CODE OF PRACTICE FOR THE SAFETY AND QUALITY ASSURANCE OF SMOKED TILAPIA, NILE PERCH AND OTHER FISH SPECIES IN THE ARTISANAL FISHERIES SUB SECTOR

THE REPUBLIC OF UGANDA

Ministry of Agriculture,
Animal Industry & Fisheries
Directorate of Fisheries Resources

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Smoking is a common processing method because it accelerates drying of the fish, imparts desirable flavours liked by consumers and preserves fish. Smoked products have a longer shelf life when properly smoked which enables them be marketed without the use of refrigerated systems. Smoking is usually combined with a period of sun drying and/or brining.

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1.1.2 TRANSPORTATION OF RAW MATERIAL

1.1.3 PREPARATION FOR SMOKING (GUTTING, SCALING, WASHING AND BRINING)

1.1.4 DRYING

1.1.5 SMOKING

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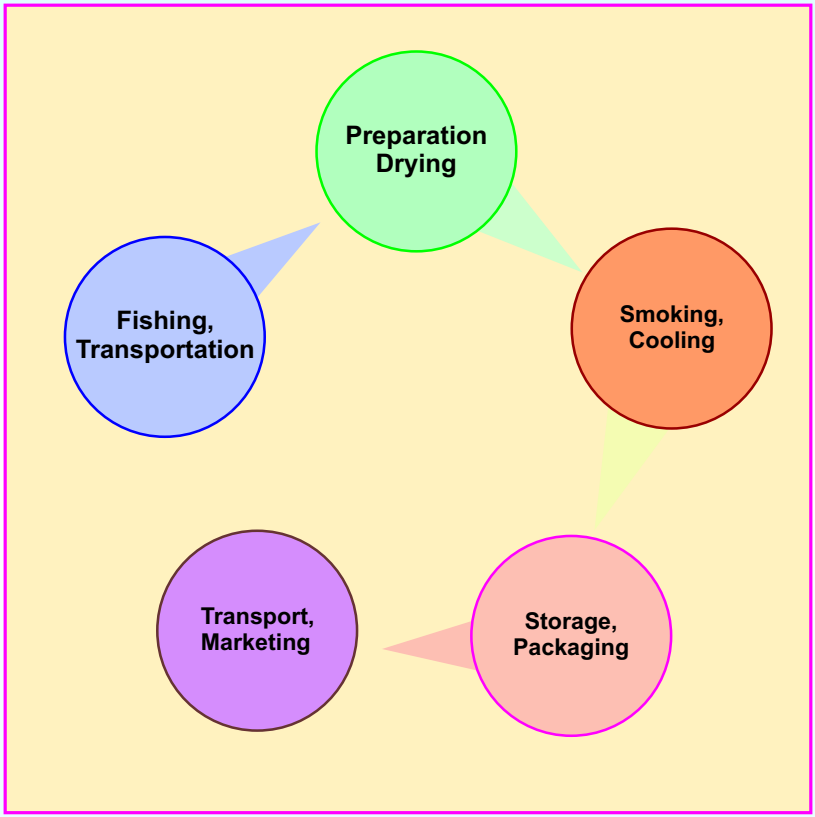


1.1.1 RECEPTION OF FISH

1.1.1.1 Bad practices

a) Dropping and piling of raw material fish on the ground during landing
b) Contamination of landed fish with in-shore dirty water
c) Spillage from waste water or cross-contamination with waste water runoffs
d) Reception of low quality fish
e) Handling of fish by medically unfit workers

1.1.1.2 **Good Practices**

a) At landing sites the raw material fish should not be thrown on the ground but received direct into clean containers or the fish reception jetty

b) Care should be taken when retrieving the fish from the boats to avoid contact with dirty inshore waters

c) Only good quality fish should be received

d) The workers should have the necessary protective wear like aprons, gloves and gum boots for use in handling the raw material fish and ensure proper hygiene

e) Raised surfaces should be used during fish inspection and sale

1.1.2 TRANSPORTATION OF RAW MATERIAL FISH TO SMOKING CENTRES

1.1.2.1 Bad Practices

a) Use of inappropriate and /or dirty containers or pickups
b) Uncovered fish transported at the back of trucks
c) Failure to maintain the cold chain during transport
d) Slow transport means that may lead to spoilage
e) Transporting fish with humans, or livestock, charcoal, oils, agricultural chemicals or paraffin

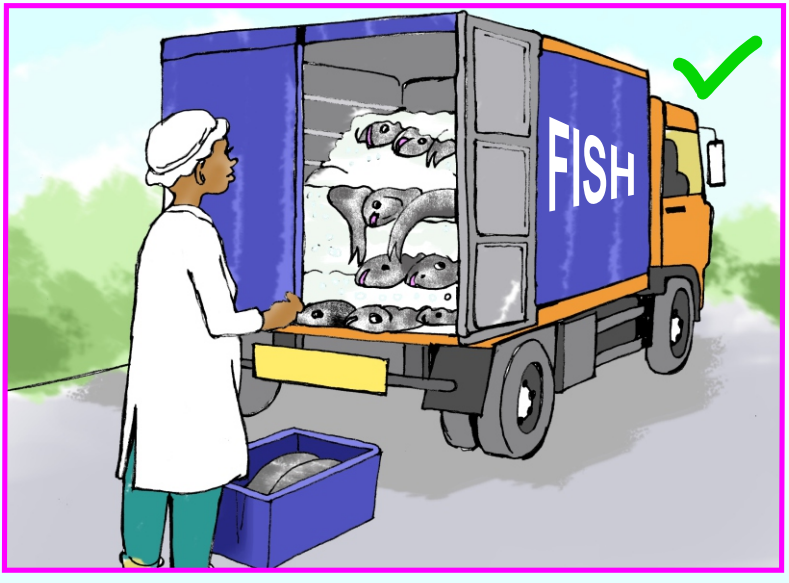
1.1.2.2 Good Practices

a) Where possible, the raw material fish obtained should be immediately iced and the icing maintained even during transportation for further processing like smoking

b) Where icing is not possible, the raw material should be transported and covered in clean containers and if possible in cool weather.

c) People should not sit or step on fish during transport

d) The fish should be covered with tarpaulin to avoid contamination with dust if transported in unsheltered / uncovered vehicles



e) Any means of transport used should be fast enough to avoid any further spoilage during transport.

f) Fish should not be transported with other products or materials

g) Transporters should have a movement permit allowing fish to be moved

1.1.3 PREPARATION FOR SMOKING (GUTTING, SCALING AND WASHING)

1.1.3.1 Bad Practices

a) Operating on dirty work surfaces
b) Operating on the ground
c) Use of uncleanable work surfaces
d) Poor hygiene of working premises and environment
e) Poor worker hygiene
f) Long time lag between landing of fish and preparation for smoking
g) Poor preparation practices –failure to properly clean the product and leave it to drain before smoking
h) Use of improper cleaning detergents
i) Poor hygiene of equipment used

1.1.3.2 Good practices

a) Scale and wash the fish properly using clean potable water

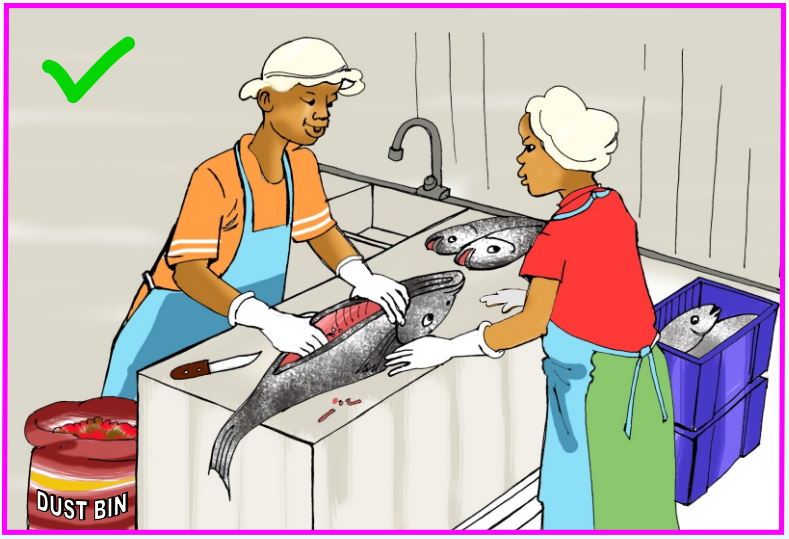
b) Use raised cleanable work surfaces made of say, aluminum or stainless steel or hard transparent cleanable polythene sheet; for polythene sheet, keep changing the material and avoid the re-use of the same sheet after handling a batch of fish from the ground

c) Ensure that the work surface can drain easily and safely

d) Fish can be split to quicken water loss from the fish and lessen the time for smoking - hence saving wood fuel being used

e) Ensure that the work premises is constantly cleaned and waste material removed and disposed of appropriately

f) Avoid working in places close to garbage dumping sites, toilets, leaking sewage, or any dirty places



g) Workers should wear appropriate protective gear – head caps, mouth/nose protection, aprons, hand gloves, and appropriate footwear (boots) which should be cleaned regularly

h) Food grade cleaning detergents should be used to clean the workers' protective gear, work surfaces and equipment

i) Any equipment used should be cleaned frequently during the preparation

j) Constantly keep the place clean and keep insects like flies away from fish

1.1.4 DRYING

1.1.4.1 Bad Practices

a) Failure to observe appropriate measures in drip drying.
Drip drying is done to drain any excess water in preparation for smoking and if the drying time is short water will not drain sufficiently. However, also if the drying time is too long the fish will undergo spoilage

b) Drying of fish on the ground.

c) Drying of fish on a surface that does not allow easy drainage of water

d) Drying fish on the premises that are close to dirty areas like garbage dumps, toilets, leaking sewage, dusty areas, or any areas with potential for contaminating the drying fish

e) Poor hygiene of the workers

f) Potential for cross-contamination by scavenging birds and animals

1.1.4.2 Good Practices

a) Fish should be sun dried on the smoking trays for 2 hours before smoking

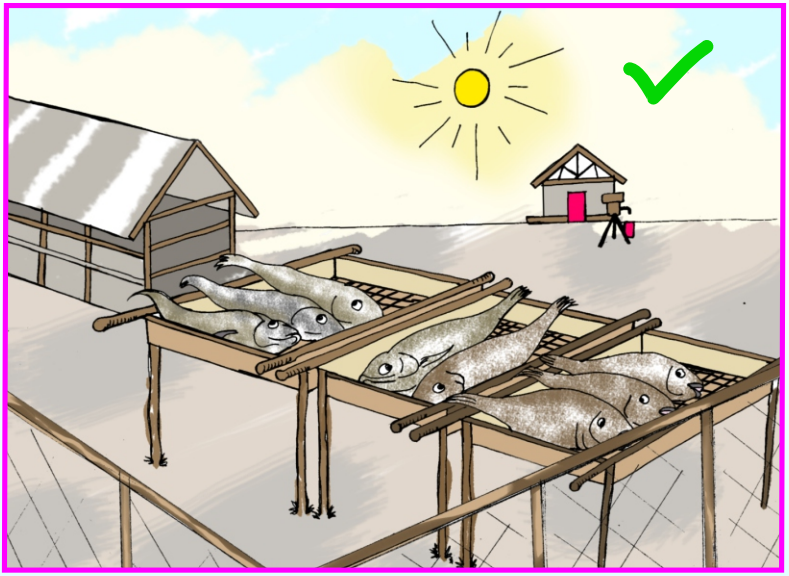
b) The fish should be dried on raised racks, avoiding contact and avoid contact with the ground

c) Fish drying areas should be isolated from dirty environments and kept away from garbage dumps, toilets, sewerage leaks etc

d) Drying areas should be located away from dust and exhaust fumes of moving vehicles or herds of grazing animals

e) Keep watch over the drying fish to keep insect swarms like flies away from the fish

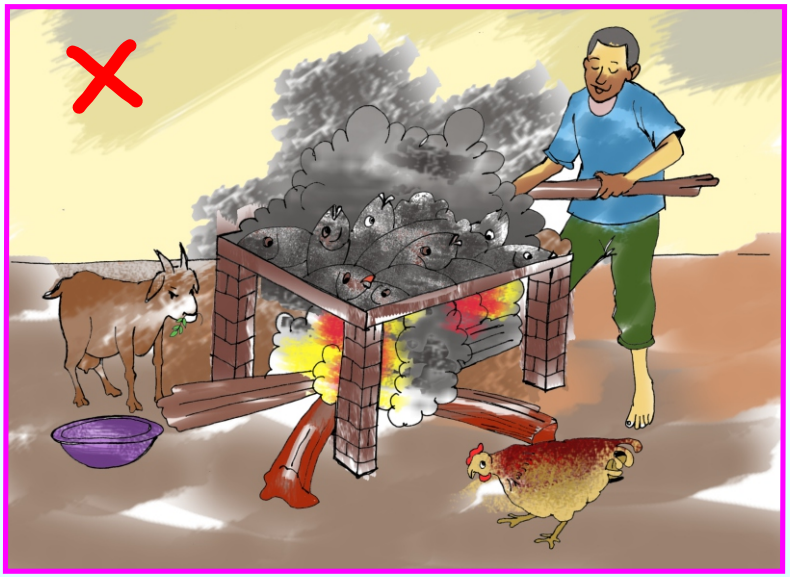
f) Keep scavenging birds like eagles, and domestic animals like dogs, cats, chicken etc well away from fish.



1.1.5 SMOKING

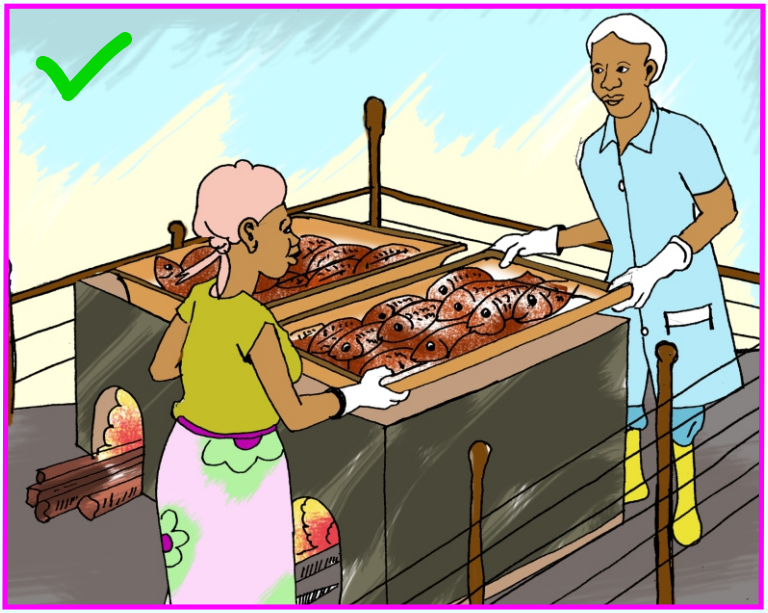
1.1.5.1 Bad Practices

a) Use of fuel wood of a type that is known to be poisonous
b) Use of painted or vanished wood to smoke fish
c) Over smoking of fish which completely denatures the product, which can lose key nutrients
d) Poor regulation of smoke with too much smoke coating the product
e) Use of already spoilt fish for smoking
f) Failure to allow enough cooling time after smoking
g) Poor hygiene of workers
h) Failure to control the smoking rate and duration



1.1.5.2 **Good Practices**

In hot smoking the time period is about 30 minutes at temperature ranges of 63 to 72°C, followed by reduced temperature for about 24 hours. Hot smoking means smoking at a temperature that cooks the smoked product. The smoking process must be done for long enough to let the fish dry well enough i.e. reduce moisture content to the recommended 10% or lower. The smoking should not be extended unnecessarily as this will result in the denaturing of the nutritional values of the product.



To obtain the best quality and safe smoked products the following is required:

a) Use good quality fish, split them, remove the guts and wash them well in clean water

b) Allow them to drain for a short time and place them on the smoking trays.

c) If the fish needs to be kept longer or sold to distant markets, then soak the gutted split fish in brine for 12-24 hours, then drain and smoke for 24 hours or longer

d) Fish should not be held on racks for the whole day before they are smoked, because this exposes the fish to flies and weather elements which deteriorate their condition before fish is smoked.

e) The use of cow dung as fuel should be avoided because of the high risk of cross contamination; unrefined dung affects the flavour and taste of the fish products.

f) Processors should avoid using fish guts to plug holes of smoking kilns, because this attracts flies and other pests to the kiln when the fires are out

g) A large fire and good ventilation for about 15 hours are needed to dry the fish and deposit the smoke

h) Change the trays around regularly during that time so that all the fish is evenly smoked (Use an appropriate smoking kiln e.g Chorkor)

i) Wood used for smoking includes sawdust, shavings and chips, and woody plants in their natural or dried state.

j) Wood for generating smoke should not have been treated with any chemicals or painted

k) Wood for plants that are normally known to be poisonous should not be used as toxins from those plants may end up in the fish

l) Wood should be stored in a dry place separated from the production rooms;

m) To avoid cross contamination from wood to products place the smoke generator in a separate room from the production rooms;

n) Keep the drying time of fish before smoking as short as possible; to avoid unwanted microbiological growth and formation of histamine in susceptible species

o) Monitor the time and temperature of the smoking process

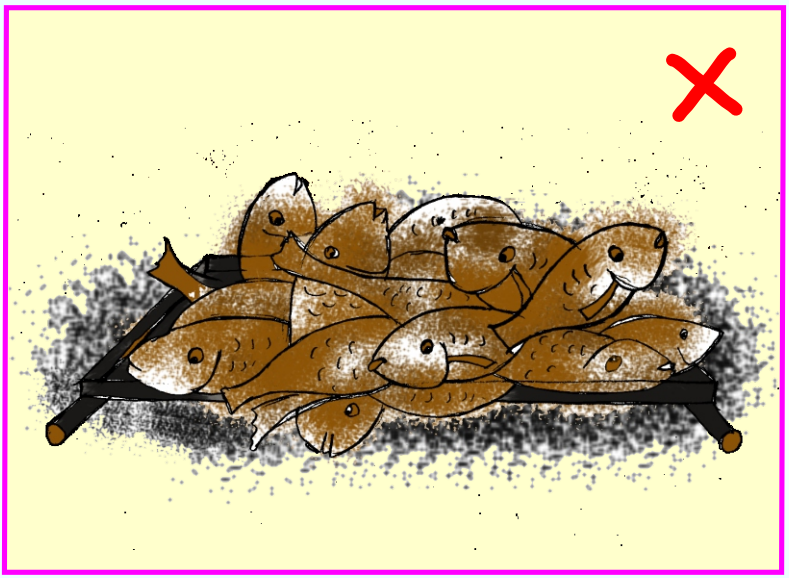
p) Ensure that the smoking environment and the smokers are in a good state of hygiene.

1.1.6 COOLING

1.1.6.1 Bad Practices

a) Inadequate cooling of products which might increase the attack of fish in storage by moulds

b) Warm products lead to microbiological attack and rotting in storage



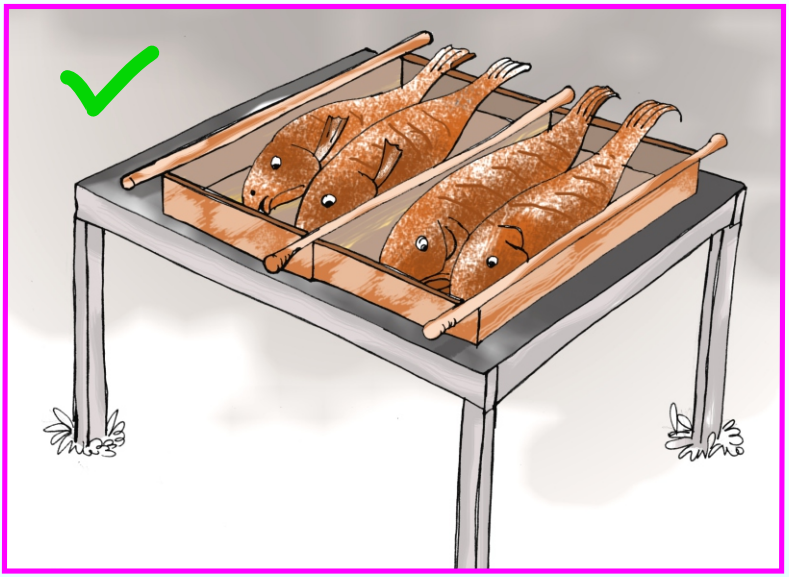
1.1.6.2 Good Practices

a) Before storage, fish should be allowed to cool properly after smoking so that the skin completely dries which will make it less likely to be attacked by moulds

b) Cooling after smoking and before packaging should be carried out with care to avoid over exposure of products to spoilage - ensure clean environment, no insect swarms etc

c) Cool hot smoked products adequately

d) Cooling should be done to prevent warmth in the products which when packed will generate moisture to cause molding and rotting.



1.1.7 STORAGE

1.1.7.1 Bad Practices

a) If not well dried, the fish will be attacked by fungus in storage
b) Fish stored when still warm develops moulds and rots
c) Storage facilities exposed to dust and fumes
d) Storage areas accessible by vermin, pests and insects
e) Storage facilities with no proper ventilation
f) Storing fish on the ground within the storage area
g) Storing fish in areas used for other purposes like boarding for animals and persons, storage of other materials or foodstuffs or storing fish in inappropriate areas – say under the beds
h) Poor sanitation and hygiene of storage areas
i) Improper storage containers with no covers, or that are rusted or dirty

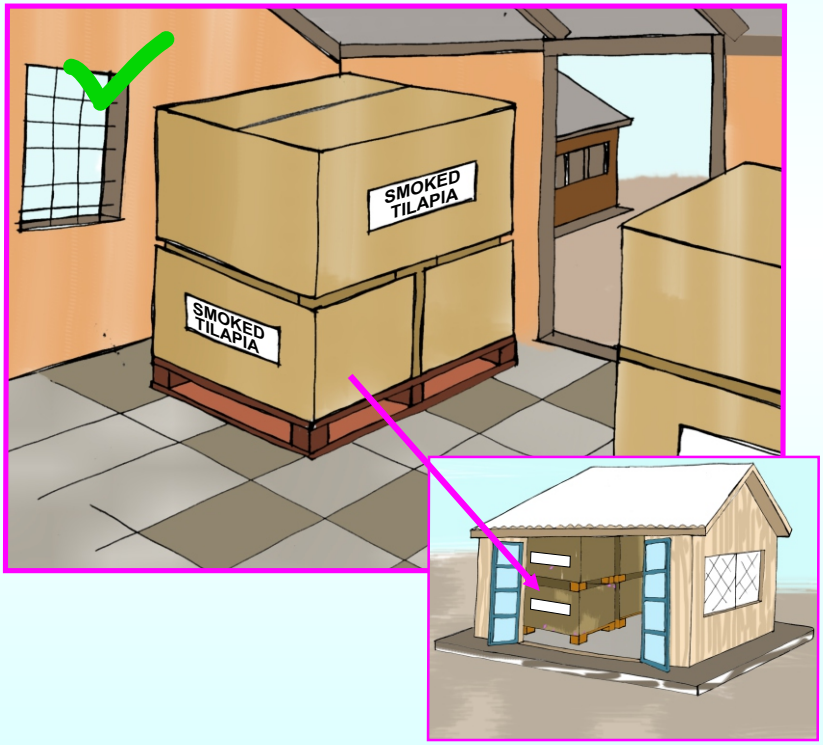
1.1.7.2 Good Practices

a) Allow the fish to cool and then store in a well-ventilated, vermin proof building

b) Avoid keeping fish in the same places of board like bedrooms or under the beds

c) Use containers of appropriate size to keep a matching amount of fish and avoid squeezing the fish into the container

d) Avoid storing fish in areas that are accessible to domestic animals like goats, dogs and cats etc



e) Storage areas should be free of any vermin, rats, birds, and pests like insects etc. The room must be protected against the entry of animals and insects i.e. well netted with no holes

f) The store should be clean, dry and well ventilated and sheltered from rain or sunshine. Where possible smoked-dried fish should be placed on shelving which allows for a good circulation of air

g) In case the storage life is longer there is need to re-dry the fish at intervals during storage especially during the rainy season

h) Ensure that fish holding containers are not placed on the ground but on raised racks to avoid damp conditions.

i) There should not be any chemicals in the store room and the room should be out of bounds for unauthorized persons.

j) Where possible, no other food stuffs, materials etc should be kept in the same store unless they are appropriately secured and packed to avoid cross-contamination of fish.

k) The store areas should be kept in good hygiene condition and care must be taken to ensure that the fish is not exposed to dust from domestic cleaning, or dust and fumes from moving vehicles etc.

1.1.8 PACKAGING

1.1.8.1 Bad Practices

a) Squeezing of fish in packing containers
b) Use of inappropriate packing containers to pack fish
c) Use of unhygienic packing containers
d) Poor hygiene of the packers

1.1.8.2 Good Practices

a) Smoked fish is brittle and easily breaks so it should be handled carefully during packaging and transportation

b) An improved packaging container for the transportation of smoked fish that can be used consists of a wooden box with a wire mesh top and bottom. This allows air to circulate through the box and fish are protected against breakage. FAO recommends a box of dimensions 90 x 60 x 45cm.

c) When well smoked, fish can be stored for 4-7 days

d) Traditionally designed containers like baskets with good aeration can be feasible for packing smoked fish; boxes of soft material like paper material are not good for packing smoked fish

e) Ensure proper hygiene for workers

1.1.9 TRANSPORTATION TO THE MARKET

1.1.9.1 Bad Practices

a) Transportation means such as the use of old and subserviced trucks which emit a lot of soot or fuel exhaust fumes

b) Stepping, sitting, stamping, sleeping etc on top of the fish transport truck

c) Transporting too much fish in smaller means of transport which results in stacking and squeezing too many packages and overloading

d) Use of slow means of transport that result in spoilage of fish before reaching the market

e) Use of poor roads with dust and mud, some which enter the product

f) Poor sanitation of transport trucks

g) Poor hygiene of personnel who come into contact with fish during transport

h) Transportation of fish with other merchandise in the same truck cabin

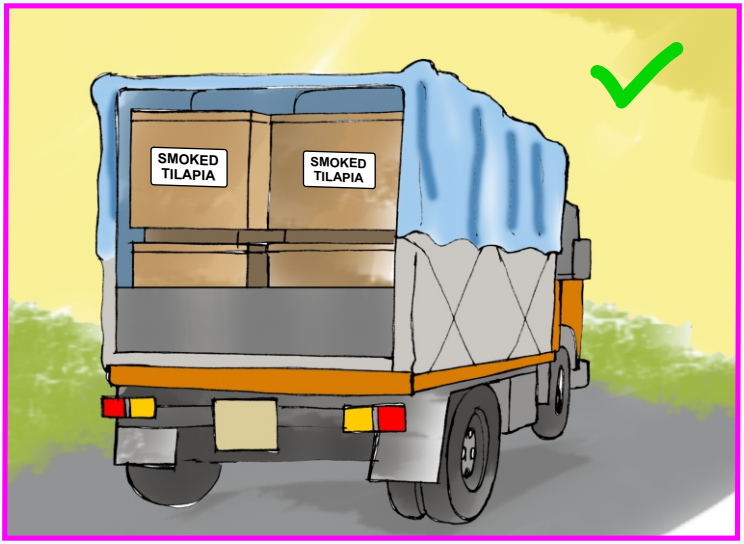
1.1.9.2 Good Practices

a) Smoked fish is brittle and easily breaks and so it should be handled carefully during packaging and transportation

b) If possible use covered vehicles that provide adequate shelter to fish

c) Do not transport fish with other merchandise in the same truck cabin. If this is unavoidable, ensure that all the other merchandise is securely packed to avoid cross-contamination

d) Do not carry persons or their belongings in the same truck with fish



e) Old trucks or pickups which emit a lot of exhaust fumes should not be used to transport fish

f) If alternative routes exist, avoid transporting fish on dusty and muddy roads

g) Drive faster to ensure that the fish is not spoiled before reaching the market

h) Avoid transporting fish with other food stuffs which may contaminate the fish

i) Avoid transportation of fish by use of old and subserviced trucks

which emit a lot of soot; ensure that all vehicles are well serviced and maintained

j) Ensure proper hygiene and sanitation of the transport vehicle

k) Cover the fish containing packages with a water resistant material like plastic sheet or tarpaulin to protect the product from dust or rain during transportation

1.1.10 MARKETING

1.1.10.1 Bad Practices

a) Selling of already spoilt fish
b) Selling fish on dirty surfaces
c) Using bare hands during the selling of fish
d) Poor hygiene of containers
e) Use of poor packing materials
f) Location of the marketing area e.g. close to garbage areas or toilets
g) Unacceptable practices like the smearing of fish with oils to make it look attractive to the buyer

1.1.10.2 **Good Practices**

a) First of all ensure that a comprehensive quality check is undertaken on all the fish delivered on the market to ensure that there is no fungal or mould growth

b) Ensure that spoiled/rotten fish is separated from good fish to be sold

c) Ensure that fish is sold on a raised surface that is made up of cleanable material such as aluminum, or steel racks which should be self-draining of any water after cleaning.

d) In small local markets, raised surfaces like a table or stall stand are recommended to minimize contamination from dust, insects and also to prevent the fish from being stepped on by people when sold on the ground.

e) Ensure that the surface where smoked fish is sold is clean and dry

f) It is illegal to sell contaminated fish. Avoid selling fish with clear signs of fungal growth, rotten fish or fish with off smells uncharacteristic of smoked fish.

g) The fish seller should be hygienically clean to handle fish

h) The fish market should not be located close to garbage areas or toilets or any areas of potential contamination

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