

INVESTMENT OPPORTUNITY IN IMPROVED FISH SMOKER (IFS) AS FOOD SECURITY FOR ARTISANAL WOMEN FISH PROCESSORS (AWOFPS) IN NIGERIA. A CASE STUDY OF KAINJI LAKE AREA.

By

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ABSTRACT

The Improved Fish Smoker (IFS) was designed and constructed by NIFFR in collaboration with GTZ in 1997. After the on-station trials, five fishing villages with pronounced fishing activities were selected for the demonstration. The IFS and the Traditional Smoking Kiln were compared in one of the fishing villages using Gross Margin analysis (GM) and productivity index to determine the profitability and productivity of the two kilns. It was found that the average income of IFS users at fully capacity was N5,555.50 per day. In a year N1.3 million would be realised. Conversely, the average income of the users of Traditional Smoking Kiln (TSK) was N649.00 per day and about N152,150.50 would be realised in a year. From this estimate, it is evident that the IFS is more profitable than the TSK. Productivity index of the two kilns also revealed that the productivity of IFS is higher than the TSK. Thus, using the IFS would enhance the income of Artisanal women Fish Processors (AWOFPS) and ensure food security for the household.

INTRODUCTION

The greatest challenge and the most important in the developing countries today is the issue of food security. With the rate of population growth in these areas, this challenge is likely to assume worse dimensions. It is now a common knowledge that the imbalances between supply and demand in Nigeria's food situation is constantly in favour of demand. Though the fishery sector has over the years risen to the challenge of shortfall in quantity and quality of food in Nigeria, its development has been stunted by the difficulty in handling excess supply especially in boom seasons (Akeredolu, 1994).

However, in spite of supply of fish falling short of demand, the sub sector still experiences high loss due to wastage. As one of the most perishable of all foodstuffs, fish needs proper care from the time it is caught until it is served or processed as handling during this interval determines the extent of deterioration. Estimates of post harvest loss in Nigeria are about 45% of total catch (FAO, 1985; Eyo, 1997). With no refrigerating facilities available to artisanal fishermen, they are compelled to sell their catch before spoilage and this is limited by poor transportation system. The options open to them are to sell at markets close to the coast or to process their catch traditionally by either salting, drying or smoking in order to get more fish to distant markets (Brownell 1983).

Preservation by smoking is probably the oldest and most popular method of fish preservation in Nigeria and is carried out mostly by women. Fish may be smoked in a variety of ways but the longer it is smoked, the better it will keep. However, in order to improve smoking techniques, some control must be exercised over temperature, airflow and smoked density. Traditional open type oven produce non-uniform smoked product, consume high quantity of wood (Clucas, 1981, 1982), produces dark, tan and sooty colouration on fish (Eyo 1981) which makes the fish unattractive to consumers, has low batch capacity and constitutes health hazards to the women fish processors (Obiekizie, 1997). In order to

arrest these problems, attention has been paid to the development of improved smoking oven all over the world (FAO, 1979). These have focussed on such aspects as increased fuel efficiency, improvement on product quality and shelf life, more uniform smoke density, better handling and better ventilation system (ILO/FAO 1982).

Efforts to improve smoking kilns have been more successful and have been introduced to small scale fish processors. Some improved kilns designed include:- Mud and pole kiln, oil dream, ivory coast kiln, Altona-watanabe, Kainji Gas Smoking Kiln, Walker smokers, Adjectety oven and chokor oven among others.

Inspite of the efficiency of most of these Kilns, their adoption has been a difficult process because of cost of procuring them. Besides, most of these technologies did not take cognisance of the socio-cultural background of the end-users which made adoption a herculian task.

The improved Traditional smoking kiln Otherwise known as improved fish smoker (IFS) was fashioned after the traditional smoking kiln with slight modification, which makes its adoption very easy. The uniqueness of IFS is such that there was no direct firing to the fish (unlike the traditional oven) as a result of incorporation of a damper that controls the smoke density and ensure uniform distribution of heat and smoke by convection to the fish.

The greatest advantage of IFS is that it conserves fuel wood by 52 percent compared with the traditional kiln. Other advantages include; high batch capacity and good wholesome product that commanded high price in the market. Consequently using this kiln, the women fish processors would be able to save a lot of money, which would have been spent on buying firewood as well as high economic returns from sales of the smoked fish. Above all the IFS technology is dynamic. It is adaptable to any locality.

The objective of this paper is to investigate the profitability of using IFS vis-à-vis the traditional smoking kiln (TSK) with a view to recommending it to women fish processors as a sustainable venture that can ensure food security for them.

THE IMPROVED FISH SMOKER TECHNOLOGY (IFS).

The improved fish smoker (IFS) technology is as described by Adelowo *et. al.* (2002)

RELEVANCE OF IFS TO KAINJI LAKE AREA.

The relevance of IFS to fish production in Nigeria becomes apparent because Kainji Lake area is one of the fish baskets of Nigeria and a lot of smoking activities take place. The IFS was constructed in 1997 with the sole objective of reducing post harvest losses of fish to the barest minimum. It also aimed at

- i) Conservation of fuel wood
- ii) Improve the quality of the fish
- iii) Increase the batch capacity to be able to handle large catches especially during the boom season.
- iv) Enhance the income of the fish processor by empowering them.
- v) Reduces labour and exposure of fish processor to excessive heat.

METHODOLOGY

The IFS was designed and constructed in NIFFR in collaboration with the GTZ. After the on-station trials, four fishing villages (two each on the eastern and western bank of the lake) with pronounced processing activities were chosen for the demonstration. 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). After demonstration of the kiln a comparison of the

technical performance of IFS and the Traditional smoking Kilns were made. Analysis of variance (ANOVA) was used to compare the result from the finals.

RESULTS AND DISCUSSIONS.

Table 1 shows the technical performance of both the IFS and the traditional kilns. *Lates niloticus*, *Synodontis membranaceus*, *Tilapia*, *Citharinus citharus* and *Alestes sp* were used for the trials. From Table1, it is evident that the IFS is more efficient in fuel wood utilization than the traditional kiln. The percentage wood conserved varied with the species. 42%, 46.43%, 61%, 44% and 65% fuelwood were conserved while smoking *Lates niloticus*, *Tilapia sp*, *Synodontis membranaceus*, *citharinus cithanus* and *Alestes* respectively using the IFS. Thus there was significant difference $P = 0.05$ in the utilization of wood between IFS and the Traditional smoking kiln. On the average, it could be asserted

Table 1: Technical Performance of improved 'Banda' and the Traditional 'Badana'

Oven type	Spp. Smoked	Wt. of smoked	Kg fuel (kg)	Kg fresh fish	Percentage conserved	Process	Cost of fish	Cost fuel (N)
Improved	<i>Lates niloticus</i>	28.5	13	0.46	42.0	6½	4,987.50	15
Tradition	<i>Lates niloticus</i>	7.95	22.15	2.79	-		1,391.25	60
Improved	<i>Tilapia</i>	9.6	3	0.3	46.43	4½	768.00	10
Tradition	<i>Tilapia</i>	2.3	5.6	0.41	-		184.00	20
Improved	<i>Synodontis membraceous</i>	21.	3.5	0.15	61.0	4½	2,190.00	10
Tradition	<i>Synodontis membraceous</i>	7.3	9	0.81	-		730.00	30
Improved	<i>Cithareus citl</i>	10.5	3.2	0.3	44.00	4	682.50	10
Tradition	<i>Cithareus citl</i>	3.25	5.7	0.57	-		211.50	20
Improved	<i>Alestes spp</i>	25.8	3.8	0.15	65.00	3½	1,806.00	15
Tradition	<i>Alestes spp</i>	9.0	11	1.22	-		630.00	35

that 52% fuel wood was conserved using the IFS. The relationship between cost of fuel wood and cost of smoked fish is also presented in table 1. For instance N15 fuel wood was required to smoke N4,987.50 fish using the IFS while the sum of N60.00 was required to process N1,391.25 fish using the traditional kiln. Thus about 50% of the income of the fish processor, which could have been expended on fuel wood, would be saved using the IFS.

The reduction in the consumption of firewood by 52% using the IFS could be attributed to the reduction in the size of fire box to 0.22 x 0.33m compared with the firebox of the traditional kiln that is usually large about 0.55 x 0.66m dimension which permits large volume of air thus accelerating the burning of wood hence the high consumption of fuel wood.

There was significant difference $P = 0.05$ in the quality of fish smoked using the IFS compared with the traditionally smoked fish. Buyers expressed this as they were prepared to pay higher prices to have the fish. The quality of fish produce by IFS was as a result of incorporation of a damper, which prevented direct contact of fire with the fish thus ensuring that the fish were not burnt and charred hence the neat, good coloration and sweet aroma of the fish. Conversely, such device (damper) was not provided in the traditional kiln hence there was direct firing with attendant smoke consequently leading to charring of the fish.

Estimated income from using IFS and Traditional smoking kiln in the villages.

Gross margin analysis (GM) was used to compute the average income of the fish processors from the total variable cost (table 2). From this analysis, the improved fish smoker (IFS) produces on the average 53.15kg of smoked fish everyday at full capacity while the traditional smoking kiln produces only 19.7kg on the average. IFS processed fish sell for N300 per kg while traditionally processed fish sell for N200 per kg. The expected average income of IFS users, using the gross margin analysis (GM) is as follows:

$$GM = TR - TVC.$$

$$\text{Total Revenue (TR)} = \text{Inputs (kg)} \times \text{Unit Price/day}$$

$$TVC = \text{Total variable cost (cost of fish + Cost of wood)}$$

$$TR = 53.15\text{kg} \times N300 = 15,945$$

$$TVC = 10,389.50 \text{ (table 2)}$$

$$GM = 15,945 - 10,399.50 = 5,555.50.$$

Average income of IFS users at full capacity is N5,555.50 per day. It is pertinent to note that this profit is realisable only at full capacity especially during the boom season. The gross margin analysis (GM) for traditional oven users:-

$$TR = 19.7\text{kg} \times 200.00$$

$$TVC = 3,291$$

$$GM = 3,940 - 3,291 = 649$$

$$GM = 649$$

Table 2: Estimated income per day from using improved fish smoker (IFS) and Traditional Smoking/Kiln

	Cost of fish	Cost of wood	Wt of smoked density	Price of smoked fresh 300/kg	Total variable cost TVC cost of fish + Cost of canoes	Total revenue TR = Inputs (kg) x Unit price/day	Profit
IFS	10,329.50	60	53.15	300	10,389.50	15,945	5,555.50
TSK	3,146.50	145	19.70	200	3,291.50	3,940	649

The average income of traditional oven user daily is N649.00. In the Kainji Lake Area, there is no off-season as processing activities takes place all the year round except Fridays, Sundays, and during festivals. Therefore there are 235 working days in a year for artisanal fish processors. On a yearly basis, the gross margin analysis for IFS Users will be N5,555.5 x 235 days = 1,305,542.50. Gross margin analysis for non users of IFS will be 649 x 235 = 152,152.50.

From the foregoing calculations, the difference in the average daily income of IFS users and TSK users at full capacity is 4,906.50. In terms of variable cost per unit output the IFS is more profitable and economical. This findings agrees with Anon (1986), ILO (1985) who concluded that in terms of variable cost per unit output, use of chokor is cheaper than traditional ovens.

PRODUCTIVITY OF IFS AND TRADITIONAL SMOKING KILNS.

Productivity is a measure of the efficiency of operation. It is an expression of the relationship between the variable cost and the total revenue.

$$\text{Productivity} = \frac{\text{Total Revenue}}{\text{Total variable cost/Day}}$$

$$\text{For IFS Users TR} = \frac{15945}{10.38950} = 1.53$$

$$\text{Productivity} = 1.53$$

For traditional smoking kiln users

$$\text{TR} = \frac{3940}{3,291.50}$$

$$\text{Productivity} = 1.19$$

The difference in the productivity of IFS and TSK is 1.53 - 1.19 = 0.34.

This shows that the productivity of IFS is higher than that of TSK.

CONCLUSION

The improved fish smoker when compared with the traditional smoking kiln was found to be more efficient in fuel wood utilization, better quality of smoked fish and has high batch capacity than the traditional smoking kiln. Using the Gross Margin analysis, to determine the profitability of the two kiln, the IFS was found to be more profitable than the traditional Smoking kiln as the sum of N1.3 million Naira would be realised in a year. Productivity index of the two kilns also revealed

that the IFS is more productive than the TSK. Thus using the IFS would enhance the income of Artisanal women fish processors (AWOFPS) and ensure food security for the household.

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