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Research Supporting African MSMEs
To Provide Safe and Nutritious Food

Guidelines for Good Hygienic Practices for Fish and Fish Products

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Authors: Obadina Adewale and Lenis Saweda O. Liverpool-Tasie

Authors

Obadina Adewale is a Professor in the Department of Food Science and Technology at the Federal University of Agriculture Abeokuta, Ogun State, Nigeria

Lenis Saweda Onipede Liverpool-Tasie is a MSU Foundation Professor in the Department of Agricultural, Food, and Resource Economics at Michigan State University, East Lansing, Michigan.

Forward

The Nigerian Fish sector plays an important role in the food security and nutrition of Nigerians. It is also an important livelihood source for many. Fish production/capture and postharvest activities play a key role in ensuring that fish products meet the domestic demand and to promote export to international markets. Currently, a key challenge in the fish sector relates to the quality and safety of fish products and their possible impact on public health" This is especially so for the numerous small and micro enterprises that handle fish products. The RSM2SNF project is taking steps to help improve the quality and safety of fishery products by promoting Good Hygienic Practice (GHP) for Nigerian fish producers, traders, processing cooperative associations and other relevant stakeholders.

This document "Guidelines for Fish and Fishery Products" is a technical guide drafted by the RSM2SNF project in accordance with the guidelines of the Codex Alimentarius Commission, 2003. Using the practices outlined below, stakeholders should be able to minimize several food safety hazards, negative environmental impacts, and illnesses associated with unsafe food. It is envisaged that compliance of fish farmers, processors, transporters and vendors with these practices will enhance the volume of trade and the competitiveness of the country's fishery products while promoting consumer protection against food safety hazards. It is anticipated that this "Guidelines on Good Handling Practices" document will be supplemented with training materials and non-technical communication pieces appropriate for different stakeholder groups in Nigeria.

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About Research Supporting African MSMEs to Provide Safe and Nutrition Food (RSM2SNF)

The Research Supporting African MSMEs to Provide Safe and Nutritious Food (RSM2SNF) is funded by the Bill and Melinda Gates Foundation. RSM2SNF dives deep into the wholesale, logistics, processing, and retail segments of the value chains of several products, such as fish, tomato, and green leafy vegetables. The goal is to understand the midstream of these food value chains with a focus on Micro, Small and Medium Enterprises (MSMEs), and to inform policies and interventions to support MSMEs in providing safe and nutritious foods at affordable prices. This five-year project (2022–2026) is led by Michigan State University (MSU) working with partners in Nigeria and Tanzania.

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1 Scope

This guideline covers the general hygienic practices for the production, processing, transport, and sale of fish. For fish production, it pays particular attention to farmed fish raised in controlled environments such as tanks or earthen ponds; often used for processing by hot smoke drying to enhance the shelf-life. However, guidelines related to activities of postproduction (processing and handling) apply to all fish both farmed and captured.

2 Normative references

The following referenced document is recommended for the application of these guidelines.
Good Agricultural Practices (GAP) for production of fresh and smoked fish in Nigeria

3. Definitions (taken from the Code of Practice for Fish and Fishery Products (CAC/RCP 52-2003).

For the purpose of these guidelines, the following terms shall apply:

3.1 Biotoxins
Poisonous substances naturally present in fish and fishery products or accumulated by the animals feeding on toxin-producing algae or in water containing toxins produced by such organisms.

3.2 Cooling
The process of heat removal via cooling for fish and shellfish to a temperature approaching that of melting ice.

3.3 Clean water
Water from any source where harmful microbiological contamination, substances and/or toxic plankton are not present in such quantities that may affect the safety of fish, shellfish and their products intended for human consumption. Cleaning means the removal of soil, food residues, dirt, grease, or other objectionable matter.

3.4 Contaminant
Any biological or chemical agent, foreign matter or other substances not intentionally added to food that may compromise food safety or suitability.

3.5 Contamination
The introduction or occurrence of a contaminant in fish, shellfish and their products A control measure is any action and activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

3.6 Critical control point (CCP)
A step at which control can be applied and is essential to prevent or eliminate a food safety

hazard or reduce it to an acceptable level. e.g., to prevent feeding fish with contaminated matter.

3.7 Corrective action
Any action to be taken as a result of monitoring at the critical control point (CCP).

3.8 Critical limit
A criterion that separates acceptability from unacceptability. If the limit is exceeded, the process is not under control. Examples of critical safety limits for fresh fish include processing of the fish within 6 hours after harvesting or subject to cold-holding temperature. For smoked fish, the smoking temperature must be between 90 - 94 degrees Celsius (Obadina, 2022).

3.9 Decision tree
A sequence of questions applied to each process step with an identified hazard to identify process steps that are CCPs.

3.10 Decomposition
The deterioration of fish, shellfish and their products including texture breakdown causing a persistent and distinct objectionable odour or flavour.

3.11 Defect
A condition found in a product that fails to meet essential quality, composition and/or appropriate labelling provisions.

3.12 Dressed
That portion of fish remaining after heading and gutting.

3.13 Facility
Any premises where fish and fishery products are prepared, processed, chilled, frozen, packaged or stored. For the purposes of these guidelines, premises also include vessels.

3.14 Fish
Any of the cold-blooded (ectothermic) aquatic vertebrates with fins, scales/gelatin and breath using gills. Amphibians and aquatic reptiles are not included.

3.15 Hazard
A biological, chemical, or physical agent in, or condition of, food with the potential to cause an adverse health effect.

3.16 Microbiological contamination
The presence, introduction, reintroduction, growth and/or survival of pathogens of public health concern.

3.17 Monitor
The act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control.

3.18 Potable water
Freshwater fit for human consumption. Standards of potability should not be lower than those contained in the latest edition of the International Standards for Drinking-water issued by the World Health Organization.

3.19 Raw materials
Fresh and frozen fish, shellfish and/or their parts that may be utilized to produce fish and shellfish products intended for human consumption.

3.20 Shelf-life
The period during which the product maintains its microbiological and chemical safety and sensory qualities at a specific storage temperature. It is based on identified hazards for the product, heat or other preservation treatments, packaging method and other hurdles or inhibiting factors that may be used.

3.21 Whole fish (or round fish)
Fish as captured, ungutted.

4. Aquaculture
Refer to the Code of Practice for fish and Fishery Products (CAC/RCP 52-2003).

4.1 Aquaculture
The farming during part or the whole of their life cycle of all aquatic animals, intended for human consumption, except mammalian species, aquatic reptiles, and amphibians. These aquatic animals are hereafter referred to as "fish".

4.2 Aquaculture establishment
Any premises for the production of fish intended for human consumption, including the supporting inner infrastructure and surroundings under the control of the same management.

4.3 Chemicals
Any substance either natural or synthetic that can affect the live fish, its pathogens, the water, equipment used for production or the land within the aquaculture establishment.

4.4 Colouring
Obtaining specifically coloured feature (e.g., flesh, shell, or gonad) of a targeted organism by incorporating into the fish food a natural or artificial substance or additive approved for this purpose by the agency having jurisdiction.

4.5 Diseased fish
A fish on or in which pathological changes or other abnormalities that affect safety and quality are apparent.

4.6 Extensive farming
Raising fish under conditions of little or incomplete control over the growing process and production conditions where their growth is dependent upon endogenously supplied nutrient inputs.

4.7 Feed additives
Chemicals other than nutrients for fish that are approved for addition to their feed.

4.8 Fish farm
An aquaculture production unit (either land- or water-based); usually consisting of holding facilities (tanks, ponds, raceways, cages), plant (buildings, storage, processing), service equipment and stock.

4.9 Fish feed
Fodder and animal protein intended for fish in aquaculture establishments, in any form and of any composition.

4.10 Good aquaculture (or good fish farming) practices
Those practices of the aquaculture sector that are necessary to produce quality and safe food products conforming to food laws and regulations.

4.11 Harvesting
Operations involving taking the fish from the water.

4.12 Intensive farming
Raising fish under controlled growing process and production conditions where their growth is completely dependent on externally supplied fish feed.

4.13 Semi-intensive farming
Raising fish under conditions of partial control over the growing process and production conditions where their growth is dependent upon endogenously supplied nutrient inputs and externally supplied fish feed.

4.14 Stocking density
The quantity of fish stocked per unit of area or volume.

4.15 Veterinary drug
Any substance applied or administered to any food producing animal, such as meat- or milk-producing animals, poultry, fish, or bees, whether used for therapeutic, prophylactic, or diagnostic purposes or for modification of physiological functions or behaviour.

4.16 Withdrawal time

The period necessary between the last administration of a veterinary drug to fish, or exposure of these animals to a veterinary drug, and harvesting of them to ensure that the concentration of the veterinary drug in their edible flesh intended for human consumption complies with the maximum permitted residue limits.

5. Smoked and Smoke-dried fish

Refer to the Code of Practice for fish and Fishery Products (CAC/RCP 52-2003).

5.1 Smoking

A process of treating fish by exposing it to smoke from smouldering wood or plant materials. This process is usually characterised by an integrated combination of salting, drying, heating and smoking steps in a smoking chamber.

5.2 Smoke Drying

A process in which fish is treated by combined smoking and drying steps to such an extent that the final product can be stored and transported without refrigeration and to achieve 10% of moisture or less, as necessary to control bacteria pathogen or fungal spoilage.

5.3. Drying

A process in which the moisture content in the fish is decreased to appropriate required characteristics under controlled hygienic conditions.

5.4 Salting

A process of treating fish with salt of food grade quality to lower water activity in fish flesh and to enhance flavour by any appropriate salting technology (e.g., dry salting, brining, injection salting).

5.5 Packaging of smoked fish or smoke-flavoured fish

A process in which smoked fish or smoke-flavoured fish is put in a container, either aerobically or under reduced oxygen conditions including under vacuum or in a modified atmosphere.

5.6 Storage

A process in which products covered by these guidelines are kept under conditions to assure their safety and quality.

6. Recommended production and handling practices

Drawn from the Code of Practice for fish and Fishery Products (CAC/RCP 52-2003).

6.1 Good Aquaculture Practice for Fish Farming (drawn from Good Aquaculture Practice for Fish Farming – FF Singapore Food Agency)

6.1.1 Farm Structure and Maintenance

- Farm and on-farm equipment and facilities must be well maintained, with proper equipment storage. Farm equipment,should be disinfected.
- Farm structures should be checked regularly for damage or signs of weakness/instability to minimise risk of escapes.
- Farm should take appropriate measures to deter/prevent predator entry into fish culture areas.
- Farm, in particular, the packing area, must be cleaned regularly with planned cleaning schedules and procedures.

6.1.2Farming and Packaging Practices

- Fish Stock Management
- Incoming fish stocks must be of good health and known origin i.e. from hatchery source.
- New fish stocks should be quarantined and separated from the other fish stocks.
- There must be proper documentation of fish stocks in the various netcages which must be labelled, and records MUST be kept of fish movement between netcages.

6.1.3 Feed Management

- Fish must be fed in a manner that avoids over-feeding and minimises water pollution.
- Feeding on dry, formulated pellet feeds is encouraged.
- Feeds must be properly stored to prevent spoilage/decomposition/ contamination.
- Expired or rancid fish feeds must not be used. Expiry dates of fish feed must be clearly stated on the storage containers/bags.
- Records of fish feed purchases (suppliers, dates, etc) must be kept.

6.2 Fishing Operations and Construction of fishing structures

There are many different types of fishing and fish farming systems used throughout the world. They have evolved in particular regions to take account of the prevailing economics (demand and supply for different kinds of fish) and environment (e.g., existence of water bodies and temperatures). This section attempts to highlight the basic requirements for cleanliness, which all fish production systems should have, to the extent possible, to ensure hygienic, high-quality in the handling of fresh fish as well as fish intended for further processing and during transportation. It is based on common practices found in Nigeria.

The design and construction of a fishing structure used to farm and harvest fish such as earthen ponds, plastic tanks, concrete tanks, and tarpaulin ponds commonly used in Nigeria should take the following into consideration:

6.2.1 For ease of cleaning and disinfection

- The structure should be designed and constructed to minimize sharp corners with spaces (inside the pond/structure) that are difficult to clean to avoid trapping dirt and thus expose the fish to more contaminants.
- The structure should facilitate ample drainage.
- A good supply of clean water or potable water at adequate pressure should be in use. For example, in Nigeria the pond water should be treated to supply fish adequate oxygen and save them from intoxication and other microbial infections.
- For fishers, vessels used for capture should be kept clean.

6.2.2 To minimize contamination.

- All surfaces in handling areas should be non-toxic, smooth, and impervious to contaminated water/fluid and in sound condition to minimize the buildup of fish slime, blood, scales, and guts and to reduce the risk of physical and microbial contamination.
- Where appropriate, adequate facilities should be provided for the handling and washing of fish with an adequate supply of potable water or clean water.
- Adequate facilities should be provided for the washing and disinfecting equipment, where appropriate.
- The intake for clean water should be located, to avoid contamination.
- All plumbing and waste lines should be capable of coping with peak demand.
- Where appropriate, containers for offal and waste material should be clearly identified, suitably constructed with a fitted cover and made of impervious material such as plastic, metals or cement.
- Separate and adequate facilities should be provided to prevent the contamination of fish and dry materials, such as packaging, by: – poisonous or harmful substances; – dry storage of materials, packaging, etc.; – offal and waste materials.
- Adequate hand washing and toilet facilities, isolated from the fish handling areas, should be available.
- The entry of birds, insects, or other pests, animals, and vermin, should be prevented, where appropriate.

- Individuals handling fish should avoid wearing jewellery such as rings because they are made from metals and can thus be a source of physical, chemical, and microbiological contamination to the fish.

6.3 Good handling practices at market places and processing clusters

6.3.1 Construction at market places and processing clusters

The construction/design and/or organization of a processing facility and/or market should take into consideration the following for ease of cleaning and disinfection

- Equipment should be durable and movable and/or capable of being disassembled to allow for maintenance, cleaning, disinfection, and monitoring.
- Equipment, containers, and utensils coming into contact with fish should be designed to provide for adequate drainage and constructed to ensure that they can be adequately cleaned, disinfected and maintained to avoid contamination.
- Equipment and utensils should be designed and constructed to minimize sharp inside corners and projections as well as tiny crevices or gaps to avoid dirt traps.
- A suitable and adequate supply of cleaning utensils and cleaning agents, approved by the official agency having jurisdiction, should be provided.
- In the absence of a strong regulatory system, the coordination of access to (and use of) appropriate cleaning utensils and agents should be coordinated by the leadership of the traders and processors and/or those managing the day to day operations of the market or processing cluster.

6.3.2 To minimize fish contamination in markets and processing clusters

- All surfaces of equipment in handling areas should be non-toxic, smooth, impervious to heat and contaminants from the environment (e.g., liquids and contaminated water). The surfaces and equipment handling areas should also be designed to minimize the buildup of fish slime, blood, scales, and guts and to reduce the risk of physical contamination.
- Accumulation of solid, semi-solid or liquid wastes should be minimized to prevent contamination of fish.
- Adequate drainage should be provided.
- Drainage should be unable to contaminate products.

6.3.3 To minimize damage to fish and fish products

- Surfaces should have a minimum of sharp corners and projections.
- Storage equipment should be fit for the purpose and not lead to crushing of the product.

7.0 Hygiene control programme along the fish value chain (drawn from the Code of Practice for fish and Fishery Products (CAC/RCP 52-2003).

The potential effects of harvesting and handling activities on the safety and suitability of fish should be always considered. This includes maintaining hygienic practices at all points where contamination may occur and taking specific measures to ensure the production of a safe and wholesome product. The type of control and supervision needed will depend on the size of the operation and the nature of its activities.

Frequent hygiene activities as listed in 7.1 below should be implemented to:

- prevent the buildup of waste and debris.
- protect the fish from contamination.
- dispose of any rejected material in a hygienic manner.
- monitor personal hygiene and health standards.
- monitor the pest control programme.
- monitor cleaning and disinfecting programmes.
- monitor the quality and safety of water used.

The hygiene control programme should take into consideration the following:

7.1 A permanent cleaning and disinfection schedule

A permanent cleaning and disinfection schedule should be drawn up to ensure that all parts of the containers, processing facility and equipment therein are cleaned appropriately and regularly. The schedule should be reassessed whenever changes occur to the processing facility and/or equipment. Part of this schedule should include a "clean as you go" policy. This guideline applies to individual fish traders or processors in a market/cluster and any shared spaces/equipment (e.g., smoking kilns or mud ovens) used jointly by traders/processors. It also applies to other stakeholders such as transporters during their handling of fish products.

A typical cleaning and disinfecting process may involve as many as seven separate steps:

Precleaning: Preparation of area and equipment for cleaning.
Pre-rinse: A first rinsing with water to remove remaining large pieces of loose soil.
Cleaning: The removal of soil, food residues, dirt, grease, or other objectionable matter.
Rinse: A second rinsing with potable water or clean water, as appropriate, to remove all soil and detergent residues.
Disinfection: Application of chemicals, approved by the official agency having jurisdiction, and/or heat to destroy most microorganisms on surfaces.
Post-rinse: As appropriate, a final rinse with potable water or clean water to remove all disinfectant residues.
Storage: Cleaned and disinfected equipment such as the container and utensils used for handling fish, nets for harvesting, should be stored in a fashion that would prevent their contamination.

Fish farmers, middlemen that transport fish to processors and transporters should be well trained in the use of special cleaning tools and chemicals, and in methods of dismantling equipment for cleaning and they should be knowledgeable in terms of the significance of contamination and the hazards involved.

7.1.2 Designation of personnel for cleaning

- In each processing cluster, plant or vessel, a trained individual should be designated to be responsible for the sanitation of the processing facility or vessel and the equipment therein.
- Where not appointed/provided for by the government, market/processing cluster leaders can coordinate for the provision of this service by an external provider or by getting one of their

members (processors or traders in the cluster) to be trained for this task.

7.1.3 Maintenance of premises/environment, equipment, and utensils

- Buildings, materials, utensils, and all equipment in the establishment – including drainage systems – should be maintained in a good state and order.
- Equipment, utensils and other physical facilities of the plant or vessel should be kept clean and in good repair.

7.1.4 Pest control systems

- Good hygienic practices should be employed to avoid creating an environment conducive to pests.
- Pest control programmes could include preventing access, eliminating harbourage and infestations, and establishing monitoring detection and eradication systems.

7.1.5 Supply of water

When an establishment has its own supply of water or other water sources, and chlorine is used for the treatment of water that may come in direct contact with fish and fishery products, the residual content of chlorine should not exceed that of potable water. The use of higher concentrations of chlorine in water treatment, in the primary production-to-consumption food chain is subject to approval by the competent authority.

7.1.6 Waste management

- Offal and other waste materials should be removed from the premises of a processing facility on a regular basis.
- Facilities for the containment of offal and waste material should be properly maintained.
- Containers for waste discharge should not contaminate water intake systems or incoming product.

7.2 Personal hygiene and health

An appropriate degree of personal hygiene should be maintained by all individuals handling fish to avoid contamination. This cuts across the middlemen and transporters (moving fish from one location to another) as well as the farmers and traders and all actors should be continually reminded about the need for and practices associated with good hygiene.

7.2.1 Facilities and equipment

Facilities and equipment should include:

- Adequate means of hygienically washing and drying hands.
- Adequate toilet and changing facilities for personnel, suitably located, and designated.

7.2.2 Personnel hygiene

- No person who is known to be suffering from, or who is a carrier of, any communicable disease or has an infected wound or open lesion should be engaged in preparation, handling, or transportation. Traders, processors and transporters should be educated and reminded about this.
- Where necessary, adequate, and appropriate protective clothing, head coverings and

footwear should be worn.

- All persons working in a facility should maintain a high degree of personal cleanliness and should take all necessary precautions to prevent contamination.
- Hand washing should be carried out by all personnel working in a processing area:
  - at the start of fish or shellfish handling activities and upon re-entering a processing area.
  - immediately after using the toilet.
- The following should not be permitted in handling and processing areas:
  - smoking;
  - spitting;
  - chewing or eating;
  - sneezing or coughing over unprotected food;
  - the adornment by personal effects, such as jewellery, watches, pins, or other items that may pose a threat to the safety and suitability of the products.

7.3 Transportation

Vehicles should be designed and constructed:

- such that walls, floors and ceilings, where appropriate, are made of a suitable corrosion-resistant material with smooth, non-absorbent surfaces. Floors should be adequately drained.
- to provide the fish with protection against contamination, exposure to extreme temperatures and the drying effects of the sun or wind;

7.4 Training

Fish hygiene training is of fundamental importance. All personnel should be aware of their roles and responsibilities in protecting fish from contamination and deterioration. Handlers should have the necessary knowledge and skill to enable them to handle fish hygienically. Those who handle strong cleaning chemicals or other potentially hazardous chemicals should be skilled with safe handling techniques. The training should be able to enhance the technical skills of handlers along the value chain to meet basic food safety and hygiene standards. The training is to be facilitated with a well-constructed basic food safety manual. Training and reminders about the importance of good handling practices and hygiene should be deliberately planned by relevant authorities including the government agencies responsible for food safety and hygiene (e.g. environmental officers in local government areas) as well as trader, processor and transporter associations.

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