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

FACILITATOR GUIDE

Feed the Future Innovation Lab for Fish Nourishing Nations Team

Photo by: Ayoola, Babatunde Ph.D.
NUTRITION EDUCATION, FOOD SAFETY, AND SAFE FISH HANDLING PRACTICE GUIDE FOR FISH PROCESSORS

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Feed the Future Innovation Lab for Fish: Nourishing Nations Team.
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For Bibliographic purposes, this document should be cited as follows:

# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgement</td>
<td>3</td>
</tr>
<tr>
<td>Table of Content</td>
<td>5</td>
</tr>
<tr>
<td>Introduction</td>
<td>6</td>
</tr>
<tr>
<td>Module 1 Nutrition Education</td>
<td>7</td>
</tr>
<tr>
<td>Healthy eating</td>
<td></td>
</tr>
<tr>
<td>Module 2 Animal Source Food</td>
<td>20</td>
</tr>
<tr>
<td>Fish nutrition</td>
<td></td>
</tr>
<tr>
<td>Module 3 Food Safety</td>
<td>32</td>
</tr>
<tr>
<td>Fish safety and handling</td>
<td></td>
</tr>
<tr>
<td>Module 4 Fish Processing Techniques</td>
<td>48</td>
</tr>
<tr>
<td>Fish process methods</td>
<td></td>
</tr>
<tr>
<td>Module 5 Food Poisoning and Contamination</td>
<td>68</td>
</tr>
<tr>
<td>Fish contamination</td>
<td></td>
</tr>
<tr>
<td>Module 6 Hygiene Rules and Good Practices</td>
<td>81</td>
</tr>
<tr>
<td>Hygiene rules for fish handlers</td>
<td></td>
</tr>
<tr>
<td>Module 7 Economic Benefits of Quality and Safe Fish Products.</td>
<td>92</td>
</tr>
<tr>
<td>Economic and nutritional benefits of quality fish products.</td>
<td></td>
</tr>
<tr>
<td>Bibliography</td>
<td>102</td>
</tr>
<tr>
<td>Training Evaluation</td>
<td>103</td>
</tr>
</tbody>
</table>
NUTRITION EDUCATION, FOOD SAFETY, AND SAFE FISH HANDLING PRACTICE GUIDE FOR FISH PROCESSORS.

Introduction

The nutrition education, food safety, and safe fish handling practice guide is a step-by-step instructional material on nutrition and food safety for low literacy educators. It includes a training curriculum and a low literacy flipbook on nutrition and food safety developed for women fish processors with low literacy to facilitate participatory training. The developed flipbook is a seven-module instructional guide validated by experts for relevancy, cultural appropriateness, comprehensibility, and readability. It was deemed suitable for training the women and youth fish processors in Delta State, Nigeria.

This nutrition education, food safety, and safe fish handling practice guide for fish processors contains seven different modules, which cover (1) Nutrition education, focusing on healthy eating (2) Animal sources of protein, (3) Food safety, (4) Fish processing techniques, (5) Food poisoning and contamination, (6) Hygiene rules and good practices, and (7) Economic benefits of quality and safe fish products. The guide contains complementary lesson plans which contain learning objectives, teaching methodology, instructional materials, teaching aids, instructions for group activities, discussion points, time frames, and key messages. The overall objective of the training is to improve the knowledge of women fish processors on nutrition and the quality and safety of processed fish products in Nigeria.
MODULE 1- NUTRITION EDUCATION
FACILITATOR GUIDE 1

Healthy Eating
OVERVIEW

LEARNING OBJECTIVE
Participants will learn about healthy eating and its importance to the health and proper growth of their children.

DURATION: 1 hour 20 mins.

MATERIALS NEEDED
- Handout
- Flipchart/projectors
- Food models or game cards
- Pencils, pens, crayons, or different color markers that will represent different food colors.
- Timer

KEY CONCEPTS
- Foods can be divided into five different groups: fruits, vegetable, protein, carbs (grains and tubers), and dairy.
- Healthy diet is a well-balanced diet that contains enough rainbow, brown and whites.
- Infants, young children, and women need to eat a well-balanced diet.
- Diet diversity supports growth, development, and healthful living.

TRAINING AGENDA

<table>
<thead>
<tr>
<th>S/N</th>
<th>Agenda</th>
<th>Teaching Method</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction and warm-up</td>
<td>Discussion</td>
<td>10 min</td>
</tr>
<tr>
<td>2.</td>
<td>Pre quiz</td>
<td></td>
<td>5 min</td>
</tr>
<tr>
<td>3.</td>
<td>What is healthy eating?</td>
<td>Discussion</td>
<td>20 min</td>
</tr>
<tr>
<td>4.</td>
<td>Food groups and their health benefits</td>
<td>Discussion</td>
<td>10 mins</td>
</tr>
<tr>
<td>5.</td>
<td>MyPlate and the food color groups</td>
<td>Discussion</td>
<td>20 mins</td>
</tr>
<tr>
<td></td>
<td>How can MyPlate help me to eat a healthy diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Closing discussion</td>
<td>Discussion</td>
<td>10 mins</td>
</tr>
<tr>
<td>7.</td>
<td>Post quiz</td>
<td></td>
<td>5 mins</td>
</tr>
</tbody>
</table>
1. Introduction (10 mins)

Welcome the fish processors to the training. Introduce today’s topic and review the training agenda. You may highlight the training agenda on your flipchart or board so participants can see it on arrival. Focus on the key learning area, eating a variety of food sources or groups.

Conduct a warm-up exercise or icebreaker to make sure all fish processors feel welcome and ready to fully participate. You can use suggested warm-up activities or icebreakers in the facilitators’ guide.

Tips for Facilitator

- Establish rapport to give the participants a sense of inclusiveness
- Use the approved low-literacy educational tool and materials
- Use simple, clear sentences. Make recommendations using voice (action verbs)
- Make sure that the participants are comfortable and free from distractions.
- Use appropriate visuals e.g., flipchart showing MyPlate, food group, and color.
- Encourage active participation, asking questions, and for clarification.
- Adopt buzz group by asking the participant to form a small group of 4-5 people
- Initiate discussion using prompt questions and activities using the social cognitive theory
- Provide practical advice in a way that encourages the positive aspect of the fish processor’s diet while drawing attention to areas of improvement without being critical or judgmental.

2. Pre-quiz (5 mins)

Instructions

- Administer the pre-quiz before the training session and discussion immediately after the brief introduction and warm-up exercise.
- Inform the participants that the quiz contains three multiple-choice questions on the module to be taught for today, and it will last for 5 minutes.
- Assure the participants that the quiz will not be graded, and it is okay if they do not know the answers to the questions.
• Inform the participants that the same question will be re-administer after the training session of each module.

3. What is healthy eating? (20 mins)

INTERACTIVE DISCUSSION

Goal of Discussion: Fish processors will see how healthy eating contributes to good health and will learn to choose healthy food plates using food colors and groups

Facilitator Preparation: In advance, prepare 20-30 cards or slips of paper with the picture or name of the common food item on each card. Make sure you have included a good mix of rainbow, brown and white foods to make a healthy plate.

1. Ask the fish processors to form a group of 4-5 people and ask them to finish this sentence “healthy eating is important because…” Encourage each group to come up with as many ways to finish the sentence as they can in five minutes. After five minutes, have some groups share what they discussed with the larger group.

2. Tell fish processors that a healthy diet is consistently eating a variety of food groups or enough Rainbow, White, and Brown foods and not too many packaged, fatty, salty, or sugary foods.

3. Introduce fish processors to MyPlate and the three Food Color Groups. Use the Food Color Groups Training Aid to show food items in each group. Demonstrate to fish processors the motions associated with each color group.

4. Put away the training aid and play the game with participants. Aim to complete the game in 15 minutes or less.

5. After the game, draw a large circle representing a plate on your flipchart or board. If it is not common in your area for an individual to eat from their plate or bowl, draw circles to represent the serving bowls or a communal serving tray used at a meal. Have one volunteer shade the plate/ serving bowls/serving tray with the appropriate colors or draw circles within it to represent the portion sizes of Rainbow, Brown, and White foods as they are typically consumed. Rainbow foods can be represented by two colors on top of one another. Ask the group if the drawings depict what is consumed in their households as well. This exercise can be repeated for breakfast, lunch, and dinner.
6. Review what a healthy meal looks like (half Rainbow, one-quarter Brown, and one-quarter White foods) and discuss how this may differ from the meals that participants drew. Ask if any meals could be modified and discuss how.

7. Discuss with participants why packaged, fatty, salty, or sugary foods should be consumed in moderation.

8. Ask participants if they can think of any other characteristics of a healthy diet. Write their suggestions on your flipchart or board, adding any suggestions that they missed and discussing them as needed.

Adapted from Home Garden Toolkit, World Vegetable Center.

4. Food groups and their health benefits (10 mins)

Fruits

Nutrients and health benefits of eating fruits

• Eating fruits can reduce the risk of heart disease and stroke.
• Fruits contain folate (folic acid) that helps the body form red blood cells.
• Eating fruits contains essential micronutrients required for pregnant women and children
• Fruits are a good source of Vitamin C which supports the growth and repair of all body tissues
• Fruits are naturally low in fat, sodium, and calories.
• Potassium in fruits may help to maintain healthy blood pressure
• Fruit intake may protect against certain types of cancers.
Vegetables

Nutrients and Health benefits of vegetables

- Low in fat and calories
- Rich in nutrients like potassium, folate (folic acid), vitamin A, & C
- Reduce the risk of Type II Diabetes (T2D), heart disease, and stroke
- Helps to maintain a healthy weight
- Lowers blood pressure
- Good for eye health
- Improves brain health
- Good source of dietary fiber: aid digestion and gut health

Proteins

Nutrients and Health benefits of protein

- Reduces appetite and hunger levels.
- Increases muscle mass and strength.
- Fish and dairy are rich in calcium and good for bone health.
- Reduces cravings and desire for late-night snacking.
- Essential for growth and development.
- Protein foods from animal sources provide B vitamins.

Grains

(SOURCE: Wikipedia)

Nutrients & Health Benefits of Grain

- Contains high nutrients, fiber, vitamins, and minerals.
- Reduce the risk of type 2 diabetics (T2D).
- The fiber contained in grains reduce the risk of colon cancer.
- Fiber improves food digestion.
- Fiber reduces the risk of obesity or being overweight.
- Important source of B group vitamins (except B12).
Roots and Tuber

Source: https://modernfarmer.com/2016/01/roots-tubers-guide/

Nutrition and Health Benefits of roots and tubers

- Root and tubers are rich in carbohydrates or starch
- Supply energy to the body
- It improves glucose level in the blood when it is low
- It contains fiber which helps to lower cholesterol or fat level
- Helps to maintain a healthy weight

Milk and Milk products (Dairy)

Photo by: Adegoye Grace. A

Nutrition and health benefits of milk and dairy

- Contains various nutrients; calcium, fat, vitamin D, B12, Calcium, potassium, phosphorus, selenium, riboflavin (B2), protein, and calories
- Important for healthy growth and development.
- Good source of proteins
5. Choose MyPlate (20 mins)

The Three Food Color Groups

**WHITE COLOR** Carbs, mainly grains, roots, and tubers

White foods provide us with energy. They include staple foods like rice, potatoes, cassava, cocoyam, yams, gari, maize, millet, and wheat. White foods are important because they supply fuel to our bodies for everyday use. In the discussion activity,

White foods are linked with a running motion.

**BROWN** mainly plant and animal proteins and dairy products.

BROWN foods supply our bodies with proteins that build our muscles. Brown foods include fish, meat or beef, pork, beans, eggs, turkey, chicken, seeds and nuts, tofu, soy, and milk. Brown foods are important because they allow us to build and maintain muscles. In the discussion activity, Brown foods are associated with making a muscle with your arms.
**RAINBOW** mainly fruits and vegetables.

RAINBOW foods (reds, oranges, yellows, greens, blues, purples) provide our bodies with the nutrients they need to fight disease and help our organs (eyes, heart, lungs, liver, and brain) function properly. Rainbow foods include all vegetables and fruits such as tomatoes, onions, lettuce, okra, spinach, ugwu, waterleaf, garden egg, peppers, bananas, mango, avocados, guava, watermelon, orange, strawberry, and pawpaw. In the discussion activity, Rainbow foods are associated with pointing to your eyes and heart and breathing deeply.

**Diverse diet** is a diet with a variety of foods from all the food groups or colors, containing nutrients required for optimum health and wellbeing. A diverse diet is a healthy diet.

**Healthy diet:** Eating enough Rainbow, White, and Brown food and less processed packaged, sugary, salty, and fatty foods. A Colorful plate makes a Healthy diet.

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Adegoye, G.A 2021, Adapted from Home Garden Toolkit, World Vegetable Center.

- A healthy diet is an adequate and proper combination of Rainbow, Brown, and White foods
- A healthy diet should contain one food from each color group.
- A healthy diet has a large diversity of foods that supply all the nutrients the body needs.
- Rotate the foods you consume within each color group whenever possible. For example, if someone had pawpaw for their Rainbow food at breakfast, they could eat leafy greens for lunch and watermelon for dinner.
• A healthy meal is one-quarter White foods, one-quarter Brown foods, and half Rainbow foods. Eat the right portion of each color at every meal.
• A healthy diet does not include processed, packaged, salty, or sugary and fatty foods. These foods should not be eaten too frequently, they are known to cause problems in our bodies if they are consumed regularly or in large amounts.

**Additional tips**

• Drink lots of clean water and milk.
• Wash your fruits and vegetables thoroughly with clean water heating and cooking.
• Cook fish and meat products all the way to avoid getting sick.
• Wash hands with soap and water before food preparation and before eating.
• Also, wash your children’s hands too.

**6. How can MyPlate help me eat a healthy diet: Dietary Diversity**

**INTERACTIVE DISCUSSION (10 mins)**

**Goal of Discussion:** Eating food containing different varieties of food groups in correct proportion. Fish processors will discuss how MyPlate can help in eating a healthy diet within their household.

**Materials needed:** Flipchart and markers.

1. Ask participants if anyone can share how MyPlate could help eat the three Food Color Groups more frequently.

2. Brainstorm with fish processors ways that they can access all the food group colors especially the “browns” all year long to contribute to a healthy diet.

**KEY MESSAGES**

• A healthy diet is essential for optimum growth and development. This is especially important for young children and women of reproductive age.
• All the food groups are needed to supply essential nutrients that the body needs.
7. Closing discussion (10 mins)
Go around and ask each participant to share one thing they learned with the group.

8. Post quiz (5 mins)

Module 1  Healthy Eating

1. What is healthy eating? (a) Eating all food colors (b) Eating yam, rice, and corn (c) Eating vegetables, and multivitamins

2. Eating varieties of food is important because it will make us (a) look robust and very fat (b) hungry and eat more (c) grow well

3. Choose the correct MyPlate from the list of good foods
   (a) Vegetables, juice, and tubers (b) Fruits, vegetables, proteins, grains, dairy, root, and tubers (c) Water, diet coke, tubers, and vegetables.
FOOD CARD GAME INSTRUCTION

HOW TO PLAY THE FOOD COLOR GROUPS GAME

Card preparation:

Aim to prepare about 20–30 cards in advance. Select healthy food items that are available in your area, such as local staples, beans, eggs, fish, vegetables, and fruits to include on the cards. Do not include packaged, fatty, salty, or sugary foods in the game. In the corner of each card, indicate the correct color group for each food item.

Game instructions: Split up the group into three smaller groups. Have each group choose a team name using the food colors (White, Brown, and Rainbow) to make it easier to keep track of the points on your flipchart or board as you go. The goal of the game is to help participants connect each food to 1) the correct color group, so that they can eat a properly balanced meal, and 2) the correct motion, so they understand what each food does in their bodies.

1. Split the group into three smaller groups. Have each team choose a name and write it on your flipchart or board to keep score.

2. The stack of cards is placed face down on a table, chair, or the ground in front of the three groups. Ask each person from each group to pick a card.

3. One person from the first team stands next to the cards. A timer is set for one minute. This person will draw card one at a time and must identify the food item listed on the card and their food color until time is over. If the team member gets the food items and the color group correctly, their team gets one point.

4. If the teammate guesses incorrectly, the other team has a chance to “steal” the point and mention the food item and the color group. If the opposing team guesses correctly, they are awarded the point instead.

5. The next team now chooses a person to come to the front. Cards that have already been used are put away, and the timer is reset to one minute. Now the opposing team must answer first. If they guess incorrectly, the next team may “steal” the point by correctly mentioning the food item and color group.

6. Continue to switch teams until all the cards are used up.

0 POINTS: The card is forfeited if another person accidently sees or says the name or color of the food and no points are awarded.

1 POINT: If someone on the team does the correct food color group and the name of the food listed.

1 POINT: If one team does not get the answer correctly the first time, the other team may take a turn at completing the task.

Adapted from Home Garden Toolkit, World Vegetable Center https://toolbox.avrdc.org/
Fish Nutrition

Courtesy: Adegoye G.A 2021

Feed the Future Innovation Lab for Fish Nourishing Nations Team
OVERVIEW

LEARNING OBJECTIVE
Participants will learn about fish nutrition and its importance to the health of their households, most especially young children, and women of reproductive age (WRA).

DURATION: 1hour 20 mins.

MATERIALS NEEDED
- Handout
- Flipchart
- Pencils, pen, paper.
- Timer

KEY CONCEPTS
Animal source foods are different groups derived from animal sources: meat, egg, chicken, milk, fish, seafoods etc. They are the Brown foods.
Eating a well-balanced diet that contains fish or fish products can support growth and wellness.
Infants, young children, and pregnant women need to eat fish regularly.
Fish provides variety of nutrients that support brain health, growth, and development.

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<table>
<thead>
<tr>
<th>S/N</th>
<th>Agenda</th>
<th>Teaching Method</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction and warm-up</td>
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</tr>
<tr>
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<td>Pre quiz</td>
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<td>Nutritional value of fish?</td>
<td>Discussion</td>
<td>20 min</td>
</tr>
<tr>
<td>4.</td>
<td>Health benefits of fish to children and women</td>
<td>Discussion</td>
<td>10 mins</td>
</tr>
<tr>
<td>5.</td>
<td>Diets for young children and women</td>
<td>Discussion</td>
<td>20 mins</td>
</tr>
<tr>
<td>6.</td>
<td>Closing discussion</td>
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1. Introduction (10 mins)

Welcome the fish processors to the training. Introduce today’s topic and review the training agenda. You may highlight the training agenda on your flipchart or board so participants can see it on arrival. Focus on the key learning area, eating a diet that contains fish. Conduct a warm-up exercise or icebreaker to make sure all fish processors feel welcome and ready to fully participate. You can use suggested warm-up activities or icebreakers in the facilitators’ guide.

Tips for the facilitator

- Make sure that the participants do not get overwhelmed during the sessions.
- Sustain the trainee’s attention, make the session interesting, and be conscious of verbal and nonverbal communications.
- Use the training handout and any additional educational aid to enhance your teaching.
- Encourage active participation, asking questions, and small group discussion using prompt questions and activities using the Socio-Cognitive Theory.
- Provide practical advice in a way that encourages the positive aspect of the trainee’s diet, while drawing attention to areas of improvement without being critical or judgmental.

2. Pre-quiz (5 mins)

Instructions

- Administer the Initiate the pre-quiz before the training session and discussion immediately after the brief introduction and warm-up exercise.
- Inform the participants that the quiz contains three multiple-choice questions on the module to be taught for today, and it will last for 5 minutes.
- Assure the participants that the quiz will not be graded, and it is okay if they do not know the answers to the questions.
- Inform the participants that the same question will be re-administer after the training session of each module.
What is Animal Source Food? Why is fish consumption important?

INTERACTIVE DISCUSSION

Introduce animal sources of protein but focus on fish as an affordable and rich source of protein, and other micronutrients needed for body growth and development especially in children, pregnant and lactating mothers.

**Key learning area:** the potential of fish nutritional composition and consumption in reducing the prevalence of micronutrient deficiencies such as wasting and stunting among children and women of reproductive ages (WRA).

**Goal of Discussion:** Fish processors will see how fish consumption prevents malnutrition, contributes to cognitive development, bone health, good vision, prevention of heart diseases. They will also learn how and when to introduce fish into their young child’s diet or meal and in what form or fish product.

**Facilitator Preparation:** In advance, A. Determine a topic related to mother’s nutrition during pregnancy and the impact of the child’s growth which will be useful to measure the level of knowledge after the training. Pre-arrange with a co-facilitator, to quietly observe and take notes on discussion points made.

B. Prepare a flipchart with a picture of fish and its health benefits to infants and young children, pregnant and breastfeeding mothers, and adults.

1. Ask the fish processors to form a group of two groups, to present their views or experience on the topic. A mother’s feeding habits, and nutrition can affect a child’s growth and development during pregnancy and after birth.

2. Ask each group to mention specific foods including fish they ate during pregnancy. Give each team about 5 mins to prepare their discussion. Each team will present two spokespeople to discuss their views, 3 mins each of the lead speakers and 2 mins for the seconder from each group.

3. Allow 1 opportunity for rebuttal or closing statement for each point of view for 1 min.

4. Moderate the activity, taking brief notes or asking another facilitator to take detailed notes. Take note of salient, direct quotes, comments of the participants on the level of knowledge.
5. Ensure all participants, including less assertive ones, could participate.

6. Close activity with appropriate debriefs discussion.

7. Introduce fish processors to the nutritional value of fish consumption. Use the flip chart containing the picture of a fish with the nutrients and their health benefits.

8. Clarify every superstitious belief or concern on fish or seafood consumption that you had noted during the discussion. Aim to complete it in 15 minutes or less.

9. Ask volunteers to mention one benefit of fish while you write on the board or chart.

10. Review the importance of fish to a child, pregnant women, and lactating mothers, and discuss why fish is less consumed, believes, or challenges.

11. Discuss with participants why fish should be introduced to the child’s diet at the early stage.

12. Ask participants how to encourage eating fish. Write their suggestions on your flipchart or board, adding any suggestions that they missed and discussing them as needed.

3. Nutritional Value of Fish (20 mins)

Fish is an aquatic food rich in macronutrients: proteins, carbohydrates, lipids, and micronutrients; vitamins and minerals.

Fish contains several nutrients that can help prevent malnutrition in children under 5 years old and women of reproductive age. Eating fish supports a child’s normal physical growth, prevents stunting, wasting, and promotes mental development.

By Dr. Lyle Conrad – Centers for Disease Control and Prevention, Atlanta, Georgia, USA Public Health Image Library (PHIL); ID: 6901 http://phil.cdc.gov/. License: Public Domain.
How eating fish can support our body and health

Calcium supports bone and teeth health. It helps to prevent preterm delivery in pregnant women.

Vitamin D helps the body to get more calcium and other nutrients for normal growth.

Vitamin A protects the child from blindness due to lack of Vitamin A. It also helps to fight sickness and supports healthy growth.

Zinc supports normal growth (height) in children and prevents loss of weight from diarrhea.

Iron is needed for brain development of an unborn child and supports safe delivery in pregnant women.

Protein is important for building muscles and helps in repairing worn out tissues. It also helps in the digestion of food.

Omega 3 fatty acids can support brain development in young children, and fight against sickness. It helps to protect the heart, reduce high blood pressure and the risk of stroke.

Iodine can help to prevent goiter in the neck region.

Vitamin B12 helps to improve the red blood cells, and can help the body to fight against sickness.

4. Health benefits of fish (10 mins)

Health benefits of fish consumption to:

- Infants and Children
- Adolescent girls
- Pregnant and breastfeeding women
- Adults

- Child's growth and development
- Fish contains many heart-healthy oils, such as omega-3 fatty acids.
- Fish oils may also help defend against some cancers, depression, and asthma

- Good Vision
- Brain Development
- Development of a baby's nervous system
- Prevent asthma in children
- Helps our body to fight diseases; increase immunity
- Strong and healthy bone

5. Malnutrition in young children and women (20 mins)

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: fish processors will discuss how children and women can eat more fish for a healthier diet when fish can be introduced to a child, and how it can help in reducing or preventing malnutrition.

MATERIALS NEEDED: Flipchart and markers

1. Explain to fish processors that fish consumption is beneficial to everyone, but there are certain phases of life where your body needs to be well-nourished. Humans need more nourishment when they are growing. This is especially true for children under two years old, adolescent girls, pregnant and breastfeeding women.

2. Label your flipchart paper or board “Foods Eaten by Children under Two” and make three columns for Rainbow, Brown, and White foods. Ask participants to name foods commonly consumed by young children in the community and let them say under which column the food should be listed. If participants name dishes that contain multiple ingredients, write the primary ingredients of the dish down in the correct columns.

3. Ask fish processors to reflect on the “think about a time when you saw malnutrition passed from mother to child and a time when both mother and child appeared healthy. Do you ever see mothers healthy and children not? Have you ever seen a malnourished child?

4. With fish processors brainstorm ways that children can eat a more nutritious diet to prevent malnutrition. Do children need to be given more access to the nutritious foods that are already around the household? Are there stigmas around certain foods that are preventing children from eating nutritious foods? Can nutritious foods be prepared in a new way that young children can eat them? Write these ideas down on your flipchart or board.

5. Label your flipchart paper or board “Healthy Foods for Pregnant and Breastfeeding Women” and make three columns for Rainbow, Brown, and White foods. Ask participants to suggest foods
that are good for women to eat during this phase of their lives and have their say under which column the food should be listed.

6. Ask fish processors why some pregnant or breastfeeding women may not eat enough of these foods. List these reasons on the left side of your flipchart or board. With participants, brainstorm potential solutions to each barrier and write ideas to the right of each reason on the board.

When our bodies are busy (growing, healing from sickness, pregnant or lactating), we need nourishing food to help our bodies do this work. Nourishing food is always important, but there are two phases of life where it is especially important to be well-nourished: when the child is under two years old and when a woman is pregnant or breastfeeding.

Home Garden Toolkit, World Vegetable Center.

Children between zero to six months

Breast Milk is highly recommended for children under six months old. Exclusive breastfeeding is more advantageous to both the child and the mother. Breast Milk contains all the food groups and essential nutrients including water that the baby requires for normal growth and development. Babies do eat more often because they have a small stomach and digest the milk very quickly. Therefore, they should be breastfed whenever they are hungry to make sure they are consuming enough food. Babies will breastfeed many times a day and use about ten wet diapers per day.

Children above six months

As a child grows, the body’s demands for nutrients change and increase. Although children over six months may continue to breastfeed, it is important to introduce solid foods around this time. As children continue to advance in age, transitioning away from breast milk, their diet should begin to change and to resemble an adult’s diet containing all three Food Color Groups consumed.

Children must be provided with nutrient-dense food since they eat little amounts of food. Rainbow and Brown foods are all highly nutritious. These groups of food should be introduced to children whenever possible. (Home Garden Toolkit, World Vegetable Center.)

Modifying foods for children over six months
Children over six months should be introduced to solid foods. Foods should be modified to prevent them from becoming a choking hazard. Fish can be introduced at this stage especially the ground or paste fish products.

- Small, dried fish can be pounded and incorporated into stews or porridges
- Paste fish can be mixed with boiled vegetables, pulse, and stews.

Large chunks of boiled fish can be mashed and mixed into rice, porridge, or stew.
- Vegetables can be boiled until they are soft and then mashed
- Beans can be boiled until they are soft and then mashed
- Fruits can be cut into spears so that young children can hold them comfortably in their hand

 Pregnant and lactating women

During pregnancy and breastfeeding, women should consume more food than normal and make an extra effort to consume a good mix of all the Rainbow, Brown, and Whites. Pregnancy and lactation require women’s bodies to do a lot of work. As babies develop, they use nutrients from the woman’s body that need to be replaced from the woman’s diet. A mother’s inadequate nutrient consumption has a greater effect on the fetus. Malnutrition in a mother during pregnancy especially at critical developmental stages can lead to low birth weight, poor cognitive development, congenital, and growth of the child. Fetuses are harmed more than the mother by maternal malnutrition.

Pregnant and breastfeeding women should eat when their bodies tell them that they are hungry. Rainbow and Brown foods especially fish and seafood will help women maintain their health while they are pregnant and will help their babies develop properly. Pregnant women need to eat more fish due to their nutritional density. They are also a significant source of omega 3-fatty acids, which are essential to the cognitive development of fetuses. Pregnant and breastfeeding
women should also drink lots of water and fluids, excluding alcohol. Moderate exercise for 20-30 minutes is recommended three to five times a week.

*Home Garden Toolkit, World Vegetable Center.*

**Fish consumption dietary recommendation**

- Eat fish at least 3 times a week
- Serve 2-3 serving a week to children
- Eat a variety of fish
- Preferably serve small fish to children because they are more nutrient-dense.
- Fish powdered and paste can be mixed with other foods as complements

**Additional tips**

- Drink lots of clean water and milk.
- Cook meats and fish thoroughly and at a high temperature to reduce the risk of getting sick.
- Wash your fruits and vegetables thoroughly with clean water
- Wash hands with soap and water before food preparation and before eating.
- Also, wash your children’s hands too.

**INTERACTIVE DISCUSSION (10 mins)**

**Goal of Discussion:** Fish processors will discuss how child malnutrition can be prevented by pregnant and breastfeeding mothers.

**Materials needed:** Flipchart and markers.

1. Ask participants if anyone can share how fish as animal-source protein could be helpful if eaten more frequently.

2. Brainstorm with fish processors ways that they can access nutritious and safe fish products all year long to contribute to a healthy diet.
KEY MESSAGES

- Fish consumption provides essential nutrients for optimum growth in young children and pregnant women.
- Fish supports bone and teeth health, a good heart, lower blood sugar, brain development in a child, and the immune system.

6. Closing discussion (10 mins)
Go around and ask each participant to share one thing they learned with the group.

7. Post quiz (5 mins)

Module 2  Animal Source Food

1. Fish is an animal source of protein.
   It is good for (a) only infants and children (b) Pregnant women only (c) Children, young children, women, and adults.
2. One of the options is not a benefit of eating fish
   (a) good for the eye (b) good for brain development in children (c) good for treating malaria.
3. Fish contains (a) fruits and veggies (b) salt and sweet (c) Omega 3 and Vitamin A.

Activity in Training- Debate
Mother’s nutrition during pregnancy and breastfeeding can affect a child’s growth and development.
Fish Safety and Handling

**Module 3 Food Safety**

**Facilitator Guide**

**Feed the Future Innovation Lab for Fish Nourishing Nations Team**
LEARNING OBJECTIVE
Participants will learn about safe fish handling and its importance in preventing diseases and promoting health.

DURATION: 1 hour 20 mins.

MATERIALS NEEDED
- Handout
- Flipchart/projector
- Pencils, pen, paper.
- Timer

KEY CONCEPTS
- Food safety and safe fish handling are important in preventing foodborne illnesses
- Unsafe fish and unsafe practices can cause food borne illnesses.
- Food borne illness include cholera, typhoid, dysentery, diarrhea, hepatitis A etc.
- Food safety measures like proper hand washing, proper cooking, hygiene and sanitation, disinfection, proper storage, preservation, and transportation can prevent food borne illnesses.

TRAINING AGENDA

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<td>5 min</td>
</tr>
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<td>What is food safety? Importance of fish safety</td>
<td>Discussion</td>
<td>20 min</td>
</tr>
<tr>
<td>4.</td>
<td>Foodborne illnesses; Examples</td>
<td>Discussion</td>
<td>15 mins</td>
</tr>
<tr>
<td>5.</td>
<td>Personal hygiene -hand washing</td>
<td>Discussion</td>
<td>15 mins</td>
</tr>
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1. Introduction (10 mins)

Welcome the fish processors to the training. Introduce today’s topic and review the training agenda. You may highlight the training agenda on your flipchart or board so participants can see it on arrival. Focus on the key learning area, the importance of fish safety and handling.

Conduct a warm-up exercise or icebreaker to make sure all fish processors feel welcome and ready to fully participate. You can use suggested warm-up activities or icebreakers in the facilitators’ guide.

Facilitator’s tips

- Make participants feel included and welcome.
- Make sure that the participants do not get exhausted during the sessions.
- Sustain the trainee’s attention, make the session interesting, and watch out for verbal and nonverbal communications.
- Use the training handout and any additional educational aid
- Use active methods e.g., discussion instead of passive
- Encourage active participation, asking questions, and
- Apply the concept of social cognitive theory (SCT)
- Create small group (4-5 people) discussions using leading questions and exercises. Monitor small group discussions and activities.
- Return to a full group for general review and round up the session.

2. Pre-quiz (10 mins)

Instructions

- Administer and initiate the pre-quiz before the training session and discussion immediately after the brief introduction and warm-up exercise.
• Inform the participants that the quiz contains three multiple-choice questions on the module to be taught for today, and it will last for 5 minutes.
• Assure the participants that the quiz will not be graded, and it is okay if they do not know the answers to the questions.
• Inform the participants that the same question will be re-administer after the training session of each module.

3. Food Safety and Handling (15 mins)

INTERACTIVE DISCUSSION

Introducing food safety but focus on fish safety and handling.

Key learning area: the importance of fish safety and handling to a quality, nutritious, and safe fish products and protecting the health of vulnerable groups including children and pregnant, lactating, and older adults from foodborne diseases.

Goal of Discussion: Fish processors know and understand the importance of food safety to preventing food-borne diseases and promoting healthy living.

Facilitator Preparation: In advance, prepare a flipchart and photocopies of the picture or image showing unsafe and unhygienic practices of fish handlers in a kitchen for the activity in training (group work). Make emphasis on the importance of food safety to safe and quality fish products, and foodborne disease prevention.

1. Ask the fish processors to form a group of 4-5 people and ask them to identify what is wrong in the picture presented. Encourage each group to identify all possible unsafe conditions and practice in the picture. After five minutes, have some groups share what they discovered with the larger group.

2. Tell fish processors that unsafe food handling practices lead to food contamination and food-borne illnesses such as cholera, typhoid, dysentery, diarrhea, hepatitis A, etc. The presence of germs or pathogens makes the fish or food unsafe for consumption. Several factors (unsafe conditions and practices) favor the growth of food-borne pathogens in food.

Ask the fish processors what they understand about germs and how they get into fish product
3. Introduce safety measures and safe fish handling. Use the training aid; facilitator’s copy of the activity in training contained in this module.

4. Put away the training aid and discuss the safety measures and practices with the fish processors.

5. After the exercise, bring out your flipchart. Have some volunteers mention one safe practice and handling while you write on the board.

6. Review the importance of handwashing in food safety.

7. Discuss with participants why fish processors should wash their hands and when.

8. Ask participants how handwashing can be encouraged. Write their suggestions on your flipchart or board, adding any suggestions that they missed and discussing them as needed.

**Safe fish handling and processing practices**

**Safe raw material and equipment**

1. Buy quality raw fish, avoid injured, contaminated, thawing, and decomposing fish
2. Use of good smoking oven of quality products to produce reduced smoke exposure
3. Use of modern and hybrid oven where affordable
4. Use sola dryer instead of open sun-drying
5. Cleaning and washing of equipment such as trays, basins, and tanks, chopping board or tables,
6. Use easy to clean fish processing material and equipment and disinfect to prevent cross-contamination when in contact with fish.

**Safe storage condition and equipment**

7. Separating processed or cooked fish from the raw fish
8. Keeping fresh or unprocessed fish under a cold temperature below 40 degrees Fahrenheit
9. Stored your finished products properly on trays, shelves, packed in baskets or wood planks.
10. Avoid spraying pesticides during processing or where fish products are not properly stored.

**Hygiene, and sanitation**
11. Sanitary disposal of fish waste to prevent flies, pests, and offensive odors
12. Proper cleaning and disinfection of processing areas to prevent contamination.
13. Washing of hands with soap and water before handling fish, after using the toilet, or changing a child's diaper
14. Always wear your hand glove, apron, and cap or hear gear (protective clothing) while handling or preparing fish.
15. Remove your protective clothing before going or using the toilet.
16. Do not use your cloth or apron for cleaning or drying surfaces or materials.
17. Use clean and safe water for processing and washing fish to avoid contamination
18. Remove and throw away the waste generated from fish preparation in a sanitary manner to prevent flies and rodents.
19. Avoid direct contact of fish and processing ingredients e.g., salt with the floor.
20. The vehicle used for transporting fish must be cleaned and disinfected regularly to prevent cross-contamination
21. Avoid coughing into your palms during fish processing and preparation
22. Do not sneeze into open space while preparing or processing fish
23. Avoid handling fish if you have an unprotected or open wound. Use adhesive bandage and waterproof material if you must.
24. Cut your fingernails and clean them regularly. Avoid nail polish
25. Wearing rings, bracelets, dangling earrings, watches, or other similar items while processing fish should be avoided.
26. Do not eat, or chew gum, smoking, and spitting, while preparing or processing fish
27. Avoid touching processed fish products with bare hands
28. Monitor your health and avoid working or processing fish while sick.

**Keys to Food safety**

**WASH**- wash your hands, utensils, slabs, raw or wet fish.

**COOK**- cook fish thoroughly to keep germs or bacteria.

**SEPARATE**- separate raw fish from processed or cooked one to avoid contamination from raw fish to processed fish.
REFRIGERATE (Keep cool)- keep fish products at the proper temperature, below 40°F in a refrigerator.

Adapted from FAO, *Food Handlers Manual*.

In the absence of a refrigerator, keep your fish in a well-covered container with enough ice to protect and preserve the fish from deterioration before processing or in the absence of a refrigerator. If there is no ice, fish can be preserved in clean seawater or cold clean water or covered with a clean wet cloth and placed in a container under a shelter.

*Preserve unprocessed fish or raw material 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.*

*Diei Y and Ndiaye O, 1998.*
**High-risk food** - Fish, and seafood are high-risk protein foods. Protein food in a liquid or wet form is at greater risk of microbial food contamination and poisoning. Other high-risk protein foods are milk and dairy products, eggs, meats, poultry, etc. This category of food requires greater adherence to food safety principles to ensure that they are safe or fit for human consumption.

**Conditions that favor the growth of food-borne pathogens**

- **Temperature**: Bacteria grow more rapidly within a range known as the temperature danger zone; warm or hot condition i.e., $5^0\text{C}$ and $57^0\text{C}$ ($41^0\text{F}$ and $135^0\text{F}$). Fish and other seafood must be preserved at or below the temperature $5^0\text{C}$, which is under a chilled or cold condition to prevent bacteria growth. This is recommended for wet or cooked fish.
- **Moisture**: The presence of water or moisture favors the growth of bacteria. The amount of moisture available in food for the growth of bacteria is known as water activity which ranges from 0.0 to 1.0. Dehydrated or dried fish can stay longer but must be kept under low humidity.
- **Oxygen (air)**: The presence or absence of oxygen can favor bacteria growth. Some bacteria are aerobic (need oxygen to grow and survive) and some are anaerobic (no need of oxygen).
- **Time**: the longer the bacteria stay in a temperature danger zone, the greater the chance to render the fish unsafe. Fish starts to decompose and deteriorates a few hours after harvest if not properly preserved.
- **Food**: Microorganisms need nutrients such as carbohydrates and proteins to grow and survive. These microorganisms hasten the decomposition of fish products when present.
- **Acidity**: Bacteria often thrive in a neutral to the slightly acidic range, a pH of 7.5 to 4.5. pH is the measure of acidity.
Importance of food safety

- Prevent germs or microbial growth in food (food toxins) that cause foodborne illnesses and poisoning.
- Food safety practices will reduce hospitalization due to food poisoning and illness and promote healthy and productive (active) lives.
- Food safety practices preserve the quality of food products, prevent food spoilage, and waste.
- It prevents economic loss, and diversion because of medical bills for treatment.

4. Foodborne illnesses

Illnesses of diseases are caused by foodborne pathogens and toxins when they are consumed through food, water, or drink. They are caused by biological, chemical, or physical contaminants.

Common foodborne illnesses, signs and symptoms, and implications.

- Hepatitis A
- Norovirus
- Typhoid
- Cholerae
- Dysentery
- Anisakiasis (sickness caused by eating raw or undercooked fish) FAO/PAHO-WHO 2014.
**Common signs and symptoms of food-borne illness:** Nausea, Vomiting, diarrhea, abdominal pain or cramps, fever, and headache.

Do not handle fish if you suffer any of these:

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

Visit hospital for proper treatment

Adeoye G.A, 2021
5. Hand Washing Tips (20 mins)

1. Wet your hands
2. Apply soap or lather and scrub for 20 secs.
3. Rub hands palm to palm
4. Right palm over left dorsum with interlaced fingers and vice versa.
5. Palm to palm with fingers interlaced
6. Back of fingers to opposing palms with fingers interlocked
7. Rotational rubbing of left thumb clasped in right palm and vice versa.
8. Wash the tips of your finger
9. Rinse hand with water for 10 secs, use a paper towel to dry your hands
10. Your hands are safe

Adegoye, G.A 2021
When to wash your hands

◦ Wash your hands before handling or processing fish or any food
◦ Wash your hands after handling raw fish or meat.
◦ Wash your hands after using the toilet or changing baby’s diapers
◦ Sneeze or cough into your elbow. Coughing or sneezing directly into your palms (hand) can contaminate the food. Wash your hands after such an action.
◦ Wash your hands after picking your nose, scratching your body or head

Importance of personal hygiene in food safety

◦ Long fingernails and the use of jewelry during fish processing or preparation can harbor germs (disease-causing agents).
◦ Blood and other fluid from fish processing are biological contaminants, often associated with a repelling odor. Regular bathing with soap and water will help to get rid of it as well as prevent cross-contamination of fish products.
◦ Personal hygiene will reduce the risk of food contamination through handlers or processors
◦ Wash your clothing, apron, and headwear regularly with soap and water, and iron or sundry to kill hanging germs.
◦ Sanitize your hands when reasonable, but it does not replace hand washing.

Adegoye G.A 2021
Washing of utensils and fish processing materials or equipment.
Always wash the utensils with soap and water, rinsing them with hot (boiled) water or water to which bleach has been added to kill invisible germs. Examples: knife, trays, bowls, chopping boards and cutting slabs, etc.

- Scrape all the debris, and fish wastes from the utensils and sanitorily dispose of them in a covered non-permeable waste bin to deny flies and rodents access to foods.
- Change the water if it is becoming unclean and greasy if not rinsed under a running tap
- Set the utensils in the drainboard or dish rack to allow draining.

Wash the dust bin with detergent and disinfectant

INTERACTIVE DISCUSSION (20 mins)

Goal of Discussion:
Fish processors will discuss how food safety practices can prevent foodborne illnesses

Materials needed: Flipchart and markers.

1. Ask participants if anyone could share how food safety practices can be helpful to reduce the incidence of food-borne illnesses like cholera, diarrhea, typhoid among children and women
2. Brainstorm with fish processors what actions to be taken if they are sick or care for a sick person (child, relative, friend, neighbor) who is vomiting, stooling, coughing, and with a high fever but they still need to process or sell fish. How do they maintain good handling and processing of fish during this time?

3. Brainstorm with fish processors what actions do they take when they have no money to buy gloves or when fresh or clean water is not available for processing, washing, and cleaning. How they handle the situation where the latrines at the market are continuously dirty, and they have no choice but to use them.

**KEY MESSAGES**

- Food safety training and practices are essential in preventing food contamination or food poisoning and food-borne illnesses.
- Food prepared under an unhygienic environment and conditions is prone to contamination.

6. **Closing discussion (10 mins)**

Go around and ask each participant to share one thing they learned with the group.

7. **Post quiz (5 mins)**

**Module 3 Food Safety**

1. Food safety is (a) making food free from harmful substances (b) making food look nice and smell good (c) making food taste delicious

2. What are safe practices? (a) Watching TV (b) Actions taken to ensure safe and quality food production (c) helping others.

3. What will you do to keep fish from harmful germs and substances that can affect humans? (a) use pesticides to kill germs and flies (b) call the Delta State government for help (c) wash your hands with soap and clean water.
Activity in Training- Group Work

Identify unsafe food conditions and practices in this picture

Facilitator’s copy

1. Food products without refrigeration (chicken and milk).
2. Sneezing over food (chicken).
3. Animals in the working area (cats and flies).
5. Garbage container near the food handling area.
6. Food handler’s inappropriate clothing.
7. Drawers and doors open.
8. Biological hazard vectors in the food handling area (cats and flies).
9. Chemical products stored next to foods.
10. Storage in cans.
11. Food products stored without proper sealing.
12. Dirty working area. (Glass thrown in the food handling area.)

MODULE 4 FISH PROCESSING TECHNIQUES

FACILITATOR GUIDE

FISH PROCESSING METHODS

Photo by Ayoola, Babatunde

Feed the Future Innovation Lab for Fish Nourishing Nations Team
OVERVIEW

LEARNING OBJECTIVE
Participants will learn about safe fish handling and its importance in preventing diseases and promoting health.

DURATION: 1 hour 20 mins.

MATERIALS NEEDED
- Handout
- Projector, Flipchart
- Pencils, pen, note.
- Timer

KEY CONCEPTS
- Fish processing techniques can be traditional or modern method
- Fish processing methods usually have influence on the quality and safety of fish products.
- Safe fish processing and handling principles are crucial in producing safe and quality fish products.

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<table>
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<tr>
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<tr>
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<td>Fish Processing Methods</td>
<td>Discussion</td>
<td>20 min</td>
</tr>
<tr>
<td>4.</td>
<td>Processed Fish Products</td>
<td>Discussion</td>
<td>10 mins</td>
</tr>
<tr>
<td>5.</td>
<td>Fish Production and Preparation</td>
<td>Discussion</td>
<td>20 mins</td>
</tr>
<tr>
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1. Introduction (10 mins)

Welcome the fish processors to the training. Introduce today’s topic and review the training agenda. You may highlight the training agenda on your flipchart or board so participants can see it on arrival. Focus on the key learning area, the importance of fish safety and handling.

Conduct a warm-up exercise or icebreaker to make sure all fish processors feel welcome and ready to fully participate. You can use suggested warm-up activities or icebreakers in the facilitators’ guide.

2. Pre-quiz (5 mins)

Instructions

- Administer the pre-quiz before the training session and discussion immediately after the brief introduction and warm-up exercise.
- Inform the participants that the quiz contains three multiple-choice questions on the module to be taught for today, and it will last for 5 minutes.
- Assure the participants that the quiz will not be graded, and it is okay if they do not know the answers to the questions.
- Inform the participants that the same question will be re-administer after the training session of each module.

3. Fish Processing Methods (20 mins)

INTERACTIVE DISCUSSION- Methods of fish products processing or and preservation

Introduce food processing but focus on improved (safe) fish processing techniques and the implication or outcome on the quality, safe, and nutritive content of fish products.

Key learning area: Improved, safe, and quality fish processing technique.

The most common methods used in Nigeria are smoking, sun drying, salting, frying, braising, and cooking. These methods can be combined most often to reduce the water content and to improve the quality and taste of the fish product. For instance, Braining + Smoking + drying. (smoke-dried fish). It is
worthy of note that the choice of raw fish being processed has a consequence on the quality of the final product.

Goal of Discussion: Fish processors will learn the importance of proper and safe processing, preparation, and preservation methods in producing quality, safe, and nutritious fish products.

Fish processors will discuss their processing methods and how to improve the quality of their fish products.

Facilitator Preparation: In advance, prepare a flipchart or PowerPoint slides showing safe fish processing and preparation methods.

1. Ask participants to share the fish processing methods they use and the challenges they encountered with the processes. Write down the challenges in your note. Ask 2-3 volunteers to tell the larger group about the type of fish and fish processing methods they are using, and their experiences and challenges.
2. Write down other salient points, take note of their concerns and areas of interest
3. Appreciate the participants for their contributions.

REFERENCE MATERIAL

Fish Processing Methods: There are traditional methods and modern methods of fish processing. Although, modern methods are safer and more hygienic. Examples of modern fish processing methods are Oven baking or drying, canning, grinding into powder, or fermenting into a paste. The traditional methods that are widely and currently practiced in Nigeria are smoking, smoke-drying, sun drying, roasting, frying, and cooking.

Traditional Methods

Salting

- Salting is an effective preservation method, which provides antiseptic or antimicrobial quality. This method can be combined with fermentation, smoking, and drying.

  Dry salting: This involves sprinkling or rubbing and spreading evenly on the fish. The salt dissolves and slowly penetrates the fish. Then place the fish in a perforated container or net or wire mesh tray to facilitate the drainage of the brine.
Humid salting can be done in two ways: soaking in brine solution and by alternating layers of fish and salt in a tank that has no outlet.

- Salting good method to remove water (dehydrate) from the fish & prevents or slow down the growth of food spoiling agents or germs e.g., bacteria
- Dry and salting or brining is a good way to preserve fish or animal protein in the absence of refrigeration or electricity. Appropriate for lean fish.
- Excess salt intake increases the risk of high blood pressure (hypertension)
- Dry salted fatty fish exposed to air becomes rancid with altered taste.
- Salt-loving bacteria (halophytic) can survive and grow on salted fish. Salting can be combined with another method such as drying for proper preservation.
Drying

This is the method of reducing the moisture or water content of fish which helps to increase the shelf-life span of a fish product.

In many parts of the developing world, drying is done by spreading fish on the floor or a mat, cloth, polythene, or sack on the ground and exposed to sunlight for days. This method exposes the fish to different kinds of contamination and vectors of diseases such as insects, animals, etc. Drying by hanging or on a raised net tray is recommended to reduce contamination and improve air circulation. Also, cover with plastic or polythene to protect the fish from humid conditions and dust contamination. This method reduces drying time, is easy to manipulate, utilizes lesser space, and produces quality products. The modern method of drying includes oven drying and freeze-drying.

Adegoye G.A 2021

Oven drying

Oven drying is a modern method of fish preservation. It is used in dehydrating fish products for a longer preservation period. The oven must be regulated at a moderate temperature. Protect the
oven from adverse weather such as rain. Always cover the oven during operations. Wash the tray and racks always to prevent cross-contamination.

![Modern Electric oven](Photo by Adegoye Grace)

**Smoking:**

Smoking is one of the major traditional ways of preserving fish in Nigeria. It requires burning wood to produce heat high enough to cook and dry the fish. It releases an antibacterial substance from the burning wood and inhibits bacterial or microbial growth and activities. Therefore, preserving the fish products is better. Smoking produces a distinguished aroma, an attractive appearance, and enhances a desirable taste appreciated by the consumers.

**Types of fish smoking kiln**

**Traditional or local kiln** which is often made of mud; a smokehouse with a fireplace for burning wood and generating smoke.

**Modern or mechanical fish smoking kilns** involve the use of force-draft to enhance the drying and smoke application and the use of a heater source remote to the smoke generator to reduce the smoking time. Advantages of the modern smoking methods include fish products with no heavy smoke contamination, large-scale production, less labor, and time is required.

**There are two methods of smoking depending on the kiln type.**

- **Cold smoking** requires a lower temperature of about 35°C but not high enough to cook the fish.
- **The hot smoking** method requires a very high temperature between 300°C and 700°C using the traditional kiln with wood burning.
Three processes or stages of fish smoking:

- **Cooking**: smoking is done at a high temperature of at least 85°C to last for 1 to 2 hours. This process is to firm up the flesh of the fish.
- **Drying**: This is done at the temperature of 30-40°C for about 2 hours. The process allows slow dehydration and firming up the fish flesh.
- **Smoking**: This involves wood burning to produce smoke. This process is done at a moderate temperature of 60°C for about two days, depending on the length of time the product is to be preserved. The longer the period of drying the product the longer the shelf life. To maintain a uniformly smoked product, turn the fish regularly.

**Additional tips**: the quality of wood used for smoking is very important in producing a quality smoked fish product. Use hard and dry woods. Avoid resinous and painted woods, they produce unpleasant smells and tastes.

Traditional smoking kiln: mud block. *(Nigerian Smoked Fish Market Potential 2012.)*

Metal smoking kiln (Photo by Adegoye Grace)
Burkina smoking kiln: Use of a metal drum with gauze; adopted from Burkina Faso in West Africa. (Photo by Adegoye Grace)

Confined Burkina smoking kiln: metal drum with fire inlet or heat space is confined with planks in a rectangular form to retain the heat or serve as an insulator. Wooden framed gauze is arranged on top for fish smoking.

Chorkor Oven: It is made up of a smoke chamber (oven) and the smoke tray which fish is laid for smoking. It could be constructed with clay bricks, mud, cement blocks, and burnt bricks, with
fire inlets, and a wooden cover to be placed on the trays during smoking. (Diei Y and Ndiaye O, 1998)

Modern oven made of metal has a smoking chamber with an array of trays for drying fish. It also has a thermometer for temperature or heat regulation.
**Grilling Machine**: used in producing barbequed fish.

Photos by Adegoye Grace

**Solar-Dryer**

Fish processing equipment and maintenance

A. Chopping boards  
B. Blender  
C. Knives

D. Bowl  
E. Cooler  
F. Refrigerator with freezer

Photos by Adegoye Grace

Maintenance

- Always wash and sanitize the processing equipment after use
- Air dry to prevent bacteria growth
- Always keep the refrigerator clean, avoid overloading it with food items.
- Close the door of the refrigerator always
4. Processed Fish Products (10 mins)

Smoked fish

- Fish is exposed to organic pollutants or contaminants
- Dioxin from the smoke can cause cancer
- Eye irritations from the smoke
- Smoked fish may attract rats and rodents due to the appealing smell
- Exposure to dust and flies (traditional method)

Source: https://pricepally.com/product/detail/catfish-native-30pcs

Barbeque or roasted fish

- Barbeque or roasted fish are usually grilled
- Barbeque fish may be exposed to dust and smoke contaminants
- It must be turned regularly to prevent fish from getting burnt
- It is attractive and has an appealing organoleptic quality

Source: https://www.jessicagavin.com/grilled-salmon/
Sun-dried (ground dried) fish

Source: Internet

- Fish is exposed to organic pollutants or contaminants
- Exposure to environmental contaminants e.g., dust, flies, pests, etc.
- Loss of nutrients e.g., Vitamins A & B12
- Dry fish may attract rats and rodents
- Exposure to flies and insects (houseflies) - mechanical transmission of disease.
- Humidity promotes fungi and mold growth in dried fish – increasing spoilage and waste.

Fried fish

Photo: Adegoye Grace
- Loss of benefiting nutrients
- Excess trans-fat from the cooking oil
- May attract rodents and rats when not properly stored or preserved
- Fried foods are not good for the heart; increase the risk of stroke, and heart attack by 7%.
  (American Heart Association)
- High risk of burn from the cooking oil.

**Frozen or iced fish**

![Frozen fish](image)

Photo: Adegoye Grace

- One of the best methods of food preservation
- Power outage causes food to fall within the temperature danger zone.
- Refrigerate at $\leq 40 \, ^\circ\text{F}$ or freeze at $\leq 0 \, ^\circ\text{F}$
- Loss of nutrients during thawing
- Decomposition and foul odor if it stays longer out of temperature required for preservation
- Waste and loss of profit.
- Private cold rooms are costly (expensive)
Powdered or groundfish

- Can be easily mixed safely with a child’s food
- Retained nutrients for example bones rich calcium is grounded with the small fish products.
- Can be packaged in different, more presentable, and marketable form
- Upgraded products with food labels and nutritional information
- Can be measured with a spoon or any food quantity measuring device
- Reduce waste and monetary loss, maximizes profit and business growth/expansion

Photo: Adegoye Grace

Fish paste

- Can be easily mixed safely with children and sick patients.
- Retained nutrients calcium, proteins, omega 3 fatty acid, etc
- Can be packaged into cubes, as food condiments
- More presentable and marketable form
- Can be measured with a spoon or any food quantity measuring device
- Reduce waste and loss
- Business upgrading
- Packaged processed fish can be easily transported with limited risk of contamination
Canned fish

- Free from dust, flies, and rodent contamination
- Prepared under highly clean/hygienic condition- safe for consumption
- Reduced contact with fish processors
- Nutrients are intact and preserved
- Ready to eat
- Stay longer without spoilage

5. Fish Production or Preparation Process (20 mins)

1. **Fish grading:** sorting fish by species or size for fish processing or marketing. This can be done manually on a small scale, and mechanically on a large scale using fish grading equipment.
2. **Fin removal:** fins are usually sharp and can prick your finger or cause injury. Remove the fins with clean scissors or a knife.
3. **Descaling:** removing scale from the fish is a necessary process because scales are unpleasant to eat. Hold the head of the fish and descale towards you using a sharp clean knife, also turn and hold the tail and move the knife away from you.
4. **Removal of viscera and internal content (Evisceration):** insert the knife into the hole by the side of the fish and move the knife upward. Open the fish and remove the internal organs, stomach content, and gills. This process will reduce fish spoilage.

5. **Fish Cleaning:** wash the fish thoroughly in clean water to remove slime on fish skin if present, blood, and other dirt or germs. You can wash with water and lime, hot or cold water, freshwater, or saltwater.

6. **Fish cutting:** This may include the removal of the head, cutting into large or small pieces (chunks) depending on the processing methods you choose, splitting, filleting, etc.
   i. Fish splitting is cutting the fish open to increase the surface area, especially for smoked or sun-dried fish to reduce the smoke and sun exposure time.
   ii. Fish filleting is the process of separating the flesh of the fish from the bone. This is a special fillet knife, which makes a precise and smooth cut from the tail to the head of the fish to remove the fish’s backbone.

7. **Soaking:** fish soaking in a tank or bowl in a salt-water solution. This depends on the level of salinity (saltiness) desired.

8. **Fermentation:** involves the molecular destruction of the muscular tissues by microorganisms and proteolytic enzymes. Fermentation tanks are to be kept in a clean state
and a warm condition to speed up the process. Duration varies from a few hours to a week or weeks sometimes.

9. **Sieve/strain:** drain the fish while getting ready for the next processing method.

10. **Drying:** This is the removal of water content from the fish. This can be achieved through exposure to sunlight or mechanically using an oven, food dryer, and dehydrator, freeze dryer (preserves the nutrient and prevents microbial growth, and lasts longer).

11. **Grinding:** grinding fish into powder after drying or dehydrating using a grinding machine or manually by pounding using a pestle. This can be packed into a final product using containers, and plastic bags.

12. **Pasting:** fish paste can be produced by fermentation, after the softening of the fish. The fish will be rinsed in clean seawater or potable water to completely remove the blood and fatty scum. Salting is often involved to ensure preservation.

### Interactive discussion

**Goal of Discussion:** the challenges and limitations to producing a quality and safe fish product.

Fish processors will discuss how to overcome these challenges to improve the quality of their fish products.

**Materials needed:** Flipchart and markers.

1. Brainstorm with fish processors ways that they can reduce or eliminate the challenges associated with the identified processing methods and ensure the production of nutritious and safe fish products all year long to facilitate a healthy diet.

**KEY MESSAGES**

- Improved fish processing methods and practices will improve the quality of fish products.
- Modern methods can help in producing more quality and safe fish products in large quantities to meet consumer’s demand

### 6. Closing discussion (10 mins)

Go around and ask each participant to share one thing they learned with the group.
7. Post quiz (5 mins)

Module 4  Fish Processing and preservation

1. Modern fish processing methods are? (a) Oven baking and solar drying (b) smoking, and sun drying. (c) Salting and frying.

2. The method used for fish preparation or processing can affect
   (a) the level of fish exposure to harmful substances (b) its quality (c) Both a and b

3. Which of these is not a safe and hygienic method of fish drying? (a) Air drying by hanging or spreading on a net table (b) solar or oven drying (c) Spread on the ground and cover it with a nylon or transparent plastic
FISH CONTAMINATION

Fingers (dirty hands containing germs)
Flies (insects & Foes (pests, rodents)
Fomites (dirty apron, handkerchief, napkins)
Fumes (gases or smoke, vapor, fog, etc.)
Forks (represents cutlery 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 2021. Sources of fish contamination
OVERVIEW

LEARNING OBJECTIVE
Participants will learn about safe fish contaminants, risk, and preventive measures.

DURATION: 1 hour 20 mins.

MATERIALS NEEDED
- Handout
- Flipchart, Projector
- Pencils, pen, paper.
- Timer

KEY CONCEPTS
- Fish contaminant causes food borne illnesses especially biological contaminants
- Fish contaminants can be classified as biological, chemical, and physical contaminants
- Unsafe fish is a product of contamination.
- Food contamination and food borne illness are preventable through food safety, personal hygiene, good practices, sanitation, and hygiene.

TRAINING AGENDA

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<td>Discussion</td>
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</tr>
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<td>Health implication of food contamination and prevention</td>
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1. **Introduction (10 mins)**

Welcome the fish processors to the training. Introduce today’s topic and review the training agenda. You may highlight the training agenda on your flipchart or board so participants can see it on arrival. Focus on the key learning area, the importance of fish safety and handling.

Conduct a warm-up exercise or icebreaker to make sure all fish processors feel welcome and ready to fully participate. You can use suggested warm-up activities or icebreakers in the facilitators’ guide.

**Tips for Facilitator**

- Make participants feel included and welcome.
- Make sure that the participants do not get exhausted during the sessions.
- Sustain the trainee’s attention, make the session interesting, and watch out for verbal and nonverbal communications.
- Use the training handout and any additional educational aid.
- Use active methods e.g., discussion instead of passive.
- Encourage active participation, asking questions, and
- Apply the concept of social cognitive theory (SCT).
- Create small group (4-5 people) discussions using leading questions and exercises.
  Monitor small group discussions and activities.
- Return to a full group for general review and round up the session.

2. **Pre-quiz (5 mins)**

**Instructions**

- Administer the Initiate the pre-quiz before the training session and discussion immediately after the brief introduction and warm-up exercise.
- Inform the participants that the quiz contains three multiple-choice questions on the module to be taught for today, and it will last for 5 minutes.
• Assure the participants that the quiz will not be graded, and it is okay if they do not know the answers to the questions.
• Inform the participants that the same question will be re-administer after the training session of each module.

3. What are Contaminants? (10 mins)

Interactive Discussion
Introduce the topic but focus on how to prevent or avoid food poisoning and contamination.

Key learning area: Preventive measures against food contamination and its consequences

Goal of Discussion: Fish processors will identify harmful food substances and their effects on the health and safety of the consumers, as well as the quality of the fish product. They will also discuss what is expected of them in preventing foodborne illnesses because of food contamination.

Facilitator Preparation: In advance, prepare a flipchart with a picture of biological, chemical, and physical contaminants. Also, prepare a flipchart with the sources of contamination.

1. Ask the participants to list substances or objects they have seen in their fish products before that could be harmful to human health and write their responses on the flip chart or board.
2. Tell fish processors that contaminants are harmful substances present in food. These substances may be seen or invisible with our eye such as microorganisms e.g. virus, and bacteria. The presence of these substances makes the food unsafe for human consumption. Also, tell the participants that fish can contain harmful agents because of poor sanitation, poor hygiene, dirty or unsafe water, and several other unhygienic practices.
3. Introduce contaminants and their health effects or consequences. Use the training aid containing the picture of different classifications of food contaminants and their sources. Go back to the original list of contaminants they developed and ask them if now they think anything is missing.
4. Put away the training aid. Ask the fish processors to form a group of 4-5 and ask them to complete the activity in training for this module.
5. Come back to the large group after 5 minutes and do the activity with participants. Aim to complete it in 15 minutes or less.

6. After the exercise, ask volunteers to mention some of the dangers or risks associated with identified contaminants in the activity under each category.

7. Review the importance of food hygiene, personal hygiene, sanitation, and good practices and handling in preventing food poisoning and foodborne illnesses.

8. Discuss with participants why contaminated fish is harmful mostly to children and pregnant women.

9. Discuss with participants on “why are these contaminants present in our fish?” and “what can we do about it?” You can go category by category. Ask the fish processors to split up into 4 groups and have each group will report back the answers to these questions for their category of contaminant.

10. Ask participants how to avoid or prevent these harmful materials from getting into their fish products during processing and after. Write their suggestions on your flipchart or board, adding any suggestions that they missed and discussing them as needed.

4. Classification of contaminants (30 mins)

Contaminants are substances that make food unsafe for human consumption.

Contamination is the presence of harmful substances in food, drink, or water meant for human consumption. It makes food unsafe and can lead to food-borne illnesses or food poisoning. These can be physical objects, pathogens, or disease-causing microorganisms (germs) and chemical substances. They are also called contaminants.

- Contaminants are hazardous substances capable of causing harm or risk to the health of man, animal, or ecosystem. The two sources and causes of contamination are natural and man-made or human activities.

- Unsafe Fish processing methods and poor handling, hygiene, and practices of fish processors are good examples of the man-made source of fish contamination.
Contaminants are classified into three categories: Physical, Biological, and Chemical.

**Physical contaminants** can also be known as physical hazards. They are foreign materials that get into food. This includes a piece of glass, wood, dust, dirt, sand, metal shavings from cutting devices or food processing machinery, bones, or sharp part of fish in fillets, shards of bones in meat, pieces of plastic, stones, bandages, bag ties, hair strand, and other items used by the fish processor.

![Physical contaminants icons]

Adegoye G.A 2021

**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.

![Biological contaminants icons]

Adegoye G.A 2021

**Sources of biological contamination**

- Dirty hands containing germs
- Dirty plates, knives, buckets, etc.
- Contaminated cutting slab, chopping board, or table
- Dirty and polluted water and food (including raw and perishable food)
- Contaminated soil and dirty floor and surroundings
- Dirty clothes, napkins, handkerchief, and aprons
- Human wastes, animals, and bird’s droppings
- Sick person (fish handler)
Biological carrier or vector of diseases
- Animals: pets, pests, and insects/ flies e.g., houseflies, cockroaches are biological carriers of germs.

Foodborne pathogens or biological contaminants are responsible for fish decomposition.

**Chemical contaminants or hazards** are substances that are dangerous to humans and can cause food poisoning when present in food. Examples of chemical contaminants are pesticides, sanitizers, cleaning substances, disinfectants, detergents or soap, smoke, gas, fog, including foodservice chemicals when not properly used, and improper use of pesticide, especially without supervision. Use of dynamites and gammallin 20 for fish harvesting in artisanal fishing.
Potential hazard associated with pesticides and precautions

- Pesticide containers litter in the field contaminants drains and water bodies such as rivers, lakes, oceans causing water pollution and contamination of aquatic or seafood.
- Large fish are likely to have a high level of pesticide in their tissues
- Pesticides can build up to a toxic level in the body of the consumer in the food chain.

- Small fish may be safer for children to reduce the risk of poisoning (dietary pesticide exposure.)
- Do not spray pesticide directly on raw or processed fish to kill germs, flies, or insects
- Protect all fish products from pesticide exposure
- Spray your shop before going home after the day sales if you must
- keep pesticides away from children’s reach

Food additives you should avoid: to prevent accidental poisoning or contamination

- Nitrates
- Trans fats
- Artificial food coloring
- Aspartame
- Monosodium Glutamate (MSG)
➢ Use only labeled food additives, preservatives, or ingredients.
➢ Check for the expiration date

5. Health implications of fish poisoning and contamination (10 mins)

Common major foodborne illnesses: Hepatitis A, norovirus, typhoid, cholera, dysentery, anisakiasis (sickness caused by eating raw or undercooked fish)

Common signs and symptoms of food-borne illness: Nausea, vomiting, diarrhea, abdominal pain or cramps, fever, and headache.

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

Chemical poisons: Polyaromatic hydrocarbons, dioxin, mercury, and lead poisoning.

Common symptoms of toxins: dizziness, sweating, headache, tingling, numbness, vomiting, confusion or memory loss, abdominal pain, coma, etc.

Preventive measures against food or fish contamination: refer to hygiene rules and food safety principles.

● Handwashing
● Proper cooking
● Cooling
● Reheating
● Preventing cross-contamination
● Practicing personal hygiene
● Purchasing food ingredients from an approved supplier
● Excluding sick food handlers
Additional tips

Check your temperature, and stay home if you are sick

call or visit your health care personnel for checkup and

Visit hospital for proper medical attention

Use your medications and complete the prescribed treatment to prevent relapse.

Treat and cover all wounds with a waterproof bandage.

Photo by: Adegoye Grace

INTERACTIVE DISCUSSION (10 mins)

Goal of Discussion: Measures to be taken in preventing fish contamination

Fish processors will discuss how safety practices can prevent fish contamination and its consequences.
**Materials needed:** Flipchart and markers.

1. Ask participants to share how they can prevent various fish products from contamination

2. Brainstorm with fish processors ways to prevent food-borne illnesses and poisoning associated with unsafe or contaminated fish products.

**KEY MESSAGES**

- Contaminants and harmful substances in fish products cause great havoc but can be prevented through safe practices
- Contaminants reduce the quality, acceptance, and wholesomeness of fish products.

**6. Closing discussion (10 mins)**

Go around and ask each participant to share one thing they learned with the group.

**7. Post quiz (5 mins)**

**Module 5 Food Contamination**

1. Choose one of these options that do not make fish unsafe for eating.
   (a) germs, chemicals, and harmful substances (b) witchcraft and evil eye (c) unclean water and expired ingredients.

2. How can you prevent or stop harmful substances from getting into product fish?
   (a) Cover the fish products with your wrapper of cloth, (b) do not spray pesticides on fish (c) store the fish in a covered paint container to protect it from rats, cats, and insect attacks.

3. Why do we need to prevent fish and other foods from these harmful agents?
   (a) to promote our business (b) to maintain a good name in the community (c) to prevent foodborne diseases.
Activity in Training- Group Work

Identify these images and group them into the contaminant category they belong to. Also, identify the biological agent or carrier of germs.

Instruction: Use the number of the images to group them into the group they belong

Biological contaminant........................................................................................................
Physical contaminant ...........................................................................................................
Chemical contaminant ......................................................................................................
Biological agent or carrier of germs: .............................................................................
Identify these images and group them into the contaminant category they belong to. Also, identify the biological agent or carrier of germs.

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**Instruction:** Use the number of the images to group them into the group they belong

Biological contaminant: 1, 4, 9, 12
Physical contaminant: 3, 7, 13
Chemical contaminant: 5, 6, 8, 11,
Biological agent or carrier of germs: 2, 10, 14, 15.
OVERVIEW

LEARNING OBJECTIVE

Participants will learn about hygiene rules and good practices principles to ensure quality and safe food products.

DURATION: 1 hour 20 mins.

MATERIALS NEEDED

- Handout
- Flipchart/Projector
- Pencils, pen, paper.
- Timer

KEY CONCEPTS

- Sanitary rules for fish handlers are essential in preventing fish contamination and illness.
- Hygiene, sanitation, and good practices ensures food safety.
- Good practices are essential in production quality, nutritious and safe fish products.

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</tr>
<tr>
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<td>15 mins</td>
</tr>
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<td>Good Practices</td>
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Welcome the fish processors to the training. Introduce today’s topic and review the training agenda. You may highlight the training agenda on your flipchart or board so participants can see it on arrival. Focus on the key learning area, the importance of hygiene rules for fish handlers and processors.

Conduct a warm-up exercise or icebreaker to make sure all fish processors feel welcome and ready to fully participate. You can use suggested warm-up activities or icebreakers in the facilitators’ guide.

Tips for Facilitator

- Make participants feel included and welcome.
- Make sure that the participants do not get exhausted during the sessions.
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• Inform the participants that the same question will be re-administer after the training session of each module.

3. **Environmental Sanitation and disinfection (20mins)**

**INTERACTIVE DISCUSSION**

Introduce food safety rules but focus on safe fish handling, food hygiene regulations, and practices.

**Key learning area:** Good practices; emphasis on personal and improved food hygiene practices of fish processors.

**Goal of Discussion:** Fish processors will understand safety and sanitary rules that guide food handling and processing.

**Facilitator Preparation:** In advance, prepare a flip chart showing good practices.

1. Ask the fish processors if they have participated in a food safety training program before.
2. Ask the participants to form a small group of 4-5 people. Ask them to create a checklist of sanitary and good practices. Ask the small group to present back to the larger group.
3. Also, ask the fish processors if there are any sanitation laws, they are aware of in their community and their views about it. Is it helpful, needless, or not sure? Write down their responses in your note. Aim to complete the activity in 10 minutes or less.
4. Introduce fish processors to hygiene rules and regulations, and good practices.
5. Discuss with participants why hygiene and good practices are important in ensuring food safety, quality, and sound fish product.
6. Ask participants how they can encourage hygienic behavior or safe practices. Write their suggestions on your flipchart or board, adding any suggestions that they missed and discussing them as needed.
Sanitation and cleaning of fish processing environment or kitchen

Disinfection will help to kill pathogenic or disease-causing germs in the environment, processing equipment, material, and surfaces likely to have contact with fish. Always use clean water, add 1 spoon of bleach or chlorine to 10 liters of water.


Photo by: Ayoola, Babatunde.
4. **Sanitary recommendations of fish processing environment (15 mins)**

- Ensure a clean environment free from rubbish and dirt. Keep the processing environment or room clean always
- Provision of improved sanitary facilities; toilets, wash hand basins, sanitary drainage system
- Adequate and clean water supply for cleaning, washing, and fish preparation
- Food processing site or kitchen must not be close to a dumping sites or latrine
- Fly proof or screening of the entrance to prevent fly contamination
- Rodent proof and regular disinfestation to prevent rodent infestation
- A Sanitary waste bin with a well-covered lid and must be raised about 4 inches or 10cm above the ground to deny accessibility to pets, pests or rodents, and flies (mechanical vehicle of disease transmission).
- Clean and free-flowing drainage system to discharge wastewater like brine and water used for washing and cleaning equipment to prevent the breeding of flies.
- Proper arrangement and adequate spacing is important to prevent an accident
- Remove cobwebs from the ceilings to prevent suspended dust from contaminating the fish
- Ensure clean floor, cement broken floors, walls, and cracks to keep rodents and pets off the room/shop
- Sanitary disposal of spoilt fish, fish waste, and other domestic waste generated during processing and other domestic waste.
- Remove water-holding containers that can harbor flies e.g., houseflies, mosquitoes
- Adequate lighting, and ventilation to prevent an accident, and to reduce the risk of spreading diseases among workers or fish processors.
Sanitary requirements for fish processing premises

- Quality water supply-accessible to clean water source
- Cold chain maintenance (cold storage)
- Personal hygiene and wellness of the workers
- Sanitation and improved toilet facility
- The kitchen should be well-spaced with adequate light (illuminated)

Minimum health requirements for fish processors

- Health services or screening, medical test for processors twice an in year
- Fish processors should attend food safety training at least once a year.

5. Good Practices (15 mins)

Good practices and a clean environment are required to have the good result of the HACCP system in any food business. Good Practices includes:

1. **Good Hygiene practices (GHP)**
   - Hygiene and safety rules for fish handlers and processors
   - Sanitary requirement of the fish processing premises

2. **Good Aquaculture Practice (GAQP in fisheries or aquatic food processing)**
   - Preserve wet fish by chilling in ice from the time caught or purchased from the farm gate until it reaches the customer.
   - Gut the fish immediately where necessary, wash to remove debris, bloodstains, and bacteria on the skin and gills of the fish and stow with ice inboxes.

3. **Good Transport Practices (GTP)**
   - Keep cool rapidly to ice temperature close to 0°C during transportation.
   - Preferably use the flake or crushed block ice
   - If transported by road, it must be carried by insulated and refrigerated vehicles under a controlled temperature and satisfactory conditions.
Do not transport fish or food products in the same vehicle with:

- Chemicals
- Pesticides
- Life animals
- Humans

4. Good Handling and Packaging Practices (GHPP)

Good handling and packaging practices ensure adequate protection of all fish products from direct or physical contamination and humidity.

- Sort fish products before packaging and handle them with care to avoid breaking them accidentally. This may reduce the quality of your product and increase fish loss.
- Always place your packaging materials on the table or sanitized platform to avoid contamination from the floor or immediate environment.
- Use a solid, dry, clean, water resistance, nondeformable, and easy to handle and stack.
- Fish products could be packed in a carton, paper, jute bags with plastic. It can also be packed in a recyclable or reusable plastic (BSA free) container with a tight lid cover.
- Do not compromise or overload the packaging material.
5. **Good Storage Practices (GSP).**

Storage of the final products is very essential to prevent deterioration and waste. Proper storage prolongs or extends the shelf-life span of a product.

- Store or stow final products on shelves, wood planks, trays, trolleys, or baskets.
- Store in a dry, cool, well-ventilated, clean, and illuminated place.
- Ensure a distance of at least 15 cm (5.9 in) from the walls, ceiling, and ground level.
- Ensure the product is dry enough to prevent the growth of mold and contamination by insects or parasites.
- Re-dry or re-smoke if you observe a mold growth
- Heat smoked fish regularly. In raining season 2-3 days and once a week during the dry season
- Always keep the store in a hygienic condition. Free of garbage or food waste.
- Observe or check the products regularly and carefully
- Store finished products processed at different periods separately.
- Pesticides are not preservatives, do not apply them to fish products.

**Safety instructions on food storage**

- Keep and store raw fish separately from cooked or processed fish
- Keep cooked foods under the required temperature (keep chilled or iced)
- Store frozen or wet fish in refrigerator or freezer
- Store processed fish in a well-covered or tight lid container or plastic bag
● Do not store raw or package processed fish products in chemical or pesticide containers/bags.

● Refrain from storing chemicals such as detergents, disinfectants in food storage containers to prevent accidental poisoning

● Chemicals must be stored separately away from food storage areas

Health Effects of pesticide exposure include vomiting, headache, nausea, skin problem, eye damage/ problem, poisoning, breathing problem, cancers, etc.

INTERACTIVE DISCUSSION (10 mins)

Goal of Discussion: to learn the essentiality of hygiene, sanitation, and safe food handling practices. Fish processors will discuss how hygiene rules and practices can help in improving the quality and safety of processed fish for the benefit of consumers and the community at large

Materials needed: Flipchart and markers.

1. Ask participants to rank good practices as easy, moderately hard, and very hard to do. Ask them if they do the easy practices and, if not, what would make them start. Ask them if they do any moderate or hard practices and, if not, what resources they would need to do so. Are there cheaper or easier alternatives they could use to achieve the same goal?

KEY MESSAGES

● Hygiene rules and good practices are essential in ensuring safe fish products

● Good practices help in controlling hazards at critical points, where fish can be easily contaminated.
6. Closing discussion (10 mins)
Go around and ask each participant to share one thing they learned with the group.

7. Post quiz (5 mins)

Module 6     Hygiene rules and good practices

1. Sanitary requirements of fish processing premises are the following except
   (a) Adequate lighting, space, and fresh air (b) clean water, and handwashing facility
   (c) located close to a latrine or dumpsite.

2. Which one does not describe good practices? (a) good makeups and customer service.
   (b) good hygiene and processing practices, (c) good fish handling and packaging practices.

3. You can store processed fish in a chemical container if you wash it properly with water?
   (a) True (b) False

Activity in Training
A small group of 4-5 people will create a checklist of sanitary and good practices, then present it to the larger group.
MODULE 7 ECONOMIC BENEFITS OF QUALITY AND SAFE FISH PRODUCTS.
FACILITATOR GUIDE

ECONOMIC AND NUTRITION BENEFITS
OF QUALITY FISH

Feed the Future Innovation Lab for Fish Nourishing Nations Team
OVERVIEW

LEARNING OBJECTIVE

Participants will learn about the economic benefits of quality fish production through waste reduction and economic enhancement strategies.

DURATION: 1 hour 20 mins.

MATERIALS NEEDED

- Handout
- Flipchart
- Graph
- Pencils, pen, note.
- Timer

KEY CONCEPTS

- Quality and safe fish products improves the nutrition and economic value of fish
- Fish waste reduction strategy reduces post-harvest fish waste and loss
- Quality and safe fish product will provide a sustainable economic market

TRAINING AGENDA

<table>
<thead>
<tr>
<th>S/N</th>
<th>Agenda</th>
<th>Teaching Method</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction and warm-up</td>
<td>Discussion</td>
<td>10 min</td>
</tr>
<tr>
<td>2.</td>
<td>Pre quiz</td>
<td></td>
<td>5 min</td>
</tr>
<tr>
<td>3.</td>
<td>What is Fish Quality?</td>
<td>Discussion</td>
<td>10 min</td>
</tr>
<tr>
<td>4.</td>
<td>Poverty reduction through economic reinforcement</td>
<td>Discussion</td>
<td>15 mins</td>
</tr>
<tr>
<td>5.</td>
<td>The economic implication of fish loss</td>
<td>Discussion</td>
<td>10 mins</td>
</tr>
<tr>
<td>6.</td>
<td>Benefits of quality fish products</td>
<td>Discussion</td>
<td>10 mins</td>
</tr>
<tr>
<td>7.</td>
<td>Closing discussion</td>
<td>Discussion</td>
<td>10 mins</td>
</tr>
<tr>
<td>8.</td>
<td>Post quiz</td>
<td></td>
<td>5 mins</td>
</tr>
</tbody>
</table>
1. Introduction (10 mins)

Welcome the fish processors to the training. Introduce today’s topic and review the training agenda. You may highlight the training agenda on your flipchart or board so participants can see it on arrival. Focus on the key learning area, the importance of fish safety and handling.

Conduct a warm-up exercise or icebreaker to make sure all fish processors feel welcome and ready to fully participate. You can use suggested warm-up activities or icebreakers in the facilitators’ guide.

Tips for Facilitator

- Make participants feel included and welcome.
- Make sure that the participants do not get exhausted during the sessions.
- Sustain the trainee’s attention, make the session interesting, and watch out for verbal and nonverbal communications.
- Use the training handout and any additional educational aid
- Use active methods e.g., discussion instead of passive
- Encourage active participation and asking questions.
- Apply the concept of social cognitive theory (SCT)
- Create small group (4-5 people) discussions using leading questions and exercises.
  Monitor small group discussions and activities.
- Return to a full group for general review and round up the session.

2. Pre-quiz (5 mins)

Instructions

- Administer the Initiate the pre-quiz before the training session and discussion immediately after the brief introduction and warm-up exercise.
- Inform the participants that the quiz contains three multiple-choice questions on the module to be taught for today, and it will last for 5 minutes.
- Assure the participants that the quiz will not be graded, and it is okay if they do not know the answers to the questions.
- Inform the participants that the same question will be re-administer after the training session of each module.

3. Fish Quality (10 mins)

INTERACTIVE SESSION

Introduce Economic and nutrition benefits of quality and safe fish production.

**Key learning area:** Economic enhancement through quality fish production.

**Goal of Discussion:** Fish processors will learn how quality fish products contribute to economic development and better living. They will also see how economic increment can contribute to making appropriate food choices and eating healthy.

**Facilitator Preparation:** In advance, prepare a list of controversial statements about improved fish quality can improve income and bring a better life. Prepare two large cards or flip charts, labeled “Sure” and “Not Sure” and paste them on two different locations around the training room. You will need an extra facilitator or moderator, if possible, to observe and take notes on participants’ votes and debate arguments used.

1. Invite participants to stand up in the middle of the room and clear any obstructions that might get in the way.

2. Explain to the participants the activity we are going to do and ask about their opinions about certain statements. Advise them to listen carefully to the statement and make up their minds if they agree with (sure), or not sure about their thoughts.

3. Point out the locations and where they will stand. Then clarify any questions they may ask.

4. Read the first statement aloud. E.g., “Lack of money or poverty increases crime rate in the society” or “little or lack of finance affects the choice and quality of food consumed”

5. Ask: Are you sure or not sure?
6. Repeat the statement as necessary and wait until the participants decide and walk to the location that shows their views.

7. Invite one participant from each location to explain why they chose as they did for 2 mins.

8. Allow further debate, depending on time and how useful the debate seems to the training content. When appropriate, thank participants and say we can come back to these discussions at another time. **Aim to complete the game in 15 minutes or less.**

9. Read another statement, as desired, and repeat the process, or continue with further training content.

10. During or after voting, take basic notes or invite another facilitator to assist in doing so. Record participant number of votes each way for each statement, taking down major quotes participants use to support their statements. After the training, go back and reflect on notes, determining which statements it will be useful to ask again at a later stage.

**Fish Quality**

- Quality fish can be described as a wholesome fish; that is edible, healthy, fit, and safe for human consumption, physically acceptable with neither wound/injury, rat bite, and mold, free from microbial, chemical, and physical contaminants, maintains the organoleptic property, appeals to the palate or sense of taste, free from an obnoxious odor, maintained, and sold under a hygienic condition and acceptable temperature, with little or no alteration in the nutritional quality by the processing or preservation methods.
- Fish quality is paramount in reducing waste yield and loss. Therefore, it is significant in improving the economic capacity of the fishmongers, or artisanal fish processors and reducing post-harvest or post-gate fish loss in the fish value chain.
- Quality fish products provide adequate and substantial nutrients needed for brain and mental development, and normal growth in children. It reduces the risk of foodborne illnesses and the rate of hospitalization because of unsafe fish consumption.
4. Poverty reduction through economic reinforcement

Poverty, low income, or financial incapacity to purchase the necessities of life or economic denier to access food in a sufficient, and sustainable quality and quantity, infrastructures, potable water supply, sanitary housing, sanitary facilities, health care services, including social and recreational facilities for physical and mental health. Economic reinforcement through practicable strategies to reduce or eliminate fish loss and waste will contribute tremendously to poverty reduction and alleviation among the small-scale fish processors. It will also promote improved nutrition, quality diet, and dietary diversification.

5. The economic implication of fish loss and waste in the value chain

1. **Reduction in fish loss and waste**: wastes are generated from fish just like other foods. Different factors are responsible for post-harvest waste and loss which negatively impact the economic outcome. Identified factors include lack of proper storage facility, malfunctioning cold storage system, lack of controlled temperature vehicle for transportation, electricity outage, poor handling, improper or poor preservation methods and techniques, pest attack that contaminates and reduces the quality and quantity of processed fish products, and microbial contamination which hastens fish deterioration. The latter is usually responsible for the change in taste, color, smell, and unwholesomeness of the processed fish products. Improved quality fish products will help to reduce waste generated and fish loss.

2. **Waste reduction strategy**: The financial implication of managing, removing, and disposing of waste generated from fish processing can also be reduced through a waste reduction strategy. The following environmental efforts are considerable:
   - Reduce the price for the old fish products in stock. In other words, introduce a discount system for fish products with the nearest best use date.
   - 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 and process only quantities you can process, preserve, and store.
• Always use environmentally friendly disposable materials such as cartons, jute bags, reusable plastic in packaging and selling the processed fish products.
• Encourage your customers to come with reusable bags or provide a discount scheme for returning the reusables if possible and when reasonable.
• Ensure sanitary disposal of fish waste generated daily, accumulation of such waste favors prolific breeding of flies, attracts rodents and pests, and presents an atmosphere for their destructive and provoking activities.

5. Economic benefits of quality fish products (10 mins)
  ◦ Quality fish products will attract more buyers within and outside the state.
  ◦ Reduction in post-harvest and post-farmgate loss
  ◦ Reduce financial loss due to fish decomposition and spoilage
  ◦ Long shelf span makes fish available to consumers or customers all year
  ◦ New business opportunity e.g., process food zonal or state distributor, wholesalers, and retailers
  ◦ Reduce the economic loss and hospital bills due to foodborne illness, food poisoning, and related cases of hospitalization
  ◦ New job opportunity for youths and women – economic empowerment
  ◦ Canned food can offer great support, especially during an economic recession.
  ◦ Export and import- international and national market expansion

Nutrition and health benefits of quality and safe fish products
  ◦ Food poisoning and contamination is reduced to the barest minimum
  ◦ Will reduce hospitalization due to foodborne illness
  ◦ Reduced exposure to physical, and environmental contamination
  ◦ Improved nutrition status and dietary diversity
INTERACTIVE DISCUSSION (10 mins)

Goal of Discussion: Fish processors will learn to reduce fish waste and loss to boost or promote one's economy. And how waste reduction helps in reducing post-harvest fish waste and loss.

Materials needed: Projector, Flipchart, Blackboard, Graph.

1. Ask participants if anyone can share how quality fish products could reduce fish waste generation and how it could help increase the income or economy.

2. Brainstorm with fish processors ways that they can produce quality nutritious and safe fish products all year long to contribute to a healthy diet.

KEY MESSAGES

- Fish waste and loss reduction are crucial in reducing economic waste and loss.
- Quality fish products enhance the economy

Additional tips

How to recognize spoiled or poor-quality fish and to reduce economic loss and waste.

- Dropped scale
- Presence of offensive odor
- Sunk eyes
- Dark brown gills
- Flabby skin
- Fly attraction
- Presence of worms or insect larva, mold, and black spots
- Rodent bites and rat droppings
- Thawed fish
- Wound, injury, or bruise
- Bad taste if cooked
- For canned fish, check for leakages, expiry date, dent, bulging, rusting on the can
6. Closing discussion (10 mins)
Go around and ask each participant to share one thing they learned with the group.

7. Post quiz (5 mins)

Module 7  Economic benefits of a quality and safe fish product

1. Health benefits of quality and safe fish products to an individual is: (a) improve nutrition status, and healthy eating habits (b) prevent foodborne diseases (c) a and b is correct.

2. Economic benefits of quality and safe fish products include (a) create job opportunities and reduce poverty. (b) improve income and prevent fish loss (c) b and a is correct.

3. You can save more money by reducing the fish waste generated (a) Yes (b) No (c) I don’t know.
Activity in Training.

If 1 kg of fish product cost value is 10 naira, and the cost of disposing of fish waste and other fish business generated waste is 2 naira per kg. Determine the economic loss or benefits of waste reduction. **Hints:** The total loss will be the value cost plus the waste disposal charges per kilogram as shown in the table below.

<table>
<thead>
<tr>
<th>Fish waste (Kg)</th>
<th>Value (Naira)</th>
<th>Cost of Disposal (Naira)</th>
<th>Total (Naira)</th>
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<tbody>
<tr>
<td>50</td>
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<td>100</td>
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<tr>
<td>10</td>
<td>100</td>
<td>10</td>
<td>110</td>
</tr>
</tbody>
</table>

The lower the fish waste generated per kilogram, the lower the economic loss in naira.
Bibliography

4. Some notes on fish handling and processing. FOA http://www.fao.org/3/x5927e/x5927e01.htm
Training Evaluation

1. Please rate the training in terms of its impact and usefulness in your business using the scale below. Circle the numbers that apply to your opinions

1= Not useful at all  5= Very useful

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td><strong>Training program</strong></td>
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2. Please complete the following by checking the column of your choice

<table>
<thead>
<tr>
<th>Rate the quality of the following</th>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Very good</th>
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<tr>
<td>The overall content of the training</td>
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<td>PowerPoints slides</td>
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<td>Low literacy material and tools</td>
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<tr>
<td>Presentation of the material &amp; training method</td>
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<tr>
<td>Participant/group activities</td>
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<tr>
<td>Facilitation activities by trainers</td>
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Self-knowledge Assessment

3. Think about what you knew and what you learned during this training about nutrition and food safety instructions. Evaluate your knowledge in each topic area related to nutrition and food safety *Before and After* this training.

<table>
<thead>
<tr>
<th>Before Training</th>
<th>Self-Assessment of your knowledge and skills related to:</th>
<th>After Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5</td>
<td>Module 1: Healthy Eating Habits</td>
<td>1 2 3 4 5</td>
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<tr>
<td>1 2 3 4 5</td>
<td>Module 2: Animal Source Protein</td>
<td>1 2 3 4 5</td>
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<tr>
<td>1 2 3 4 5</td>
<td>Module 3: Food Safety</td>
<td>1 2 3 4 5</td>
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<td>1 2 3 4 5</td>
<td>Module 4: Fish Processing and preservation</td>
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<td>1 2 3 4 5</td>
<td>Module 5: Food Poisoning/Contamination</td>
<td>1 2 3 4 5</td>
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<tr>
<td>1 2 3 4 5</td>
<td>Module 6: Hygiene and good practices</td>
<td>1 2 3 4 5</td>
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<tr>
<td>1 2 3 4 5</td>
<td>Module 7: Economic benefits of a quality &amp; safe fish product</td>
<td>1 2 3 4 5</td>
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