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NUTRITION EDUCATION, FOOD SAFETY, AND SAFE FISH HANDLING PRACTICE GUIDE FOR FISH PROCESSORS IN NIGERIA



Feed the Future Innovation Lab for Fish Nourishing Nations Team



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MODULE 1 NUTRITION EDUCATION

HEALTHY EATING

Nourishing Nations Project

August 2021/Delta State, Nigeria



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HEALTHY DIET

WHITE



BROWNS



RAINBOW



Home Garden Toolkit, World Vegetable Center.



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EATING THE RIGHT PORTIONS



- ❖ **WHITE:** Grains, roots, and tubers ($\frac{1}{4}$ of your meal)
- ❖ **BROWN:** Proteins, milk and milk product ($\frac{1}{4}$ of your meal)
- ❖ **RAINBOW:** Fruits and Veggies ($\frac{1}{2}$ of your meal)
- ❖ **Diverse diet** are daily meals with a variety of foods from all the food colors.

Adegoye G.A 2022. Adapted from Home Garden Toolkit, World Vegetable Center.





WHITE, BROWN, AND RAINBOW FOODS

- **WHITE:** White foods are carbohydrates, and starch. They provide us with energy. Examples are rice, potatoes, cassava, cocoyam, yams, gari, maize, millet, and wheat.
- **BROWN:** Brown foods supply our bodies with proteins that build our muscles. Examples are fish, beef, pork, beans, eggs, chicken, seeds and nuts, tofu, and milk.
- **RAINBOW:** Rainbow foods (reds, oranges, yellows, greens, blues, purples) provide our bodies with the nutrients needed to fight disease and help our organs (eyes, heart, lungs, liver, and brain) function properly. Examples are mango, pawpaw, tomatoes, and spinach.





BENEFITS OF EATING RAINBOW FOODS: FRUITS AND VEGETABLES



FRUITS

- ❖ Fruits are a good source of vitamin C, folic acid, and other nutrients. Fruit is good for pregnant women and children
- ❖ Eating fruit can help lower the risk of heart problems, high blood pressure and stroke
- ❖ Eating fruit may protect against certain types of cancers



VEGETABLES

- ❖ Eating plenty of vegetables can help lower high blood sugar, high blood pressure, and risk of heart problems
- ❖ Vegetables are good for eyes, and skin, and keeps gums and teeth healthy
- ❖ Vegetables support proper digestion of food





BENEFITS OF EATING BROWN FOODS: PROTEINS, MILK AND DAIRY



PROTEINS

- ❖ Proteins help in building body muscle and repairing worn out tissues.
- ❖ Omega 3 fatty acid in seafood can help to lower blood pressure



MILK AND MILK PRODUCTS (DAIRY)

- ❖ Good source of protein and it contains various vitamins and minerals that are important for healthy growth and development in children and pregnant women.





BENEFITS OF EATING WHITE FOODS: GRAINS, ROOTS, AND TUBERS



GRAINS

- ❖ Grains contain fiber, vitamins, and minerals
- ❖ Fiber in grains can lower the risk of colon cancer
- ❖ Fiber also helps in food digestion



ROOTS AND TUBERS

- ❖ Root and tubers are rich in carbohydrates and starch. They provide energy
- ❖ They can help raise the sugar level in the blood when it is low. They also contain fiber.

Source: modernfarmer.com





BENEFITS OF BREASTFEEDING FOR INFANTS

HEALTHY EATING FOR INFANTS

1. Breastmilk contains all nutrients the baby needs for proper growth
2. Breastmilk provides natural protection to babies against diseases
3. Feeding only breastmilk for the first six months of life is healthy for both the baby and mother

CDC, Brown, J. E. 2016



Photo by: Adegoye David. A





BENEFITS OF BREASTFEEDING TO MOTHERS

Breastfeeding can help to lower a mother's risk of:

1. high blood pressure
2. high blood sugar
3. breast cancer

CDC, Brown, J. E. 2016

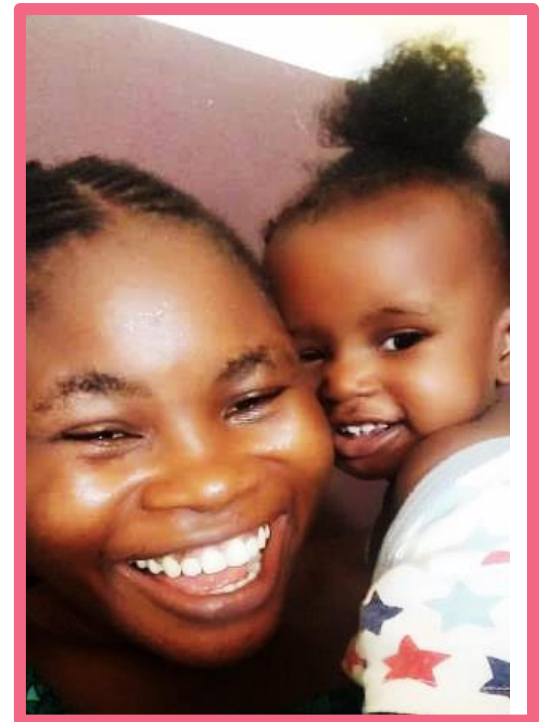


Photo by: Adegoye David. A





HEALTHY EATING TIPS FOR WOMEN

- ❖ During pregnancy and breastfeeding, women need more energy
- ❖ Women's bodies change a lot during pregnancy and throughout breastfeeding to support the needs of the baby
 1. Eat foods from healthy plate
 2. Eat small extra meals
 3. Eat when you feel hungry
 4. Avoid processed and packaged foods
 5. Also drink lots of water





EASY WAY TO MAKE HEALTHY MEAL

1. A healthy plate should contain one food from each color group every day.
2. A healthy plate has a lot of food variety to supply all the nutrients the body needs.
3. Change the foods you consume within each color group whenever possible.
4. A healthy plate is one-quarter white foods, one-quarter brown foods, and half rainbow foods.
5. Eat the right portion of each color at every meal. A colorful plate makes a healthy meal.
6. Eating the right mix of food can help you stay healthy.
7. Eat less processed, packaged, sugary, salty, and fried foods.





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MYPLATE FOR NIGERIA



Adegoye G. A. 2022, Adapted from USDA MyPlate



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MODULE 2 ANIMAL SOURCE FOOD

ANIMAL SOURCE PROTEIN

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ANIMAL SOURCE PROTEIN

- ❖ Animal sources of protein come from animals and seafood.
- ❖ They are mostly in the brown food group.
- ❖ They supply nutrients that are important for children's growth.
- ❖ Examples are egg, fish, beef, chicken, milk, cheese, snail, crab, and other seafood.





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FISH

- ❖ Fish is one of the animal source foods
- ❖ It is rich in proteins
- ❖ It contains different kinds of vitamins and minerals
- ❖ Fish is cheaper than other animal source proteins
- ❖ It supplies nutrients important for normal growth to children and pregnant mothers



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MOTHER'S NUTRITION AND CHILD'S HEALTH

- ❖ Nutrition of the mother can affect her child's growth and development
- ❖ Nourished mother may deliver normal weight babies
- ❖ Unborn babies can be harmed by mother's poor nutrition
- ❖ The child may be sick even after birth
- ❖ Pregnant women, especially adolescent young girls, need more nutrients for normal growth and development of their child
- ❖ Eating different forms of animal source protein with other food groups will provide enough nutrient for the mother and the baby



Photo by Dr. Lyle Conrad – Centers for Disease Control and Prevention, Atlanta, Georgia, USA Public Health Image Library (PHIL); ID: 6901.



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BENEFITS OF EATING FISH: PREGNANT AND BREASTFEEDING MOTHERS



- ❖ Fish supplies nutrients (calcium, iron) for baby's growth and development during pregnancy and after birth



- ❖ Fish contains omega-3 fatty acids that are good for the mother's heart health
- ❖ Omega 3 fatty acid in fish can help with blood pressure during pregnancy





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BENEFITS OF EATING FISH: INFANTS AND CHILDREN



Brain
development



Good vision



Strong bone



Strong teeth



Normal growth

Photo: Adegoye David A.



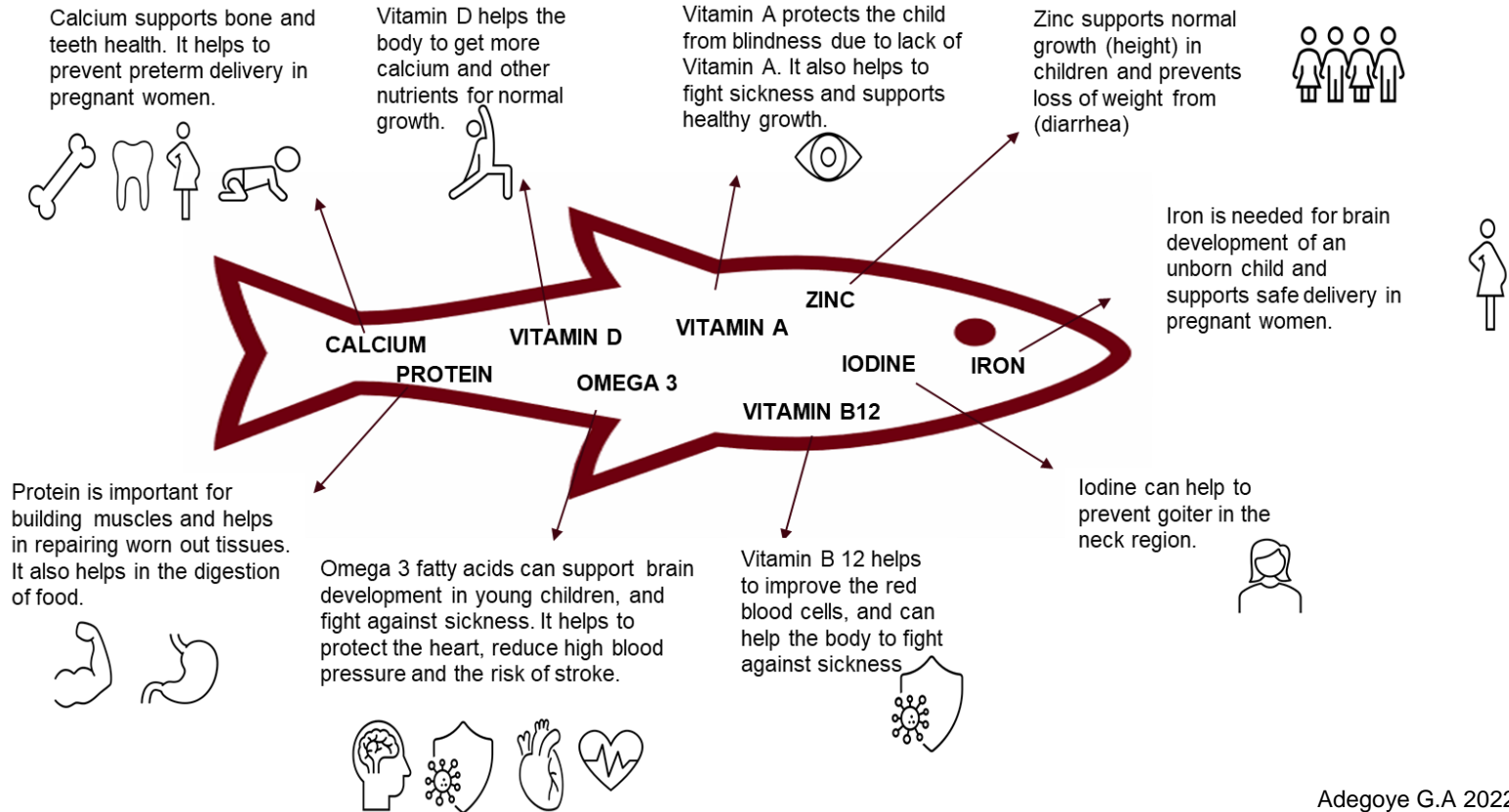
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GENERAL BENEFITS OF EATING FISH



Adegoye G.A 2022





MODIFIED FOOD FOR CHILDREN OVER 6 MONTHS

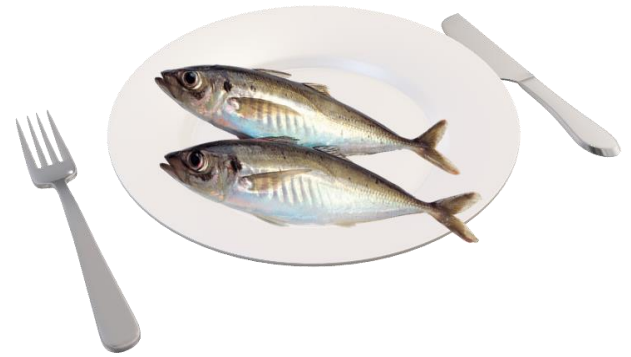
1. Introduce solid foods; rainbow, white and brown foods.
2. Small, dried fish can be pounded and mixed with stews or porridges.
3. Mix paste fish with boiled vegetables, pulses, and stews.
4. Boil vegetables until they are soft and then mash.
5. Boil beans until they are soft and then mash.
6. Fruits can be blended to make smoothies for young children.





DIETARY RECOMMENDATION ON FISH EATING

1. Eat fish at least 2-3 times a week
2. Serve 2-3 serving of fish a week to children
3. Eat a variety or different kinds of fish, if possible
4. Preferably serve small fish to children because they are more nutritious and safer.
5. Fish powder and paste can be mixed with other foods to provide extra nutrients
6. Serve fish with leafy green vegetables, and other rainbow foods.





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MODULE 3 FOOD SAFETY

FISH SAFETY AND HANDLING

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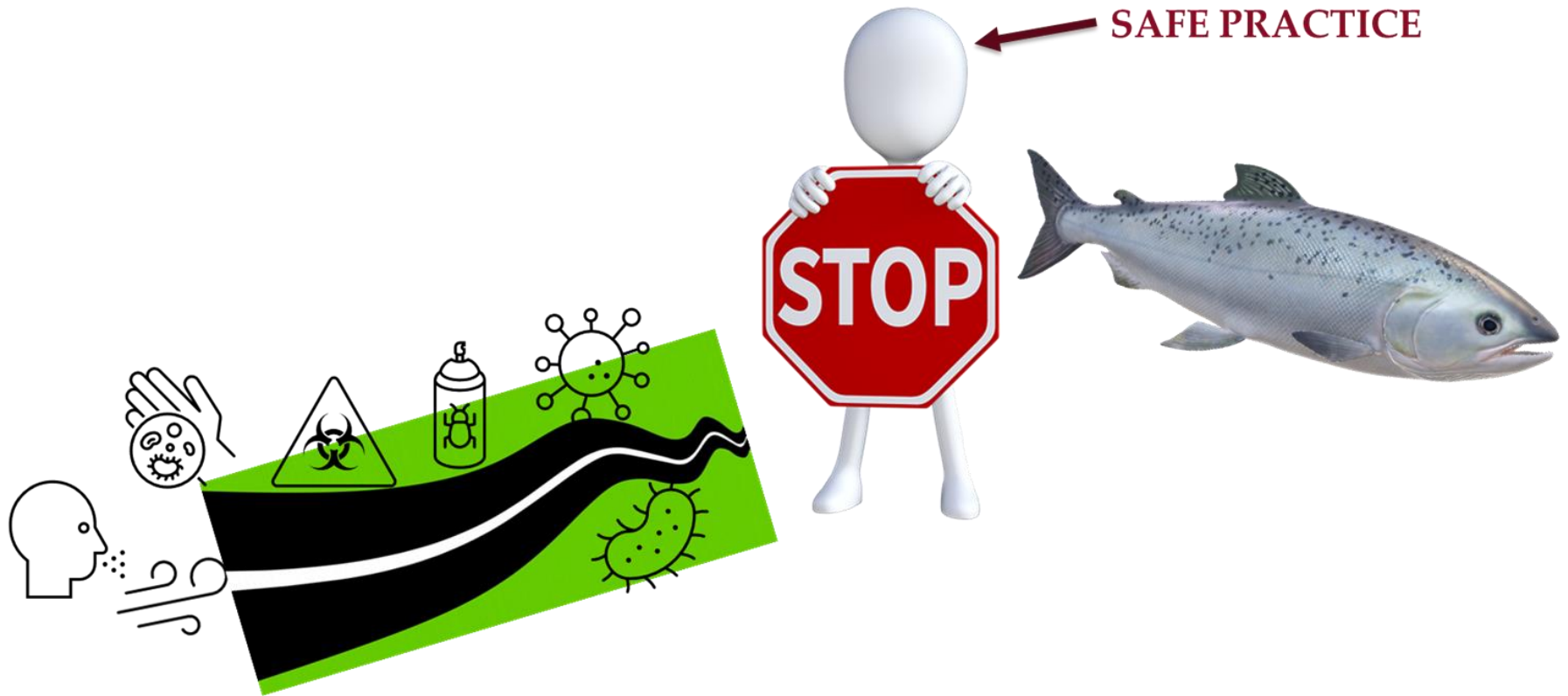
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SAFE FISH HANDLING AND PRACTICES



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KEYS TO FOOD SAFETY



WASH- wash your hands, utensils, cutting boards.



COOK- cook fish thoroughly to kill germs or bacteria.



SEPARATE- separate raw fish from processed or ready to eat food.



REFRIGERATE (Keep cool)- keep fish products at a low temperature. In the absence of a refrigerator use ice cubes or cold water.



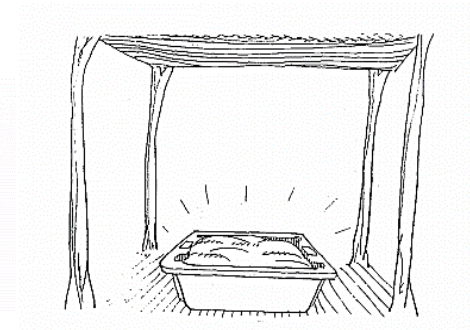
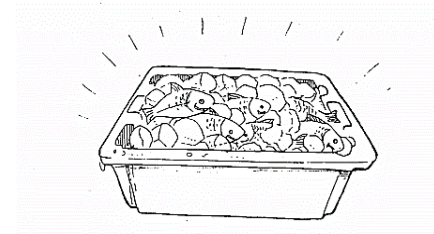
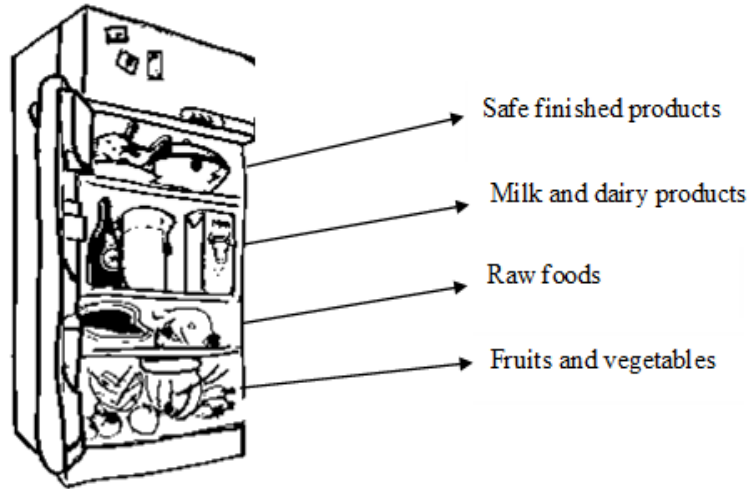
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KEEP RAW FISH UNDER A COLD TEMPERATURE



Keep raw fish in a container with ice cubes and enough clean seawater and/ or cover under shelter with a wet clean cloth if there is no ice.

Keep raw fish and processed fish separately in a refrigerator

Adapted from FAO/PAHO-WHO 2014, *Food Handlers Manual*.

Diei Y and Ndiaye O, 1998.

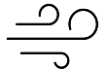




UNSAFE CONDITIONS THAT CAN SPOIL FISH



Temperature: raw fish spoils quickly when it is not under a cold or chilled condition.



Air: human needs air (oxygen) to survive, so do food spoilage organisms.



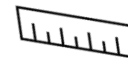
Time: fish spoils when it stays for long periods of time under unsafe conditions.



Moisture: Dried fish spoils when they stay too long under wet conditions.



Food: food spoilage germs and other insect or animals feed on fish as food and cause spoilage



Acidity: neutral condition like water favors some food spoilage germs

Servsafe Manager, 2017



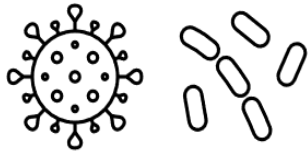
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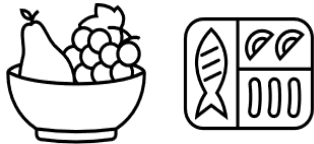
WHY DO WE NEED TO PRACTICE FOOD SAFETY?



Keep germs or disease-causing agents out of food



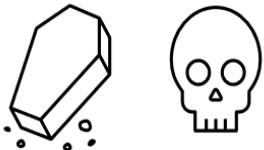
Protect us from getting sick (germs)



Enable safe and quality food free from germs



Reduce hospital bills for treatment



Prevent untimely death from food poisoning



Reduce time spent sick in the hospital





FOOD-BORNE ILLNESSES

Food-borne illnesses or **illnesses** are caused by germs that can make us sick when they get into the food we eat or water that we drink.

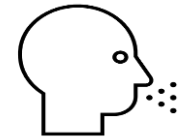
How to know if you are suffering from food-borne sickness



Headache



Fever



Vomiting



Sweating



Stomach pain/discomfort



Stooling





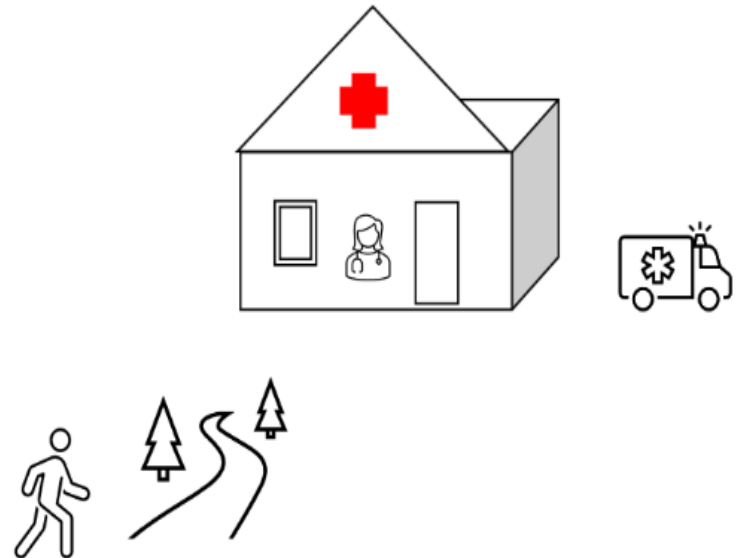
SAFE PRACTICES

1. Do not handle fish if you suffer from these:

- Coughing
- Vomiting
- Stooling
- Fever
- Headache
- Stomach upset



2. Visit hospital for treatment











Adegoye et al, 2022





HANDWASHING TIPS FOR FISH HANDLERS

- 1  Wet your hands
- 2  Apply soap & scrub for 20 seconds.
- 3  Rub palm to palm
- 4  Rub back of your hands with fingers open
- 5  Rub palm to palm with fingers open
- 6  Rub back of fingers to palms with hands interlocked
- 7  Rub the thumb
- 8  Wash the fingertips
- 9  Rinse your hands with clean water
- 10  Air dry your hands. Now your hands are safe 

FAO/PAHO-WHO 2014



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WHEN TO WASH YOUR HANDS

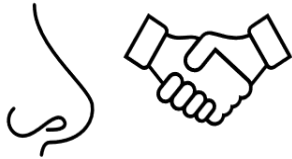
Wash your hands



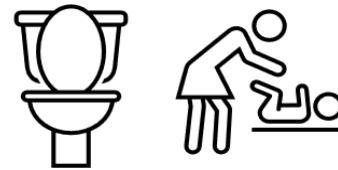
After handling raw fish or meat.



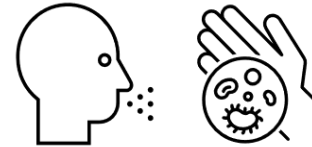
Before handling any food



After picking your nose, scratching your body or shaking hands



After using the toilet or changing baby's diaper



If you sneeze or cough into your hand



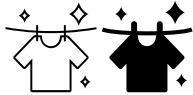
Hand sanitizer does not replace handwashing

Servsafe Manager, 2017

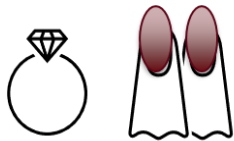




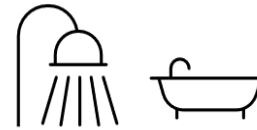
PERSONAL HYGIENE OF FISH PROCESSORS



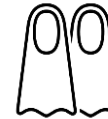
Wash your clothes, apron, and headwear regularly with soap and clean water.



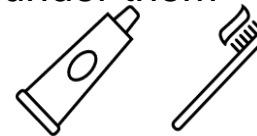
Do not wear jewelry, ring, nail polish while handling fish



Bath at least once a day, especially after the day's job



Cut your fingernails to prevent germs from hiding under them



Brush your teeth at least once daily





PERSONAL PROTECTIVE WEARS



Picture from Amazon.com

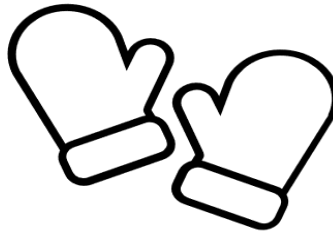
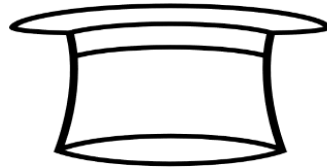


Photo by Alaina Dismuke





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MODULE 4 FISH PROCESSING TECHNIQUES

FISH PROCESSING

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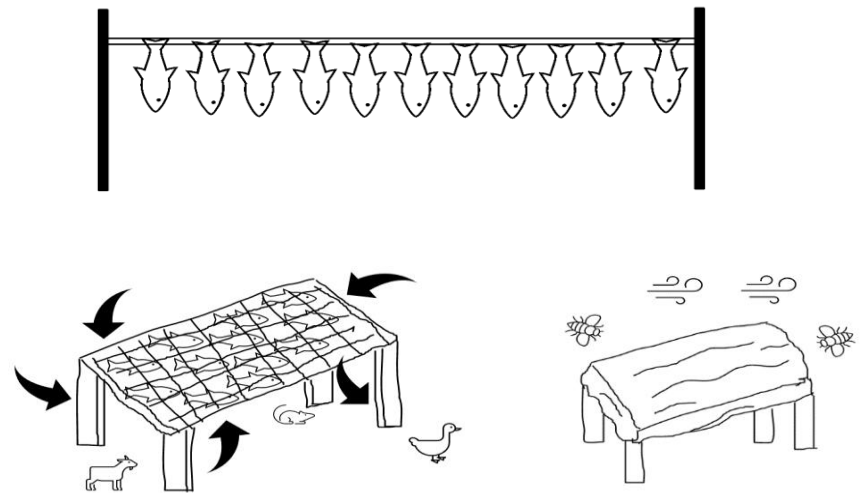
FISH PROCESSING METHODS

Sun-drying



Source: Internet

Do not dry fish on the ground. It increases the risk of contact with dirt, germs, insects, and animals.



Dry fish by hanging or on a raised net tray to reduce exposure to germs, dirt, and stray animals. Cover with plastic or polythene nylon when necessary.

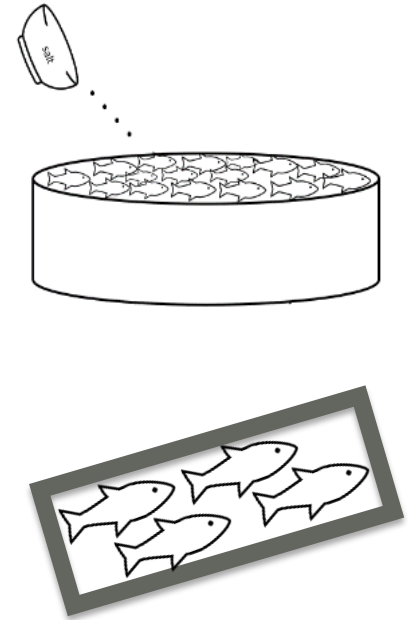




FISH PROCESSING METHODS

Salting

- ❖ Salting is a very good method to keep food spoiling germs away from food.
- ❖ It can be combined with other methods like smoking and drying.
- ❖ It slows down the growth of food spoiling germs
- ❖ Drying and salting is a good way to keep fish or animal protein for a longer time where there is no refrigeration or electricity.
- ❖ Two types of salting are: **Dry salting** (rub or sprinkle salt directly on the fish) and **wet salting** (soak fish in salty water).





FISH PROCESSING METHODS

Smoking



Metallic smoking kiln



Traditional smoking mud kiln

Three processes or stages of fish smoking

Cooking at a very high heat for 1-2 hours

Drying at a low heat for 2 hours

Smoking at a moderate heat for about 2 days

Nigerian Smoked Fish Market Potential



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MODERN METHODS OF FISH PROCESSING



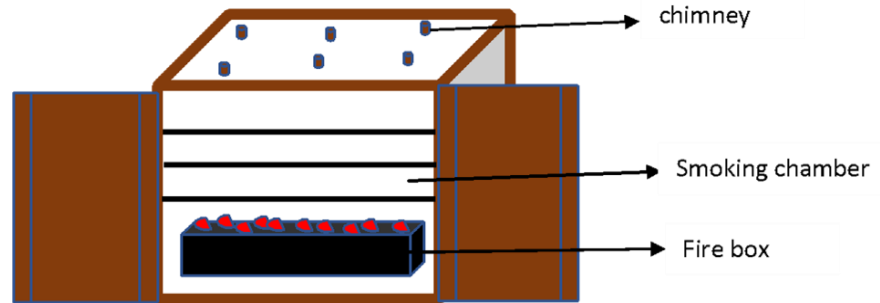
Gas Griller



Modernized Charcoal Griller



Modern or Electric Oven



Modern Fish-smoking Kiln

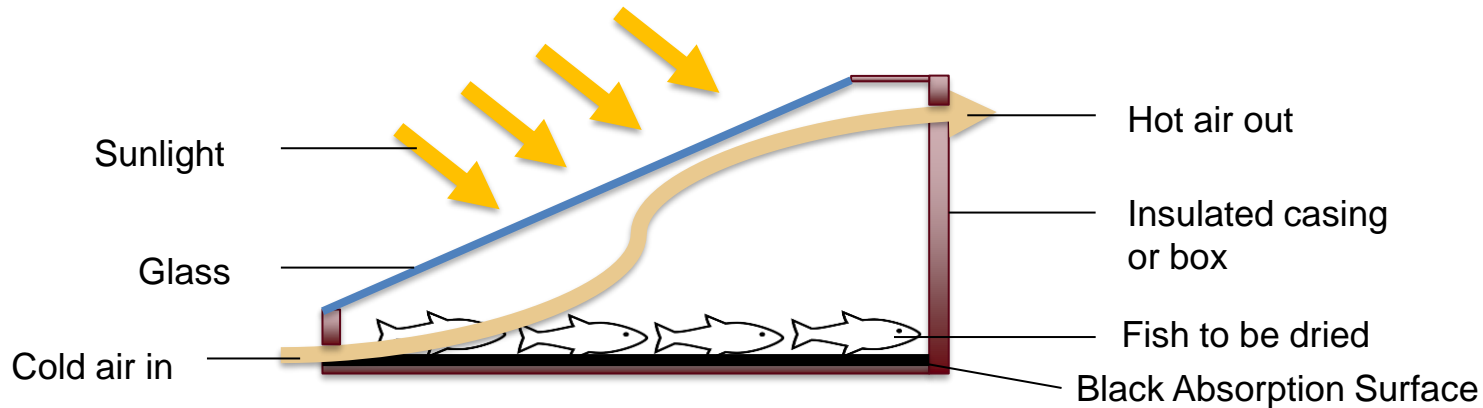




MODERN METHODS OF FISH PROCESSING

Solar-drying

- ❖ Solar drying is a modern method of drying fish.
- ❖ Fish is placed and dried in a solar dryer and placed outside in the sun.
- ❖ It can be locally made and its easy to operate.
- ❖ It produces better quality dried fish product.





MODERN METHODS OF FISH PROCESSING

Freezing- chilling



Limitations of freezing method

Lack of electricity causes fish to spoil, smell bad, or loses nutrient as the icy fish melts. This may cause fish loss or waste and loss of profit.

Freezers or refrigerators cost a lot of money

Raw fish can be kept in a container with ice cubes or cooler, but electricity and freezer are needed to produce ice





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LOCAL PROCESSED FISH PRODUCTS

Smoked fish: smoke can kill bacteria or germs and make fish stay in a safe condition longer.

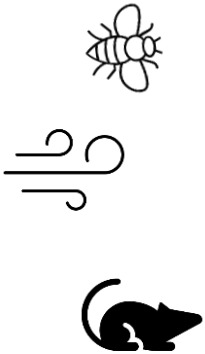


Photo by: Adegoye Grace A.

Attract flies and rodents.



Smoke can cause poor vision, poor breathing, and certain types of cancer.

Barbequed fish are grilled. They look nice and tastes good.



<https://www.jessicagavin.com/grilled-salmon/>

Barbequed fish may be exposed to dust and smoke



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LOCAL PROCESSED FISH PRODUCTS

Sundried fish

Removes water content from the fish to make it last longer without going bad.



- Exposure to sand, dust, flies, pests, and rats
- Mold grows on dried fish when stored under wet (humid) conditions.

Fried fish has a nice taste, and smell. Some nutrients may be lost through frying.



Fried fish attracts rats and cats.

Fried foods may increase the risk of heart disease and stroke. (American Heart Association)

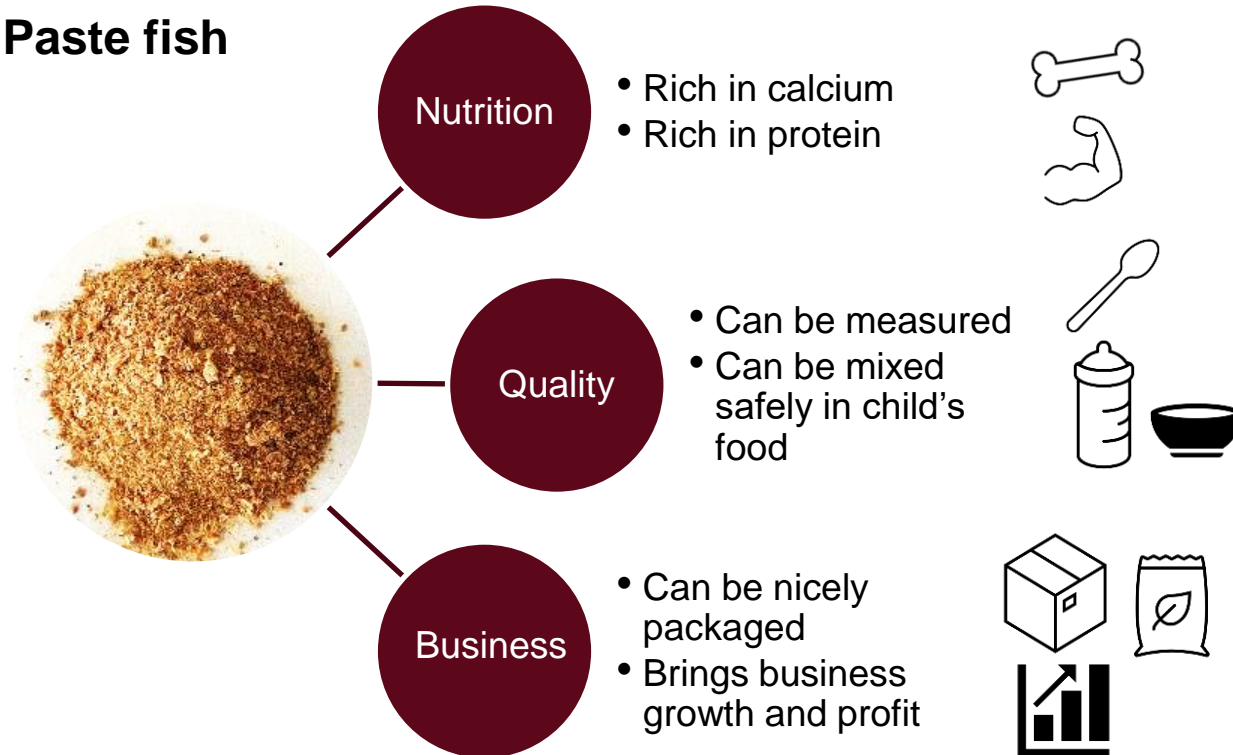
Photos by Nuntah Joseph & Adegoye Grace A.





MODERN PROCESSED FISH PRODUCTS

Powdered and Paste fish





FISH PRODUCTS FROM MODERN METHODS

Canned fish



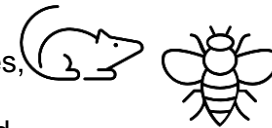
Nutrition

- Rich in calcium, iron, proteins.
- Supports child and pregnant women's nutrition



Quality and safety

- Free from dust, flies, and pests.
- Safe, nutritious and ready to eat



Business

- Safe fish for a longer time. Fish is available year round.
- Business growth and profit.





FISH PROCESSING AND PROCEDURES

1



Remove scale

2



Remove fin

3



Remove intestine

4



Remove gill

5



Cleaning-remove slime





FISH PROCESSING-CUTTING

Fish cutting: Cutting of the head, cutting into large or small pieces (chunks); splitting, filleting.

1. Fish splitting is cutting the fish open
2. Fish filleting: separating the flesh of the fish from the bone.



Cut the fish into sizes and shapes

Photo by Dismuke Alaina



Fish Splitting



Fish fillet





FISH PROCESSING AND PREPARATION



Soaking- wet salting



Sieving-Reduce water

Drying

Solar drying

Oven drying

Hanging
(Air drying)

Drying-remove water



Grinding- blending



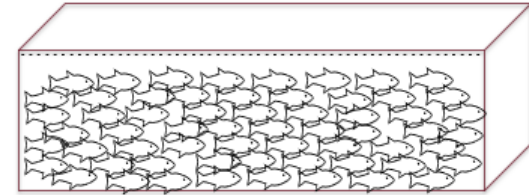
Packaging






FISH PROCESSING AND PROCEDURE

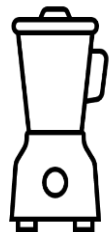
- 1. Fermentation:** Raw fish is kept under a warm condition in the fermentation tank for a period ranging from a few hours to a week or weeks



- 2. Pasting:** Fish paste can be produced by fermentation and by grinding

- After fermentation -> Rinse the fish with seawater or clean water- > Add salt as preservative-> Package

- Rinse raw fish in clean water 





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ADDITIONAL TIPS:

- ❖ Use quality wood for smoking to have a quality smoked fish product.
- ❖ Use hard and dry woods.
- ❖ Use quality charcoal for smoking
- ❖ Do not use rubber-like and painted woods for smoking.
- ❖ Do not use plastics, nylon, or rubbish for fish smoking



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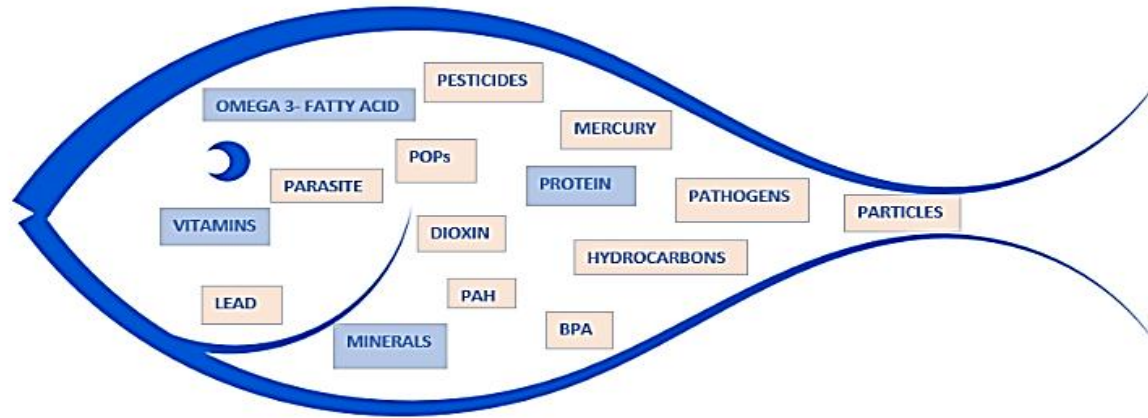


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MODULE 5 FISH POISONING AND CONTAMINATION FISH CONTAMINATION

Nourishing Nations Project

August 2021/Delta State, Nigeria



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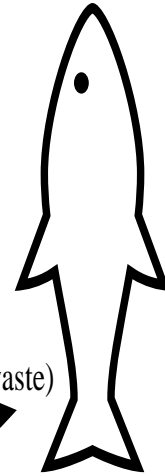


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FISH CONTAMINATION

- Fingers** (dirty hands containing germs)
- Flies** (insects) & **foes** (pests, rodents)
- Fomites** (dirty apron, handkerchief, napkins)
- Fumes** (gases or smoke, fog, etc.)
- Forks** (represents cutleries and cooking utensils)
- Field** (contaminated river or fish source)
- Floor** (dirty floor, dust, soil, sand, grit)
- Fluids** (dirty water, nose discharge, saliva, stool, urine, wound discharge, industrial waste)
- Feces** (human, animal, insect excreta)
- Fahrenheit** (Temperature at or above 40 °F. "Danger Zone" (40-140 °F))



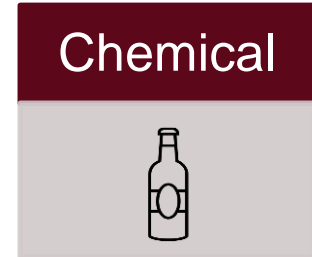
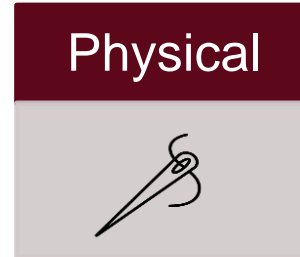
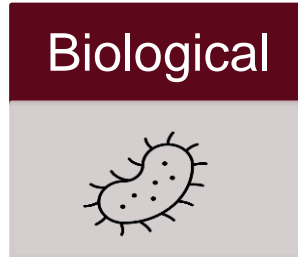
Adegoye G.A. 2022





WHAT ARE CONTAMINANTS

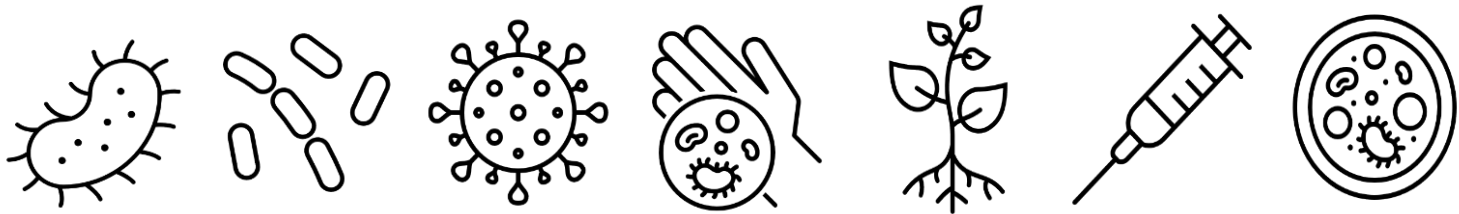
- ❖ **Contaminants** are any object, thing, or germs that can cause danger and harm us when present in our food or water.
- ❖ **Contamination** is when a harmful substance is present in food, drink, or water meant for eating or drinking.





BIOLOGICAL CONTAMINANTS OR HAZARD

Biological contaminants or hazards in food are pathogenic organisms capable of causing foodborne illnesses or diseases and food spoilage. Pathogens or germs include bacteria, fungi, viruses, protozoa, prions. Some plants and seafood also carry harmful toxins. Mold on dried fish containing aflatoxin is also included in this group.



Adegoye, G.A, 2022





PHYSICAL CONTAMINANTS OR HAZARD

Physical contaminants or hazards are harmful objects or materials that can be seen, touched or felt. Examples are a piece of glass, wood, dust, dirt, sand, metal shavings from knives, a piece of bone, or sharp part of fish like the fin, pieces of plastic, stones, bandages, bag ties, hair strand, and other items used by the fish processor.



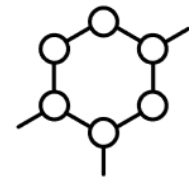
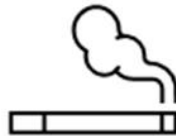
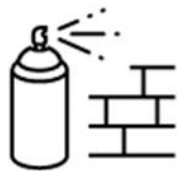
Adegoye, G.A, 2022





CHEMICAL CONTAMINANTS OR HAZARDS

Chemical contaminants or hazards are any substance in liquid, solid, or gaseous form that can cause danger or harm to humans when present in food. Examples are pesticides, sanitizers, cleaning substances, disinfectants, chemical (mercury, lead, detergents or soap), smoke, and gas.



Adegoye, G.A, 2022



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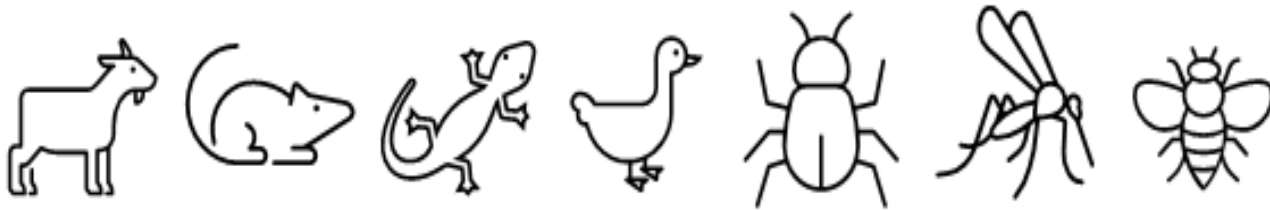


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BIOLOGICAL CARRIERS OF DISEASES

Animals; pests, and insects/ flies e.g., houseflies, cockroaches are biological carriers of germs.



Adegoye, G.A, 2022



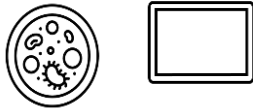


How do harmful agents get into fish products?

- ❖ Dirty hands containing germs



- ❖ Dirty plates, knives, buckets, or cutting slabs



- ❖ Dirty and polluted water and ingredients



- ❖ Animals, insects, and birds



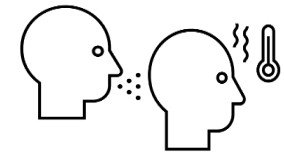
- ❖ Dirty floors and surroundings, uncovered waste bins



- ❖ Dirty clothes, napkins, handkerchief, and aprons



- ❖ Sick person (fish handler)





FISH TOXINS AND POISONS

Fish toxins: Aflatoxin (mold growth on dried fish), Ciguatoxin (found in some marine algae.)

Chemicals poisons: like polyaromatic hydrocarbons, mercury, and lead.

Common symptoms of toxins OR poisons:

Dizziness

Numbness

Sweating

Vomiting

Headache

Confusion or memory loss

Tingling

Abdominal pain, coma, etc.

Effect of fish contamination and poisoning- See Module 3; Food safety.





SAFETY GUIDELINE ON PESTICIDE USE AND WARNINGS

Fish is contaminated by pesticide from containers that are dropped into rivers, lakes, and seas.

Large fish are more likely to have a high level of pesticides in their flesh



Pesticides can build up to a toxic level in the body of the consumer

Small fish may be safer for children to reduce the risk of poisoning

Do not spray pesticide directly on raw or processed fish to kill germs, flies, or insects

Keep fish products safe from pesticide exposure.

Spray your shop before going home, after the day's sales if you must.

Take pesticides away from children's reach

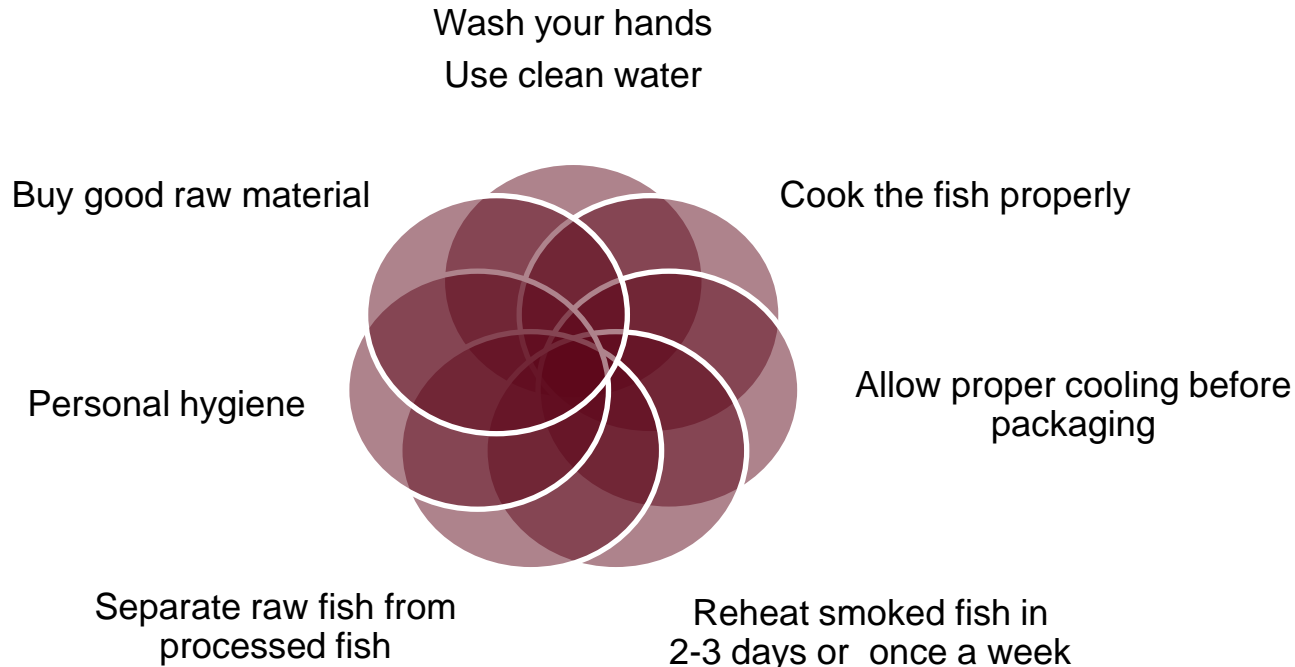




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HOW TO STOP OR PREVENT HARMFUL SUBSTANCE FROM GETTING INTO FISH PRODUCTS



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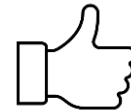


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HOW TO HANDLE AN OPEN WOUND

Open wounds and cuts are sources of biological contaminants. They can be very dangerous

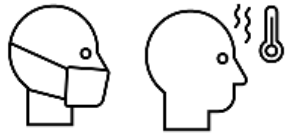


1. Wash your hands immediately with clean water
2. Do not leak the blood or stop the flow by putting it in your mouth
3. Apply pressure on the site of the wound to stop the blood flow
4. Apply disinfectant like methylated spirit, or hydrogen peroxide
5. Cover all wounds with a waterproof bandage or adhesive (plaster)
6. Go to the hospital if the bleeding does not stop

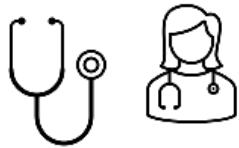




ADDITIONAL TIPS



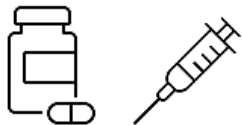
Check your body for fever, and stay at home if you are sick



Call or visit your nurse or health caregiver for checkup



Visit hospital for proper care if you did not feel better



Use your pills as directed by the doctor and complete the treatment to prevent sickness from recurring.

If you have wounds use gloves while handling fish or spoons if possible

FAO/PAHO-WHO 2014, FAO



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MODULE 6 HYGIENE RULES AND GOOD PRACTICES

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SANITARY REQUIREMENTS OF FISH PROCESSING PREMISES

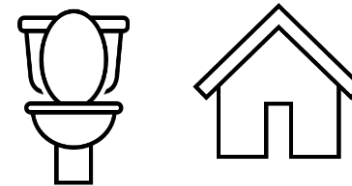
Clean fish processing environment (Sanitize and disinfect work area)



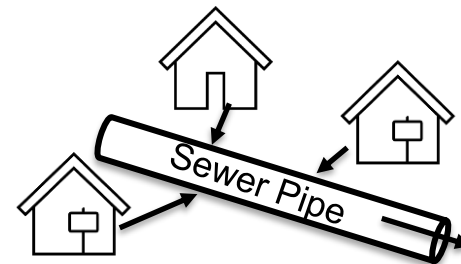
Clean water supply source for hand washing and fish processing.



Clean toilet or sanitary improved latrine



Free flowing channel for waste water



Federal Republic of Nigeria Official Gazette, 2016



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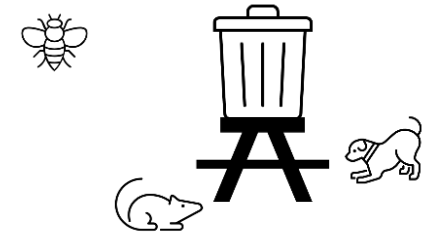


SANITARY REQUIREMENTS OF FISH PROCESSING PREMISES

Fish processing site or kitchen must **NOT** be close to a latrine or a dumping sites.



A sanitary waste bin with a well-fitted lid. Raise it 4 inches or 10 cm above the ground to keep rats, rodents, and flies out.



Fish processing kitchen must have enough openings for fresh air and light.



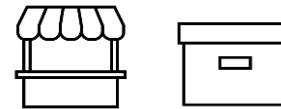


OTHER SANITARY AND HEALTH REQUIREMENTS

A cold room or a cold storage facility

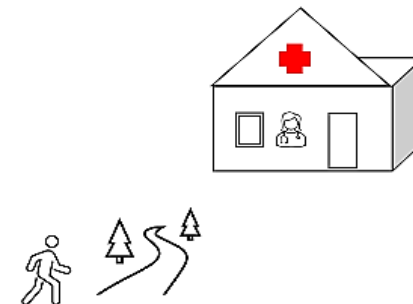
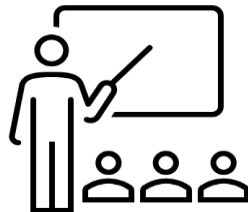


Adequate space and equipment for storage.



Fish processors must check their state of health two times a year, even if they do not appear sick.

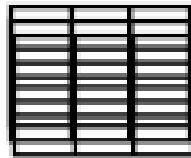
Fish processors should attend food safety training at least once a year.





SANITARY RECOMMENDATIONS

Use material that will not allow rats to get into your kitchen or store. Repair broken floors, walls, and cracks to keep rodents out of the kitchen or shop. Call a trained pest manager.

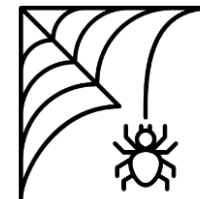


Use insect nets on the windows and doors to prevent flies.

Remove water-holding containers where mosquitoes can live.



Remove cobwebs from the ceilings



Federal Republic of Nigeria Official Gazette, 2016



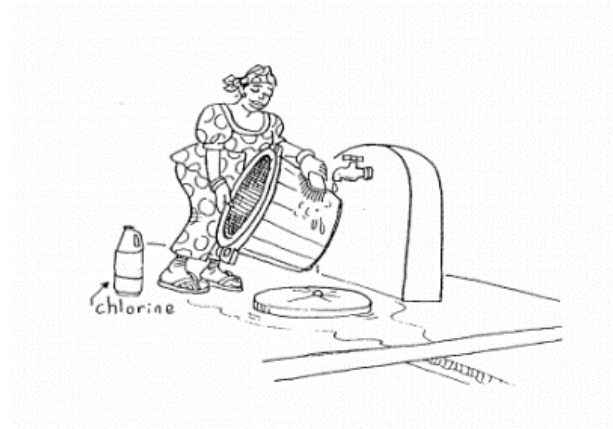
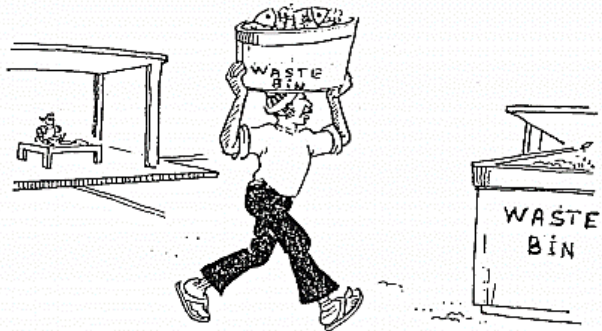


SANITARY RECOMMENDATIONS



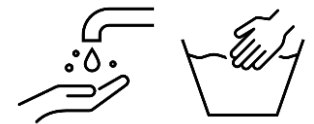
Sanitary disposal of spoiled fish, fish waste, and other domestic waste generated during processing.

Wash the waste bin with soap and disinfectant.



Diei, Y. and Ndiaye, O. 1998.

❖ Always wash your hands after cleaning the waste bin and before handling fish.





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ENVIRONMENTAL SANITATION



Photo by: Ayoola Babatunde. M

- ❖ Sweeping
- ❖ Mopping floors
- ❖ Wetting floors to prevent dust
- ❖ Washing floors and surfaces
- ❖ Picking trash
- ❖ Cleaning drainages
- ❖ Clearing dump sites
- ❖ Cutting overgrown weeds



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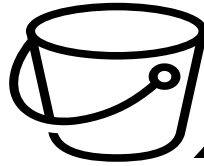
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DISINFECTION (KILLING GERMS)

Disinfection is the act of killing germs or disease-causing agents in the environment, processing equipment, material, and surfaces where fish may likely be placed.

Instruction: Always use clean water, add 1 teaspoon of bleach or chlorine to 10 liters of water.



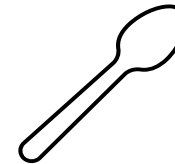
1 bucket = 10 liters



Chlorine 1 liter



1 glass of water = 150 ml



1 teaspoon = 10 ml

Adapted from Diei, Y. and Ndiaye, O. 1998.





GOOD PRACTICES

Good practices and a clean environment are required to have good result in the fish processing business.

Good Practices includes:

- 1. Good Hygiene Practices**
- 2. Good Aquaculture Practice (in fisheries or aquatic food processing)**
- 3. Good Transport Practices**
- 4. Good Handling and Packaging Practices**
- 5. Good Storage Practices**





GOOD HYGIENE PRACTICES GOOD AQUACULTURE PRACTICE

1. Good Hygiene practices (GHP)

- ❖ Hygiene and safety rules for fish handlers and processors (Module 3)
- ❖ Sanitary requirements of the fish processing premises

2. Good Aquaculture Practices

- ❖ Good practices in fish or seafood processing (Module 3 and 4)

FAO/PAHO-WHO 2014, FAO



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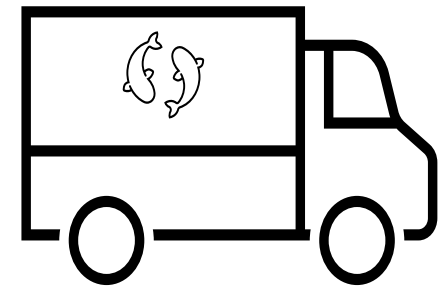


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GOOD TRANSPORT PRACTICES

- i. During transportation, keep fish in ice flakes or crushed block ice.
- ii. If transporting fish by road, it must be carried by protected and refrigerated trucks in good condition.
- iii. Always keep the truck neat and clean. Also disinfect the truck to kill germs if needed
- iv. Do not transport fish products in the same vehicle with:
 - ✓ **Chemicals**
 - ✓ **Pesticides**
 - ✓ **Live animals**
 - ✓ **Humans**





GOOD HANDLING AND PACKAGING PRACTICES

Good handling and packaging practices will protect all fish products from harmful substances and waste



1. Fish products could be packed in carton, paper, or jute bags with plastic.
2. It can also be packed in a recyclable or reusable plastic (BPA free) container with a tight lid cover.





GOOD HANDLING AND PACKAGING PRACTICES

Safe packaging tips:

1. Allow the processed fish to cool down before packaging.
2. Sort fish products before packaging
3. Handle them with care to avoid breaking them mistakenly.
4. Always place your packaging materials on the table or on a sanitized platform.
5. Use a solid, dry, clean, water -proof, and easy to handle material and stack.
6. Do not put too many fish or overload the packaging material.





GOOD STORAGE PRACTICES

Storage of the final products is essential to prevent spoilage and waste. Good storage makes fish to last longer and stay safe in a good shape and form.

1. Store final products on shelves, wood planks, trays, trolleys, or in baskets.
2. Store in a dry, cool, well-aerated clean, and with natural lighting room.
3. Ensure a distance of **at least 15 cm (5.9 in) from the walls, ceiling, and ground level.**
4. Ensure the product is dry enough to prevent the growth of mold and keep fish product away from insects, rodents, or stray animals.

FAO/PAHO-WHO 2014, FAO



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GOOD STORAGE PRACTICES

1. Heat smoked fish regularly. During rainy season every 2-3 days, and once a week during the dry season
2. Always store in a clean condition, free of dirt, garbage or food waste.
3. Observe or check the products regularly and carefully.
4. Store finished fish products processed at different times or days separately and label.



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SAFETY INSTRUCTIONS ON CHEMICAL HANDLING

Do not store raw or packaged processed fish products in chemical or pesticide containers/bags .

Pesticides are not preservatives, do not apply them to fish products.

Keep all chemicals, pesticide etc. away from the reach of children



Do not store chemicals such as detergents, or disinfectants in food storage containers to prevent accidental poisoning

Chemicals must be stored separately from food storage areas

Wash your hands thoroughly after handling chemicals, or pesticides.

Adegoye et al., 2022





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MODULE 7 ECONOMIC AND NUTRITION BENEFITS OF QUALITY FISH PRODUCTS

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The better the quality,
The better your income,
The better your life.



Photo by: Ayoola, Babatunde M



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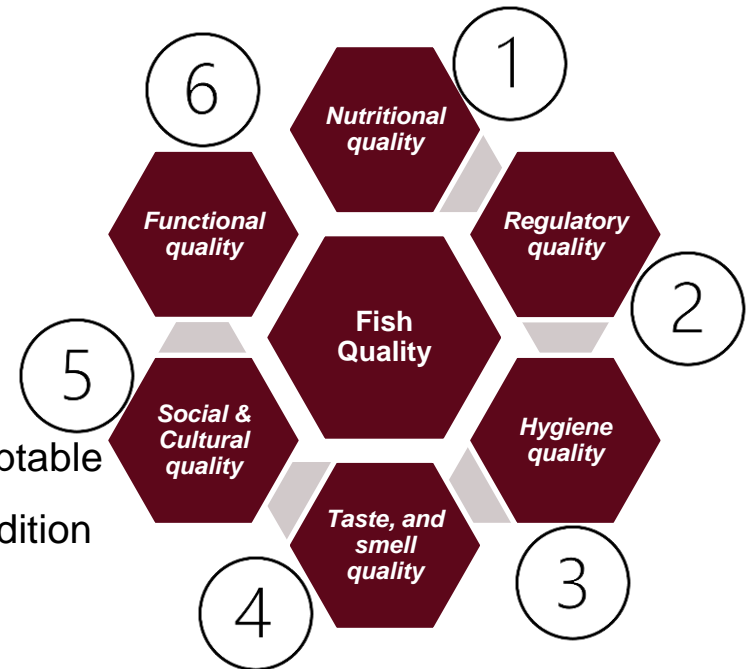


FISH QUALITY

Quality fish can be described as a fish product that is free from any harmful materials, or germs, and meets customer's satisfaction.

How to know a quality fish product

1. Has or retains the nutrient after processing
2. Meets the processing procedures and standards
3. Prepared in a clean and hygienic condition
4. Tastes and smells good
5. Appeals to the customers and is attractive and acceptable
6. Stored and transported under the right and safe condition

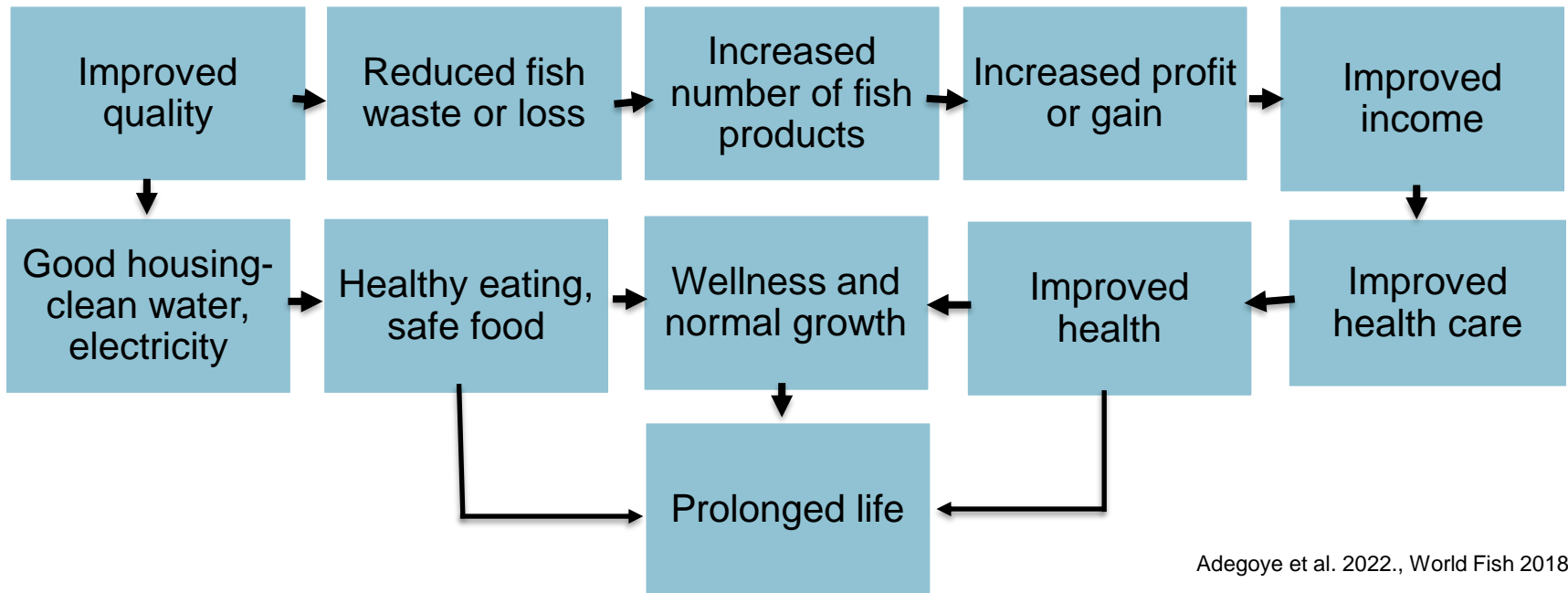


Adegoye 2022, Adapted from Cailliau, B. 2013





HOW CAN QUALITY FISH PRODUCT IMPACT YOUR INCOME AND WELLBEING



Adegoye et al. 2022., World Fish 2018





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HOW TO REDUCE FISH WASTE

Reduce the price of the older fish products in stock.

First-in-first-out: Arrange the fish products with the closest best use by date in the front line of the shelf or desk.

Buy only the quantity you can process, preserve, and store.

Always use good packaging materials such as cartons, jute bags, and reusable plastics.

Ensure sanitary disposal of fish waste generated on daily basis.



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NUTRITION AND HEALTH BENEFITS OF QUALITY AND SAFE FISH PRODUCT

Quality fish product:

1. Provide enough quantity and quality of nutrients needed for brain development and normal growth in children and pregnant women.
2. Lowers the risk of foodborne illnesses
3. Lowers the rate of visiting hospitals due to unsafe fish consumption.
4. Lowers the risk of food poisoning and foodborne illnesses
5. Reduces hospital bills due to foodborne illnesses
6. Lowers the risk of exposure to harmful substances
7. Improves nutrition and wellbeing.

Troell et al, 2019



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ECONOMIC BENEFITS OF QUALITY FISH PRODUCTS

Quality fish products will attract more buyers.

Reduction in post-harvest and post-farmgate loss

Reduce fish waste and spoilage

Fish will be available to consumers year round

New business opportunity

Reduce the economic loss and hospital bills due to foodborne illness, food poisoning.

New job opportunity for youths and women – economic empowerment

Canned fish can offer both nutrition and economic support.

World Fish 2018





HOW TO RECOGNIZE SPOILED OR POOR-QUALITY FISH TO AVOID ECONOMIC LOSS AND WASTE

- ❖ Dropped scale
- ❖ Presence of worms or insect larva, mold, and black spots
- ❖ Presence of offensive odor
- ❖ Sunk eyes
- ❖ Dark brown gills
- ❖ Flabby skin
- ❖ Attract flies



Photo source: internet

- ❖ Rodent bites and rat droppings
- ❖ Thawed fish
- ❖ Wound, injury, or bruise on fish
- ❖ Bad taste (cooked or processed product)

For canned fish;

- ❖ check for leakages,
- ❖ expiration,
- ❖ dent, bulging, and rusting on the can





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ACKNOWLEDGMENTS

We appreciate the contribution of all the experts from various field in validating this educational material. Thanks to Professor Moses. A. Omishakin; Bamidele.B. Oni, (M.Sc. REHO, LEHO); Nicole, Reeder (M.Sc., R.D); Jasmine, Hendrix (M.Sc.); Dr. Rahel Matthew; Professor Juan. L. Silva; Professor Henrietta, N. Ene-Obong; and Dr. Joseph, N. Nuntah.



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Adegoye, G.A.; Tolar-Peterson, T.; Ene-Obong, N. H.; Nuntah, N.J.; Pasqualino, M.M.; Mathews, R.; Silva, J.L.; Cheng, W.-H.; Evans, M.W., Jr.; Pincus, L. Development and Validation of Nutrition and Food Safety Educational Material for Fish Processors in Nigeria. *Int. J. Environ. Res. Public Health* **2023**, *20*, x.



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