

Food Hygiene and Safety Management in Nigeria

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Abstract – Current food production processes from farm to fork are bedevilled by food safety hazards and risks which result to frequent foodborne disease outbreaks locally, nationally and internationally. Food hygiene and safety management systems are put in place to insure that food that gets to the consumer is safe. The objective of this paper is to review the current food hygiene and safety management (FHSM) in Nigeria. The concept of food hygiene represents the ways and means of controlling hazards in food in order to ensure that the food is fit for human consumption and that it is prepared according to the intended use, while food safety management guarantees the harmlessness of food and the absence of adverse effects for the consumers. FHSM start from primary production in the farm, through manufacturing processes, to distribution of the food up to the consumers' table. Credible FHSM can only take place within robust international and national regulatory systems. Education on and development of internationally regulated hazard prevention and control systems such as hazard analysis and critical points (HACCP) and ISO 22000 will strengthen FHSM in Nigeria. It is recommended here that Nigeria should develop and enforce HACCP and ISO 22000 for the achievement of FHSM.

Keywords – Hygiene; hazards; consumption; regulatory; prevention; enforce.

I. INTRODUCTION

Globally 600 million people are estimated to have post-consumption food-related illnesses; and among these, 420,000 die annually giving rise to loss of 33 million healthy life years (DALYs) with the cost of illness that is associated with illness in Nigeria estimated at US\$3.6 billion per annum (WHO, 2017; Ezirigwe, 2018). These events were caused by inadequate or faulty food hygiene and safety management. Food handlers in the food chain often have inadequate knowledge of food safety standard operations checklists, and their practices reflect these deficiencies (Iro *et al.*, 2017; Azuama *et al.*, 2018; Amadi *et al.*, 2018; Chukuezi, 2010); as well as in the poor bacteriological qualities of the food produced by the food handlers (Onyeneho & Hedberg, 2013; Ifeadike *et al.*, 2014; Azuama *et al.*, 2018; Iro *et al.*, 2019).

Poor food hygiene and safety management starts from the farms where primary production takes place. The quantities of pesticide and other agrochemicals used in the farms are not in agreement with the quantities recommended by Codex Alimentarius Commission, and this results to their residues

rising higher than recommended quantities. Majority of food vendors sell along the streets, carrying their food in carts, wheel-barrows or such other carriers like these from one customer to the other (Ezirigwe, 2018; Onyeneho & Hedberg, 2013). Some of the food handlers display their wares on bare ground (Iro, 2015). Poor food hygiene and safety management by producers and manufacturers is further compounded by the inadequate knowledge of food hygiene and safety management by food consumers themselves (ILRI, 2011).

Poor regulatory system also impedes food hygiene and management in Nigeria (Omotayo & Denloye, 2002; Ifenkwe, 2012; Omojokun, 2013). A clement regulatory environment is key to achieving food hygiene and safety management.

A robust food hygiene and safety management system offers immeasurable advantages not only to the individual consumers and the business communities, but also to the entire nation as well as the global community. It confers good health to food consumers; increases the profit of the food businesses; it improves the economy of the country as it opens the way for food exports – the international community imports only food and food products that have been certified to have been produced with international food hygiene and safety guidelines; it therefore reduces the quantity of unsafe food that crosses international borders; finally, it addresses four of the 17 sustainable development goals (SDGs) of the United Nations: 1. No Poverty, 2. Zero Hunger, 3. Good Health and Well-being, and 12. Responsible Consumption and Production.

The main objective of this paper is to review the current food hygiene and safety management and the possibility of adapting international best practices to the Nigeria situation. The paper shall explain the concepts of food hygiene and food safety management system, food safety hazards, legal instruments for food hygiene and food safety management, the ideal food safety management system, and conducting food safety management system in Nigeria. It will also recommend the way forward.

II. FOOD SAFETY HAZARDS

These are substances that are capable of adversely affecting the integrity of food and causing deleterious effects

on food consumers, and they include chemical, biological and chemical (CAC, 2018). There exist three types of food-borne hazards: chemical, physical and biological hazards.

According to Canadian Food Safety Knowledge Centre (2016), Physical hazards may be extraneous materials accidentally introduced to food products (e.g.: metal chips in minced meat) or materials that are naturally part of the meat (e.g.: bones in fish) that may harm the consumer. A physical hazard pollutes a food substance at any step during production. Physical hazards mostly found in food include: 1) Glass fragments from light bulbs and other glass containers used for food; 2) Metal chips from containers used for food production and even such materials as razor blades, staples, etc.; 3) Plastic materials used for packaging and fragments of containers used for washing equipment; 4) Small stones that are accidentally added to grains in the field, such as stones in rice and beans, at the point of harvesting; 5) Wood chips from equipment used in producing, distributing or storing food; 6) Substances that naturally occur with food such as shells or husks, if consumers do not expect them.

A food-borne chemical hazard is any chemical substance found in food that can cause a health problem when ingested or inhaled (Canadian Food Safety Knowledge Centre, 2016). They include toxins, dangerous chemicals, residue of excess chemicals used in processing food products (Iro, 2016). A lot of the chemical hazards come from pest control processes (pesticide residue), food additives, drugs given to animals to prevent or treat diseases, toxic chemicals that percolate from metal and electronic wastes at landfill waste dumps and seep into underground water table and the water is used for food processing (e.g. mercury, lead, cadmium, chloroform, benzene, dioxane, polychlorinatedbiphenyls), and toxins produced by biological agents associated with food – they include mycotoxins (e.g. aflatoxin), scombrototoxin, ciguatoxin, and shellfish toxins (paralytic shellfish poisoning – PSP, diarrhetic shellfish poisoning – DSP, neurotoxic shellfish poisoning – NSP, and amnesic shellfish poisoning – ASP).

The food-borne hazards that are of more serious concern in public health are the biological hazards, because of the high prevalence of food-borne illnesses and the associated chronic sequelae attributable to them (Sofos, 2008; Norung and Buncic, 2008; Heinz and Hautzinger, 2007; Oluwafemi and Simisaye, 2006; Dorny *et al.*, 2009; Singh *et al.*, 2014; Batz *et al.* 2013). The scope of this paper is not broad enough to give a comprehensive outline of the food-borne biological hazards; however, a synopsis will be constructed to remind the readers of what they will look for in sampling and analyzing food at various food premises.

Food-borne biological hazards include food spoilage and pathogenic bacteria, pathogenic parasites and viruses. Nychas *et al.* (2007) gave a list of food spoilage bacteria to include *Achromobacter spp.*, *Athrobacter spp.*, *Brochothrix spp.*, *Clostridium spp.*, etc.

In terms of food-borne disease, microbes are classified into two – those that cause food intoxication and those that cause food infection. Food intoxication causing bacteria produce toxin in the food and cause health problems soon after the food is ingested by humans.

There are four important bacteria that cause foodborne intoxication that will be mentioned here: *Clostridium perfringens*, *Staphylococcus aureus*, *Clostridium botulinum*, and *Escherichia coli*.

Many bacteria cause foodborne infection but only two shall be mentioned here namely, *Listeria monocytogenes* and *Salmonella spp.*

There are also foodborne parasites which include *Trichinella spiralis*, *Anasakis simplex*, *Ascaris lumbricoides*, *Cryptosporidium parvum*, *Diphyllobothrium latum*, *Entamoeba histolytica*, *Giardia lamblia*, *Pseudoterranova dicepiens*, *Taenia solium*, and *T. saginata*.

Viruses are a third type of pathogen that can cause foodborne illnesses (Iro, 2016). A virus must attach to a host cell. Genetic material from the virus is injected into the host cell. The genetic material can attach to the host cell's genes. This causes the host cell to make more virus particles. Eventually, the large number of virus particles causes the host cell to rupture and die. The virus particles are then freed to find new host cells and repeat the process. The nature of viral infections is related to which cells the virus can attach to and destroy. Four main types of viruses have been found to cause foodborne illness. These include Rotavirus, Norwalk virus, and Hepatitis A and E. Threat of the fourth type, poliovirus, has largely been eliminated in Nigeria by vaccinations.

III. FOOD HYGIENE

The Codex Alimentarius Commission (CAC, 2018) defines food hygiene as comprising 'conditions and measures necessary for the production, processing, storage and distribution of food designed to ensure a safe, sound, wholesome product fit for human consumption'. These conditions and measures must start from the farm where the primary production of the crops and animals are raised for food, through the food manufacturing, processing and the final preparation of the food for the table, till it enters the mouth through the fork. It is indeed a complex set of activities, beginning from production stages with good agricultural practice (GAP) starting from selection of healthy uncontaminated seedlings (for plant) and young healthy animals for animal husbandry. The use of pesticides, fertilizers, soil, water, feeds and veterinary drugs must be used according as provided by regulations to avoid residues of these chemicals in the plant and animals overshooting levels allowed by regulations.

The Codex Alimentarius Commission (CAC/RCP 1-1969, Rev. 3 (1997, Amended 1999) recommends the following for primary food production. The management of primary production should be such as would ensure the safety

and suitability of food for its intended use. This includes the following where necessary:

1. Avoidance of the use of spaces with environmental risks to food safety;
2. Controlling pollutants, pests as well as plant and animal diseases such that they do not constitute a threat to the safety of food;
3. Embracing practices and processes that ensure adequate hygienic production of food.

These conditions involve personal hygiene of the food producers and hygiene of the environment where the food is produced, ensuring that no hazard is introduced into the food plants and animals.

In relation to primary production, CAC (1999) further states “Producers should as far as is feasible, implement processes to:

1. Control contaminants from substances utilized in primary production, including contaminants in the soil, air, water, animal feed and drugs, pesticides, artificial and natural fertilizers;
2. Control the health of plants and animals in order that they neither adversely affect humans through consumption of food, nor adversely affect the product’s suitability; and
3. Protect contamination of food sources from faecal and other contaminants”.

Particularly, appropriate management of wastes and storage of harmful materials should be considered. Additionally, on-farm programmes need to be supported to attain definite food safety goals as a vital part of primary production. The code continues and gives recommendations for handling storage and transport; cleaning, maintenance and personal hygiene at primary production; design and layout of premises for food manufacturing; manufacturing equipment; water supply, drainage and waste disposal; cleaning facilities; personal hygiene facilities and toilets; air quality and ventilation; lighting; and storage.

Food hygiene also includes hygienic control of operations, including control of food hazards through hazard analysis and critical control points (HACCP), in key aspects of control of systems: incoming material requirements, packaging, water, management and supervision, documentation and records, and recall procedures. In addition, food hygiene involves establishment maintenance and sanitation which include, maintenance and cleaning, establishing health status, illness and injury, personal cleanliness, personal behaviour, and visitors; use and maintenance of transportation; product information and consumer awareness; and training on food hygiene.

IV. FOOD SAFETY MANAGEMENT SYSTEM

According to Food Safety and Standards Authority of India (FSSAI, 2006), Food Safety Management System (FSMS) means the adoption Good Manufacturing Practices, Good Hygienic Practices, Hazard Analysis and Critical Control Point as well as other such practices as may be specified by regulation, for the food business. This definition explicates the International Organization for Standardization’s ISO 22003 definition of food safety management system (FSMS) as the set of elements which interrelate or interact to establish policy and objectives and to achieve those objectives, used to direct and control an organization with regard to food safety (ISO 22003:2013). Yasmine & Lelieveld (2014) discussed the fundamentals of food safety management in the industrial setting. They asserted that according to Codex Alimentarius Commission, “food safety is the assurance that no harm will be caused by food to the consumer when the food is prepared and/or consumed in accordance to its intended use.” According to these authors, there is a leading role to be exercised by authorities in public health and food control, particularly in the management of food safety. They also should oversee food safety from primary production until the consumption point. Thus, the following need to be done:

1. Foresee that every structure and public health service that are essential for good management of safety of food are in place including public health laboratories, supply of water, sanitation, etc.;
2. Propagate laws and regulations, that will prioritize public health, as well as cater to social and environmental factors;
3. Administer regulations from guidance in the market and the industrial sectors, examination and surveillance of food supply, as well as taking action against lawbreakers;
4. Educate caregivers, consumers, travellers, health experts and the general public.

On the other hand, the food industry has the responsibility to make sure that the food that is provided in the market, or the food that is offered in food service industries are safe, good for human consumption and up to the regulatory requirements of the country of consumption. There is need to factor in the regulatory norms and make sure the food products are within these limits. The food industry is expected to have an integrated food safety assurance system in order to meet these responsibilities.

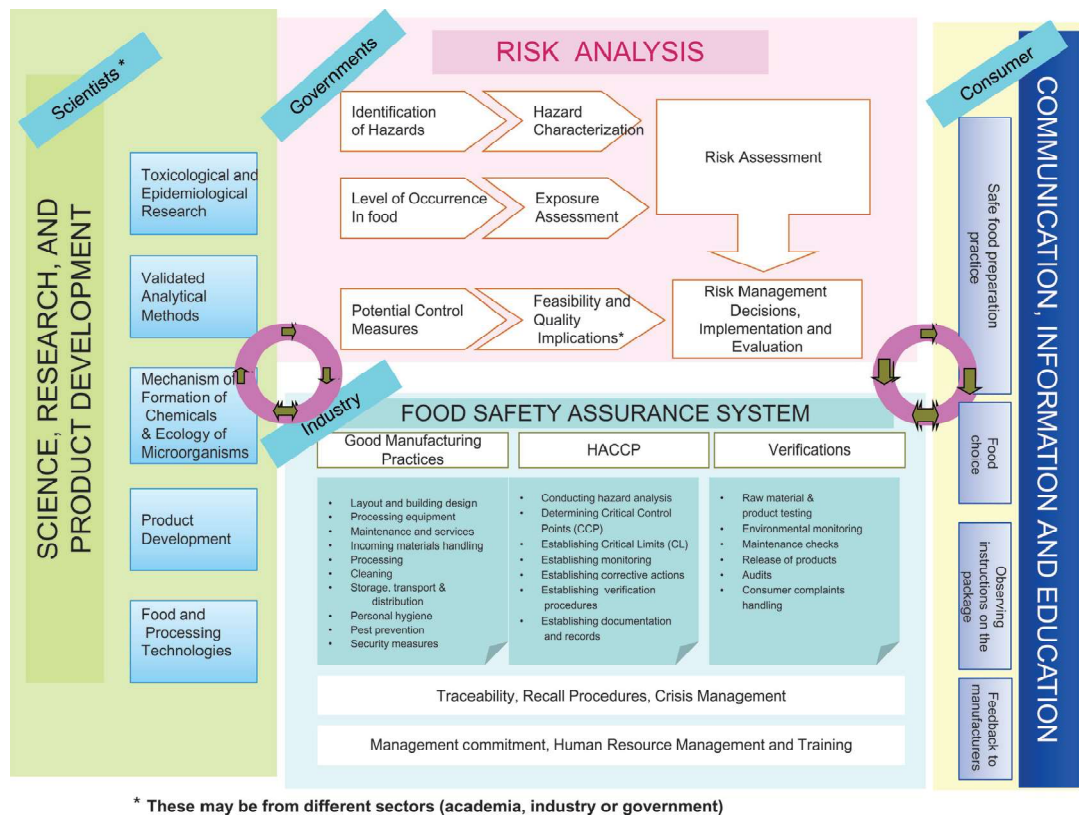


Figure 1: General overview of the organization of food safety management in society (Yasmine and Lelieveld, 2014).

A model for this system consists in combining three sets of measures according to the three lines of defence (Figure 1). The first line of defence is the enactment of codes of good practices. The codes of good practices are a group of values and procedures derived from previous practices as essential in ensuring the food safety and wholesomeness; and with some alteration, they generally apply to all groups of foods and products and/or establishments irrespective of place, specific conditions and business category. Depending on the sector, they are referred to as Codes of Good Agriculture Practice, Animal Husbandry Codes, Codes of Good Manufacturing Practice, Codes of Good Transport or Storage Practice, etc. Very often, such codes are voluntary, but at times they are legally established by regulatory authorities especially if the country manufactures food for export.

The second line of defence is the application of the HACCP system and ISO 22000. Here, specific hazards are proactively identified, and specific control measures to the specific hazards are decided with respect to critical measures that ensure food safety: monitoring parameters are established and the measures are checked to make sure that the critical limits are always recognized. Additionally, there is need to consider any requirements by regulatory bodies (including national standards or codes of practices, sampling plans, objectives of food safety) or requirements by customers

(including specifications, performance criteria for intermediary processes during product/ process design) and to respect them during operations.

The third and final line of defence is the activities for verification. These as well, form part of the HACCP application; however, they are presented separately in order to differentiate between preventive measures and measures for verifying that preventive measures are effective and are performing correctly.

4.1 The Role of Consumers

The role of consumers and the informal sector in food safety management is equally crucial. These roles are not exhausted here, but include:

1. Scrutiny of the practice of good hygiene during food preparation;
2. Reading information on product labels and observing preparation and storage information (including products' "use by date", storage, allergen watch, target consumers);
3. Reporting faulty and unsafe products to the manufacturers and/or public health authorities.

4.2 The Role of Scientists

Scientists in general, whether they work in academic institutions, in government or in industry, also have an important function. The role of this sector in analyzing risk

has been expanded in recent times following inclinations towards evidence-based decision-making and considerations for science which include life and social sciences. Their integrity, excellence and relevance make them ideal communicators for managers (e.g. report of their results, articles) or for the general public (e.g. interviews in the social media or mass media). Thus, they are essential in both food safety and crisis managements.

HACCP and ISO 22000:2018 as Food Safety Management System Tools

Before the advent of HACCP food producers depended on end product tests and analysis for food safety assurance. By early 1960s the Scientists and Engineers from Pillsbury Company developed the concept of hazard analysis and critical control points (HACCP) with the objective of producing zero-defect food products for NASA astronauts (PECB 2014). However, the first HACCP standard was issued in late 1980s by the U.S. National Advisory Committee on the Microbiological Criteria for Food (NACMCF). It was not until the first revision in 1992 that it was adopted by the Codex Alimentarius Commission and published as the first international HACCP standard. HACCP has since then been extensively and efficaciously been utilized by the food industry and by regulatory authorities to prevent and control risks associated with potential hazards that may dispose food to being unsafe.

It was in 2001 that the International Organization for Standardization (ISO) commenced work on an auditable standard for Food Safety Management System (FSMS). This international FSMS standard, known as ISO 22000, was published in September 2005. It is a framework that pools prerequisite programs, the HACCP principles and application steps as described by the Codex Alimentarius Commission and elements of the ISO 9001:2000 standard.

Within two years more than 50 countries started using the standard as an alternative to more than 20 food safety schemes developed by individual companies in the sector for auditing their suppliers.

ISO 22000 intends to define the Food Safety Management System requirements that companies are required to meet in order to conform to food safety regulations worldwide.

ISO 22000:2018 Food safety management system is a necessity for any organization in the food chain, and it lays down what is required of a system of food safety management. It defines organizational needs which establish its ability to control food safety hazards and ensure the safety of food for human consumption. It takes a food chain approach to food safety. It states the established requirements for management of food safety that apply to all organizations in the food supply chain including food producers and manufacturers. It stipulates the needs for an FSMS to

combines the following strategic elements to ensure safety of food along the food chain:

1. Interactive communication. Communication along the food chain is important to identify and adequately control all relevant food safety hazards at each stage of the food chain. This entails intra-organizational communication, both upstream and downstream along the food chain.
2. Management system. ISO 22000 can be applied independently of other management system standards. Its application can be allied or incorporated with current interrelated management system necessities, while organizations may use prevailing system(s) of management to inaugurate a system of food safety management that fulfils the requirements of ISO 22000.
3. HACCP principles and prerequisite programs. ISO 22000 incorporates the principles of the Hazard Analysis and Critical Control Point (HACCP) system, and through auditable requirements it combines the plan of HACCP with prerequisite programs (PRPs). Prerequisite programmes encompass all basic conditions and activities that are required to sustain an environment that is hygienic all through the food chain which are suitable for the production, handling and provision of safe end-products.

HACCP is an industry-specific hazard assessment tool that is centered on preventing hazards instead of inspecting end-products. The HACCP tool can be applied throughout the food chain from primary production to final consumption.

This is different from the HACCP system which is a universally recognized Food Safety System. The HACCP system aids in identifying and controlling the hazards that may arise in the process of producing food. The system canters around the prevention of potential hazards by strictly monitoring and controlling each critical control point of the food production process. Although the HACCP system was made up of three principles initially, it has been revised over time to simplify it and introduce changes; however, the initial concept of HACCP has been always been maintained.

The three original HACCP principles were:

1. Identification and assessment of hazards associated with the food product;
2. Determination of the critical control points to control the identified hazards; and
3. Establishment of a system to monitor the critical control points.

At present, there are five preliminary steps and seven principles associated with application of the HACCP system. The five preliminary steps are extra steps outlined by the Codex, and are required to be carried out prior to implementation of the seven principles of HACCP. These steps ensure more effective establishment, implementation and management of the HACCP system.

A. Application of the HACCP system in 12 steps

Five preliminary steps:

1. Assemble HACCP team
2. Describe the product
3. Identify intended use
4. Construct flow diagram
5. On-site confirmation of flow diagram

Seven principles of the HACCP system:

1. Conduct a hazards analysis
2. Determine Critical Control Points
3. Establish critical limits for each CCP
4. Establish a monitoring system for each CCP
5. Establish corrective actions
6. Establish verification procedures
7. Establish documentation and record keeping

The HACCP system can be applied to any company regardless of its size, or if it is directly or indirectly involved in the food chain. The implementation of HACCP system should be supported by prerequisite programs. That is, an organization that is getting ready to implement the HACCP system needs to have in place, prerequisite programs that are being carried out in accordance with national regulations, codes of practice or other food safety requirements. Prerequisite programs are listed below, and they can be incorporated to support the HACCP system. However, every business does not necessarily need to have the same prerequisite programs.

B. Common prerequisite programs may include but are not limited to:

1. Facilities and Equipment
2. Personnel Training
3. Cleaning and Sanitation
4. Maintenance
5. Supplier Review
6. Chemical Control
7. Waste Management
8. Pest Management
9. Storage and Transportation
10. Product Recall Procedures
11. Labeling
12. Purchasing Procedures.

Difference between HACCP and ISO 22000

It must be pointed that there is a difference between HACCP and ISO 22000. Whilst HACCP is a food safety system ISO 22000 is a food safety management system standard. The differences between HACCP and ISO 22000 include:

1. ISO 22000 allows the development of a food safety management system by external experts for any company, and this includes implementation and

verification of all or part of activities involved in the system.

2. ISO 22000 also refers to good practices in sectors and general hygiene rules published by Codex Alimentarius.
3. According to ISO 22000, external communication is also an indication for instituting, executing and updating the FSMS, aside the internal communication.
4. ISO 22000 requires risk analysis to asses that each food safety hazards are recognized.
5. ISO 22000 demands documentation of prerequisite programmes (PRPs).
6. HACCP utilizes the customary concept of splitting control measures into two groups: prerequisites and measures applied at critical control points (CCPs). For ISO 22000, these concepts are restructured in a logical order by adding a group of control measures named operational prerequisite programs (oPRPs).
7. ISO 22000 stresses monitoring system and planning of corrective actions for oPRPs, as for CCPs.
8. ISO 22000 requires analysis and improvement according to the outcome of monitoring of oPRPs and HACCP plan.
9. ISO 22000 also necessitates the review and identification of specifications, formulation and origin for input and end-products.
10. ISO 22000 splits and clarifies verification activities and validation activities.
11. Allergen control is an essential prerequisite program in ISO 22000; but is not mentioned in HACCP.
12. In ISO 22000, new terminologies have been developed, such as “potentially unsafe product” and “withdrawal” for product recall and product recollection activities respectively.
13. ISO 22000 necessitates continuous improvement and updating of the management system.

It is mandatory for any food producer and manufacturer to have the HACCP system in place, whereas the ISO 22000 FSMS standard is voluntary. Research has however shown that the ISO 22000 certified dairy companies significantly outperform the non-certified with regard to the HACCP food safety system effectiveness, that is, to the degree of achievement of the HACCP objectives (Psomas & Kafetzopoulos, 2015).

V. LEGAL FRAMEWORK FOR FOOD SAFETY REGULATIONS IN NIGERIA

Adequate food safety and hygiene cannot be realized in Nigeria without a robust food safety regulatory system that is established by government. Effective national food safety control systems are necessary to protect the health and safety of consumers by assuring the safety of imports and exports as well as foods produced for local consumption. Such systems comprise food policy, law and regulations; food control management; inspection services; laboratory services and

information, education, communication and training programmes (Mwamakamba *et al.*, 2012). The extant National regulations relating to food safety are listed as follows (Omotayo and Denloye, 2002; Ifenkwe, 2012; Omojokun, 2013):

- a. The Public Health Laws (1917) now known as Public Health Ordinance Cap 164 of 1958;
- b. The Standards Organization of Nigeria Decree, No. 56 of 1971;
- c. The Animal Disease Control Decree, No. 10 of 1988;
- d. The Food and Drugs Decree, No. 35 of 1974 (now Food and Drug Act Cap F32 Laws of the Federal Republic of Nigeria, 2004);
- e. The Marketing of Breast Milk substitute Decree, No. 41 of 1990 (now Marketing - Breast Milk - Act Cap M5 LFN 2004);
- f. The National Agency for Food and Drugs Administration and Control (NAFDAC) Decree No. 15 of 1993 (now NAFDAC Act CAP N1 Laws of the Federal Republic of Nigeria, 2004);
- g. The Food, Drug and Related Products (Registration etc) Decree No 19 of 1993 [now Food, Drugs & Related Products (Registration etc.) Act Cap F33 Laws of the Federal Republic of Nigeria (LFN), 2004];
- h. The Counterfeit and Fake Drugs and Unwholesome Processed Food Act No 25 of 1999 (now Counterfeit & Fake Drugs and Unwholesome Processed Foods (Miscellaneous Provisions) Act Cap C34 LFN 2004.

Other regulatory instruments established by government are:

- a. The National Policy on Food and Nutrition in Nigeria (National Planning Commission, 2001) and
- b. Revised National Health Policy (Federal Ministry of Health, 2004).

An assessment of the above regulatory instruments reveals, among other deficiencies, that most of them are outdated (Omotayo and Denloye, 2002). They emphasize end product safety evaluation rather than process preventive evaluation which enables food producers take corrective actions before the distribution of food. The two existing policy instruments seem to beg the question of safety. They rather emphasize access to food than food safety.

In addition to the above shortcomings in the Nigeria food safety regulatory instruments they fail to meet the international guidelines for food safety and control as “a compulsory regulatory activity of enforcement by national or local authorities to deliver consumer protection and ensure that all foods during production, handling, storage, processing, and distribution are safe, wholesome and fit for human consumption; conform to safety and quality requirements; and are honestly and accurately labeled as prescribed by law.” (FAO/WHO, 2006; FAO, 2006). The guidelines state as follows:

Food legislation should include the following aspects:

1. It must provide a high level of health protection;
2. It should comprise clear definitions aimed at increasing consistency and legal security;
3. It should be founded on high quality, transparent, and independent scientific advice following risk assessment, risk management and risk communication;
4. It should comprise provision for the use of precaution and the adoption of provisional measures where an unacceptable level of risk to health has been identified and where full risk assessment could not be performed;
5. It should include provisions for the right of consumers to have access to accurate and sufficient information;
6. It should provide for tracing of food products and for their recall in case of problems;
7. It should include clear provisions indicating that primary responsibility for food safety and quality rests with producers and processors;
8. It should include obligation to ensure that only safe and fairly presented food is placed on the market;
9. It should also recognize the country's international obligations particularly in relation to trade; and
10. It should ensure transparency in the development of food law and access to information.

On inspection services, the guidelines state that administering and implementing food laws need qualified, trained, competent and candid food inspection services. The food inspector is a fundamental official who has daily interactions with the food industry, the food trade and frequently with the public. The reputation and integrity of the system of food control rests largely on the integrity and skill of the food inspectors.

VI. GLOBAL BEST PRACTICES IN FOOD SAFETY MANAGEMENT SYSTEM

Food safety management is everybody's business (FAO/WHO, 2019). There must be an effective collaboration between International bilateral and multilateral organizations, International Non-governmental organizations, different national governmental agencies, the local non-governmental agencies, the private sector and the food consumers. This is essential for success in food hygiene and food safety management which insures the production, manufacturing and delivery of safe food in the food chain, from farm to fork.

The use of international and national codes and legal framework in the establishment of national and company-specific food safety management system must be emphasized at every turn. Meaningful National participation in Codex Alimentarius Commission (CAC) activities of the United Nations is a basic requirement for successful food safety management system in any country. Countries that effectively participate are known to have successful food safety

management system which has reflected in improved health and a more prosperous economy (FAO/WHO, 2019). Participation in FAO/WHO International Food Safety Authority Network (INFOSAN) has enhanced cross border food safety and security (Savelli *et al.*, 2019). Often times because of resource constraint Nigeria does not have many of the state of the art guidelines. Some countries like Nepal have been using the ones provided by CAC pending the time they will have the resources to establish their own (FAO/WHO, 2019).

VII. CONCLUSION

Nigeria is a member of Codex Alimentarius Commission (CAC) and International Organization for Standardization (ISO) but its food safety management system has enough gaps that make it difficult (and sometimes impossible) for food producers and manufacturers to export their products. HACCP Committee is barely five years old, and organizations using HACCP and ISO 22000 form a wretched percentage of food producers and manufacturers. Something drastic actions must be taken to resolve this.

VIII. WAY FORWARD

- i. Nigeria should urgently incorporate HACCP and ISO 22000 across the food chain from farm to fork. This is more so as the possibility of food terrorism looms in and around us.
- ii. Decision making on food safety and hygiene management should be based on Science and not myth.
- iii. Nigeria should appropriate the state of the art application of technology in food hygiene and safety management.
- iv. Nigeria as a member of FAO/WHO International Food Safety Authority Network (IFOSAN) should promote and enhance information sharing on food hygiene and safety issues among stakeholders in the food chain.
- iv. The CODEX System in Nigeria is weak and should be strengthened urgently.
- v. Nigeria should have in-country Codex strategic plan which shall be shared among food safety stakeholders.
- vi. The legislative and regulatory framework should be strengthened to produce and enforce laws and regulations that are of international standard.

Finally, many food stakeholders especially the consumers do not have adequate knowledge of food hygiene and safety management systems, code and regulations so there should be a deliberate and systematic training of producers, manufacturers, distributors and consumers of food in Nigeria on food hygiene and safety management and the regulations governing them.

CONFLICT OF INTEREST STATEMENT

The authors have declared there is no conflict of interest.

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