

## PROFITABILITY OF GILL NET AND CAST NET FISHING GEARS AMONG ARTISANAL FISHERS IN LAGOON WATERS OF OGUN STATE

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### ABSTRACT

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*This study assessed the profitability of gill net and cast net fishing gears in lagoon water of Ogun State. A two-stage sampling procedure was used to select and interview 55 fishers each using gill net and cast net fishing gears. Data were collected using interview guide and analyzed using descriptive statistics and budgetary analysis. Higher revenue (₦7,250,000) was realized from gill net than cast net fishing (₦4,415,000) on an annual basis. The net farm income also indicated that gill net fishing (₦5,712,400) earned more than the cast net fishing (₦4,302,357). The rate on investment revealed that cast net fishing (3280%) yielded more profits on investment than gill net fishing (294%). The study concluded that although both gill net and cast net fishing are profitable, the use of cast net yielded higher return on investment. It is recommended that cast net fishers should invest more in cast net fishing to increase their total revenue, and net farm income.*

**Keywords:** *Artisanal fishing, Cast net, Efficiency, Gill net, Lagoon waters, Profit*

### INTRODUCTION

Nigeria is blessed with inland, brackish and marine water fisheries resources which are broadly classified into artisanal fisheries (85%), industrial fisheries (14%), and culture fisheries (1%) (Federal Department of Fisheries - FDF, 2005) and provides at least a 50% animal protein intake for the millions of Nigeria's population. The coastline in Nigeria, and especially of the Ogun Waterside Area of Ogun State, is well-endowed with river networks, and a large expanse of exclusive ocean waters for commercial fishing. Moreover, capture fisheries account for over 90 percent of total annual fish production in Nigeria (FDF, 2008; Ogunbadejo *et al.*, 2007). Fishing is an ancient human tradition and it is a traditional activity involving the hunting and gathering of aquatic products for food (FDF, 2004). The major food sources which are invaluable for the protein and the industrial products are fish (fin and shell) from freshwater and ocean habitat. Economically, fish serves as an important source of food and income for human being and it also has an important social and cultural position in riverine communities (Fasina, 2011; FAO, 2012).

In typical fishing settlements (or landing sites), men are predominantly the harvester of wild fish species (Olubanjo *et al.*, 2007) while women are engaged in fish processing, marketing, and in near shore harvesting activities. Other ancillary activities such as net-making, boat-building, engine repair and maintenance, etc. can provide additional fishery-related employment and income opportunities in marine and inland fishing communities (Olubanjo *et al.*, 2007). Small-scale fisheries can be broadly characterized as a dynamic and evolving sector employing labour, intensive harvesting, processing and distribution technologies to exploit marine and inland water fishery resources. The small-scale artisanal fishery sector remains the backbone of fish production in Nigeria, contributing a minimum of 70 per cent of the total fish production in the last decade. The total domestic fish production is far less than the total domestic demand (Bada and Rahji, 2010) thereby creating an unmet need for fish which is being met through importation. Unless policies and actions are geared towards improving the domestic production of fish in a sustainable way, Nigeria will continue to be regarded as the largest importer of fish in Africa (Rahji *et al.*, 2001). This involves paying attention to the type of fishing gears used by the fisher men and/or women involved in capture fisheries.

Cast net and gill net are among the most popular fishing gears found in Ogun Waterside area of Ogun State (Olaoye *et al.*, 2013). Since both fishing gears recorded high acceptance and use among the artisanal fishers in Ogun waterside, it is important to determine which of the fishing gears is more profitable. Hence, this study was set to carry out a comparative analysis of the profitability of the two fishing gears among the fishers in lagoon waters of Ogun State. The specific objectives were to: describe the socio-economic characteristics of gill net and cast net fishers; describe fishing characteristics of gill net and cast net fishers; and compare the profitability of artisanal fishing among the cast net and gill net fishers.

## MATERIALS AND METHOD

### Description of the study area

The study area was Ogun water side Local Government Area (LGA) in the Ijebu division of Ogun State. About half to three quarter of the length of the local government is surrounded by water extending from Lagos State to Ondo State. It has an area of 1,000 km<sup>2</sup> and a population of 72,975 as at 2006 census (NPC, 2006). Sample size and sampling procedure: A two-stage sampling procedure was used in this study. The first stage was the random selection of 3 (Iwopin, Ode Omi and Oni villages) out of the 10 fishing communities. This was followed by a random sampling of 50% of the fishers using gill nets and cast nets in each of the sampled village. This gives 55 fishers each using gill nets and cast nets making a total of 110 fishers which serves as the sample size for this study.

### Data collection and analysis

Copies of Structured interview guide were used to elicit information from the fishers using gill nets and cast nets by two trained enumerators under the close supervision of the researchers. Data were subjected to descriptive statistics and budgetary analysis. Descriptive statistics used are frequency, percentage, mean and standard deviation. Budgetary analysis was used from the cost-returns structure to calculate the profitability ratios for the two sets of fishers. Profitability ratios considered were benefit-cost ratio, gross margin, return on investment and net farm income. The models below could be used to calculate the different measures of profitability from the cost and return structure as follows (Okwu and Acheneje, 2011; Olaoye *et al.*, 2013):

$$\begin{aligned} \text{TR} &= \text{Py} \cdot \text{Y}_i \dots\dots\dots\text{(i)} \\ \text{TVC} &= \text{Px}_i \cdot \text{X}_i \dots\dots\dots\text{(ii)} \\ \text{TC} &= \text{TVC} + \text{TFC} \dots\dots\dots\text{(iii)} \\ \text{NFI} &= \text{TR} - \text{TC} \dots\dots\dots\text{(iv)} \\ \text{ROI} &= (\text{NR}/\text{TC}) \cdot 100\% \dots\dots\dots\text{(v)} \end{aligned}$$

Where,

NFI = Net Farm Income (₦)

TR = Total Revenue (₦)

TVC = Total Variable Cost (₦)

TC = Total Cost (₦)

Py = Unit Price of Output Produced (₦)

Y = Quantity of Output (kg)

Pxi = Unit Price of Variable input used (₦)

Xi = Quantity of Variable Input (Kg)

## RESULTS AND DISCUSSION

### Socio-economic characteristics of the gill net and cast net fishers

The socio-economic characteristics of the fishers were presented in Table 1. Table 1 reveals that 50.9% and 30.9% of the respondents using gill nets were within the age range of 31-40 years and 41-50 years respectively while 61.8% and 20.0% of those in cast net fishing were in the same age brackets of 31-40 years and 41-50 years respectively. The mean ages indicated that fishers using gill nets were older (mean age = 39.04±6.96 years) than those using cast nets (mean age = 36.98 ±6.118 years). The mean ages also indicate that fishing in the sampled area irrespective of the fishing gears used is dominated by persons younger than 60 years. Bello (2000) ascertained that age has positive correlation with acceptance of innovation and risks taking. Hence, the fishers are likely to adopt fishing gears that prove to be more efficient than what they are currently using.

Majority of the respondents using cast net (98.2%) and gillnet (100.0%) were married. This is in agreement with the findings of Fasina (2011) who discovered that majority of the artisanal fishers in Ogun waterside were married. More than one-quarter (27.3% and 25.5%) of the respondents in gill net fishing and cast net fishing were respectively uneducated. More than half (58.9%) of the fishers using gill nets had complete primary education while primary education was completed by only 36.4% of those using cast nets. This implies that those in gill net fishing had higher level of education than those in cast net fishing. It however indicated that most of the fish farmers are either uneducated or had low level of education. Similar findings were reported by Kingdom and Kwen (2009) who noted that the choice of cast net or gill net is not affected by the educational level of the fishers. Most (63.6% and 65.4%) of the fishers using gill nets and cast nets respectively had household size of 11-15 persons per household while only 20.0% and 32.7% of the respondents in gill net and cast net fishing had household sizes of 5-10 persons per household. The mean household sizes indicated that the fishers had large household sizes with those using gill nets having larger household sizes (mean = 13.15±3.19 persons) than those using cast nets (mean = 11.62±2.51 persons). This implies that the respondents could receive help from family members to serve as labour during fishing activities which is relatively cheaper (if paid at all) than hired labour and this could reduce the cost of production and increase profits. This is likely to increase labour efficiency among fisher folks based on the submission that the larger the household size, the more the likelihood of labour efficiency on fisher folks (Adegbite and Oluwalana, 2004; Adegbite *et al.* 2008).

While almost all (92.7%) of the fishers using cast nets were members of cooperative societies, only about two-thirds (67.3%) of those using gill nets belonged to cooperative societies. Membership of cooperative societies and other social organizations could be a reason for the choice of fishing gears used by fisher folks and this position agrees with that of Olaoye (2010) who noted that artisanal membership of social organizations is a factor which influences farmers' adoption of improved fishing technologies. Olaoye (2010) further explained that members of cooperative societies through social participation help fisher folks to pool their resources together, have access to fishing inputs and provide them with insights into fishing related issues. About 43.6% and 32.7% of the respondents in gill net fishing earned monthly incomes of ₦101,000 – 120,000 and ₦80,000 – 100,000 respectively with up to 23.6% earning more than ₦120,000 on monthly basis while 69.1% and 30.9% of the respondents in cast net fishing earned monthly incomes of ₦80,000 – 100,000 and ₦101,000 – 120,000 respectively.

The mean monthly incomes also indicated that respondents in gill net fishing had higher incomes (₦114,500±14575) than those in cast net fishing (₦96,180±7723). The higher income levels recorded by the fishermen using gill nets could be associated with larger household sizes in which their operations were based on. However, due to smaller family size, cast net fishing could be more efficient than gill net fishing and this view is in line with that of Fasina (2011) who contended that the lower the number of family dependant on capture fisheries the better the fishing performance because less time is spent on family issues and more on fishery.

The highest proportions (49.1% and 58.2%) of the respondents in gill net fishing and cast net fishing respectively had fishing experience of 21-30 years respectively with 30.9% and 29.1% of the gill net fishermen and cast net fishermen having more than 30 years and 11-20 years of fishing experience respectively. The mean fishing experience indicated that the gill net fishermen (27.49±7.094 years) were more experienced than their cast net fishermen counterparts (24.42±5.801 years). The mean fishing experience also implies that the fishermen in the study area were highly experienced regardless of the fishing gears used by them. This could further imply that the fishermen already had sufficient knowledge that could be used in determining their adoption or rejection of any innovation. The fishing experience gathered over the years and the larger household size could also explain the higher monthly income earned by gill net fishermen than the cast net fishermen. It is believed that this would enhance their efficiency and is in line with Schumpeterian theory of economic development which suggests that technical efficiency is influenced by technical knowledge and understanding in addition to other socio – economic environment with which the fisher folks must take decision (Kalirajan, 1990).

#### **Fishing characteristics of the respondent**

The fishing characteristics of the gill net and cast net fishers were presented in Table 2. It shows that almost all (92.7%) of the fishers using gill nets made use of boats with engines while all (100.0%) of those in cast net fishing used boats without engines. This agrees with the findings of Bolarinwa *et al.* (2016) which found that majority of the fishers owned and used motorized boats. Eighty percent of the fishermen using gill nets bought their fishing crafts while only a few more than half (54.5%) of those using cast nets owned fishing crafts through purchase. More than two-thirds (67.3%) of the fishers using gill nets travelled 5-8 miles while up to 81.8% of those using cast nets travel 1-4 miles during fishing activities. The mean distances travelled indicated that fishermen using gill nets travelled more than twice (7.55±2.316 miles) what the fishermen using cast nets (3.38±0.123 miles) travelled during fishing activities. Only about 36.4% of the respondents in gill net fishing made use of family members as labour during fishing while more than half (58.2%) of those in cast net fishing sourced labour for fishing from family members. The use of more hired labour by the fishers using gill nets could be attributed to long distance required during fishing.

About 61.8% and 45.5% of the fishers using gill nets and cast nets sourced capital through personal savings while loan from family members was an important source of capital to 32.7% and 45.5% of the fishers using gill nets and cast nets respectively. This implies that personal savings and loans from family members were important capital sources to fishermen in the study area irrespective of the fishing gears used. Similar findings were documented in Olaoye (2010) among artisanal fishers in Ogun and Lagos States, Nigeria.

The fishing crafts used by 72.7% and 56.4% of the fishers using gill nets and cast nets respectively was 1-4 years old while 27.3% and 45.5% of the fishermen in gill net and cast net respectively have been using their fishing crafts for 5-8 years ago. The mean ages of the fishing crafts used by fishers using gill nets and cast nets were 2.28±1.19 years and 4.22±1.79 years respectively indicating that the fishing crafts used by the cast net fishermen were older than that used by the gill net fishermen.

#### **Cost and return structure for gill net and cast net fishers**

The costs and returns from gill net and cast net fishing were presented in Table 3. The variable costs of gill net and cast net fishing were ₦1,537,600 and ₦112,643.01 respectively while the total fixed costs were ₦301,422.48 and ₦17,973.75 respectively. This implies that the cost of fishing using the gill nets is higher than the cost of using cast nets. Total revenues of ₦7,250,000 and ₦4,415,000 were realized from gill net and cast net fishing respectively while the net farm incomes of ₦5,410,977.6 and ₦4,284,383.3 were respectively recorded among fishermen using gill net and cast nets. This implies that gill net yielded higher revenues from sales of fish catches than cast net fishing. It could further be deduced from Table 3 that gill net fishing yielded higher net farm income than do cast net fishing. Fishing using either of cast nets or gill nets could be considered as profitable in Ogun

Table 1: Socioeconomic characteristics of gill net and cast net fishers

Socioeconomic variables	Gill netting		Cast netting	
	Frequency	%	Frequency	%
Age (Years)				
21-30	7	12.7	8	14.5
31-40	28	50.9	34	61.8
41-50	17	30.9	11	20.0
51-60	3	5.5	2	3.6
Mean age	39.04±6.96		36.98±6.12	
Marital status				
Single	1	1.8	0	0.0
Married	54	98.2	55	100.0
Level of education				
No formal education	15	27.3	14	25.5
Complete primary school	32	58.2	20	36.4
Incomplete primary school	1	1.8	2	3.6
Complete secondary school	6	10.9	9	16.4
Incomplete secondary school	1	1.8	10	18.2
Household size (Persons)				
5-10	11	20.0	18	32.7
11-15	35	63.6	36	65.4
>15	9	16.4	1	1.8
Mean household size	13.15±3.19		11.62±2.51	
Membership of cooperative societies				
Yes	37	67.3	51	92.7
No	18	32.7	4	7.3
Monthly income ₦'000				
80-100	18	32.7	38	69.1
101-120	24	36.2	17	30.9
>120	13	23.6	0	0.0
Mean income	114.50±14.58		96.18±7.72	
Fishing experience (years)				
1-10	1	1.80	0	0.0
11-20	10	18.1	16	29.1
21-30	27	49.1	32	58.2
>30	17	30.9	7	12.7
Mean fishing experience	27.49±7.09		24.42±5.80	

Source: Field survey (2015)

Waterside LGA of Ogun State, Nigeria since both fishing gears yielded positive net farm income. Olaoye *et al.* (2012) also noted that artisanal fishing in Ogun Waterside was profitable as total revenue was higher than total cost. This could explain why the fishers continued using their desired fishing gear. It could also be implied that cast net fishing is more efficient than gill net fishing and Kingdom and Kwen (2009) submitted that efficiency of the fishing gear is one of the important factors in the choice of fishing gear to be used. This report disagrees with the submission of Seisay (1998) who noted that cast net has often been considered as an inefficient fishing gear. Cast net and gill net fishing yielded returns on investment of 3280% and 294% respectively indicating that cast net yielded a higher return (profit) when compared with the investment (total cost). This implies that if the same amount that was pumped into gill net fishing has been invested into cast net fishing, the revenue and net farm income of the fishers using cast net would have been higher than that recorded by fishers using gill nets.

## CONCLUSION AND RECOMMENDATIONS

Although, gill net fishers earned higher revenues from sales of caught fishes thereby yielding higher net farm income than those using cast nets, profitability ratios indicated that the use of cast nets is more efficient than the use of gill nets. It could therefore be concluded that cast net fishing is more profitable and yielded more return on investment than gill net fishing. Based on the findings of this study it is recommended that cast net fishers should invest more in cast net fishing in order to increase their total revenue, and net farm income. The governments at federal, state and local levels as well as non-governmental agencies and other stakeholders should provide an enabling environment to the fishers through the provision of appropriate and consistent policies that support fishing and better extension services. Also, research institutes should develop fishing gears with better designs and these should be disseminated to the fisher through regular, efficient and effective extension service.

Table 2: Fishing characteristics of the gill net and cast net fishing

Fishing characteristics	Gill net fishing		Cast net fishing	
	Frequency	Percentage	Frequency	Percentage
Types of boats used				
Boats with engine	51	92.7	0	0.0
Boats without engine	4	7.3	55	100.0
Ownership of fishing craft				
Bought	44	80.0	30	54.5
Inherited	11	20.0	25	45.5
Distance travelled for fishing (miles)				
1-4	2	3.6	45	81.8
5-8	37	67.3	10	18.2
>8	16	29.1	0	0.0
Mean	7.55±2.316 miles		3.38±0.123 miles	
Source of labour used				
Family	20	36.4	32	58.2
Hired casual labour	35	63.6	23	41.8
Source of capital				
Personal savings	34	61.8	25	45.5
Loan from friends	2	3.6	5	9.1
Loan from family	18	32.7	25	45.5
Others	1	1.8	0	0.0
Age of fishing craft (years)				
1-4	40	72.7	31	56.4
5-8	15	27.3	24	43.6
Mean	2.28±1.19		4.22±1.79	

Source: Field survey (2015)

Table 3: Cost and return structure of gill net and cast net fishing

Cost, efficiency and profitability ratios	Gill net fishing	Cast net fishing
Total Fixed Cost (₦)	301,422.48	17,973.75
Total Variable Cost (₦)	1,537,600.00	112,643.01
Total Cost (₦)	1,839,022.48	130,616.75
Total Revenue (₦)	7,250,000.00	4,415,000.00
Net Farm Income (₦)	5,410,977.60	4,284,383.30
Return on Investment (%)	294	3,280

Source: Field survey (2015)

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