





# Profitability Analysis of Riverine Artisanal Fish Processors in Ogun Waterside Local Government Area of Ogun State, Nigeria

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## Abstract

*This study assessed the profitability of artisanal fish processors in Ogun Waterside Local Government Area of Ogun State, Nigeria. One hundred and twenty fish processors were randomly sampled from six purposively selected fishing communities with the largest number of fish processors in the Local Government Area. Data collected with the use of interview guide and analyzed using frequency, percentage, mean, standard deviation, budgetary and Chi-square analytical techniques. Results showed that the fish processors were all female, with a mean age of 36.78±8.15 years, married (81.7%), with larger household size (52.5%). They had low level of educational attainment (46.7% with no formal education), non-members of fish processors' associations (73.3%) with a mean fish processing experience of 15.56±6.65 years, and 75.0% had no secondary occupations. Fresh fish for processing were sourced from landing sites by 79.2% of the fish processors. Tilapia zilli (56.7%) and Chrysichthys nigrodigitatus (50.8%) were the most commonly processed fish species in Ogun waterside. The gross margin of ₦26,747:58k, net farm income of ₦18,731:28k and benefit-cost ratio of 1.81 proved that artisanal fish processing was profitable. The most severe constraints faced by artisanal fish processors were inadequate capital/finance (mean = 1.88) and lack of collateral/security to obtain loans (mean = 1.36). There were significant associations between respondents' marital status ( $\chi^2 = 99.134$ ,  $p < 0.05$ ), mode of processing ( $\chi^2 = 17.416$ ,  $p < 0.05$ ) and the profit earned from fish processing. The study therefore recommended that for more profit to be earned by the artisanal fish processors, credit and loan facilities should be provided with no collateral and at very low interest rates.*

**Keywords:** Artisanal fishery, benefit-cost ratio, fish processing, profitability, tilapia zilli.

## Introduction

In Nigeria, fisheries is an important sub-sector of agriculture as it contributes an average of 10% of the nation's Gross Domestic Product – GDP (FAO, 2013).

The importance of fish to developing countries cannot be overemphasized as it has notable usefulness in human nutrition, employment generation as well as raw material for industrial purposes.

Nutritionally, it is an important protein source (Adeyemo, 2003) based on its provision of at least 40% of developing countries' protein intake (Oyetoro and Akinboye, 2010; Amaefula *et al.*, 2010). According to Ekeocha *et al.* (2010), this is because fish is more affordable, palatable, readily available, less tough and more digestible than other animal protein sources. In addition, fish contains a wide variety of vitamins such as A, B, C, D and E (Okeowo *et al.*, 2015).

Fishery offers job opportunities to majority of members of fishing communities in Nigeria, especially, through artisanal fishing (in coastal, riverine and lagoon areas of the country) which provides about 70% of total domestic fish production in the country (FDF, 2013). Fishing communities also earn their living from fish processing and marketing (Soyinka and Kusemiju, 2007; Bolarinwa, 2012). Artisanal fisheries which refers to small scale fisheries where the fishermen operate in small units, is the most important fisheries subsector in Nigeria (Ekpo and Essien-Ibok, 2013). Okwu *et al.* (2011) also defined artisanal fishery as the harvesting of fish from rivers, streams, lakes and ponds by small scale fishermen using both traditional and modern fishing gears.

Data from FDF (2013) indicated that total fish production increased from 579,544 tonnes in 2005 to 636, 848 tonnes in 2006 before declining to 616,507 tonnes in 2007. Total fish production then keeps increasing to 968,283 tonnes in 2012. FDF (2013) also revealed that a significant decline in fish production from artisanal subsector caused a decline in the total domestic fish production. Hence, emphasizing the importance of artisanal

fishery in Nigeria as it contributes an average of 75.0% of the total fish produced between 2005 and 2013.

Nigeria has been reported to be the highest consumer of fish in Africa and among the highest consumers of fish in the world. This is also attributed to the country's high population and increasing annual growth rate of 3.0% (Nakazawa *et al.*, 2013). These have led to the increasing demand for fish. However, domestic fish production was estimated to be 0.97 million MTs (FDF, 2013) in the same year. This left the country with a fish supply gap deficit of about 1.0 million MTs for that year. With a current global annual consumption of about 16.0 Kg/year, and the nation's growth rate, the fish supply gap deficit is expected to continue increasing. This fish supply deficit is been supplied by importation in Nigeria. This implies that at least 50.0% of the nation's fish demand is being supplied by importation. Different records exist on the quantity of fish imported and amount spent by Nigeria on importation of fish. USAID (2010) submitted that Nigeria spent more than \$600 million on importation of about 750,000 MT of fish, while, Oota (2012) reported Nigeria's spending on fish importation to be ₦100 billion annually. Olaoye *et al.* (2013) also stated in their study that quantity of fish imported rose from 557,884 tonnes to 739,666 tonnes between 2000 and 2007 and that this made the amount of foreign exchange on fish to also rise from \$241,065.54 million in 2000 to \$594,373.69 million in 2007. These figures make Nigeria one of the largest importers of fish in the developing world (Adebayo and Daramola, 2013; Olaoye *et al.*, 2013). This also implies that a lot of

job opportunities have been lost in the country.

In addition to the insufficient local fish production of the country, fish production is faced with post harvest losses due to spoilage. Bolorunduro (2004) reported that fish will spoil within 12 hours if not quickly processed and will be totally unfit for human consumption within 24 hours. This is expected to have profound adverse effect on the availability of fish protein as well as income earnings of the majority of the fishing communities who rely mostly on artisanal fishing. Hence, to increase the availability of fish proteins, enhance the people's nutritional status, increase fishermen's income, reduce fish importation and save the nation's foreign exchange earnings, there is an urgent need to pay more attention to fish processing. Therefore, investments need to be made on reducing postharvest fish losses. This explains why most of the inhabitants of fishing communities (especially women) engaged in fish processing and marketing enterprises. A vast expanse of literature and researches exist on the profitability of fish production in Nigeria. However, the profitability of fish processing have not been ascertained by most researches especially in Ogun waterside local government area of Ogun State.

The study was therefore aimed to analyze the profitability of artisanal fish processors in the study area by describing the socio-economic characteristics of the fish processors, examine fish processing characteristics of the fish processors; determine the profitability of fish processing in the study area and identify the constraints faced by artisanal fish processors.

## **Materials and Methods**

### **Description of the study area**

The study was conducted in Ogun waterside Local Government Area of Ogun State, Nigeria. The LGA is located in the eastern part of Ogun State sharing boundaries with Ondo State in the north, Lagos State in the south and Ijebu east LGA in the west. Between 50-75% of the length of the LGA is surrounded by water extending from Lagos State to Ondo State. It has an area of 1000.0 Km<sup>2</sup> and a population of 72,935 (NPC, 2006). The area is also blessed with a large expanse of fertile soil rich in organic matter, well-drained and deep which makes it to support plantation crops.

### **Sampling procedure and sample size**

Both purposive and simple random sampling techniques were used to sample 120 fish processors for this study. Six riverine fishing communities (*Agbalegio, Ilamo, Ebutte fishery, Makun-Omi, Ode-Omi, and Oni*) were purposively selected based on the high proportion of fish processors in these communities. Sixty percent of the fish processors were then selected through the simple random sampling technique to give a total of 120 fish processors out of the 200 fish processors which served as the sampling frame for this study. The list of fish processors was compiled for the purpose of this study with the assistance of extension officers in the study area.

Structured interview guide was used to collect data from the randomly selected fish processors with the assistance of trained enumerators. Personal observation was also used to confirm some information given by the respondents.

**Data analysis techniques**

Descriptive statistics such as frequency distribution, percentage, mean and standard deviation were used to summarize the socio economic characteristics and fish processing characteristics of the fish processors. The constraints were ranked based on generated mean values from data collected. Profitability of fish processing was determined by the cost and return analysis through the budgetary analytical technique. Profitability ratios such as Net farm income - NFI, Gross margin - GM (Olukosi and Erhabor, 1988; Adebayo and Daramola, 2013) and Benefit-Cost Ratio – BCR (Andem et al., 2011) were calculated from the costs and returns analysis.

The mathematical expressions are stated as follow: 1,

$$\text{Gross margin (GM)} = \text{TR} - \text{TVC} \dots (i)$$

$$\text{Total cost (TC)} = \text{TFC} + \text{TVC} \dots (ii)$$

$$\begin{aligned} \text{Net farm income (NFI)} &= \text{Profit } (\pi) \\ &= \text{TR} - \text{TC} \dots (iii) \end{aligned}$$

$$\text{Benefit cost ratio (BCR)} = \text{TR} / \text{TC} \dots (iv)$$

Where  $\pi$  = profit

TR = Total Revenue

TVC = Total Variable Cost

TFC = Total Fixed Cost

**Results**

**Socio-economic characteristics of artisanal fish processors**

Table 1 shows that 45.8% and 25.0% of the fish processors were within the age brackets of 31-40 years and 21-30 years respectively while less than 30.0% were older than 40 years old. The mean age of the fish processors was 36.78±8.15 years.

Table 1 also reveals that all (100.0%) of the fish processors sampled were females. Approximately four out of every five (81.7%) of the fish processors were married. About 47.5% of the fish processors had a household size of between 1 and 5 persons while 52.5% had between 6 and 10 persons with a mean household size of approximately 6 (5.59±2.14) persons. About 60.0% of the fish processors either had no formal education or had incomplete primary education while just above one-third (35.0%) had complete primary education. According to religious affiliation, slightly above half (50.8%) of the fish processors were Christians while 40.0% and 9.2% were Muslims and idol worshippers, respectively.

Fish processing was the only occupation of 75.0% of the fish processors while the remaining 25.0% engaged in trading (9.2%), farming (9.2%) and hairdressing/tailoring (6.7%) as secondary occupations. More than one quarter (26.7%) of the fish processors were members of fish processors’ associations. Table 1 further reveals that 40.8% and 47.5% of the fish processors had fish processing experience of between 1 and 10 years and 11 and 20 years, respectively with an average fish processing experience of 15.56±6.65 years. More than half (52.5%) of the fish processors earned between ₦20,000.00 and ₦29,999.00 with a mean income of ₦26,431.21 per market day.

**Fish processing characteristics of fish processors**

Majority (79.2%) of the fish processors sourced fresh fish from landing sites while 4.2% and 16.7% sourced theirs from

**Table 1: Socio-economic characteristics of fish processors (n = 120)**

<b>Socio-economic characteristics</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Mean± SD</b>
<b>Age (Years)</b>			
21– 30	30	25.0	<b>36.8± 8.15</b>
31- 40	55	45.8	
>40	35	29.2	
<b>Sex</b>			
Female	120	100	
Male	0	0.0	
<b>Marital status</b>			
Single	12	10.0	
Married	98	81.7	
Divorced	9	7.5	
Widow	1	0.8	
<b>Household size (Persons)</b>			
1-5	57	47.5	<b>5.6±2.14</b>
6- 10	63	52.5	
<b>Level of education</b>			
No formal education	56	46.7	
Incomplete primary education	16	13.3	
Complete primary education	42	35.0	
Incomplete secondary education	3	2.5	
Complete secondary education	3	2.5	
<b>Religion</b>			
Christianity	48	40.0	
Islam	61	50.8	
Traditional	11	9.2	
<b>Secondary occupation</b>			
Trading	11	9.2	
Farming	11	9.2	
Tailoring/hairdressing	8	6.7	
No secondary occupation	90	75.0	
<b>Membership of fish processors' association</b>			
Yes	32	26.7	
No	88	73.3	
<b>Fish processing experience(Years)</b>			
1-10	49	40.8	<b>15.6±6.65</b>
11-20	57	47.5	
>20	14	11.7	
<b>Income per annum (Naira)</b>			
10,000-19,999	15	12.5	<b>₦26,431.21</b>
20,000-29,999	63	52.5	
30,000-39,999	22	18.3	
≥40,000	20	16.7	

Source: Field survey, 2014

middlemen and neighbouring towns respectively (Table 2). Close to two-thirds (64.2%) of the fish processors processed between 50.0 and 100.0 kg per day while 29.1% processed an average above 100.0 kg per day. The average fish processed per day was  $131.6 \pm 18.16$  kg. Table 2 also reveals that higher proportions of the fish processors processed *Tilapia zilli* (56.7%) and *Chrysichthys nigrodigitatus* (50.8%) while *Pseudotolithus typus*, *Elops lacerta* and *Clarias gariepinus* were not common among the fish processors. More than three-quarter (78.3%) of the fish processors made use of family labour.

About 9 out of every 10 (94.2%) fish processors sold their processed fish either by themselves or family members while very few (5.8%) sold theirs through the middlemen. Capital used in fish processing was sourced as shown in Table 2 from family members by 82.5% of the fish processors. Majority (74.2%) of the fish processors involved in fish processing on a full time basis. Table 2 further shows that majority (80.0%) of the fish processors sold their produce by hand weighing.

**Table 2: Fish processing characteristics of fish processors (n = 120)**

Fish processing characteristics	Frequency	Percentage	Mean
<b>Source(s) of fresh fish for processing</b>			
Landing site	95	79.2	
Middlemen	5	4.2	
Neighboring town/ state	20	16.7	
<b>Average of fish processed per day</b>			
20- 49 kg	8	6.7	
50 – 100 kg	77	64.2	131.6±18.2
Above 100 kg	35	29.1	
<b>Species of fish for processing</b>			
<i>Chrysichthysnigrodigitatus</i> (Bagrid catfish)	61	50.8	
<i>Clariasgariepinus</i>	9	7.5	
<i>Elopslacerta</i>	11	9.2	
<i>Tilapia zilli</i>	68	56.7	
<i>Pseudotolithustypus</i>	53	44.2	
<b>Type of labour</b>			
Self	13	10.8	
Family	94	78.3	
Hired	13	10.8	
<b>Middlemen involvement in sales of processed fish</b>			
Yes	7	5.8	
No	113	94.2	
<b>Source of capital</b>			
Family members	99	82.5	



Loans	23	19.2
Secondary occupation	15	12.5
<b>Mode of processing</b>		
Part time	31	25.8
Full time	89	74.2
<b>Forms of sale</b>		
Hand weighing	95	79.2
Dozen counts	17	14.2
Baskets/bowls	7	5.8
Kilogram (Kg)	1	0.8

Source: Field survey, 2014

### **Profitability of fish processing enterprise in the study area**

The costs are basically categorized into two namely; fixed cost (costs of processing shed, smoking kiln and market union tax) and variable cost (cost of fresh fish, firewood, salt/spices, baskets, bowls, cutlass, iron sheet cover and wire gauze). Average fixed cost per fish processor was put at ₦8,016.30k which translates to 34.6% of the total cost of fish processing while the average variable cost was ₦15,126.28k amounting to 65.4% of the total cost of fish processing (Table 3). Hence, the total cost per fish processor was calculated as ₦23,142.58k. However, the revenue generated was ₦41,873.86. The net farm income (also known as profit) was calculated as ₦18,731.28 while a gross margin of ₦26,747.58 was

realized from fish processing enterprise. The benefit-cost ratio (BCR) of 1.81 was obtained from fish processing.

### **Constraints facing artisanal fish processing in Ogun waterside LGA**

Majority (94.2%) and more than half (51.7%) of the artisanal fish processors identified inadequate capital/finance and lack of collateral/security to obtain loan respectively as very severe constraints to artisanal fish processing (Table 4). The mean values in Table 4 ranked inadequate capital/finance (mean = 1.88) as the most severe constraint faced by artisanal fish processors in the study area closely followed by lack of collateral/security to obtain loan (mean = 1.36) while other factors were not considered as constraints (mean values < 1.00).

**Table 3: Annual Costs and Returns Analysis of artisanal fish processors**

Items	Amount (₦)	% Total cost
<b>Fixed cost</b>		
Processing shed	3,637.00	15.71
Smoking kiln	4,367.00	18.87
Market union tax	12.30	0.05
<b>Total Fixed Cost (TFC)</b>	<b>8,016.30</b>	<b>34.64</b>
<b>Variable cost</b>		
Fresh fish	4,079.49	17.63
Firewood	819.00.	3.54
Salt/spices	207.69	0.90
Basket	3,432.00	14.83
Bowl	1,363.46	5.89
Cutlass	1,493.00	6.45
Iron-sheet cover	2,075.64	8.97
Wire gauze	1,656.00	7.16
<b>Total Variable Cost (TVC)</b>	<b>15,126.28</b>	<b>65.37</b>
<b>Total cost (TC)</b>	<b>23,142.58</b>	
<b>Total revenue (TR)</b>	<b>41,873.86</b>	
<b>Gross Marginal Income (GMI)= (TR – TVC)</b>	<b>26,747.58</b>	
<b>Net Farm Income (NFI)= (GMI – TFC)</b>	<b>18,731.28</b>	
<b>Benefit Cost Ratio (TR/TC)</b>	<b>1.81</b>	

Source: Field survey, 2014

**Table 4: Constraints facing artisanal fish processing in the study area (n = 120)**

Constraints	Very severe (2)	Severe (1)	Not a constraint (0)	Mean score	Rank
Inadequate capital/finance	113 (94.2)	0 (0.0)	7 (5.8)	1.88	1st
Lack of collateral and security to obtain loan	62 (51.7)	39 (32.5)	19 (15.8)	1.36	2nd
High cost of fresh fish	0 (0.0)	47 (39.2)	73 (60.8)	0.39	5th
Seasonality of fresh fish supply	0 (0.0)	2 (1.7)	118 (98.3)	0.02	12th
Unavailability of packaging materials	0 (0.0)	61 (50.8)	57 (49.2)	0.51	3rd
High cost of packaging materials	0 (0.0)	56 (46.7)	64 (53.3)	0.47	4th
Poor marketing arrangement	0 (0.0)	2 (1.7)	118 (98.3)	0.02	12th
Distance of landing site to processing site	0 (0.0)	24 (20.0)	96 (80.0)	0.20	6th
High cost of transportation	0 (0.0)	8 (6.7)	114 (93.3)	0.07	8th
Insufficient labour	0 (0.0)	6 (5.0)	114 (95.0)	0.05	9th
Lack of fish storage facilities	0 (0.0)	3 (2.5)	117 (97.5)	0.03	10th
High cost of modern fish processing facilities	0 (0.0)	0 (0.0)	120 (0.0)	0.00	14th
Inadequate extension services	0 (0.0)	14 (11.7)	106 (88.3)	0.12	7th
Lack of technical know how	0 (0.0)	3 (2.5)	117 (97.5)	0.03	10th

Source: Field survey, 2014

**Table 5: Chi- square analysis of association between selected socio-economic characteristics of artisanal fish processors and profit from artisanal fish processing in the study area**

Variables	$\chi^2$	Df	p-value	Decision
Marital status	99.134	3	0.000*	S
Educational level	64.696	4	0.819	NS
Mode of processing	10.637	119	0.031**	S

$\chi^2$ = Chi square value, df = Degree of freedom, \*significant at 1% level of significance and \*\*significant at 5% level of significance

#### **Association between selected socio-economic characteristics and profit levels of artisanal fish processing**

Significant associations existed between respondents' marital status ( $\chi^2 = 99.134$ ,  $p < 0.05$ ), mode of processing ( $\chi^2 = 17.416$ ,  $p < 0.05$ ) and profit level of artisanal fish processing in the study area (Table 5). However, no significant association was found between respondents' educational attainment ( $\chi^2 = 64.696$ ,  $p > 0.05$ ) and the level of profit earned from artisanal fish processing.

#### **Discussion**

The respondents' age revealed that the fish processors were in youthful, economic and active age category. Similar result was reported by Obasohan et al, (2012) among fish processors in Edo State. Fish processing is therefore expected to be more effective and this will increase the profitability of fish processors in the study area. All the fish processors were females thereby confirming the *a priori* assumption that fish processing is dominated by women in the study area. Obasohan et al. (2012) also reported that fish processing was the business of women in Ekpoma, Edo State. Fish processing was also dominated by married persons and this

means that great value was placed on marriage in the study area as opined by Oparinde and Ojo (2014). This then implies that the fish processors had additional responsibilities of taking care of their homes. The household size of the fish farmers is an indication that the fish processors could be assisted by household members in their processing activities. The educational level of the fish processors was also found to be generally low and this could affect fish processors' productivity as literate farmers are more open to innovations that could bring about increased productivity than their non-literate counterparts.

Majority of the fish farmers had fish processing as their only occupation. This implies that aside from taking care of their household chores, the women had enough time for their fish processing business as productive resources will not be diverted to other activities. Furthermore, higher proportions of the fish processors were not members of fish processors' associations implying that the fish processors are not likely to benefit from access to loan and training programmes that members of the associations might have. The study also reported that the fish processors had sufficient fish processing experience and

may be an indication that fish processing is a profitable enterprise because it would have been left if otherwise. Sourcing fresh fish for processing from landing sites by majority of the fish processors is an indication that there is a guaranteed means of getting fresh fish that will ensure continuous supply of fresh fish for processing. This is also expected to be at cheaper rates as majority neither sell through the middlemen nor spend additional fee on transportation to purchase from neighbouring towns.

A high level of fish processing was also reported on a daily basis in the study area. This could be attributed to the ready availability of fresh fish within the communities in the study area. It was also found that *Tilapia zilli* and *Chrysichthys nigro digitatus* were the most commonly processed fish species among the fish processors and this could be attributed to the fact that these are the most commonly caught fish species in the study area. Processed fishes were sold mostly by the fish processors themselves and not through the middlemen and this implies that the selling price of processed fish is likely to be affordable by the consumers and hence, more processed fish will be consumed leading to increase in the level of fish processing in the study area. Fewer fish processors sourced capital from associations and secondary occupations and this could be attributed to the facts that majority of the fish processors were not members of fish processors' associations and also that they do not have secondary occupations. Mode of involvement in fish processing is mainly full time and this could be attributed to their sole dependence on fish processing. Due to the use of hand weighing by most

of the fish processors when selling their produce, it could be inferred that price of processed fish in the study area is highly subjective and thereby reduces the gross revenue accruable to fish processing in Ogun waterside LGA, Ogun State.

This study also found that cost of variable inputs used in fish processing consumed close to two-thirds of the total cost of fish processing. The total revenue was found to be greater than the total cost and this implies that fish processing is a profitable enterprise among the sampled artisanal fish processors in Ogun Waterside LGA, Ogun State. The gross margin and BCR are also indicators that fish processing like other artisanal fishing enterprises is profitable, viable, solvent and worth venturing into. Alfred et al. (2012) also reported that fish processing was profitable to fish processors in Ondo State.

Inadequate capital/finance and lack of collateral/security to obtain loan were the only identified constraints facing fish processing in the study area. This implies that artisanal fish processors were able to overcome other factors that would have been considered as constraints except those beyond their control like financing the artisanal fish processing enterprise. Their ability to overcome other constraints could be attributed to their high fish processing experience.

### **Conclusion and Recommendation**

Fish processing in the study area was dominated by young, married women with larger household sizes, and with substantial fish processing experience. Fish processing is the major occupation in the study area. Fresh fish was primarily sourced from landing sites, labour for fish

processing was mainly sourced through family members/self labour. No standard unit of measure was used in selling the processed fish. With the net farm income of ₦18,731.28k, gross margin income of ₦26,747.58k and benefit cost ratio (BCR) of 1.81, fish processing in the study area was found profitable, viable and worth venturing into.

The study recommends that fish processors should join fish processors' associations within their respective communities. This will enable them share knowledge among themselves through training, and acquire loan for fish processing activities from the associations. These will directly lead to reduced cost of processing, increased revenue and hence improve the profitability of fish processing enterprise.

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