

SAFEGUARDING CONSUMERS HEALTH WHILE SECURING GREATER POST HARVEST BENEFITS WITH THE FAO THIAROYE FISH PROCESSING TECHNIQUES

1

I- CHALLENGES FACED BY SMALL AND MEDIUM SCALE FISH PROCESSORS IN THE TROPICS : THE CASE OF SMOKING AND DRYING TECHNIQUES

✓ FOR SMOKED PRODUCTS

- 1. The consumer health issues:** The presence of contaminants (such as PAHs) in hot smoked fish and the toxicity risk for human consumption is an increasing concern scientifically established.
- 2. The environmental concerns:** Current techniques of smoking require an important amount of woods, though some improved design existing kilns (e.g. with gas) enable to overcome this issue. This contributes in part to deforestation.
- 3. Occupational health concerns:** Heat and smoke generation by the current techniques of smoking are source of unhealthy exposure by fish smokers and source of labour intensive.
- 4. Losses concerns:** various losses occur (physical, quality) during the smoking (fish dropped into the fire, charred, spoiled by humidity or rain), during the storage (fish spoiled owing to non effective smoking), during the commercialization (the inconsistencies of smoked fish products and the lack of standard and certification lead)
- 5. The sanitary regulations:** smoked fish intended to export are faced strong pressures on chemical safety of smoked products established by sanitary and safety institutions and by countries.
- 6. Market force losses and incomes generation concern:** The sanitary regulation leads to reduction of units registered and certified for export. Also, the non conformity in the supply, the inconsistencies of the products (quality and size) and standard patterns contribute to market force losses. All this, leads to reducing the opportunity of incomes generation.

E.g.: In Togo and Ivory Coast, there were held successive mission funded by ACP-UE in 2010 in order to provide a training and technical support to fish smoking and curing establishments for the export of their products. For further information, please refer to IND045CIV, IND048CI, IND70CIV for Ivory Coast and IND022TGO, IND058TGO for Togo

✓ **FOR SUNDRIED FISH:** High post-harvest losses during adverse climatic conditions (rainy season, humid)

II- WHAT IS THE FEATURE OF FAO THIAROYE TECHNIQUE?

It represents an innovative solution to the concern above mentioned (improved method to supply safer hot smoked and standardized fish products)

1. Adaptable and suitable for utilization as mechanical drier to process fish irrespective of the weather/climatic conditions.

Testing and cost-benefit analysis on pink shrimps was conclusive (reducing of duration of drying; increasing of the efficiency of production). The pilot tests continue on fish species.

2. Adaptable design: the previous kilns could be adaptable easily and adjusted to locally made devices (materials).

In fact, it allows the possibility or a new way of using the existing improved fish smoking kilns/ovens (Chorkor, Banda, Altona, etc.) just by adding of innovating external devices which will reduce the risk of harmful contaminations (control of PAHs)

➤ *In fact, it's fitted with an indirect smoking facility (external smoke generator and filter), a fat collecting plate; a quadrilateral container (furnace for embers)*

✓ **External smoke generator** blowing the safer hot smoke to the smoke compartment of the oven via the metal pipe and the filter. The distance between the

generator to the oven and also the fuel chosen for combustion decrease the content of HAP in the smoke

- ✓ **Filter:** This retains harmful particles of smoke and decreases the temperature of the hot smoke by a system of humidification.
- ✓ **Fat collecting plate:** a perforated metal sheet between the fish and the heat source to prevent fat dripping from fish to fall into the heat source. The plate kept clean, without crusted fat, has an effect on the deposition of PAH in smoked products especially fatty fish. The use of the plate has significantly reduced (50%) the benzo (a) pyrene compared to cooked products without plate, especially when wood and coconut husks are involved. The reduction is more important when the presence of plate is coupled with indirect smoking (75%)
- ✓ **A quadrilateral container :** It's the furnace for embers (This stove is equipped with four (4) wheels for his travel, air pipes and a smithy to stoke the fire and throw the air inside the oven) using as fuel: charcoal, stones, plant materials-coconut husk or shells, rice husk...???, corn cob, etc. They were tested in order to select the least toxic.
- *Further, the oven used is the model already known (parpaing oven) but with a little adjustment to improve the efficiency of the smoking and quality and safety of smoked fish. It's fitted with:*
 - ✓ Two separate compartments (the 1st one for the cooking by embers heat and the 2nd for the smoking by the external generator)
 - ✓ A removable grid or clay in stainless materials for ease of cleaning; it's heat resistant and it's provided with metal lids which also limits the heat leakage.

3. Environmentally-smart

While the system has an obvious positive effect on the reduction of PAH, it places emphasis on (and highly recommends) the use of alternatives to woods or on a cheap heat source, environmentally-smart (less deforestation) as a source of energy.

E.g. a mixture of charcoal + stones have been tested which complies with the prevailing sanitary regulatory framework but the research are continuing to address more challenging future (2014 perspectives of the new EU regulations on PAH), by testing different types of stones mixed with different plant materials

4. Turned toward (focused) on products utilization and additional incomes generating

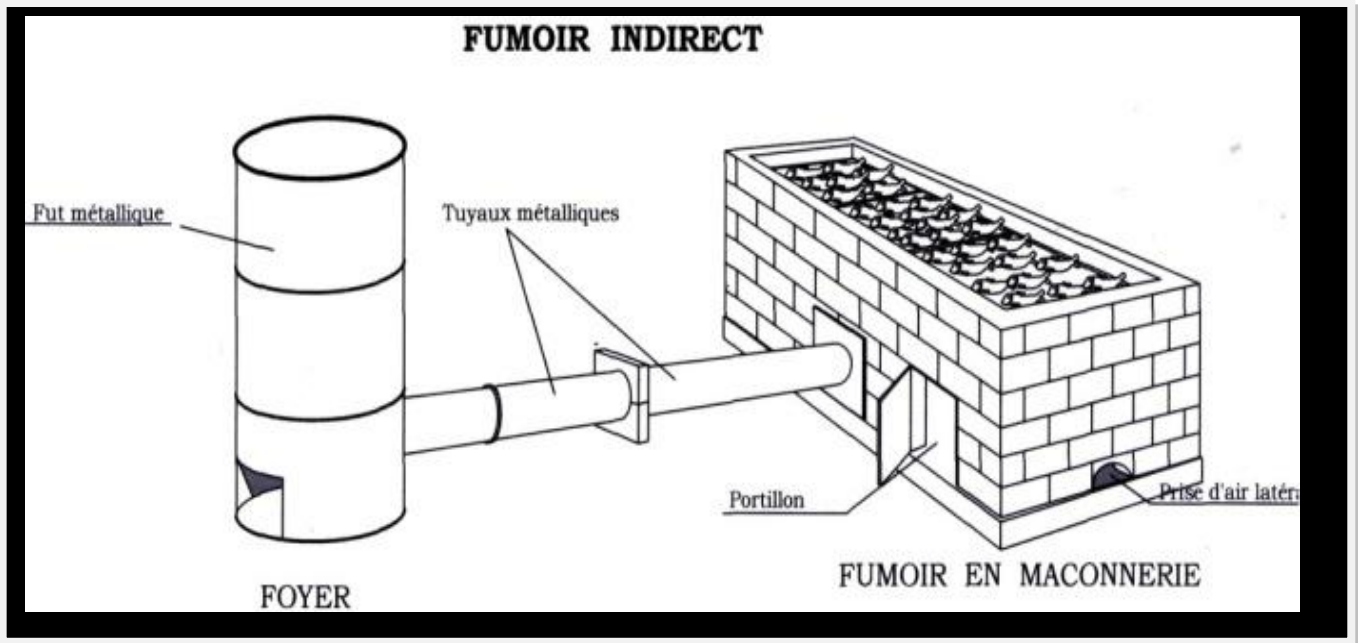
It's equipped with fat and exudates recovery system for low-cost utilization of useful byproducts that are otherwise lost. The fat collected is used for frying food or manufacturing of soap that can be sold.

III-WHAT ARE THE ADVANTAGES FOR THE STAKEHOLDERS?

- ✓ Fulfilling the responsibility towards consumer: meeting a food safety requirements
- ✓ Improved incomes of the fish processor:
 - access rewarding to markets
 - Less post-harvest losses: qualitative and quantitative losses in dried fish as well as smoked fish (retentions and destruction of non-compliant products)
 - Expected reduction in quality costs linked to screening laboratory analyses
 - Additional incomes generating opportunities with possibilities of manufacturing soap and food frying oil, using the fat collected.
- ✓ creating employment in off-fishery activities (local artisan)
- ✓ Secured smoking conditions/less exposure to occupational health hazard for the processor; labor saving and therefore gender sensitive.
- ✓ Fulfilling the responsibility towards the environment.

IV- DETAILED DESCRIPTIONS AND PHOTOGRAPHIES OF FAO THIAROYE KILN AND THEIR DEVICES

SCHEMA OF OVERVIEW



BACK VIEW connected by metal pipe to the external generator via the filter



FRONT VIEW (with the 2 compartments)

1.1 External smoke generator:

- *Why?* : It had been found that the amount of hydrocarbons smoke decreases in relationship to the distance covered by the smoke; so the FAO-Thiaroye system kilns uses external smoke generators due to these reason.

Also, the positive movement of the air-smoke mixture through the kiln allows for its recirculation which, in turn, will result in better fuel utilization.

- *How it looks?*

It is composed of a metal keg connected to the filter locker via a metal pipe of 26 cm diameter and 146 cm length. The smoking system is indirect.

- *How much and what's the long durability?* The average cost for manufacture an indirect smoking generator is \$ 200 and his service life is at least 5 years.



1.2 The metal casing

- *Why?* The metal casing is used to insert the filter to facilitate wetting or the humidification and thereby retain the exudates

- *How it looks?* (Photo)



1.3 The filter

- *Why?* It is constituted by a vegetable sponge of fine mesh, which is permanently wetted placed in a special container, and the container is disposed in the casing. The filter is

used to filter the smoke. Harmful particles of smoke are retained in the filter. And both sides of the filter (front and rear) demonstrate the value to filter the smoke.

Also the humidification of the fuel is desirable to avoid the flames and give a good flavor to the product.

- *How it looks?*



1.4 The fat plate or collector

- *Why?*

The fat plate is designed for that grease does not fall into the fire through the holes which could lead to the filing of the contaminant benzopyrene; it's placed slightly tilted to 5 cm of the tray loaded with fish. , fat and exudates from the fish during cooking (red embers) were collected on the plate and vented to the outside using two pipes. These fats can be purified into oil for direct human consumption or for frying or processed into soap.

- *How it looks?*



- *How much and what's the long durability?*

The average cost for manufacture an indirect smoking generator is \$ 100 and his service life is at least 5 years.

1.5 The quadrilateral container

- *Why?*

It serves as heat source during smoking but also for mechanical drying.

- *How it looks?*

The dimensions of the furnace for embers built with the assistance of a local blacksmith have length, width and height of 1m x 1m x 24cm, respectively. This stove is equipped with four (4) wheels for his travel, air pipes and a smithy to stoke the fire and throw the air inside the oven



1.6 The Parpaing Oven

How it's look?

It is rectangular; with length, width and height 5 m X 1 m X 90 cm, respectively. It is divided into two compartments each equipped. The distance between the center of the fire and grilling, is 70 cm.

It is equipped with removable grid stainless materials for ease of cleaning; it's heat resistant and it's provided with metal lids. Its load capacity is 400 kg of fish.

