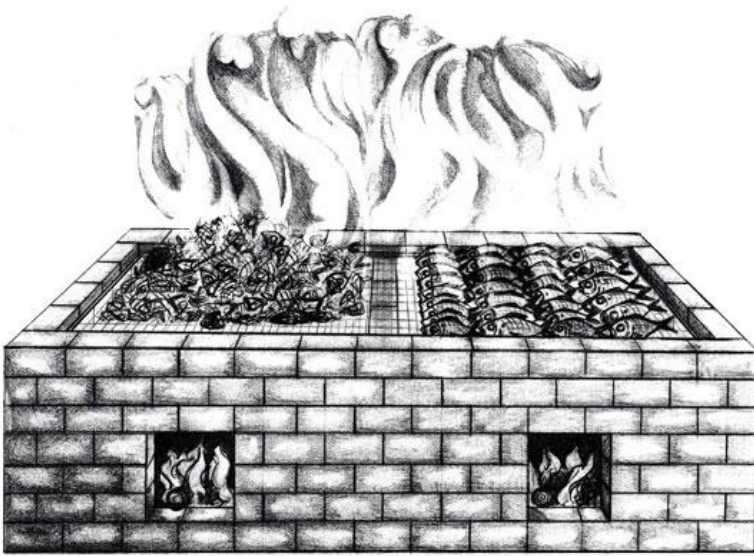


# Making Waste Work: A Toolkit

## How to transform fish waste into animal feed

A step-by-step guide



### How-to guide 4

Part of  
**Making Waste Work: A Toolkit**  
for community waste  
management in low and middle  
income countries

Zoë Lenkiewicz and Mike Webster  
Illustrated by Susan Hatfield  
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[wasteaid.org.uk/toolkit](http://wasteaid.org.uk/toolkit)





WasteAid UK is a charity working to make an impact on the global waste emergency by:

- Partnering with local organisations to improve the health, environment and livelihoods of people without waste services.
- Building the skills of local people to deliver practical solutions to the waste management crisis in their own communities.
- Raising awareness of the benefits of proper waste management and campaigning for greater change.

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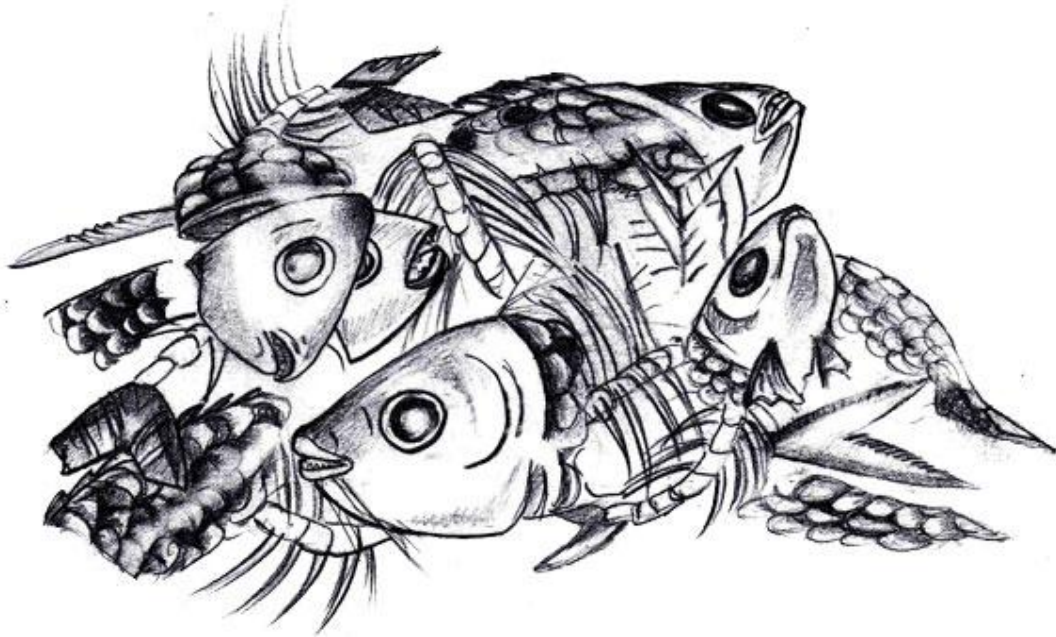
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## 4 How to transform fish waste into animal feed

*Fish waste is very rich in protein – you can make it into supplements for animal feed.*

**Summary:** Collect **fresh** fish waste – what is left over after filleting. You can smoke and dry these, adding extra smoked fish meat for a higher quality product (Class 1), and then put through a milling machine.



**Waste materials:** Fish heads, bones and tails.

**Product:** Protein supplement for animal feed.

**Benefits:** If you have access to farmers who keep animals, you can produce a nutritious animal feed. This increases productivity, is very good for young animals and is suitable for chickens, pigs, goats, cows and farmed fish. It is also useful as an alternative when there is no grass or fodder, particularly during the dry season.

**Hint:** If you don't have a market for your animal feed an alternative is to turn fish waste into very high-quality manure that is good for the soil and for plants (see *How to turn organic waste into compost*, How-to guide 5). You can use this soil conditioner on your own land or you can sell it to others.



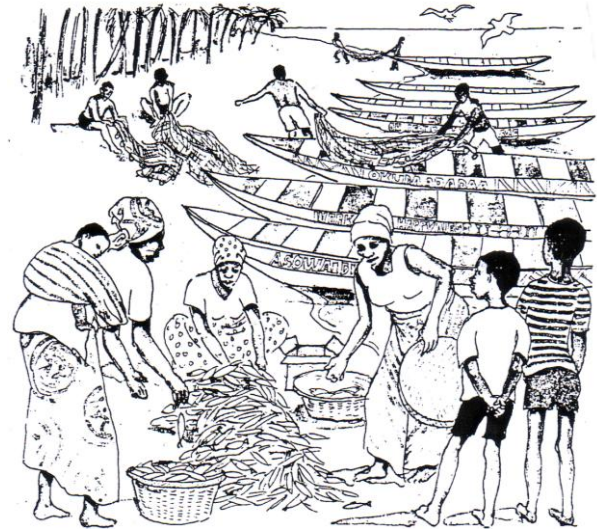
*This activity produces smoke and odour so choose a suitable place well away from houses.*

*The fish waste can harbour disease and attract flies. Always process the material quickly and wash your hands afterwards.*

*Even after you have smoked the fish waste, it may still carry disease so always wash your hands after handling it.*

**You will need:**

- Overalls, gloves, masks, covered shoes or boots
- Smoking oven
- Firewood
- Access to a milling machine.



**Class 1 animal feed – the best quality**

For the best quality feed only use heads, bones and tails, mixed with whole fresh fish. **Do not use fish guts** – these can be used to make excellent quality compost instead (see How-to guide 5).

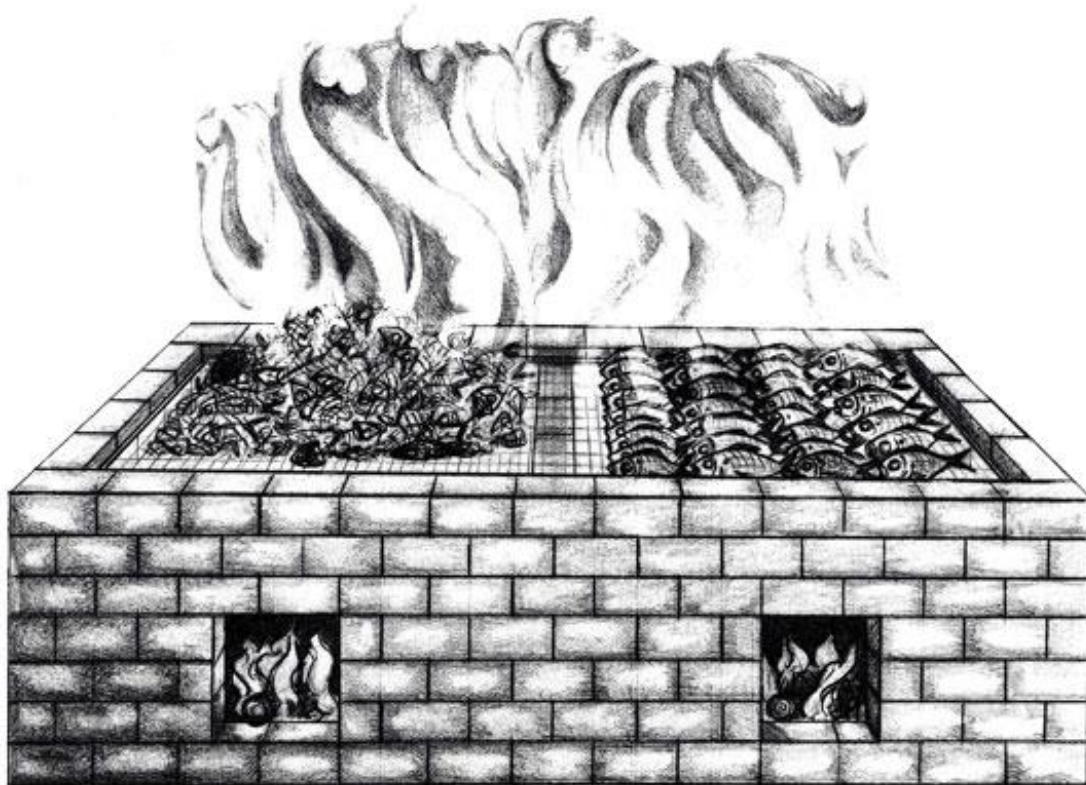


Figure 1: Class 1 animal feed is a mix of fish bones and whole fresh fish, smoked.

1. Collect fish waste (skin, heads, bones and tails), and an equal amount of whole fresh fish, and smoke for one day.
2. Dry for two days over a drying kiln.
3. Pass through a milling machine.
4. Add to grain to supplement other animal feeds.

**Class 2 animal feed**

1. Collect fresh fish remains (skin, head, and tail) and smoke for one day.
2. Dry for two days.
3. Pass through a milling machine.
4. Add to grain to supplement other animal feeds.



Figure 2: Class 2 animal feed is made by smoking and milling fresh fish remains.

### Building a smoking oven

You can build a smoking oven using different materials, depending on what is available in your area:

1. Clay mud, packed and shaped by hand (85-95 “headloads” or basins for one oven).
2. Packed clay mud faced with cement (1/2 bag).
3. Clay mud blocks (sun-dried or baked) and mortar.
4. Cement blocks with mortar (requires 3 to 4 bags of cement and sand that is well-washed).



### Oven design

The ovens are rectangular, about twice as long as wide; with two stoke holes in the front. Preferably there is a foundation sunk in the ground and a dividing wall in the middle, both being recent improvements on earlier models.

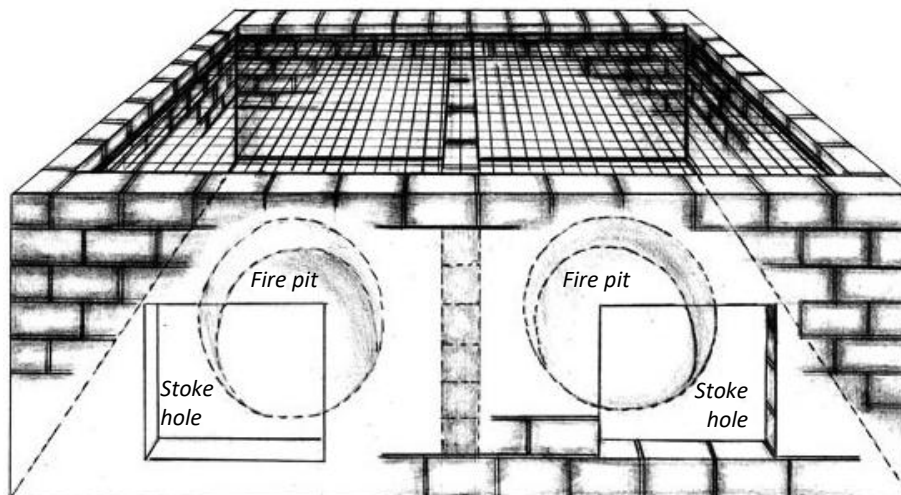


Figure 3: Example of smoking oven showing stoke holes and inner fire pits.

Advantages of middle wall:

- Gives added strength to the oven
- Protects the median cross piece of the bottom tray from burning
- Gives greater support to the loaded trays
- Allows for smoking of small quantity of fish over just one chamber, using less wood.

## Process

1. Clear and level the ground. Draw the outline of the oven walls. Dig a trench 15-20cm deep for the foundation.
2. Prepare the materials (delivery of clay soil or blocks); if loose clay, mix with water and pound until it becomes malleable and sticky.
3. Construct the walls in layers (if clay mud, do it in three stages – first pack the lower layer and allow to dry, then the next 40%, and finally pack and square the upper surface). This takes three days for packed clay ovens, or two days for block construction.
4. For the clay oven, cut stoke holes in the front wall once it is dry (with any sharpened strip of iron); wet the area to be cut first.
5. For the cement oven, make an arch with a piece of scrap plywood, and pack with cement well-bonded to the blocks surrounding it.
6. Finally, after the oven and stoke holes have dried, plaster with clay or cement.

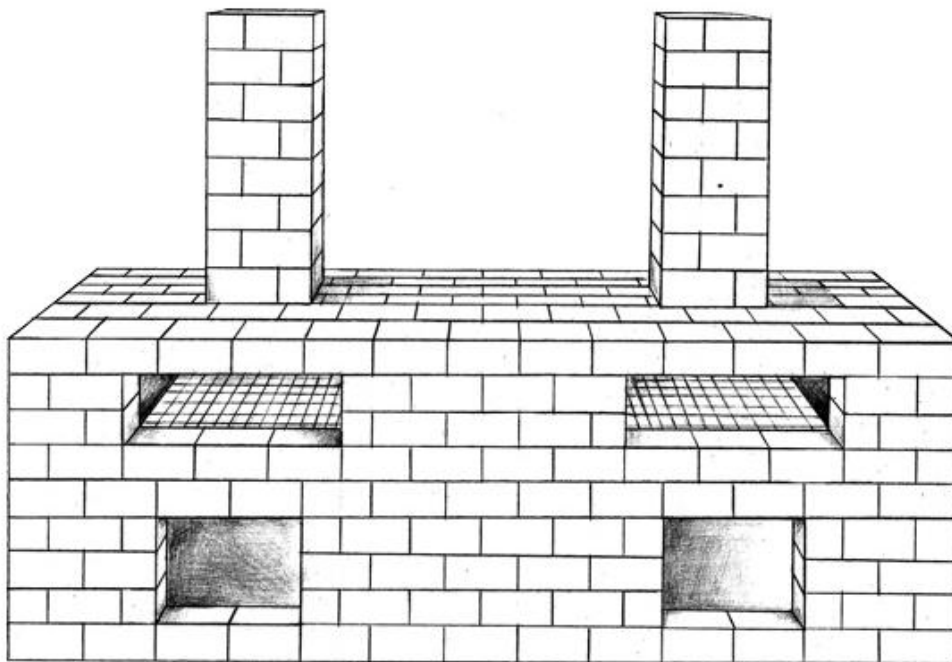


Figure 4: A different smoking oven design with chimneys, to help direct the smoke away.

## Drying fish

There are several ways to dry fish and there might be a traditional method where you live. If it is hot and dry you can simply dry the fish in the sun.

For the drying kiln table:

- Firebricks and cement or clay or mud if these are easily available
- Rebar
- 1cm metal mesh.

## Grinding and milling

If you do not have access to a milling machine, you can grind the animal feed into a fine powder using traditional tools.



## Marketing ideas

You can probably sell Class 1 feed for more, but it costs more to make as you have to buy fresh fish. You should see whether you can make more profit from Class 1 or Class 2.

Chickens fed with fish supplement make much richer eggs – talk to egg producers to see if they will buy your product.

This product can also be used as fish feed in fish farms. It can be added to smoked cow bones, oyster shells, palm nut, groundnut, maize and semolina to make high-protein animal feed.

