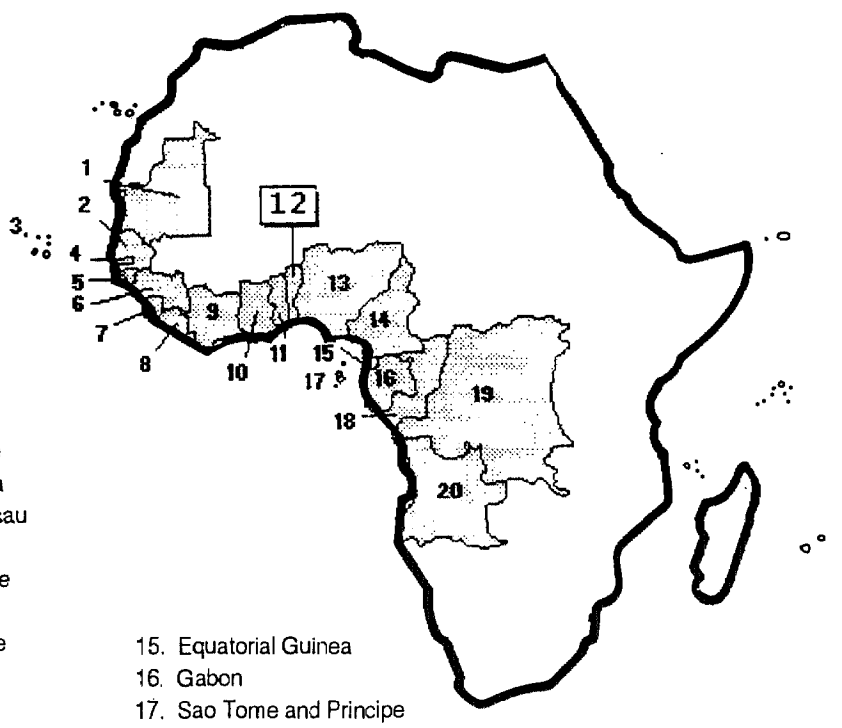
PROGRAMME FOR INTEGRATED DEVELOPMENT OF ARTISANAL FISHERIES IN WEST AFRICA

IDAF PROGRAMME

Technical Report No. 129

July 1998

Guide to proper artisanal fish handling and processing practices



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DEPARTMENT OF INTERNATIONAL DEVELOPMENT COOPERATION OF DENMARK

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Technical Report No. 129 July 1998

Guide to proper artisanal fish handling and processing practices

By

Yvette DIEI
Associate Professional Officer, Fish technologist, IDAF

and

Oumoukhairy NDIAYE
Fish Technologist

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IDAF Project
FAO
01 B.P. 1369
Cotonou, Republic of Benin

E-mail dipafao@bow.intnet.bj Fax: (229) 33.05.19 Tél: (229) 33 09.25

THE VISION FOR IDAF PHASE III

INTRODUCTION

Development strategy during the 1960 and 1970s was based on the philosophy that developing countries lacked improved technology and capital for speeding up their development. Industrialization was promoted in order to capitalize on the abundant fish resources. However, the anticipated expansion of the economy did not happen and the development approach shifted towards an integrated rural strategy where emphasis is put on the community as a whole to upgrade incomes and the quality of life through technical assistance and the active participation of fisherfolk and the community.

In this context, emphasis was initially placed on the Community Fishery Centre (CFC) concept as a means of promoting artisanal fishery development. But it became apparent that the presence of a complex of facilities and services tailored to meet local needs was no guarantee that the structures/facilities would be used or that development would occur. The active participation of fisherfolk and the mobilisation of local and community resources was imperative in order to assure sustainability of initiatives undertaken by development projects and/or the community.

So far and in general terms, the IDAF Programme has worked under the context of abundant or seemingly adequate fishery resources with moderate population pressure. The scenario is however changing (and very fast for that matter) and we would soon face the triple constraints of reduced or depleting fish stocks, degrading environment and increasing population pressure. Like in other sectors, it must be anticipated that just to survive, parts of the population surplus in the fishing communities will enter the artisanal fisheries, which will increase the competition for the resources among the small scale fisherfolk in addition to the prevailing competition between the artisanal and industrial fisheries, with their attendant effect on the environment.

This scenario calls for a continuation of the integrated participatory strategy which remains relevant to the development of artisanal fisheries in West Africa. However, the emphasis needs to be placed on the elements and mechanisms that favour the sustainability of initiatives: responsible fishing, the empowerment processes that ensure the devolution of major resource management and development decisions to the local community, the strengthening of national human and institutional capacities at all levels for a sustainable and equitable fisheries resources management and development, as well as in the follow-up and consolidation of past achievements.

DEVELOPMENT OBJECTIVE

Thus the development objective of the Programme in the present phase III which started on 1 July 1994 is to ensure twenty coastal West African countries a sustainable development and management of their artisanal fisheries for maximum social and economic benefit of their fishing communities in terms of employment, proteins and earnings. This will be done through an integrated and participatory approach in which emphasis will be laid on equity, gender issues, the transfer of technology for development, environment protection, as well as the strengthening of human and institutional capacities.

The immediate objectives are:

1. To identify, assess and disseminate strategies and mechanisms for sustainable management and development of the artisanal fisheries in fishing communities;

2. To improve the competence of national Fisheries Departments staff in development and management planning of artisanal fisheries;

3. To enhance regional technical competence in the fisheries disciplines, particularly in fishing and fish technology;

4. To improve information and experience exchange related to artisanal fisheries within the region;

5. To promote regional and sub-regional collaboration for the development and management of artisanal fisheries

In this context, IDAF will among other things tackle the following major aspects in it's work :

- assisting in the elaboration and implementation of a clear and coherent national development policy for the artisanal fishery sector;
- providing advice on management and allocation of resources between artisanal and industrial fishing fleets, both national and foreign;
- involving users in the design and management of on shore infrastructures;
- monitoring the sector's evolution by the setting up of an economic indicator system for the sector adapted to the financial and human availabilities;
- improving fishing technologies in accordance with the available resources;
- increasing the final product's value by improvement in processing and marketing;
- promoting community development in accordance with the lessons learned from Phase I and II and oriented towards the sustainability of actions undertaken;
- reinforce the Programme's information/communication system.

It is anticipated that by the end of the third phase of the Project, the region will have a nucleus of field oriented experts capable to respond to the challenges of the artisanal fisheries sector and to spur development in their individual countries in keeping with the aspirations and needs of fisherfolk.

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PREFACE

This manuâl is meant for extension officers and operators in the artisanal fish processing sector.

The purpose of this guide is to compile advice illustrated with pictures and photographs on know-how of processing, from the reception of the raw material to the sale of the final product.

Emphasis is laid on good manufacturing practices, and rules of hygiene and sanitation, to obtain good quality final products and ensure the health of consumers.

This document has been prepared in a simple style for the benefit of all, especially people working in the artisanal fish processing sector. However, extension officers will find useful information in it.

This guide was produced and financed by the Programme for the Integrated Development of Artisanal Fisheries in West Africa (IDAF).

The authors would like to express their gratitude to Professor Lahsen ABABOUCH, Food Technology and Quality Control Expert and Dr Amadou TALL, Director of INFOPECHE, for their support and enriching advice.

Drawings: Oumar DIAKITE

Pictures: Moussa MBENGUE

Resource Persons

Boubacar DIAKITE, Technologist at the Institut de Technologie Alimentaire, Dakar, Senegal

Momar Yacinthe DIOP, Technologist at the Institut de Technologie Alimentaire, Dakar, Senegal

Moussa MBENGUE, Fisheries Technician, Senegal

Assane NDOYE, Fisheries Technician, Senegal

INTRODUCTION

Fish is an important source of animal protein. It is cheap and has a very high nutritious value.

In certain areas where the supply of protein is insufficient, processed fish can significantly contribute to the food ration of the population.

In Africa, a steady increase in the landings of artisanal fish has been observed over the last two decades. These important landings led to the intensification of artisanal fish processing.

The processing techniques used add value to the fish catches, especially species with little or average commercial value, which provide employment and sources of income for operators. The advantages of these methods lie in the fact that they require a low level of investment.

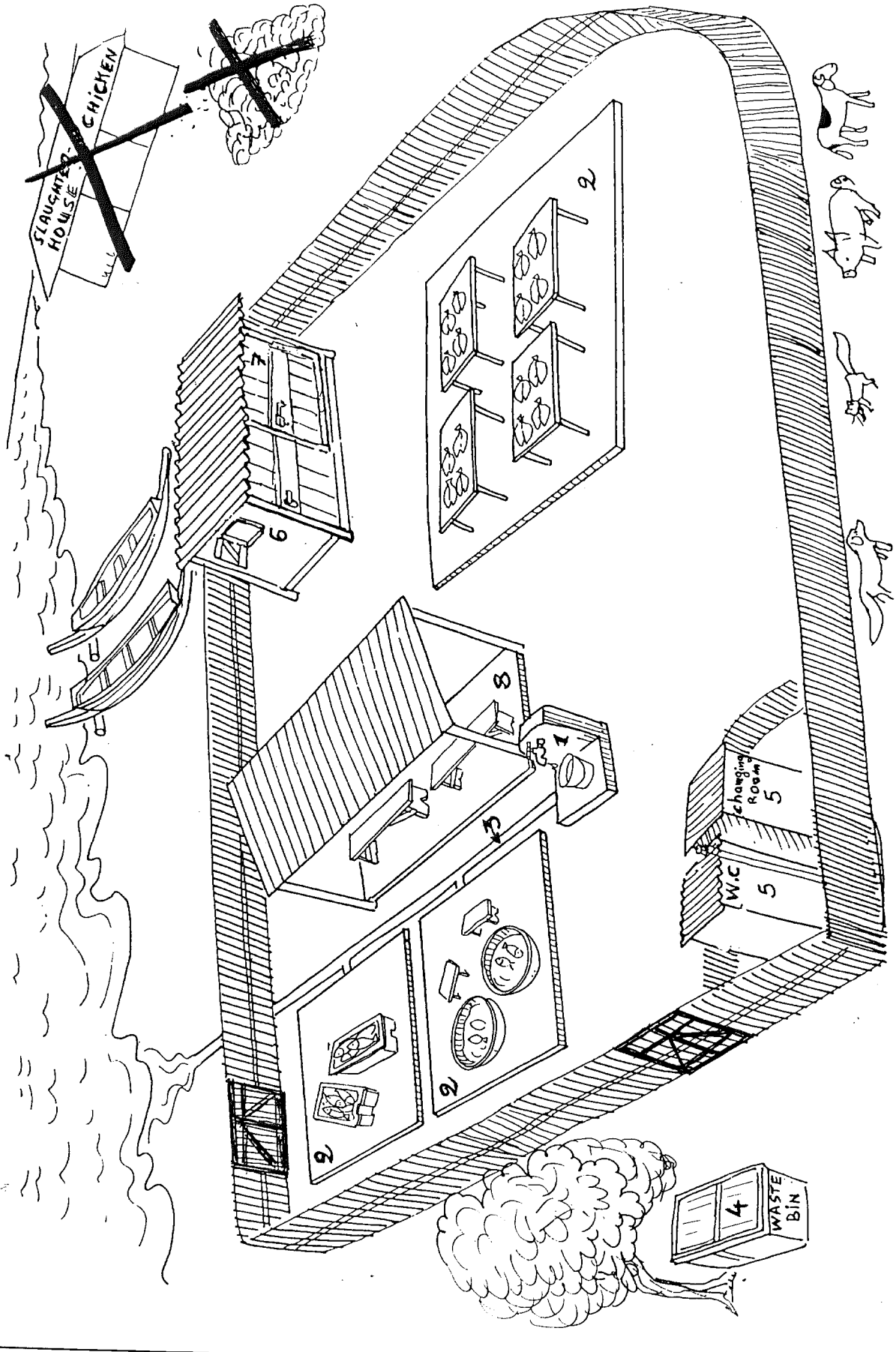
Important post-harvest losses are recorded due to weakness in knowledge on the basic principles of food hygiene and also to the unproper processing, storage and distribution practices.

Using good manufacturing practices has several advantages:

- economic profitability obtained from placing good quality products on the market;
- the protection of public health through strict practice of hygiene rules;
- the preservation of the organoleptic characteristics by the use of appropriate processing techniques;
- a significant improvement in the length of preservation by stabilizing the products.

This guide has been prepared to help operators in artisanal fisheries put good quality products on the market. It has three main parts:

- technical and sanitary design of facilities;
- conditions of hygiene;
- good handling, manufacturing, packaging and storing practices.


SLAUGHTER HOUSE
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Changing Room
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4
WASTE BIN

1. DESIGN OF FACILITIES

The design is the basic step in the setting up of a quality assurance programme in a fish processing unit. To this effect, it is necessary to answer the following questions:

- where to install the unit?
- how to set it up?
- how to equip it?
- how to manage it daily?

I.1 Technical and sanitary design

I.1.1 Technical design

The processing premises should be built following the general principles of food hygiene. These are mainly:

I.1.1.1 Location and surroundings

The chosen site must be located in an area protected from the risks of pollution, flooding and contamination. The surface of the unit should be appropriate, and it should have sufficient dimensions and be easily accessible. The unit should be fenced and protected from insects and animals which are potential sources of contamination.

I.1.1.2 Layout of premises

The workshops should include the following lay outs (Figure 1):

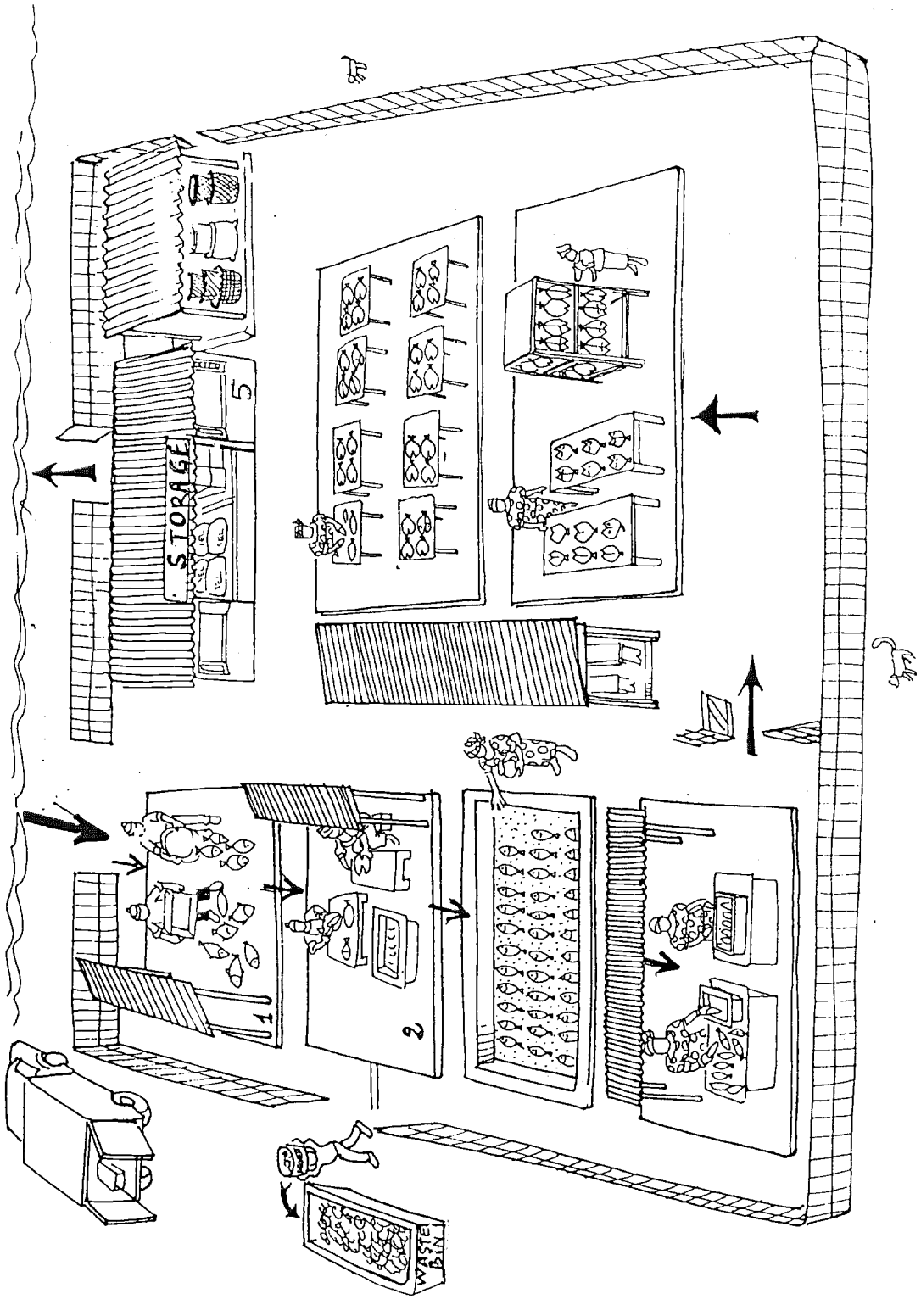
1. water supply: potable or clean sea water. It should be available and in sufficient quantity. One should have either tap water or water disinfected by boiling or by using a solution of a spoon of bleach to 100 litres of water. Sea water to be used must be pumped from at least 300m away from the shore and water from landing areas should be avoided;

2. areas for reception of raw material and processing should be preferably cemented and protected;

3. well kept canals for the drainage of waste water;

4. dumps isolated from the site, covered and placed in a well protected area;

5. toilet facilities and cloakrooms should be in sufficient number, isolated from the handling and processing areas , with supply of potable or clean sea water. It is advised to provide one toilet for the first 25 employees, and another toilet for every extra fifteen people.


STORAGE
5
1
2
WASTE BIN

6. a cemented, aerated, dry, clean room of appropriate capacity for the storage of final products.

7. a cemented and partitioned room for the storage of packages, dressing material and cleaning and disinfecting products.

8. cemented and well aerated rest room

I.1.2 Sanitary design

Basic principle: the separation of soiled and clean areas must be observed to avoid all possible cross contamination (Figure 2).

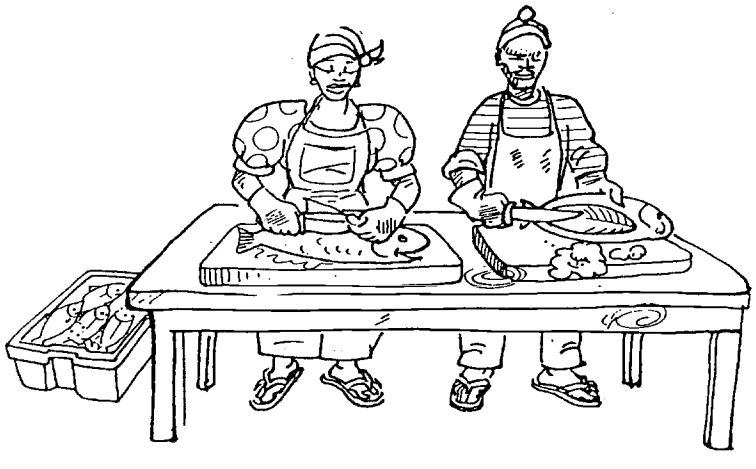
Soiled areas: areas of reception, surrounding, rubbish dump, ... (1,2)

Clean areas: areas for drying, smoking or fermentation, packages depots, stores for finished products (3, 4, 5)

I.1.3 Equipment and Material

The equipment (trays, basins, dressing tables etc.) and the small material used should be resistant to corrosion, indestructible, and easy to clean and disinfect.

Chopping boards should preferably be made from an indestructible material which is easy to clean. Wooden tables should never be used.



Knives, machetes, cutlasses, ...: blades should be made from inoxidizable material and the plastic handles should be easy to clean.

Basins and tanks for handling, salting and washing: should be made from a stainless, non deformable material (like plastic). Reinforced concrete tanks (no rough edges) can also be used for salting and washing provided they are built in such a manner as to allow for cleaning and easy drainage of washing water or used brine solution.

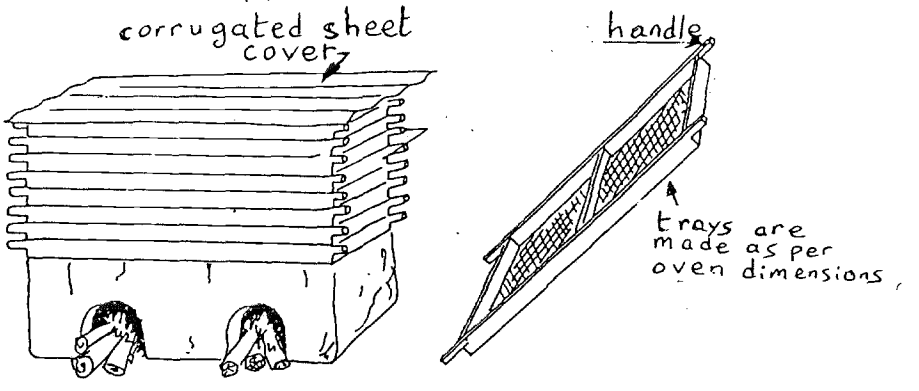
Trays for drying should be raised and made from material that is easy to clean, non absorbent, inoxydizable (for example: netting made from plastic or a stainless metal)

Trays made from bamboo, creepers, wickers etc. should not be used since they are difficult to maintain.

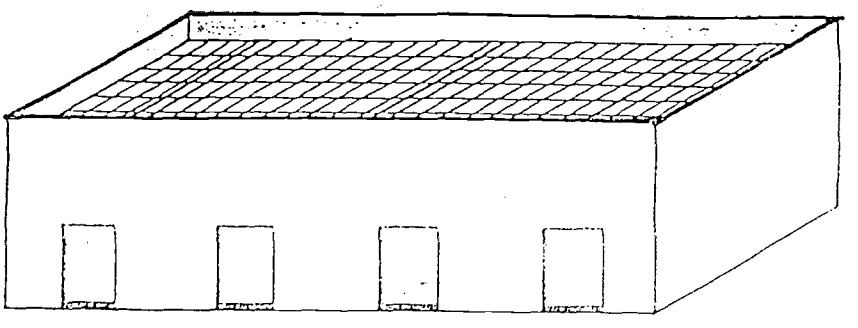
Hooks (metallic) or wooden stalks can be used to suspend or dry fish.

Ovens: There are several types of ovens for smoking. Those frequently found are:

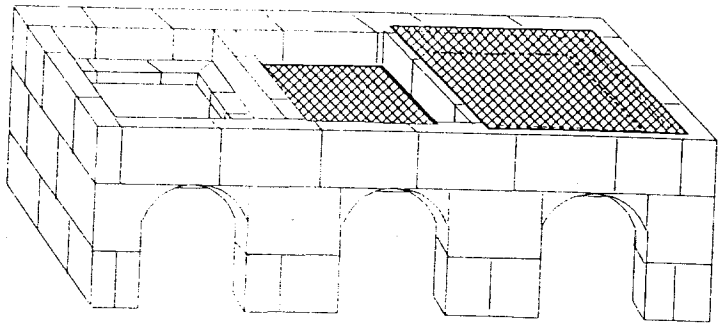
Chorkor Oven: Width 110-114cm; Length 220-230cm; height 61-65cm; thickness of walls 13cm; openings of furnace 38-40cm wide and 38-40cm high;



Mud Block Oven (Senegal): width 125cm; length 300cm , height 80cm



Hybrid Chorkor/Banda oven: width 198cm; length 466cm, height 98cm



A good smoking oven must fulfil the following requirements:

- quality of product: uniform smoking, hygienic, long period of preservation
- economy of wood: an oven with a wood consumption of 0,3 to 0,4 Kg per kg of fresh fish, is very economic.
- efficiency: appropriate capacity, reduced smoking period, easy handling
- protection: reduced smoke and thus reduced exposure of those handling to health problems

Netting of smoking oven: dismantable and galvanised netting are recommended.

Generally, good smoking ovens should resist heat, thus the importance of the choice of construction material. Because of the exorbitant cost of making cement oven, one could instead use a mixture of clay and cement. controlled mud is still a cheaper material but its life span is less than that of the cement-clay mixture.

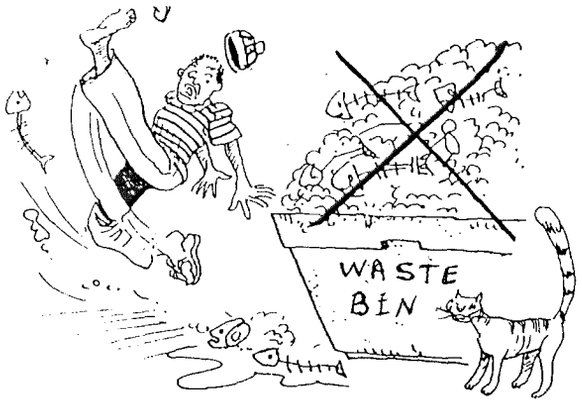
- canvas covers: should be in a good state, waterproof, and easy to clean and disinfect.

II. CONDITIONS OF HYGIENE

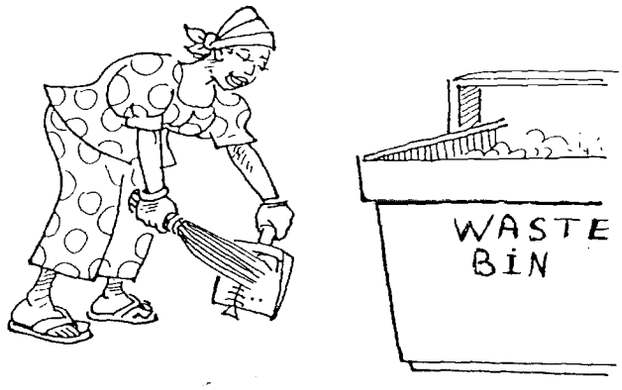
In order to guarantee the safety of the product, strict conditions of hygiene should be observed in the premises, with material, personnel and the immediate surrounding (Appendix 1).

II.1 Immediate Surrounding

Avoid throwing wastes in the immediate surroundings of the premises. Dirts and stagnant water attract flies which can contaminate products.

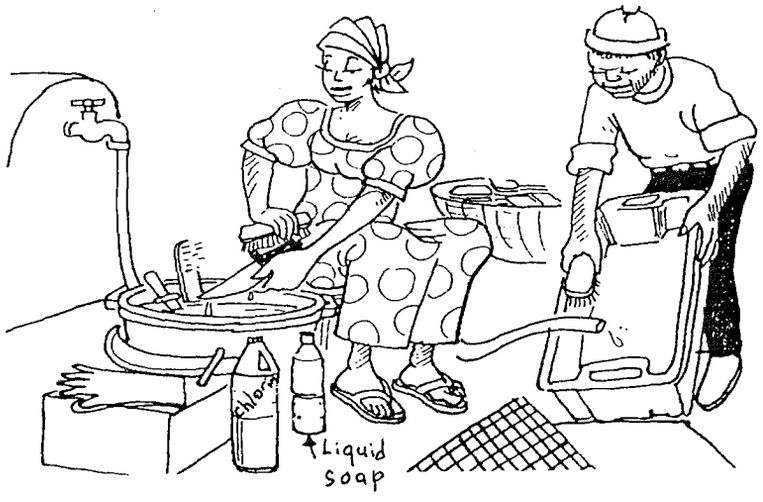


Rubbish dumps should be emptied and cleaned regularly



II.2.2 Hygiene of the premises, equipment, and material

All surfaces and equipment likely to come into contact with fish should be cleaned with abundant potable or clean sea water, using appropriate detergents, disinfectant and hand brushes.



To ensure the hygiene of the premises and equipment, one should:

- properly arrange and maintain the premises in good hygienic condition
- always ensure that equipment and material are kept clean.

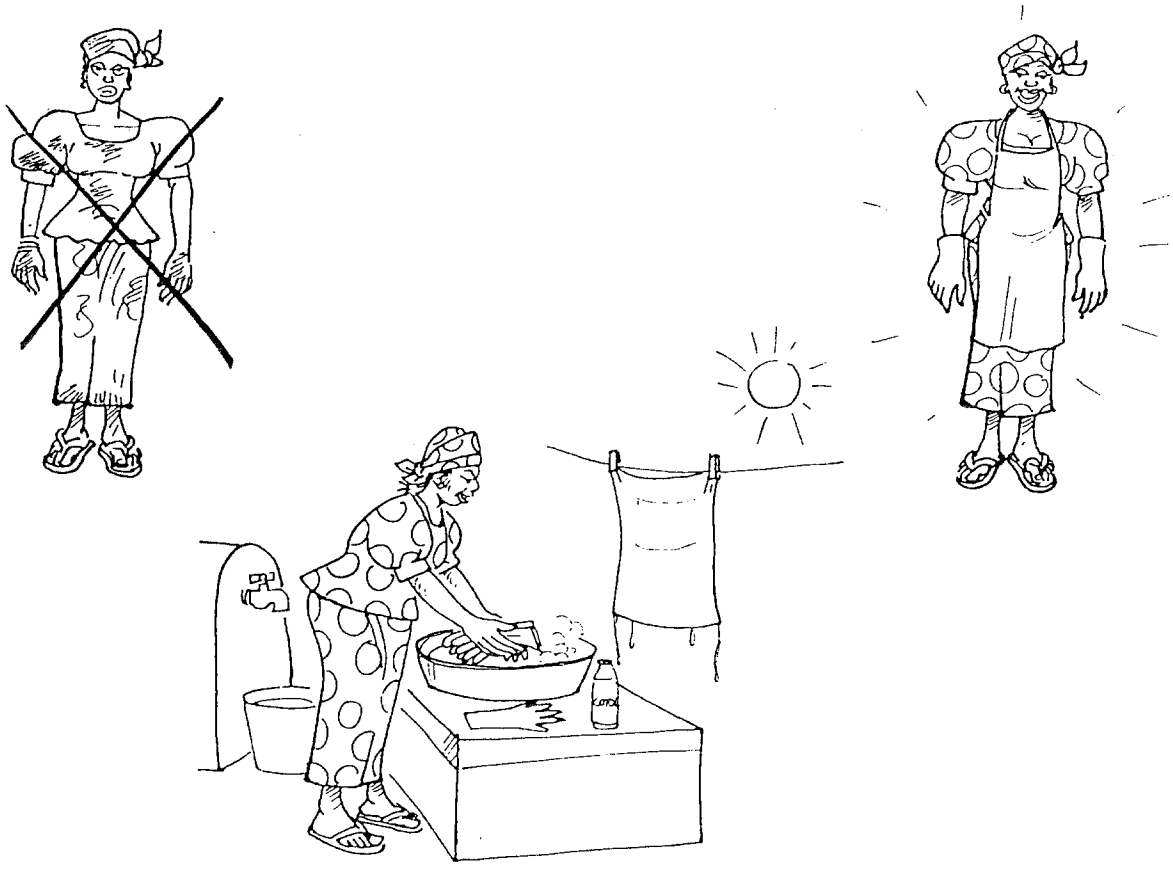
II. 3 Staff hygiene

The handler is one of the principal sources of contamination of products.

Contamination occurs through contact with hand, clothes, shoes, hair, sneezes and careless gestures during handling.

Ensure that the handlers are in a good condition of health. A regular medical examination (at least every six months) is recommended.

Working clothes and gloves can constitute a source of contamination of products. Working uniforms should be kept clean and changed after every day's work. The use of scarves or caps, gloves and aprons are recommended.

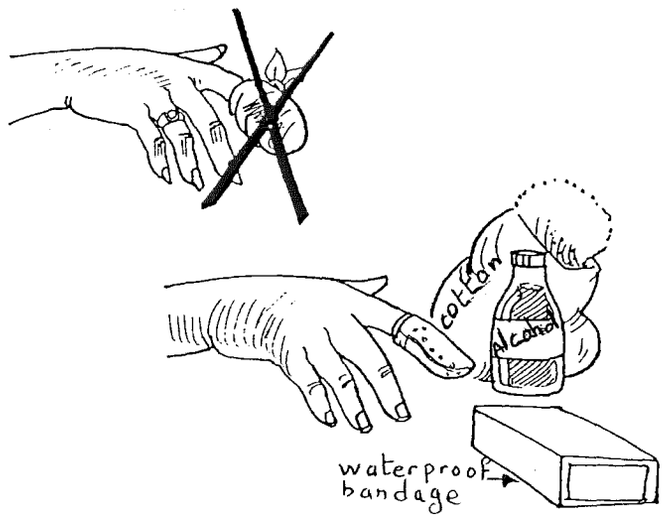


Elementary Rules of Personal Hygiene

The hands of working people should be properly washed and disinfected before and after every contaminating gesture, after using the toilets, after blowing one's nose or sneezing.

Hands should be washed with ordinary soap, preferably with liquid soap because this remains pure, and dried with single use hand towel.

All wounds should be treated and covered with waterproof bandage.



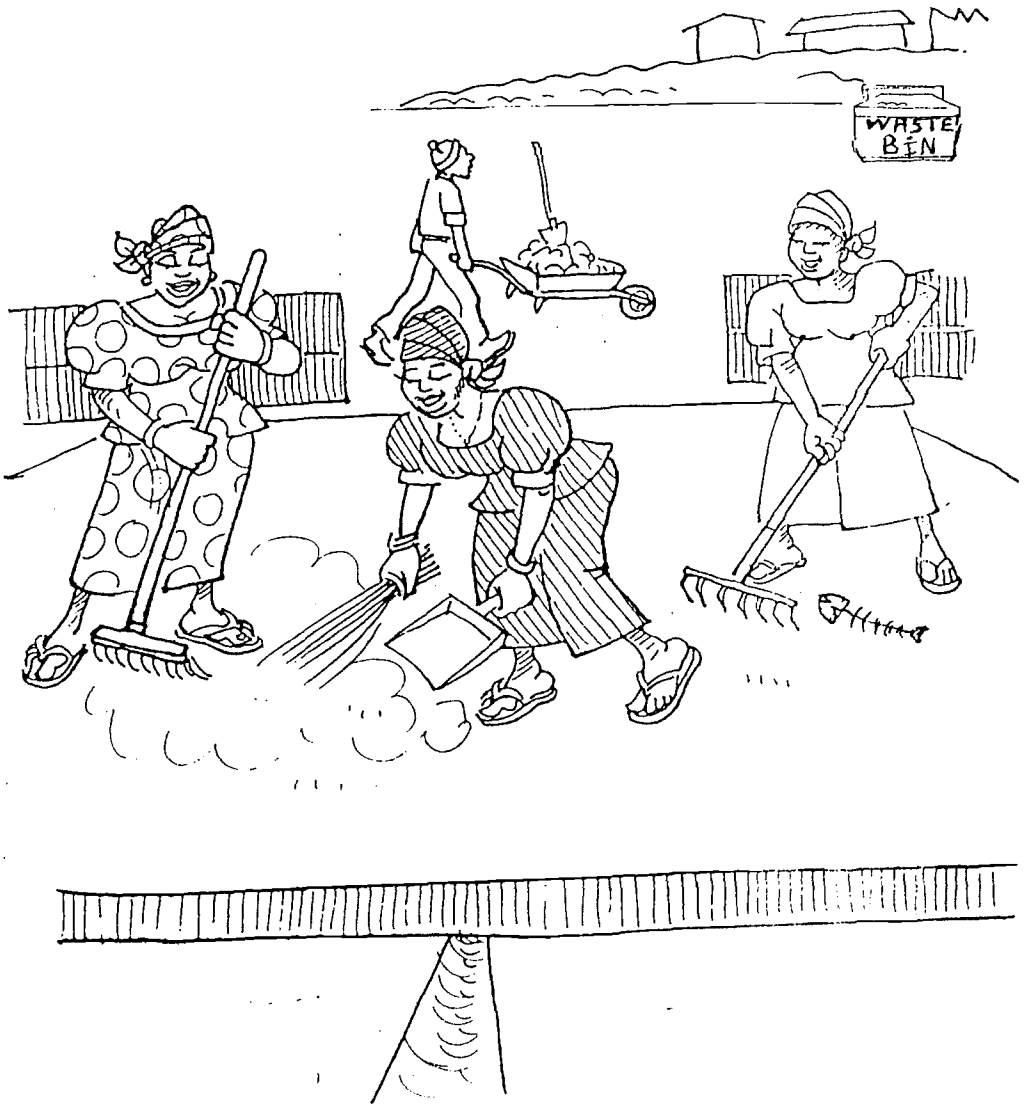
In personal hygiene, it is recommended that:

- rings and jewellery should be removed: they can constitute reservoirs for germs and thus hinder effective cleaning;
- after every change of activity, hands should be washed before and after handling fish, and also after the day's work;
- hands should always be clean;
- eating, smoking, spitting and blowing one's nose in areas reserved for processing should be avoided.

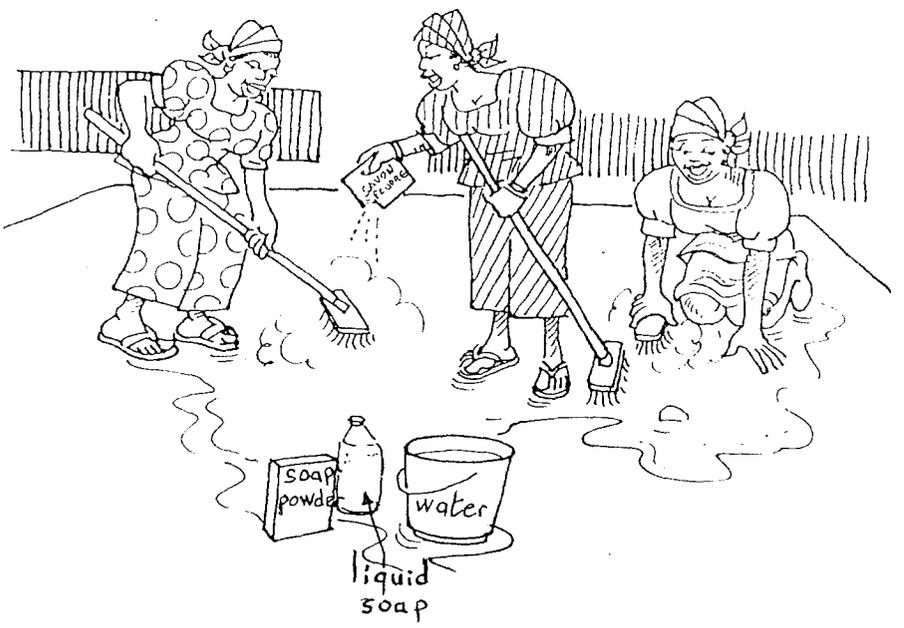
Caution! The wearing of gloves does not exempt one from cleaning and disinfecting hands

II.4 Steps of cleaning and disinfection (Appendix 2)

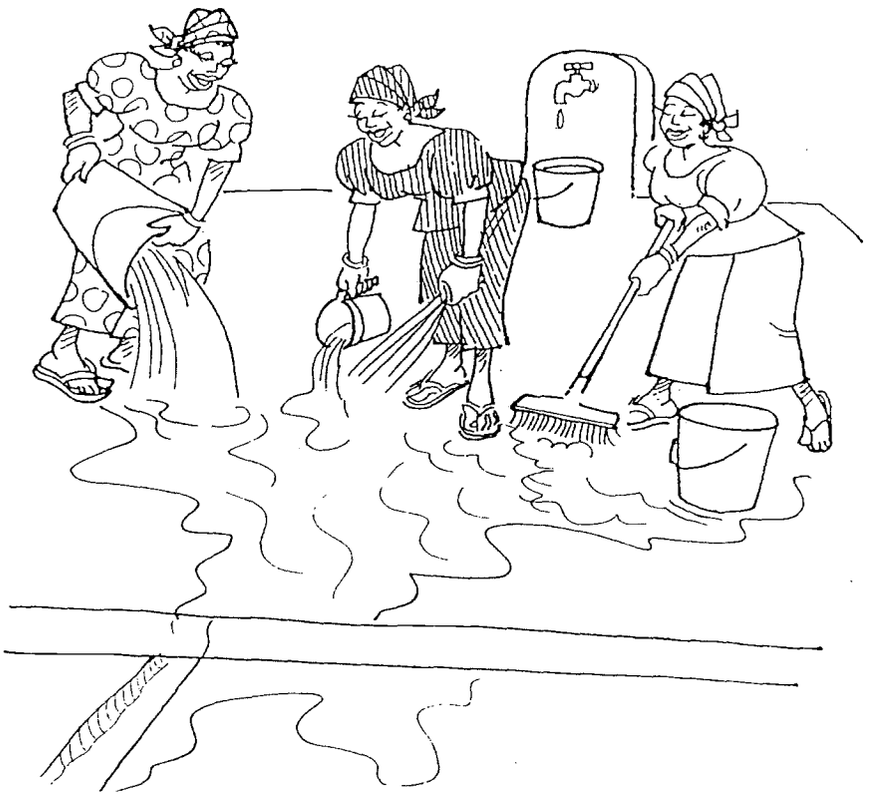
Removal of wastes by sweeping.



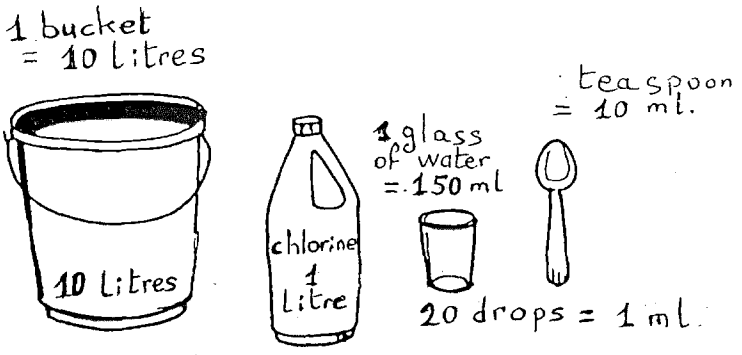
Thorough cleaning with a detergent (common soap for example) and by using brushes and the means of brushes, scrapers, to remove dirts.



Rinsing allows the drainage of all waste, in order to obtain a surface that is visually clean.



Apply disinfectant to all cleaned surfaces to eliminate all risks of microbial contamination Bleach is recommended because of its efficiency, low cost and availability. Some simple standard instruments exist for measuring the necessary quantities:



Rinse abundantly with clean water to remove all traces of disinfectant and obtain a clean surface. Rinsing after disinfecting is compulsory. Even though certain cleaning products can serve both as disinfectant/detergent, it is recommended not to mix disinfectant (bleach) and detergent (soap): the effectiveness of the disinfection would not be guaranteed.

III. FISH PROCESSING

Several methods of fish processing can be distinguished. Those most commonly used in West Africa are: smoking, braising, salting, fermenting, drying and cooking. Most often, these methods are combined to reduce the water content and thus stabilise the product, and improve the taste and quality of the final product.

III.1 Choice of raw material

A good quality raw material ensures a better quality final product.

Fish is being processed so as to increase its value. Consequently, all injured fish, contaminated or deteriorated, should be rejected, contrarily to the practices in use in the artisanal sub-sector.

The raw material should quickly be processed to avoid decomposition.

How to recognise the fresh fish:

Skin : glow, with bright colours

Scales : should adhere well

Flesh : Firm, elastic and should resist finger pressure without retaining fingerprints

Gills : Red coloured, bright pink, no mucous

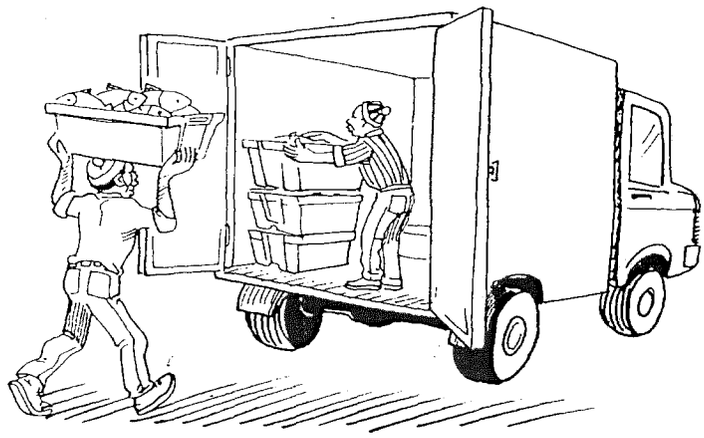
Eyes : bright, clear and full

Smell : fresh sea smell, of algaes, no unpleasant smell

III.2 Fish Transportation

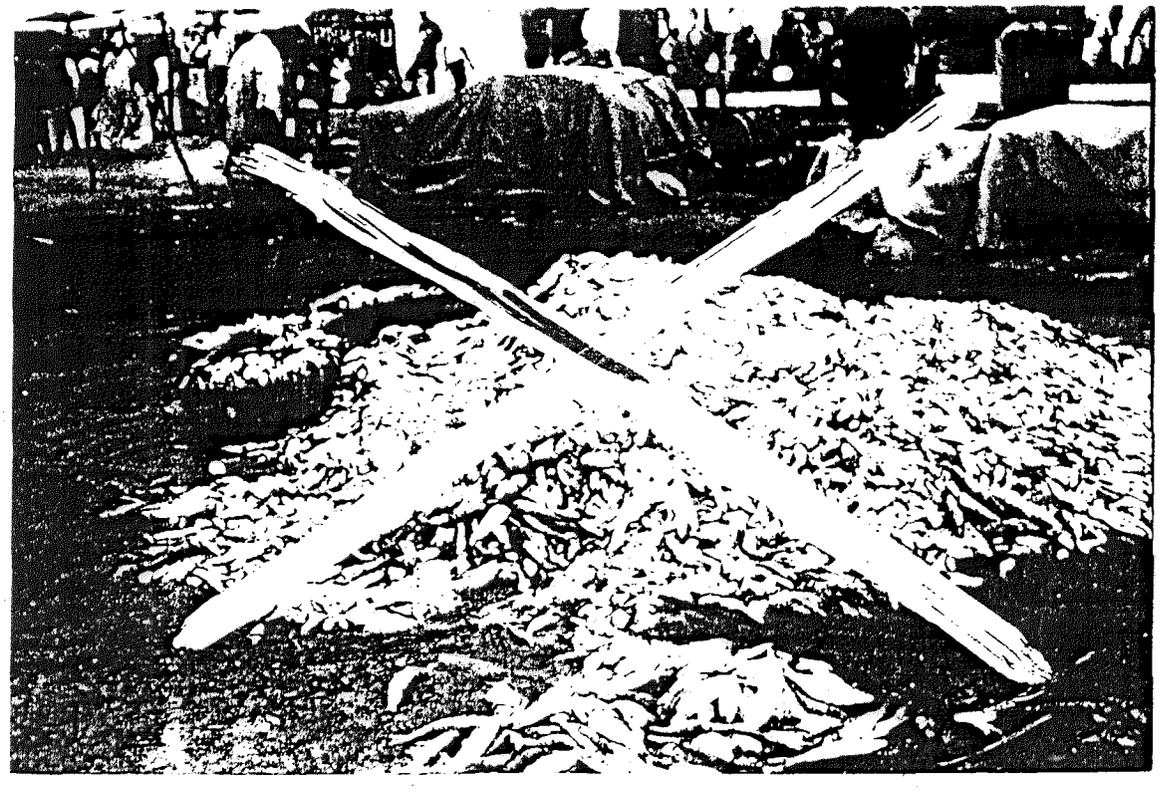
Fish transported without cover or ice deteriorates more rapidly than fish that is chilled and protected. A good icing is one that is done early, well and in a continuous manner. Information on ice/fish ratio to be observed during transportation is given in Appendix 3.

During transportation of raw material, proper packaging of the product, the cleanliness of the vehicle and the constant maintenance of a low temperature, should be ensured. All this is to maintain the quality of the product.



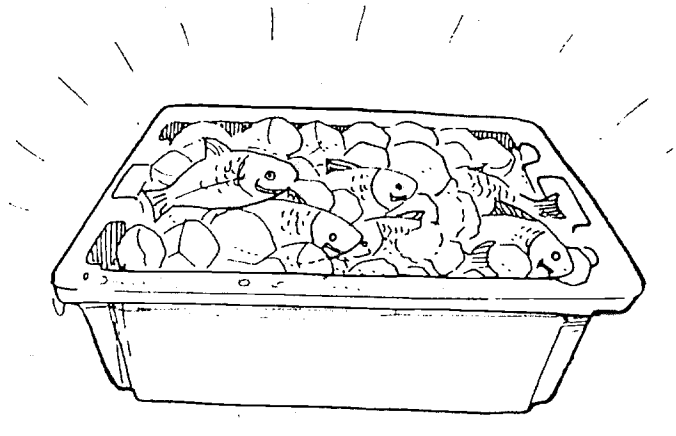
III.3 Receiving the raw material

Collecting fish on the floor should be avoided. This constitutes a source of contamination.



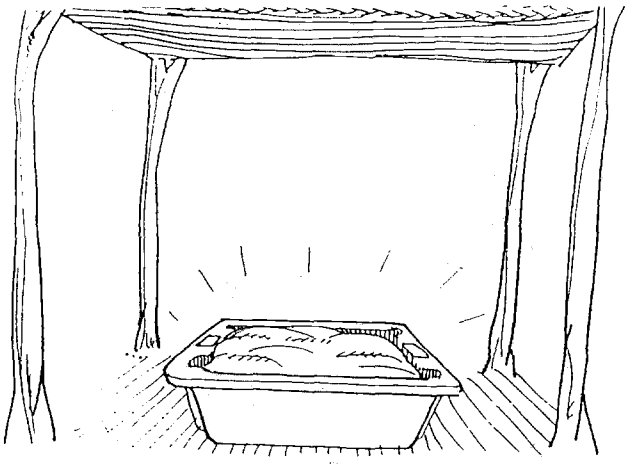
Fish should be collected in clean containers, and on a cemented surface.

When the raw material is not to be processed immediately, it is advised to ice the fish properly by using sufficient quantity of clean ice.



This operation is difficult in the case of small pelagics (sardines, ethmalose ...), which are often caught in large quantities. It is advised to preserve them in a container of clean sea water or potable water chilled with ice.

If there is no ice, keep the fish in a protected place or under shelter and cover with a wet clean cloth.



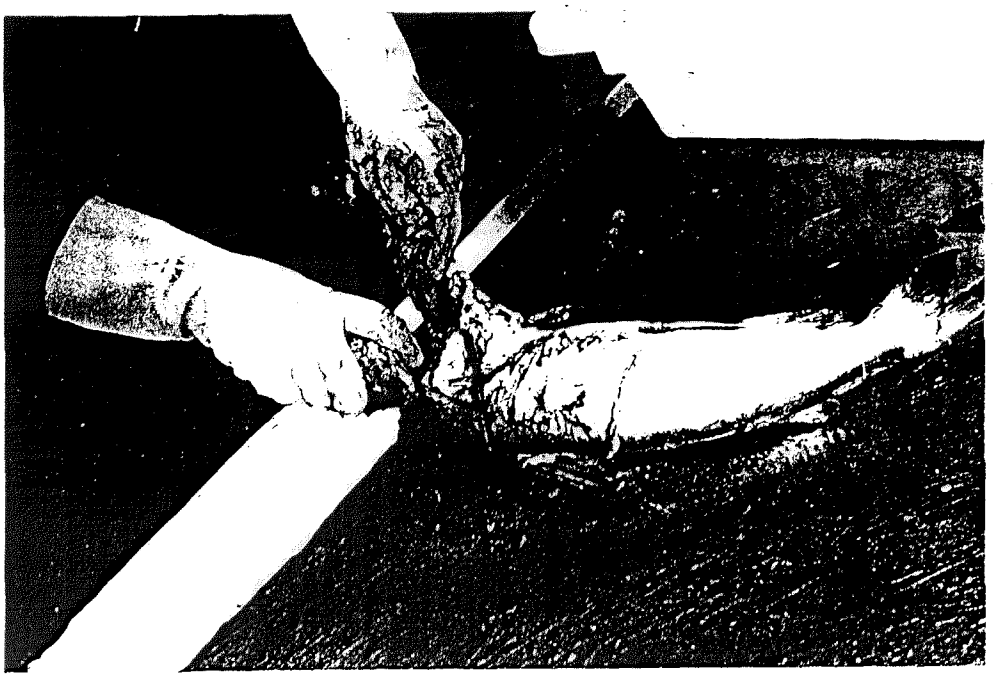
III.4 Fish Preparation

III.4.1 Dressing of Fish

Dressing of fish includes scaling, evisceration, removal of head and cutting.

Scaling: Unnecessary bruising of fish during scaling should be avoided since all bruises constitute an opening for germs to contaminate the flesh.

Evisceration: This is necessary for medium and big specimens. Cut the fish throat without removing the gill cover. To avoid contaminating the cutting surface, remove all intestines once and place them in an appropriate container. Avoid contact between intestines and flesh. If evisceration cannot be properly done for a particular reason, leave intestines.

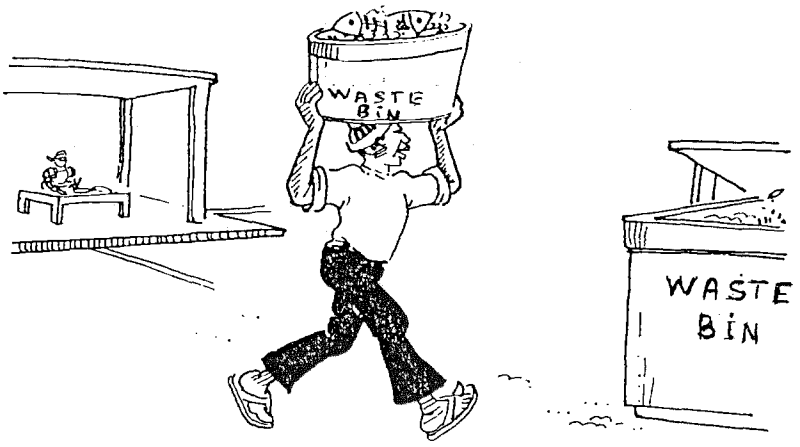


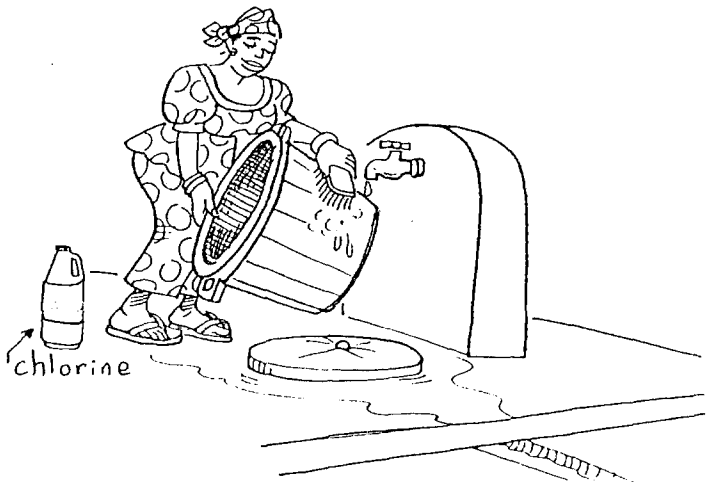
Cutting: Cutting increases the contact surface and consequently, facilitates preliminary operations in processing. Salting, drying or smoking of cut pieces is faster than of whole fish.

The cut should be made in one movement to give the fish a presentable look.

The fish can be opened on the belly or back. For big fish, make two long incisions along the vertebral colon and lift the entire vertebral colon if the 2/3 of it can't be removed.

After dressing, immediately remove and throw away all waste. Waste bins should be well maintained.





III.4.2 Cleaning

Before and after dressing, thoroughly wash the fish well to remove external filth products (mucous, bacteria) and the remains of intestines and blood.

For proper cleaning, one should:

- change water and prevent it from becoming a source of contamination;
- use clean containers and keep them clean after use.

III.5 Artisanal fish processing techniques

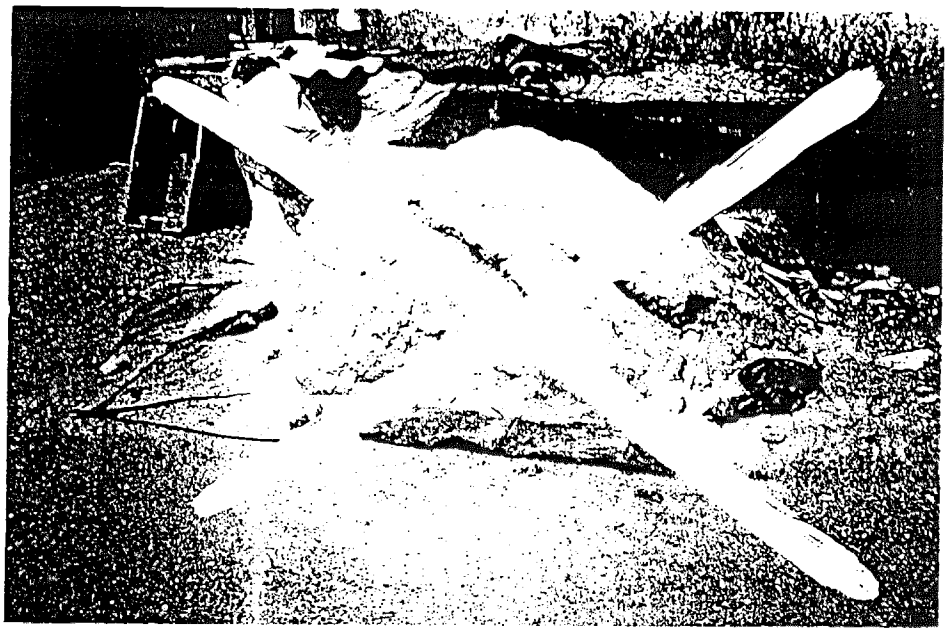
III.5.1 Salting

Salting is a very efficient preservation method. It is often used alone or combined with other processing methods (drying, fermentation, smoking). Salt has an antiseptic quality and is repellent to flies and other insects.

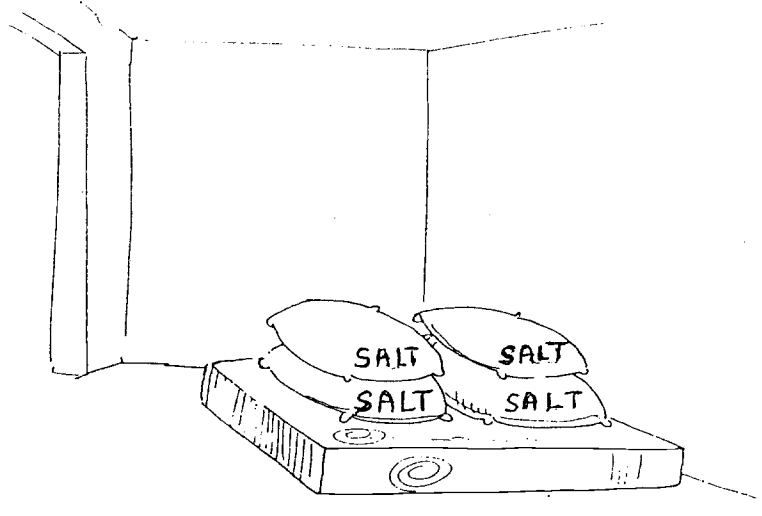
III.5.1.1 Quality of salt

The salt must be white, dry, free of dust, sand, germs and other undesirable materials.

One should avoid reusing salt which can contribute to the contamination of products by the halophile bacteria.



Keep salt in clean and dry places, avoid direct contact with floor.

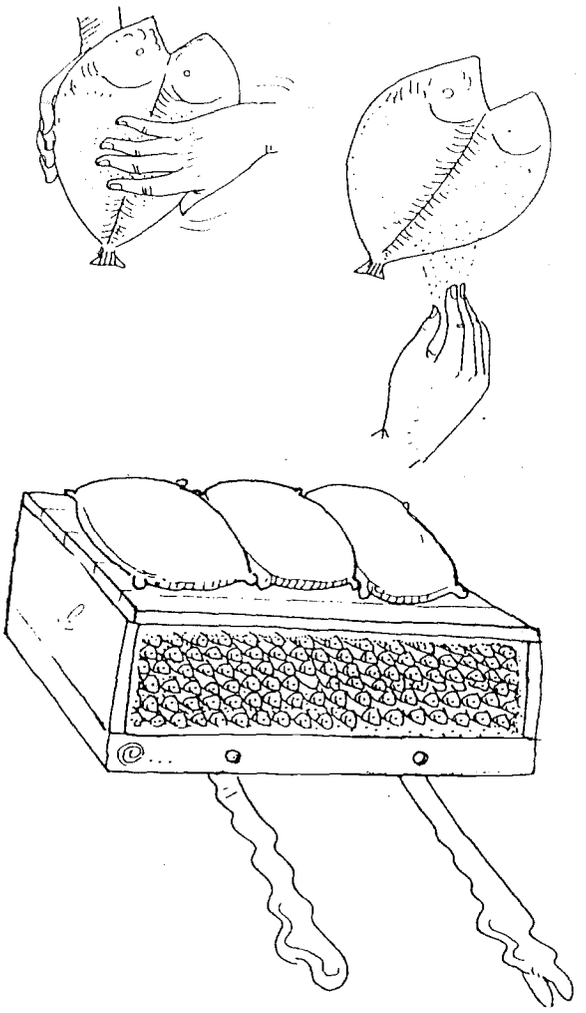


III.5.1..2 Salting Process

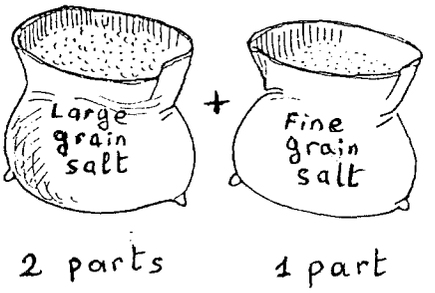
Dry salting is different from humid salting.

a. Dry Salting

Dry salting is done by alternating layers of fish and salt. During this operation, the salt is spread evenly on fish by sprinkling or rubbing. This is then put into a container facilitating regular drainage of the brine. Heavy objects are placed on the pile to increase pressure.



When dry salting, use a mixture of big and small crystals, in the proportion of 2:1 respectively.



Small crystals dissolve quickly and dry the fish surface which then hardens, leading to slow penetration of salt into the fish. Consequently, an excess of small crystals should be avoided in the mixture and the recommended ratio respected.

When there are no small crystals, grind a part of the big crystals before making the indicated mixture.

For dry salting, it is recommended to:

- before salting, apply salt in the guts and on the fish.
- use sufficient quantity of salt: 10 - 12.5 Kg (slight salting) to 30 -40 kg (heavy salting) for 100 kg of prepared product;
- salt under a shed or in a well aerated place;
- not to exceed 2 metres of pile of fish;
- cover the pile and place a heavy object to increase pressure.

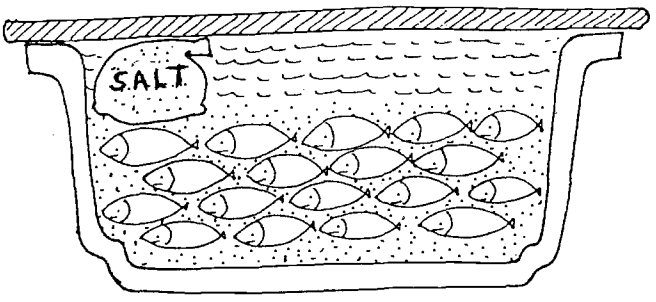
Remark:

Dry salting is appropriate for lean fish. Dry salted fatty fish exposed to air becomes rancid with a soapy taste.

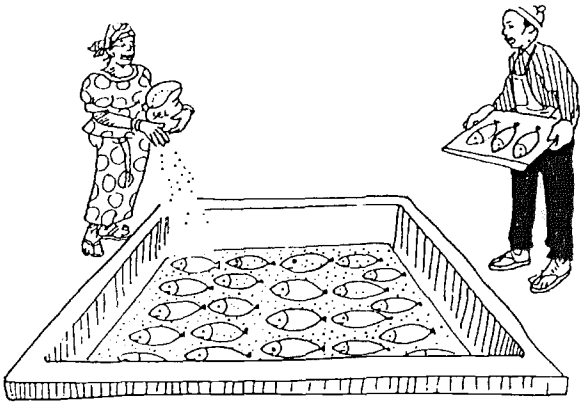
b. Humid salting

Humid salting can be carried out using the following two methods:

Soaking in brine solution: fish can be soaked in tanks, for 6 to 24 hours, depending on the degree of salinity desired. The solution is saturated in the proportion of 360g of salt per litre of water. The proportion of brine to fish should be in a minimum weight ratio of 2:1. When there are no small crystals, grind a part of the big crystals before making the indicated mixture.



Salting by alternating layers of fish and salt in a tank with no outlet: saturated liquid is drained off by osmosis. The fish is immersed in the drained liquid and matures in this brine solution after 6 to 24 hours.



To obtain a good humid salting:

- maintain brine solution clean and keep fish long enough in it to achieve the degree of maturity;
- Never re-use brine solution, it can constitute a good breeding solution for bacteria, also the degree of salt penetration into the flesh becomes low and the saltiness of the brine solution reduces with successive re use;
- Respect the fish/brine proportion;
- After salting, rinse fish with clean water to reduce the effects of crusting during drying;
- maintain all used equipment clean

Remark:

Humid salting is better for fatty fish because it reduces rancidity caused by the oxidising of fat.

III.5.2 Fermentation

Fermentation brings about the decomposition of muscular tissues. It is often done with salting and/or drying, which ensures preservation. Its duration can vary from a few hours to a week or sometimes more.

Fermentation involves the molecular destruction of muscular tissues by germs and proteolytic enzymes.

In Africa, fermentation stops after the softening of flesh, while in south-east Asia, the process takes several months until the final product is obtained, consisting of a paste, sauce or liquid.

To obtain a good quality fermented product, one should make sure that:

- the raw material is of good quality
- the fermentation tanks are put in a warm place to accelerate the process;
- fermentation tanks are kept in a clean state;
- the fermentation is of sufficient duration;
- the fish is rinsed with potable water or clean sea water after fermentation to eliminate fatty and blood residue.

Note!

- Fermented fish is not spoilt fish.
- Avoid the use of chemical additives without specialist advice.

III.5.3 Smoking

Smoking has an antiseptic role and that preserves products better. It also gives a taste appreciated by consumers and an attractive appearance.

Quality of wood to be used is very important for successful smoking. Hard (walnut tree, lemon, mangrove...) and dry wood should be preferred to soft wood (poplar, birch..), which burn fast and produce big flames which burn the surface of the fish while the interior remains uncooked. Painted or resinous woods should not be used as they produce an unpleasant taste and smell.

To produce smoke, it is best to use damp sawdust, sugar-cane or coconut fluff, groundnut shells, and corn stalks.

Smoking Stages.

Preliminary drying: This allows a slow dehydration of product and has the advantage of firming up fish flesh. This process carried out between 30-40°C can last for two hours. The fire should not be intense in the beginning. A hot flame will most likely form crust on the fish surface.

Cooking: This consists of firming up the flesh. Maintain the flames at a level which will not burn the product. Increase the heat until a hot flame is produced (at least 85°C) which should last for one or two hours.

Smoking: This consists of producing a smoke. Turn the fish regularly so as to obtain a uniformly smoked product. A moderately hot fire (60°C) will continue the drying process.

It is the most technologically important phase. It can be carried out for two days depending on the length of time the product is to be preserved. The longer the time, the dryer the product and the longer before deterioration of quality sets in. However, a too dry product will be brittle and will crumble easily.

In order to successfully smoke a product, one should:

- Cover ovens during operations;
- place doors at oven openings to regularise heat;
- place ovens under shelter to protect from bad weather (rain ...)

After the operation, smoking area should be maintained in a perfectly clean state, coal tar and ash deposits should be removed regularly from oven.

III.5.4 Braising

Braising on the floor should be avoided for the following reasons:

- microbiological contamination, usually of faecal origin;
- degradation of environment due to significant quantities of wood used and smoke produced;
- exposure of handlers to health problems because of the significant quantities of smoke inhaled during the process. Ocular and broncho-pulmonary problems can result from this;
- non uniform smoking;
- significant loss of combustible material;
- limited preservation period, because of inferior quality.

It is best and more hygienic to braise in a cemented area or on platforms resembling trays placed in smoking ovens. This process has the following advantages:

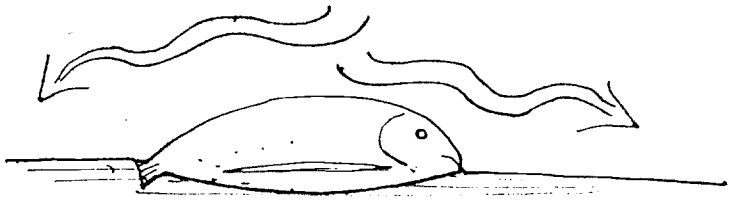
- uniform braising;
- better looking products;
- longer preservation period;
- protection of public health.

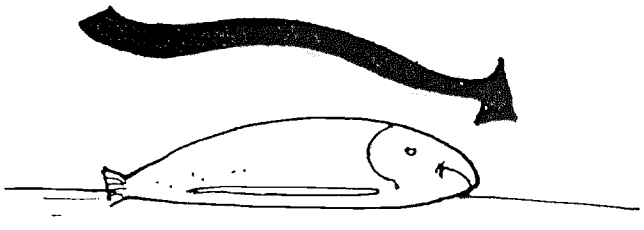
III.5.5 Drying of Fish

Drying reduces water content of fish and helps increase the preservation period of finished product.

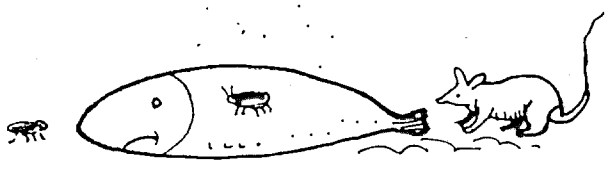
Drying on the floor should be discouraged for the following reasons:

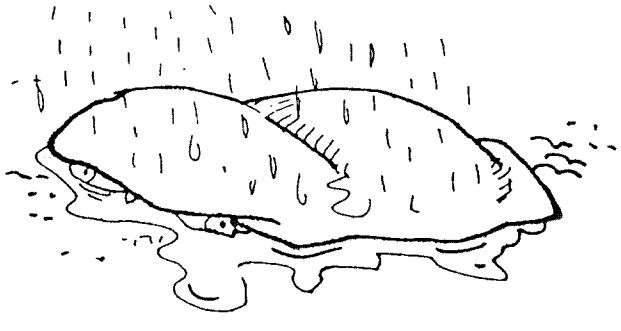
lack of air circulation around fish





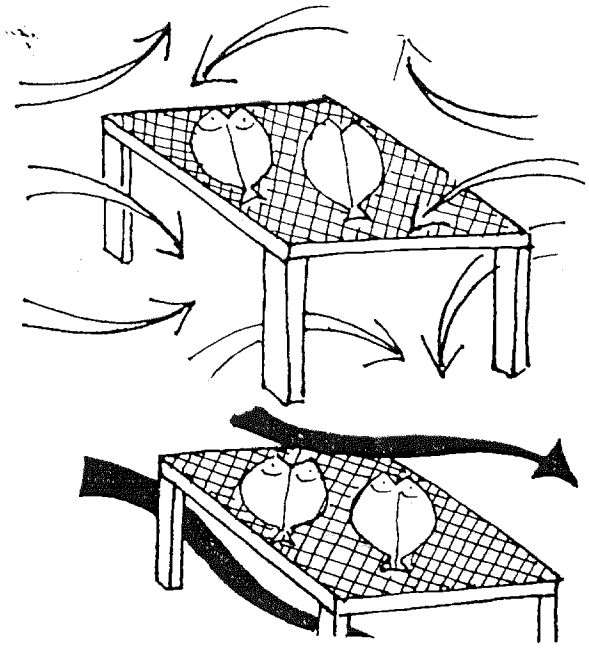
- exposure of fish to all kinds of contamination (dust, animals, insects, run off water)



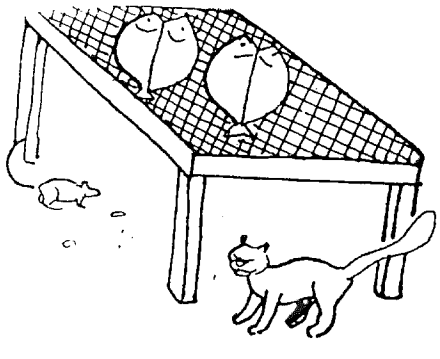


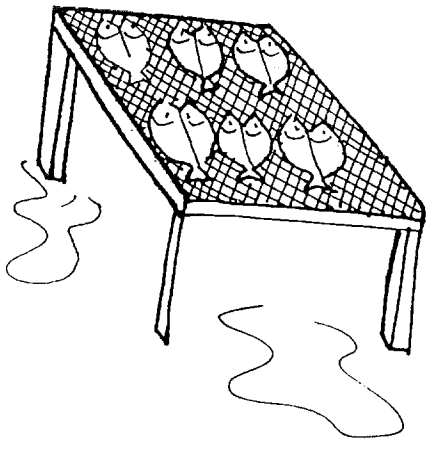
Drying on raised trays, in a fenced area has the following advantages:

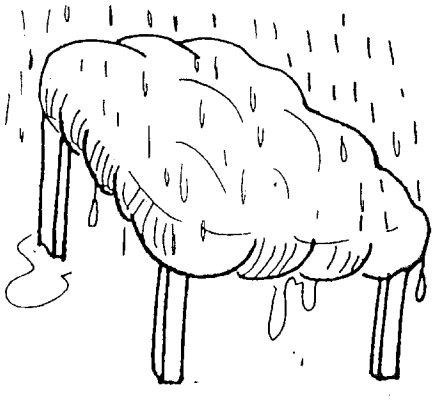
- proper circulation of air around fish



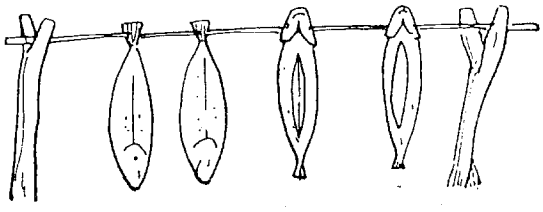
protection of fish from diverse sources of contamination

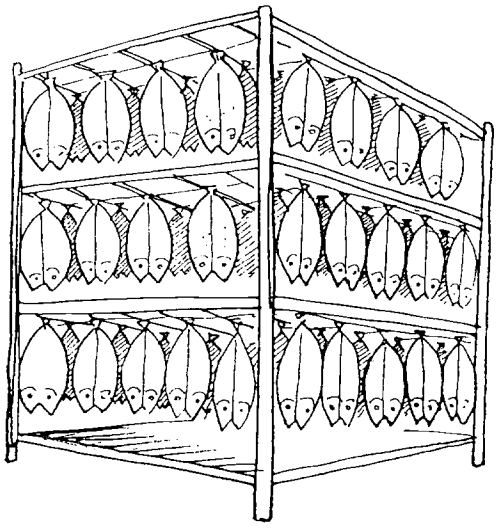






Successful drying can also be obtained by hanging the fish.



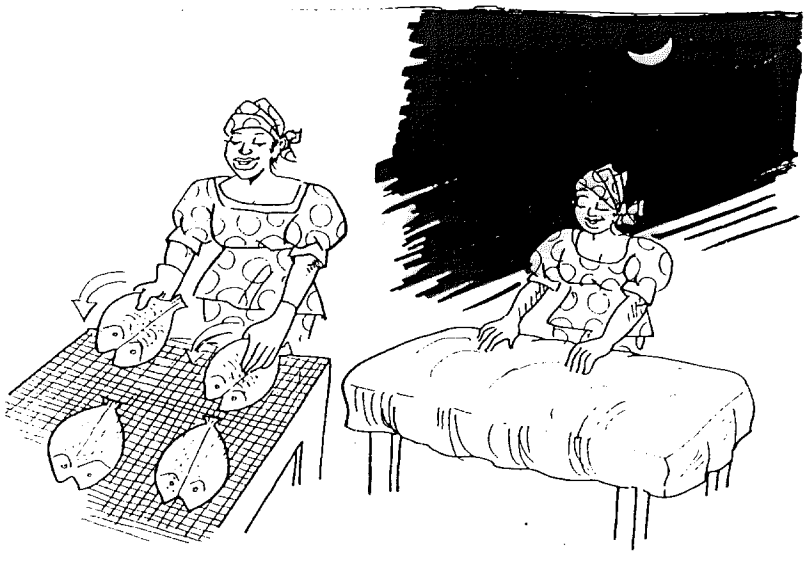


The advantages of this process are as follows:

- increment in the capacity of production;
- rational utilisation of space;
- proper circulation of air;
- quick draining of fish;
- reduced length of drying;
- easy manipulation;
- good quality products;

To obtain good quality dry products, one should:

- turn fish regularly and cover every evening to prevent absorption of humidity.



allow enough time for drying, a minimum of three days.

Note: Avoid using chemical additives without specialist advice

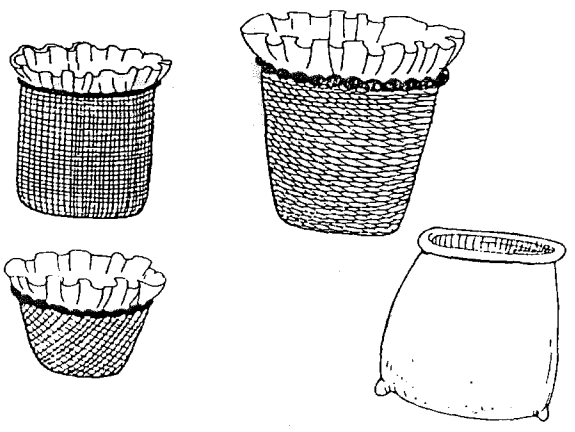
III.6 Packaging and packaging material

These steps ensure sufficient protection of products from all types of external contamination and humidity.

Packaging material must suit the type of product to be packaged. It should be solid, clean, dry, non deformable, waterproof and easy to handle and stack. Packaging material should be kept in appropriate places.

Avoid packaging products on the floor. This can facilitate contamination and the introduction of foreign bodies. The quality of product is better when the process is carried out on a platform or table.

Fish could be packed in cartons with plastic, in baskets with plastic, with paper, with jute bags or jute bags with plastic.



It is best to

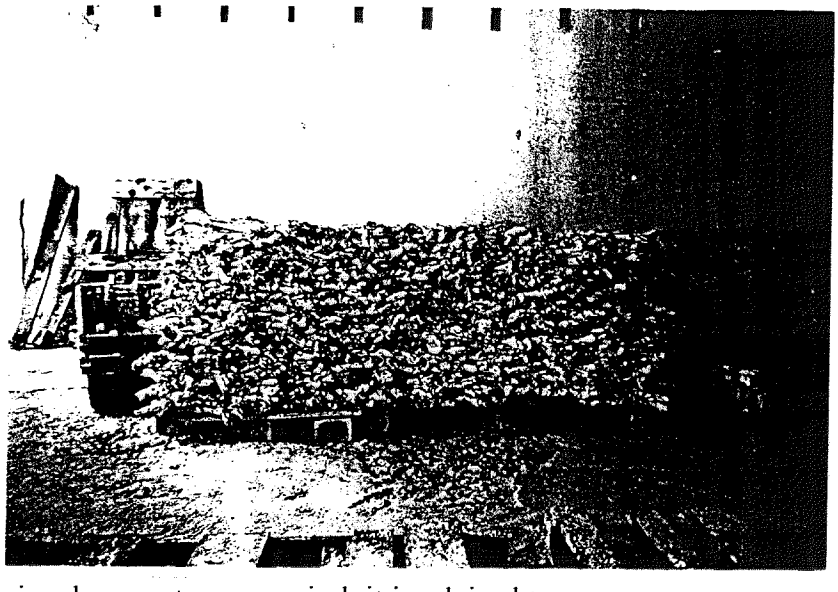
- sort fish before packaging and handle fish with care to prevent them from breaking
- avoid compressing and overloading packaging material, so as to allow easy handling and to avoid the fragmentation of products.

III.7 Storage of final product

Proper storage preserves products for a very long period of time. These products must be protected so as to avoid deterioration. A properly stored product can be preserved for up to six months.

Storing on the ground constitute a source of contamination and can bring about product loss.

Products can be stowed on trays, shelves, wood planks or packed in baskets.



To obtain a longer storage period, it is advised to:

- maintain the products dry enough to prevent contamination by moulds, insects, and parasites;
- regularly heat smoked fish: every 2 - 3 days during the rainy season and once a week during the dry season.
- When moulds start appearing on fish surface, remove by simple grating, brushing, re-drying or re-smoking;
- ensure that stores are well kept;
- avoid mixing products processed at different periods;
- check finished products regularly.

Appendix 1: General advise on hygiene and good practises

What not to do	What to do
Handling products with soiled hands	washing of hands every time especially after using toilets, before touching products
Handling of fish with open wounds or improvised bandage	Treating of all wounds, no matter the location and covering them with waterproof material. People with wounds exuding pus should avoid handling fish
Utilisation of dirty water on landing sites to wash fish	Use potable water: running water, boiled water or water to which bleach has been added (1 spoon of bleach/100l of water)
Utilisation of dirty material	Clean and disinfect all material likely to come into contact with fish (knives, basins, dressing tables...)
Stepping on products, putting them on the floor during processing or drying, squeezing the fish by overloading containers	Treat fish like a food item, avoid accidental bruising
Exposure of fish to bad weather (sunshine, rain, wind)	Avoid the heating up of fresh fish. If it cannot be immediately processed, store in ice at a low temperature or, if this cannot be done, put under shelter
Working in a dirty environment: in the middle of rubbish, waste and residual water	Avoid all situations favouring the invasion of fish by germs, flies and other insects: clean and disinfect processing areas. Dustbins should always have lids
Being slow during processing	Avoid deterioration of products by working fast and reducing length of pauses between operations
Making careless gestures while working, for example, sneezing on product, spitting, blowing of nose or eating around working area, cleaning of hands with a dirty piece of cloth	Move away from product before carrying out these gestures and wash hands before starting work
Working on a decomposing fish	Choose good quality raw products

Appendix 2: Cleaning and disinfecting programme recommended for artisanal fish processing premises.

Premises or material	Cleaning and disinfecting programme	Measurement of bleach - duration of contact	Periodicity
Areas of processing, floors, changing rooms, sanitary installations, latrines	- Elimination of big waste by sweeping - Cleaning with a detergent - Rinsing with water - Disinfecting - Rinsing with water	30 ml for 10 L of water minimum of 15 mn	During operations and after everyday work
Stores for finished products	- Rinsing with water - cleaning with a detergent - Rinsing with water - Disinfecting - Rinsing with water	30 to 40 ml for 10 L of water minimum of 15 mn	Once a week
Tanks, basins, knives, machetes	Rinsing with water - cleaning with a detergent - Rinsing with water - Disinfecting - Rinsing with water	30 to 40 ml for 10 L of water minimum of 15 mn	During operations and after everyday work
Working surfaces, cutting boards	Rinsing with water - cleaning with a detergent - Rinsing with water - Disinfecting - Rinsing with water	30 to 40 ml for 10 L of water minimum of 15 mn	During operations and after everyday work
Trays for smoking and drying	- dry clean by using an appropriate brush (scraping)	30 ml for 10 L of water minimum of 15 mn	After everyday work
Containers, dustbins, rubbish dumps	- Rinsing with water - cleaning with a detergent - Rinsing with water - Disinfecting - Rinsing with water	30 to 40 ml for 10 L of water minimum of 15 mn	At least once a day
Smoking rooms	- dry clean with a broom (scraping of coal tar, ash) - cleaning with a detergent - Rinsing with water		- Dry clean after every operation - Thorough cleaning at least once a week
Transport vehicle	Rinsing with water - cleaning with a detergent - Rinsing with water - Disinfecting - Rinsing with water	30 ml for 10 L of water minimum of 15 mn	- Thorough cleaning after every delivery - Cleaning and disinfecting at least once a week
Cleaning and disinfection of hands	Rinsing with water - cleaning with a detergent - cleaning with a detergent - Rinsing with water - Disinfecting	5 ml for 1L of water	After returning to work, after using the toilets and as often as necessary

Appendix 3: Quantity of ice needed to cool and keep at room temperature of 0°C, 100Kg of fish, based on the length of the trip, the temperature of surroundings during transport and the temperature of fish to be frozen (*).

Temperature of surroundings during transport °C	Temperature of fish before icing °C	Quantity of ice (kg) needed to cool and keep 100Kg of fish at a temperature of 0°C during a journey of:				
		3 h	6 h	12 h	18 h	24 h
15	10	16.5	23	35	48	60
	15	21.5	28	40	53	65
	25	31.5	38	50	63	75
20	10	17.5	25	40	55	70
	15	22.5	30	45	60	75
	25	32.5	40	55	70	85
25	10	18.8	28	45	63	80
	15	23.8	33	50	68	85
	25	33.8	43	60	78	95
30	10	20	30	50	701	90
	15	25	35	55	75	95
	25	35	45	65	85	105

(*): These values are an estimation based on the assumption that plastic containers which can hold a capacity of 10 Kg of transported fish are used in an insulated vehicle.