

1997	96,411	18
1998	94,345	18
1999	82,398	16
2000	79,307	15
<b>TOTAL</b>	<b>525,085</b>	<b>100</b>

**SOURCE: FEDERAL DEPARTMENT OF FISHERIES, MAIDUGURI  
(PRELIMINARY FISH STATISTICAL DATA COLLECTION)**

## **CONSTRUCTION, EXTENSION AND EVALUATION OF THE IMPROVED SMOKING KILN (BANDA) IN KAINJI LAKE AREA**

BY

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### **ABSTRACT**

Fish smoking, as a traditional occupation of fishermen and women in Kainji Lake Area is done using simple traditional ovens called 'Banda', the fuel for the smoking being almost hundred percent dependent on wood. A simple modification was made to the traditional 'Banda' oven using a damper to prevent burning of the fish.

A comparison of the improved and the traditional 'Banda' was made. Results indicate that fuel wood consumption was reduced by 52 percent using the improved 'Banda', which implied that 50 percent of fish processor's income could be saved through the adoption of this technology.

The most important advantage of the improved kiln, fuel wood conservation, seemed to be a problem that the fisherfolks are yet to attach an economic importance. Whilst they are aware that it is becoming much more difficult to get the needed fuelwood, the children can still conveniently collect enough for both home use and processing activities.

The cost of the components of the improved kiln, when compared with the traditional version may be considered quite significant, and hence the reluctance of the fish processors in constructing similar ones.

The training of the blacksmiths was embarked upon to help ensure that the improved kiln could still be constructed even after the project must have withdrawn her support for it.

### **INTRODUCTION:**

Demand for fuel wood as a source of traditional energy for smoking as well as domestic cooking is growing at an alarming proportion. FAO (1974), estimated that 52% of the world's total energy comes from fuel wood. For the developing and developed countries the corresponding percentages were 80% and 20% respectively.

World wood-resources are depleting at a rapid rate and nearly one billion population is living in regions with acute wood scarcity. FAO projected using "business as usual" assumptions that this population could grow to nearly 3 billion by the year 2,000. In Kainji Lake area, dependence on fuel wood is almost hundred percent. It is therefore imperative to reverse the trend for the sake of protecting

the environment with specific reference to desert encroachment, soil erosion and pressure on already depleted forest (Dan Shehu *et al* 1995). Fish smoking is the traditional occupation of fishermen and women in the Kainji Lake area with simple traditional oven called 'banda'. There are two types of 'Banda' – Rectangular and Conical shaped types. They are either made up of clay or drum as the case may be.

The most important advantage of simple traditional oven such as these is their low capital cost. Many disadvantages have however, been reported by Clucas (1982). These disadvantages must be reduced if not eliminated when new designs of smoking kilns are to be introduced into the fishery.

The improved 'Banda' oven has been developed using locally available materials with the objective of conserving fuel wood and improving the quality of smoked fish at minimum cost to the fish processor.

#### Description of the improved Banda

The improved smoking kiln is designed and fashioned after the traditional smoking kiln ('Banda') with slight modification. This is to make the Kiln acceptable to the local fish smokers or processors.

The Kiln is made with clay and has a surface dimension of 0.54 x 0.87 x 1m (Fig.1). On the upper part of the area is the smoking chamber with dimension 0.51 x 0.8 x 0.83m, within the smoking chamber are three rails of wire mesh trays measuring 0.71 x 0.71m each 0.1m apart. Each wire mesh rests on angle bars.

Below the smoking chamber is the firebox dimension 0.2 x 0.3m. A perforated metal sheet (0.45 x 0.23m) is incorporated at 0.5m above the firebox. This acts as a damper and allows dispersion of heat to the smoking chamber while at the same time acting as a receptacle for the collection of melted fat. It also prevents direct contact of fire with the fish.

The cover dimension 0.97 x 1m is designed to be air tight to prevent heat escape. A chimney of 0.31m diameters to fit a 1" pipe is attached to the top for providing draught to draw air into the combustion chamber and to overcome the various flow resistances in the chimney as well as escape route for excess smoke.

#### Principle

The principle behind the improved kiln is controlled burning as distinguished from the open or uncontrolled burning in the traditional 'Banda' kilns.

The rate of wood burning is determined by the manner in which the air required for combustion gets supplied to the wood. This occurs through a pressure set up through the air vent under the firebox enabling combustion products to start moving up. The inflow of air is determined by the size of the opening. Where the opening is small, as in this case the influx of air is reduced thereby accommodating more heat than the traditional kiln that is left at the mercy of wind.

#### The Smoking Process

##### Fish Preparation

Fish preparation followed the method described by Eyo (1981). Fish was eviscerated by cutting the stomach vertically from the breast near the pectoral fin to the pelvic fin. To give room for total removal of the viscera. The fish was then washed thoroughly in tap water. Large fish e.g. *Lates niloticus* were headed and split then cut into small chunks to leave a large surface area of smoke

absorption. Large fish should not be smoked whole or skewered into pointed sticks as this will delay smoke and heat penetration into the inner tissues thereby unduly lengthening the duration of smoking (Eyo, 1981).

##### Kiln Operation

After fish have been dressed for smoking they were placed on each of the wire mesh inside the smoking chamber. The total capacity of the kiln with this dimension is approximately 40kg of fresh fish. The firewood is then arranged in the firebox and then ignited to produce smoke. The damper is then inserted to prevent direct fire contact with the fish. Thereafter the kiln is covered with the metal plate to commence the smoking process.

Heat and smoke are often well distributed in the smoking chamber hence it is not necessary to alter the position of the fish on the racks until the process is complete. Excess heat and smoke in the smoking chamber leave the kiln by way of the chimney and small air passages around the cover.

#### Technical Performance of the Improved 'Banda' Compared with the Traditional 'Banda' Oven

To verify the performance of the kiln, an on-station trial was carried out and the followings were recorded.

Table 1 shows the technical performance of both the improved and the traditional 'Banda' Kilns. *Lates niloticus*, *Synodontis membranaceous*, *Tilapia* and *Cithareneus citharus* were used for the trials of the two kilns.

From the table, it is evident that the improved kiln is more efficient in fuel wood utilization than the traditional kiln (Table a). The percentage fuel wood conserved varied with the different species. 42%, 46.43%, 61%, 44% and 65% fuel wood were conserved cast while smoking. *Lates niloticus*, *Tilapia*, *Synodontis membranaceous*, *Citharinus citharus* and *Alestis* respectively using the improved kiln. On the average, it could be asserted that 52 percent fuel wood was conserved using the improved kiln.

The process time ranges between 3½ hours to 6½ hours depending on the thickness of the fish (Table 1). However, it was observed that there was no difference in the process time between the traditional and the improved kilns.

Table 1 also shows the relationship between the cost fuel and the cost of fish. For instance, N15.00 fuel wood was required to smoke N4,987.50 fish using the improved kiln while the sum of N60.00 was required to process N1,391.25 fish using traditional kiln. The same observation

was recorded for the other species (*Tilapia*, *Syndontis membranaceous*, *Citharinus citharus* and *Alestes*).

Similarly, about 50% of the income, which should have been expended on fuel wood, was saved from the utilization of the improved kiln.

#### Merits of the Kiln

1. Using the improved 'Banda' reduces fuel wood consumption by 52 percent and consequently the incident of deforestation for fish smoking is significantly reduced.
2. About 50 percent of fish processor income can be saved using the improved kiln, due to savings from purchasing fuel wood.
3. The smoked fish have a savory flavour and a desirable brownish colour, which is more acceptable to consumers than the dark tan, or black (sooty) colour commonly encountered with traditionally smoked fish (Eyo, 1981).
4. As a result of none exposure to tar, dust and soot, while in the chamber, as a result of the provision of a damper, the smoked fish are cleaner than those smoked traditionally.
5. The method of smoking is less labour intensive and does not require much supervision.
6. There is no need to strip the kiln – a process which involves shifting the fish from one rail to the other to prevent them from burning. A single operator can thus take charge of the entire operation.

#### Materials and Method

##### First Phase: Demonstration of the Improved Smoking 'Banda' Kiln in Kainji Lake Basin

After the on-station trials, four fishing (two each on the eastern and western banks of the Lake) villages with pronounced fish processing activities were chosen for the demonstration of the improved kilns. A total of 20 smoking kilns were constructed during the demonstration.

Five processors in each of the villages were identified and collaborated with (at least two native female processors were involved in each of the villages).

Fish for processing was supplied by collaborating processors while the project bore the cost of constructing the Bandas, which were later handed over to the collaborators. Four weeks was spent in each of the villages, the first two weeks was for construction while the third and fourth weeks were utilized for smoking demonstrations.

##### Monitoring Visits

Monitoring exercises were conducted at intervals to:

1. ascertain the state of utilization of the kilns by

beneficiaries.

2. address problems beneficiaries encountered in the operation of the kilns,
3. describe the general perception towards the kiln and
4. assist in deciding future activities

##### Second Phase: Construction of the Improved Smoking 'Banda' Kilns at subsidized cost in Kainji Lake Basin

The second phase started middle of 1998 till late 1999 with the kilns constructed at subsidized rate to fish processors. This led to the construction of about twenty-five kilns in six fishing villages.

##### Appraisal of the Kiln

After the second phase, with the kilns constructed at subsidized rate to fish processors, difficulties were encountered in getting fish processors to pay up the subsidized cost of constructing the kilns as at when due. However, monitoring visits undertaken at intervals showed a high percentage of utilization of the kilns and an acceptance of its products by fishmongers. But, surprisingly, non of the fisherfolks had attempted constructing the kiln on their own.

With this observation, an appraisal survey was carried out to better understand the underlying factors affecting the acceptance, use and construction of the improved kiln.

##### Objectives of the study

The general objective of the survey was to evaluate the perception of the fisherfolks concerning the improved banda. Specifically, it looked at the:

1. Performance of the improved banda as compared to the traditional kiln,
2. Market response to the product,
3. Reaction of other fish processors to the kiln,
4. Kiln ownership and operation structure within the fishing households, and
5. Factors affecting repayment of the cost of kiln.

The focus group discussion (FGD) method of qualitative study was used in conducting the interviews with fisherfolks around the Lake. Seven fishing villages where the improved smoking kilns had been constructed were selected for the FGDs using question guidelines.

##### Training Workshops for Blacksmiths on the fabrication of improved kiln components

One of the recommendations of the appraisal survey was the training of local blacksmiths and eventual hands off by the project.

## Results and Discussion

### Modifications resulting from the demonstration exercise

The hooks, which hold the screens (fish trays) in place, were originally designed to be fixed, but it was discovered that with continual usage, they soon came off. These were then changed to adjustable hooks.

The metal lids of the improved Banda were observed to be deficient in terms of its ability to protect the structure against the effect of rain. They were then redesigned in such a way as to allow some surplus sheet for protecting the Banda.

After three village demonstrations, scarcity of the metal sheet used for the construction of the lid was observed, and then a decision was taken to use old corrugated metal sheets in constructing the lid. This option was chosen because such sheets were cheap and readily available in rural areas.

### Monitoring Visits Outcome

#### Utilization

More than 85% of the constructed kilns were found to be in constant use during the monitoring visit. The few that were not being utilized were found to belong to those who had relocated and in one instance the kiln was mistakenly constructed for a none fish processor.

#### Problems Observed

Most of the beneficiaries had no problem operating their kilns. However, complaints of fat deposition on dampers, which some times get ignited and thereby exposed the fish to the risk of charring were given. There were also complaints that the improved kiln was not as fast as the traditional ones. It was observed that with only little fuel wood utilized, the flame achieved could not be as intense

as the ones the processors are used to using the traditional kilns. However, the smoking process in the improved kiln will become thorough over time without charring the product. The processors were advised to become used to the time lag, since they also observed that the products from the improved kiln were of better quality.

### General Perception

Virtually all the fish processors who made use of the kiln and their immediate family gave good attributes of the quality of the product and the economy of fuel wood consumption. The fishmongers who readily purchased the fish smoked with the smoking kiln also corroborated this observation. Some of the processors also observed that apart from the quality of the product, the lid of the kiln gives the fish protection during the rainy season.

### Conclusions from the Monitoring Visits

The extent of utilization of the kilns by the beneficiaries differed from one person to the other. While most of them are able to fill up two trays, others could only use one out of the three. Only two to three beneficiaries made use of three trays. The fishermen attributed the low capacity utilization of the kiln to the low catch during the season.

Non-beneficiaries who had seen the kilns in operation were quite impressed with the product, but the fact that they thought the accessories could not be source locally in fishing villages seemed to hinder them from building similar structures. Although there has been a reported case of a processor, who, after seeing the improved kiln, improvised a similar kiln using sticks and mud to design his damper. This of course, did not produce the same effect as the improved 'Banda' Kiln. It was then recommended that a second phase be embarked upon the construction now done at

## Appendix 1:

### Requirements and Estimated Cost of Materials for Constructing Improved 'Banda'. (Ex. New Bussa)

		N	
1.	Metal plate	-	900.00
2.	Metal trays (screen)	-	1,500.00
3.	Angle bars	-	150.00
4.	Hollow pipe	-	150.00
5.	Cost of welding	-	300.00
			<hr/>
			#3,000.00 (\$30)

a subsidized cost to fish processors. This led to the construction of about twenty-five kilns in six fishing villages.

#### **Outcome of the Appraisal Survey of the Kiln Performance of the Improved Kiln**

Most of the participants in the seven FGDs attested to the fact that the improved kiln performed better than the traditional in terms of fuel wood conservation, capacity of fish processed in a given time and the quality of the product. However, one participant was of the opinion that the qualities of the products from any of the two kilns depend on the handling by the individual processor. To him there is no significant difference in the quality of product obtainable from both.

The reduction in fuel wood consumption was noted by all the participants, but the cost implications has not been appreciated yet as they rely on their wards to fetch the needed fuel wood from the farms.

#### **Market Response to the Product**

The processors reported that products from the improved kiln fetch more money from the mongers, as they appear neater with a brownish colour, which make them more acceptable.

#### **Reaction of other Fish Processors to the Kiln**

Neighbours of beneficiaries of the improved kilns interviewed, said they have observed the performance of the kilns and were able to appreciate the advantages. In most of the cases, they have discussed the possibilities of owning one, but have not initiated any more to get the components, as they are not aware the local blacksmiths can fabricate them.

While a few do not accede to the suggestion that the initial cost of the kiln may be the reason for their inaction, some agreed to the fact that when compared to the traditional kiln, the cost is quite high.

#### **Kiln Ownership and Operational Structure within the Fishing Households**

The kiln ownership structure differs from one household to another. It depends majorly on whether the wife is a major fishmonger. Where the woman is a major fishmonger, she usually will have a separate kiln. Except in such situations, 99.9% of the kilns are owned by the husbands but operated by the wives. And where the wife engages in a low level of fish trading, she usually can make use of the family kiln. The owners usually pay for repairs and or maintenance.

The husbands or the children are responsible for taking the products to the market. The proceeds, according to the participants, are fully utilized to support the upkeep

of the family. Purchase of food items and fishing equipment ranked the highest.

#### **Factors Affecting repayment of the Cost of Constructing the Kiln**

The benefiting fish processors believed strongly that the major reason why they have not been up to date in repaying the cost of the kiln has to do with the fact that those who constructed the kiln are not always around to collect the money. They find it difficult to pay to any staff other than those who constructed it.

The experience with other activities, however, suggests otherwise. Payments of any kind by fisherfolks to government or any of her agencies have been found to meet with difficulties except backed with some threats.

#### **Observations from the Survey**

The most important advantage of the improved kiln, fuel wood conservation, seemed to be a problem that the fisherfolks are yet to attach an economic importance. Whilst they are aware that it is becoming much more difficult to get the needed fuel wood, the children can still conveniently collect enough for both home use and processing activities.

The cost of the components of the improved kiln, when compared with the traditional, may be considered quite significant, and hence the reluctance of the fish processors in constructing similar ones.

#### **Recommendations from the Appraisal Survey**

After a thorough analysis of the situation, the followings were recommended:

1. That the project should identify and train selected blacksmiths to continue the fabrication of the kiln components.
2. That the project should, after training the blacksmiths, hands off the construction of more kilns.
3. That a radio message should be produced and aired on the locations of the trained blacksmiths to afford fish processors locate them.
4. That defaulting fish processor beneficiary should be sanctioned adequately. This last recommendation was not acceptable to the project, rather displeasure was shown to defaulters at any given opportunity.

#### **Training Workshops for blacksmiths on the fabrication of improved kiln components.**

The training of the blacksmiths was to help ensure that the improved kiln could still be constructed even after the project must have withdrawn her support from it. Thirteen blacksmiths from different locations were trained at two centers. These locations are as follows:

Libata, Garafini Auna, Warra, Ngaski, Zamare, Yauri, Rofia, Shagunu, Malale, Kasabu, Angwan salkawa and Toro.

During the training workshops, visits were paid to villages where the kilns had been constructed. This gave the blacksmiths the opportunity of observing how the components are fitted and made operational on the kiln.

A radio message was produced later, announcing to fisherfolks, the names and locations of these blacksmiths.

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## COOPERATIVE MANAGEMENT OF ARTISANAL FISHERIES: IMPLEMENTATION OF DEMOCRATIC PRINCIPLES IN FISHERIES MANAGEMENT AROUND LAKE KAINJI

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#### Abstract

Kainji Lake, the first man-made lake in Nigeria is one of the most researched water bodies in Africa. Earlier studies indicated that there was no systematic management of the lake fisheries involving the participation of the fishermen in decision-making before 1993.

In 1993, the Nigeria-German Kainji Lake Fisheries Promotion Project (KLFPP) started the introduction of a bottom-up approach in the management of the fishery resources through a random selection of some fishermen representatives to the decision making body of the project. The paper traces the democratization process of the management approach to the lake fisheries culminating in the systematic selection, appointment, training and assignment of responsibilities to twenty-four *Wakilis* covering the 316 fishing communities around Lake Kainji.

#### INTRODUCTION

It has been observed worldwide that our fisheries is in trouble. The fish stocks are declining, while at the same time, more people are depending on the fisheries for their livelihood. It is generally acknowledged that previous government-based attempts to manage the fisheries have not been very effective. In recent years, more emphasis was placed on the active involvement of the fishers themselves as actual resource users in fisheries management. Cooperative or collaborative fisheries management systems are being developed (McGoodwin

1989; 1990). Cooperative fisheries management or community-based fisheries management put emphasis on the process of developing fisherfolk participation in a co-management system or in the process of acquiring user-based ownership over the resources. Around Kainji Lake the predominant fisheries is small-scale in nature. Typically, fishers go out in plank boats with fishing gears such as gill, cast and driftnets, hooks or traps and catch small quantities of fish on a daily basis meant for sale and home consumption.

Before the intervention of the Nigerian-German Kainji