., & Putnik, P. (2021). Unauthorized Food Manipulation as a Criminal Offense: Food Authenticity, Legal Frameworks, Analytical Tools and Cases. *Foods*, *10*(11), 2570.

Kowalska, A., & Manning, L. (2021). Using the rapid alert system for food and feed: Potential benefits and problems on data interpretation. *Critical reviews in food science and nutrition*, *61*(6), 906-919.

Kowalska, A., Soon, J. M., & Manning, L. (2018). A study on adulteration in cereals and bakery products from Poland including a review of definitions. *Food control*, *92*, 348-356.

Kwol, V.S., Avci, T., Eluwole, K.K., & Dalhatu, A., 2019. "Food Safety Knowledge and Hygenic-Sanitary Control: A Needed Company For Public Well-Being." *Journal of Public Affairs,* pp. 1-8.

Manning L. (2016). Food Fraud, policy and food chain, *Current Opinions in Food Science, 10*, 16-21

Manning, L & Soon, J.M, (2014). Developing systems to control food adulteration, *Food Policy, 49*(1), 23-32

Misihairabgwi, J. M., Ezekiel, C. N., Sulyok, M., Shephard, G. S., & Krska, R. (2019).

Mycotoxin contamination of foods in Southern Africa: A 10-year review (2007– 2016). *Critical reviews in food science and nutrition*, *59*(1), 43-58.

Monye, F.N., Ezumah, N.N., Ani, J., Umezuruike, H., Ukwueze, F.O., & Okiche, E.L., 2020. "Examining Knowledge, Attitude and Practice Towards Food Labels Among Consumers in Enugu State, Nigeria – A Baseline Survey." *International Journal of Law & Society,* pp. 221-231.

Moore, J.C., Spink, J. & Lipp, M., (2012). Development and application of a database of food ingredient fraud and economically motivated adulteration from 1980 to 2010. *Journal of Food Science*, *77*(4), R118-R126.

Mupunga, I., Mngqawa, P., & Katerere, D. (2017). Peanuts, aflatoxins and undernutrition in children in sub-Saharan Africa. *Nutrients*, *9*(12), 1287. https://doi.org/10.3390/nu9121287.

Nigerian Observer. 2012. *Policy Guidlines on Market and Abattoir Sanitation on Online Edition,*. Benin, 27th February.

Letuka, P., Nkhebenyane, J., & Thekisoe, O., (2021). Street Food Handlers' Food Safety Knowledge, Attitudes and Self-Reporting Practises and Consumers' Perceptions About Street Food Vending in Maseru, Lesotho . *British Food Journal; DOI 10.1108/BFJ-072020-0595*, 302-316.

NNPC, 2004. *National Economic & Development Strategy*. Abuja: Nigerian National Planning Commission.

Pepple, N., 2017. "Environment and Food Poisoning: Food Safety Knowledge and Practice Among Food Vendors in Garki, Abuja-Nigeria." *Journal of Health Eduction Research & Development*, pp. 1-4.

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379

Nwaiwu, O., Aduba, C. C., Igbokwe, V. C., Sam, C. E., & Ukwuru, M. U. (2020). Traditional and Artisanal Beverages in Nigeria: Microbial Diversity and Safety Issues. *Beverages*, *6*(3), 53.

Nwaru, J.C., Nwosu, A.C., & Agommuo, V.C., 2011. "Socio-Economic Determinant of Profit in Wholesale and Retail Banana Marketing in Umuahia Agricultural zone of AbiaState, Nigeria." *Journal of Sustainable Development in Africa*, pp. 200-211.

Ogara, I.M., Zarafi, A.B., Alabi, O., Banwo, O., Ezekiel, C.N., Warth, B., Sulyok, M. and Krska, R., 2017. Mycotoxin patterns in ear rot infected maize: A comprehensive case study in Nigeria. *Food Control*, *73*, pp.1159-1168.

Ogbeyi, O. G., Afolaranmi, T. O., Amede, P. O., Audu, O., & Koko, B. T. (2019). Food safety in sub-urban market: Knowledge, attitude and practice of hand hygiene in Wadata Market, Makurdi, Benue State, Nigeria. *Journal of BioMedical Research and Clinical Practice*, *2*(3), 172-179.

Ogun, T.P., 2010. *Infrastructure and Poverty Reduction: Implications for Urban Development in Nigeria, WIDER Working Paper, No. 2010/43, ISBN 978-92-9230-280-1.* Helsinki: University World Institute for Development Economic Research (UNUWIDER).

Ogunleye, O.S., 2010. "Towards Sustainable Poverty Alleviation in Nigeria." *African Research Review. Vol.4*, pp. 294-302.

Ojewunmi. 2022. "United Nations Sustainable Development Goals in Nigeria: An appraisal of Oritamefa Bapstist Model Schools, Ibadan." *International Journal of Arts and Social Science* 155-165.

Okojie, P. W., & Isah, E. C. (2019). Food hygiene knowledge and practices of street food vendors in Benin City, Nigeria. *International Journal of Consumer Studies*, *43*(6), 528535.

Okpala, E.F, Manning, L., & Baines, R.N., 2021. *Socio-Economic Drivers of Poverty and Food Insecurity: Nigeria a Case Study*. Food Review International. Doi:1080/87559129.2021.2012793.

Oku, I.Y., Oyedeji, A.A., & Akuru, O.I., 2020. "Microbiological Safety: Evaluation of Some Street Vended Ready-To-Eat Fruits Soldin Yenagoa Metropolis, Bayelsa Satate, Nigeria." *Britain International of Exact Sciences Journal*, pp. 603-608.

Oladokun, V.O., & Emmanuel, C.G., 2014. "Urban Market Fire Disasters Management in Nigeria: A Damage Minimisation Based Fuzzy Logic Model Approach." *International Journal of Computer Application,* pp. 1-6.

Olasehinde, S., Ogundipe, C.F., Ayodele, O.O., & Bankole, O.A., 2020. "Contemporary Factors Determining the Choice of Supermarket Patronage in Ado-Ekiti Metroplis of

Nigeria." *International Journal of Advances in Scientific Research and Engineering (IJASRE)*, pp. 174-180.

Olokor, F., 2021. *The Punch News* . 7 February. https://punchng.com/expired-productsnafdac-shuts-lagos-food-company/.

Vol. 13 No. 3 | Imp. Factor: 7.88
DOI: https://doi.org/10.5281/zenodo.15855379

Olorunsanya, E.O., & Ugbong, J.U., 2014. "Rice Marketing as a Means of Poverty Alleviation in Niger State, Nigeria." *Agricultura Tropica ET Subtropica,* pp. 137-141.

Onyeneho, S.N., & Hedberg, C.W., 2013. "An Assessment of Food Safety Needs of Restaurants in Owerri, Imo-State, Nigeria." *International Journal of Environment Research and Public Health*, pp. 3296-3309.

Opia, J. E. (2020). Food Fraud in Nigeria: Challenges, Risks and Solutions. Master's dissertation. Technological University Dublin. doi:10.21427/nm91-rk58

Oputa, P.I., 2018. "Determinants of the Choice of Marketing Channel Among Cocoyam Farmers in Southeast Nigeria." *The Journal of Animal & Plant Science*, pp. 1142-1151.

Owoo, N.S., 2020. "Demographic Considerations and Food Security in Nigeria." *Journal of Social and Economic Development*, pp. 128-167.

Perez-Escamilla, R., Gubert, M.B., Rogers, B., & Haromi-Fiedler, A., 2017. "Food Security Measurement and Governance: Assessmeny of the Usefulness of Deverse Food Insecurity Indicators for Policy Makers." *Global Food Security*, pp. 96-104.

Raab, C.A., & Woodburn, M., 1997. "Changing Risk Perceptions and Food Handling Practices of Oregon Household Food Preparers." *Journal of Consumers Studies of HomeEconomics*, pp. 117-130.

Reardon, T., & Gulati, A., 2008. *The Supermarket Revolution in Developing Countries (Policies for "Competitiveness with Inclusiveness").* Washington D.C: International Food Policy Research Institute (IFPRI).

Singh, P.K., & Chudasama, H., 2020. "Evaluating Poverty Alleviation Strategies in a Developing Country." *PLOS/ONE*, pp. 1-23.

Sirma, A. J., Lindahl, J. F., Makita, K., Senerwa, D., Mtimet, N., Kang'ethe, E. K., &

Grace, D. (2018). The impacts of aflatoxin standards on health and nutrition in sub-Saharan Africa: The case of Kenya. *Global Food Security*, *18*, 57-61. https://doi.org/10.1016/j.gfs.2018.08.001.

Sneed, J., Strohbehn, C., & Gilmore, S.A., 2004. "Food Safety Practices and Rediness to Implement HACCP Programs in Assisted Living Facilities in Iowa." *J. Am. Diet Assoc. pp.* 1678-1683.

Solate, A., 2018. *Customer Satisfaction on Supermarket Retain Shopping Using Web-based Participation GIS.* New York, USA: 7th International Conference on Business and Economic Development (ICBED), 9-10 April.

Spink, J. & Moyer, D.C. (2011). Backgrounder: Defining the Public Health Threat of Food

Fraud, in Research Grants, National Center for Food Protection and Defense (NCFPD), Minneapolis, MN, p. 7, Available from: www.ncfpd.umn.edu (Accessed 4 December 2017).

The Guardian. 2020. *Disturbing Spate of Market Fires* . 19 January. https://guardian.ng/opinion/disturbing-spate-of-market-fires/.

DOI: https://doi.org/10.5281/zenodo.15855379

Ucha, C., 2010. "Poverty in Nigeria: Some Dimensions and Contributing Factors ." *Global Majority E-Journal*, pp. 46-56.

Udoh, E., & Akpan, S.B., 2007. "Estimating Exportable Tree crop Relative Price Variability and Inflation Movement Under Different Policy Regimes in Nigeria." *Europe Journal of Social Science*, pp. 17-26.

UNDESA. 2018. *World Urbanisation Prospects, United Nations*. DESA/Population Division: United Nations.

Visciano, P., & Schirone, M. (2021). Food frauds: Global incidents and misleading situations. *Trends in Food Science & Technology*.

Wadende, P., Francis, O., Musuva, R., Mago, E., Turn-Moss, E., Were, V., Obonyo, C., & Foley, L., 2021. "Food Scapes, Finance and Faith: A Qualitative Investigation of MultiSectoral Satkeholder Perspectives on ANew Mall & Supermarket in Kenya." *Research Square*, pp. 1-16.

Wagacha, J. M., & Muthomi, J. W. (2008). Mycotoxin problem in Africa: current status, implications to food safety and health and possible management strategies. *International Journal of Food Microbiology*, *124*(1), 1-12. https://doi.org/10.1016/j.ijfoodmicro.2008.01.008.

Wenwei, T., & Tongtong, Z., 2010. "An Empirical Research on Influencing Factors of Customer Experience of Retail Industry Aiming to Improve Customer Satisfaction: Taking Supermarket as an Example." *7th International Conference on Innovation & Management*, pp. 846-850.

WHO. 2020. *Food Safety*. 30th April. https://www.who.int/news-room/factsheets/detail/food-safety.

Yusuf, T. A., & Chege, P. M. (2019). Awareness of food hygiene practices and practices among street food vendors in Nasarawa State, Nigeria. *Int J Health Sci Res*, *9*(7), 156-164.

Habib G., 2023. *Punch NewsPaper*. [Online]

Available at: https://punchng.com/54-market-fires-recorded-in-15-months/ [Accessed 26th March 2023].

Abdullahi J., Shaibu-Imodagbe E.M, Fatima M., Sa'id A., & Idris U.D., 2009. Rural-Urban Migration of the Nigerian Work Populace and Climate Change Effect on Food Supply: A case Study of Kaduna City in Nigeria,. *Fifth Urban Symposium,* pp. 1-16.

Amaka G.M., Kenechukwu O.O., & Olisa D.M., 2016. Archieving Sustainable Food Security in Nigeria Challenges and way Forward. *3rd International Conference on Africa Development Issues (CU-ICADI 2016): ISSN: 2449-075x,* pp. 182-187.

Fagbemi K.B., Ogungbemi A.O., Philips O.O., Obatuase B., & Hassan Y.O., 2020. User's Perception of Environmental Sanitation Exercise in Selected Market in Nigeria Cities. *International Journal of Waste Resources, Vol. 10, Issue No. 378,* pp. 1-4; Doi: