



## Analysis Of Artisanal Fishing Operations In Degema Local Government Area Of Rivers State, Nigeria.

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**Abstract:** This study analysed artisanal fishing in Degema Local Government Area of Rivers State. A random sampling technique was used in selecting respondents for the study. The sample size of the study was made up of 90 artisanal fishing folks. Data were elicited from fishing folks with a structured questionnaire which were administered to the respondents. Percentage, mean, costs and returns and multiple regressions were used for analyses of data. The result showed that the mean age of respondents was 40 years, while the mean house hold size was 6 persons. The result also showed that majority of the respondents had primary education and that most respondents had no access to credit facilities to enable them purchase fishing equipments for their operations. The study also shows that the fishing folks had never received extension service which should have exposed them to better fishing techniques and training. The costs and returns analysis showed that artisanal fishing is profitable in the study area. The regression analysis also revealed that the output of individual fishing households is significantly influenced by variables, namely, capital, labour, operating costs, fishing experience and education. It is therefore recommended that relevant agencies should encourage this fishing folks by providing them with the needed capacities to boost fish production to curb open and hidden hunger, promote food security and alleviate poverty.

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### Introduction

Nigeria is richly blessed with a lot of aquatic resources. Aquatic resource (example, fish) production is very important because of its role in food and nutrition security. Fish production in Nigeria comes from three main sources. These sources are artisanal (inland rivers, lakes, coastal and brackish water), aquaculture (fish farming) and industrial fishing (Otubusin, 2011; Federal Department of Fisheries FDF, 2005). Majority of the fishes supplied to the markets in most cases come from the artisanal sub-sector (Ndu, 2006). Artisanal fishery refers to traditional or crude or non-mechanized system of fishing and low level of technology is being employed by the fishermen and women, but often also includes economic and social overtones and is often equated to “Small-scale” with low level of production (Anene, Ezeh and Opute, 2010; Inoni and Oyaide, 2007).

In general, artisanal fishing is family-based, employing small or no boats/canoe and simple and/or traditional methods. These can include traps, hook and line, throw nets, small gill nets, harpoons, bow and arrows, diving, and beach seines. The catch can be either for the family’s own consumption (subsistence) and/or for sale. Often a variety of species are being

caught, and the family may have a variety of incomes. Within the artisanal level of fishing there are many sub-levels – from the subsistence fisherman or woman with a bamboo stick to a commercial fisherman that has substantial ice storage, a few boats, and employees. In some more developed countries, fleets of trolleys, small gill-netters, or lobster tenders are also considered artisanal (or at least ‘small-scale’).

With an annual estimate of 13.3 kg in 2013 *per caput* fish consumption, fish represents an important dietary element and one of the few sources of animal protein available to many Nigerians (FAO, 2017). According to Food and Agriculture Organisation (FAO) country report for 2017, fishery sub-sector contributed to 0.5 percent of national Agriculture share of the GDP in 2015 and that more than 80 percent of Nigeria’s total domestic fish production is generated by artisanal small-scale fishers from coastal, inshore, and creeks of the Niger Delta (Rivers State inclusive), lagoons, inland rivers and lakes. FAO (2017) went further to opine that total fish imports amounting to about USD 1.2 billion and exports valued at USD 284 390 million in 2013, puts Nigeria as a net importer of fishery products. Fishing is a

major source of livelihood for people in the creeks and coastal communities in Rivers State (FAO, 2017).

According Central Bank of Nigeria (CBN) (2011) and Fisheries Society of Nigeria (FISON) (2019) artisanal fishing production account for around 82% of the 1.04 million tonnes of fish produced in Nigeria, giving livelihood to one million fishermen and women and up to 5.8 million jobs in the secondary segment comprising processing, preservation, marketing and distribution. Meanwhile, industrial (trawling) fish farming accounted for only 8% of the total, indicating that a commercial fishery is still largely untapped. Recent data from the ministry of agriculture and rural development reveal that annual national supply has increased to 1.1 million metric tonnes (mmt) from 800 metric tonnes. The supply gap has reduced slightly to 1.0 mmt due to Federal Government import substitution policy (Central Bank of Nigeria (CBN), 2017 and National bureau of Statistics (NBS), 2017).

Fisheries sub-sector play an important role in food insecurity and hidden hunger eradication, livelihoods improvement and income generation in the coastal communities of Nigeria (Akinrotimi, Onunkwo, Cliffe, Anyanwu and Orokotan, 2007). The demand for fish in Nigeria has been on the increase due to increasing human population, the health benefits attributable to consumption of fish amongst others. Apart from being an income earner to many Nigerians especially people in coastal, water ways and lake areas of the country, it has a value chain in areas such as fish processing, marketing, recreation, tourism, sport, medicine, fisheries research, etc (Thorpe, Whitemash, Sandi, Baio, Lebbie and Lebbie, 2013).

The efforts of fishermen and women involved in artisanal fishing enterprises contribute greatly to the enhancement of food and nutrition security and curbing hidden hunger in Nigeria. Food and nutrition security has been described as a condition in which all people at all times have physical, social and economic access to sufficient (right quantity and quality), safe and nutritious food to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for an active and healthy life (Gahukar, 2011). Food security includes freedom from both famine and chronic malnutrition and freedom from fear of what to eat next in the right quality and quantity. It is very much linked with increased agricultural production, management of natural resources, environmental protection and trade policies. Hidden hunger is a lack of vitamins and minerals. Hidden hunger occurs when the quality of food people eat does not meet their nutrient requirements, so the food is deficient in micronutrients such as the vitamins and minerals that they need for their growth and development (WHO, 2014).

The major constraint for the growth of artisanal fisheries is how to improve productivity and efficiency and ensuring sustainable level of fisheries resources. Various actions had been undertaken by international organizations, governmental and non-governmental organizations in order to ensure that fishing activities bring about economic, social and nutritional benefits (Allison and Ellis, 2001). Nevertheless, these actions did not take into consideration the importance of artisanal fishing households socio-economic characteristics and behaviour in their decision making process. According to the findings of Gaertner *et al.*, (1999) and Salas (2000), productivity in artisanal fishing depends on the fishing households socio-economic characteristics, technology, assets endowments (physical, financial, human and social), and available infrastructure. Even though, literature suggests a good number of explanations to this phenomenon, there had been scanty empirical studies to support the above findings in the study area. Empirical evidence is very important in order to identify the factors that limit the productivity of artisanal fishing households so that policies can be designed to enhance profitability of the enterprise based on recent and reliable information. Therefore, measurement and analysis of artisanal fishing households' performance become important. This work therefore, measures the performance of artisanal fishing households in Degema L.G.A. of Rivers State. The work applied a production function model to determine the effect of socio-economic characteristics and fishing inputs on output of artisanal fishers.

Rivers state is situated along the vast coastline which is endowed with marine, brackish and fresh waters of varying ecological zones with numerous fish species. This research work will answer the following research questions? What are the socio-economic characteristics of artisanal fisher folks in the study area? What is the cost structure and profitability of artisanal fish farming in the study area? What are the factors that affect artisanal fishing output in the study area?

### **Methodology**

The study area was Degema Local Government Area of Rivers State, Nigeria. Its headquarters is at Degema town. It has an area of over 1,011 km<sup>2</sup> and a population of 249,773 (NPC, 2006). The study was conducted in three communities of Ke town, Degema and Obuama. The choice of communities was done purposely because fishing is the major occupation of the people of those communities and they are surrounded by large water bodies and the vegetation in these communities varies from mangrove to evergreen swamp forest. The climatic conditions around the communities favour fishery operation. A survey

method involving random sampling technique was employed in selecting respondents for the study. A set of structured questionnaire was used to collect the primary data on socio economic variables such as sex, age, level of education, household size, fishing experience, access to extension services, and availability of credit facilities, etc.

Data were also collected on distance to fishing sites, fishing site ownership, types of fishing gears and crafts, membership of fishing association, cost of gears and crafts, cost of other inputs, availability of market facilities, availability of storage facilities, output per season, rent on fishing site, amount and interest on credit, problems and solutions to these problems facing fishermen in the study area. Data was analysed using descriptive statistics, cost and returns analysis and multiple regression analysis.

## Results And Discussion

### Socio-Economic Characteristics of Respondents

The socio-economic characteristics analysed in this section include; sex, age, household size, educational status, fishing experience, use of credit and extension services, major and minor occupations of respondents and means of transportation to fishing sites, Sex plays a very important role in artisanal fisheries operations. The Table 1 below shows that artisanal fisheries operations were predominantly a male profession in the study area. Majority (86.7%) of the artisanal fishing folks were male while 13.3% were female. This result is supported by Brummett, Youaleu, and Tiani (2010) that artisanal fisheries activities are dominated by men.

Table 1 also shows that age is an important socioeconomic characteristic because it affects productivity, output and adoption of innovation. The age distribution of the respondents as shown in table 1 shows that most of the fisher folks fall between 30 and 49 years of age with a mean age of 40 years. This implies that most people engaged in artisanal fishing enterprises were still active and physically fit to paddle the canoes. The implication is that the respondents are within the productive and economic active age, and are able to increase fishing productivity and improve livelihood of the fishing households. This is consistent with other fisheries studies such as Tasie, Ejiogu, Onubuogu and Wilcox (2017), Okeowo, Bolarinwa and Ibrahim (2015), Olaoye (2010) and Unongo (2010).

Table 1 also shows the Household size of respondents. It shows that 45.6% of the respondents have 1-5 members in their households, 53.3% have 6-10 members in their households and 1% has 11-15

members in their households. The mean household size of the respondents was 6 (six) members. Large household size is associated with the availability of timely, free and cheap labour for the fishing households; in this case larger families are likely to be more effective and productive. Although this helped to increase the output of fish production, substantial amount of fish was also consumed by the household causing a reduction in the overall households' income. This is in line with Tasie, Ejiogu, Onubuogu and Wilcox (2017), Nlerum and Bagshaw (2015) and Unongo (2010).

Experience is very important in every enterprises, especially artisanal fishing. The view of the role of experience in fishing comes from the fact that it enables fishing folks to have information on fishing locations and water current. Table 1 shows that majority of the respondents (55.6%) have over 15 years of artisanal fishing experience. This indicates that they were well experienced because the more the years, the more the experience a person acquires in a given activity. This finding is supported by Tasie, *et al.* (2017).

Table 1 also show that 21.1% of the respondents had no formal education, 42.3% had primary education or spent between 1-6 years in school, 33.3% had secondary education or have spent between 7-12 years in school, and 3.3% of the respondents had tertiary training with more than 12 years in school. This low level of education implies that the demand and access of the respondents to bank credit and contact with extension agents would be affected. This finding is supported by Tasie, *et al.* (2017) and Nlerum and Bagshaw (2015) which in their separate studies showed that majority of artisanal fishery operators had at least primary education.

Fish is mainly marketed in the study area mainly as processed or smoked fish because of inadequate market for fresh fish. Some fishermen/women however, store their catch in iron or fibre cages in protected locations close to landing sites in rivers. There are no modern storage facilities such as cold rooms in the study area. Table 1 show that 65.6% of the respondents have no storage facility for fresh fish while 34.4% store their fresh fish in secured cages and baskets or containers submerged in waters.

Credit is important for the acquisition and maintenance of fishing crafts and gears. Table 1 show that 40% of the respondents received credit but from informal sources like friends, relatives and local money lenders, while 60% did not receive any credit facility but used their personal savings.

**Table 1: Frequency Distribution on Socio-economic characteristics of respondents**

<b>Socio-Economic characteristics</b>	<b>Respondents</b>	<b>Percentage %</b>
<b><u>Gender</u></b>		
Male	8	86.7
Female	12	13.3
<b>Total</b>	<b>90</b>	<b>100.0</b>
<b><u>Age (years)</u></b>		
Less than 20	7	7.8
20 - 29	15	16.7
30 – 39	26	28.8
40 – 49	27	30.0
50 – 59	10	11.1
60 and above	5	5.6
<b>Total</b>	<b>90</b>	<b>100.0</b>
<b><u>Marital Status</u></b>		
Single	11	12.2
Married	63	70.0
Widowed	5	5.6
Divorced	11	12.2
<b>Total</b>	<b>90</b>	<b>100</b>
<b><u>Household Size</u></b>		
1-5	41	45.6
6-10	48	53.3
11-15	1	1.0
>15	0	0.0
<b>Total</b>	<b>90</b>	<b>100.0</b>
<b><u>Fishing Experience (years)</u></b>		
1-5	2	2.2
6-10	7	7.8
11-15	31	34.4
>15	50	55.6
<b>Total</b>	<b>90</b>	<b>100.0</b>
<b><u>Level of Edu. (years in School)</u></b>		
No formal education (0 years)	19	21.1
Primary education (1-6 years)	38	42.3
Secondary education (7-12 years)	30	33.3
Tertiary education (> 12 years)	3	3.3
<b>Total</b>	<b>90</b>	<b>100.0</b>
<b><u>Credit Facility</u></b>		
Yes	36	40
No	54	60
<b>Total</b>	<b>90</b>	<b>100</b>
<b><u>Storage Facility</u></b>		
Yes	31	34.4
No	59	65.6
<b>Total</b>	<b>90</b>	<b>100</b>

Source: Field survey, 2018

### Costs and Returns Analysis in Artisanal Fishing Enterprises

The cost and return of artisanal fishing operations in the study area is presented in Table 2.

Table 2 shows that the total average household fixed costs of the artisanal fishing enterprise is higher than the variable costs. The fixed costs accounted for ₦ 90,605.50 which is 62.69% of the total cost per fishing season. Hired labour cost is high and it

accounted for ₦21, 000 or 38.94% of the total variable cost per household. The high cost of hired labour may be due to the absence of sufficient family labour that may be engaged in artisanal fishing operation, hence, the need to engage hired labour. Table 3 indicates that artisanal fishing operation is highly profitable in the study area. This finding is in line with Tasie, *et al.* (2017); Okeowo, Bolarinwa, and Ibrahim (2015).

Table 2: Cost and Return Analysis

Items	Quantity (kg)	Unit Cost	Total Value
<b>1. Revenue</b>			
Total Revenue	266.45kg	800	213,160
<b>2. Variable Cost</b>			
i. Hired Labour	7 mandays	3000	21,000.00
ii. Crafts/Gear Maintenance	-		17,630.00
iii. Running Costs			15,300.00
<b>Total Variable Cost</b>			<b>53,930.00</b>
<b>3. Fixed Cost</b>			
i. Fishing crafts (depreciated cost)			16,870.50
ii. Fishing gears (depreciated cost)			28,235.00
iii. Interest on credit			45,500.00
<b>Total fixed costs</b>			<b>90,605.50</b>
<b>4. Profit = Total Revenue – Total Costs</b>			
= 213,160.00 – (53,930.00 + 90,605.50)			
= 213,930.00 – 144,535.50			
= 68,624.50			

Source: Analysis of Field Data, 2018

#### Multiple regression analysis showing the relationship of Socio-economic Variables/Fishing inputs and output

Analysis of factors that determine fish output in artisanal fishing enterprises are presented in Table 3. The independent variables used in this study include, labour (X1), capital (X2), operational cost (X3),

fishing experience (X4) number of years spent in school by household head (X5) and household size (X6). Three functional forms were tried and these forms are Linear, Semi-log and Double-log functions. The lead equation was chosen based on the values of  $R^2$ , F-statistics and number of significant variables.

Table 3: Regression Result of Factors that Influence Artisanal Fishing Output

Variables	Linear	Semi-Log	Double-Log
Labour (X1)	1.732 (0.234)	0.066 (3.914)*	0.1645 (2.956)*
Capital (X2)	0.2256 (3.546)*	1.453 (0.842)	1.2612 (3.111)*
Operating Cost (X3)	1.421 (2.927)*	1.641 (3.875)*	0.0708 (3.795)*
Fishing Experience (X4)	0.714 (2.980)*	0.051 (3.154)*	1.0514 (2.876)*
No of years spent in school (X5)	0.727 (2.984)*	1.132 (3.712)*	4.007 (2.979)*
Household size (X6)	0.119 (0.605)	0.1753 (0.426)	0.6245 (0.687)
Constant	35.67	36.15	17.794
R-Squared	0.684	0.7654528.45*	0.8585
F- cal.	34.61*		46.44*

Source: Analysis of field survey data, 2018

Note: - The numbers in parenthesis are the significant t-values. The values asterisks are significant at 0.05 probability level.

Analysis of the factors that influence artisanal fishing output shows that the double – log function gave the best fit because of its high  $R^2$  of 0.8585, more significant variables and a significant F – value. The

$R^2$  of 0.8585 shows that the significant explanatory variables or regressors explain or influence the criterion variable or regress and by 85.85%. The significant F – value of 46.44 implies that the joint

effect of all the included variables were significant. From the regression result also, the coefficients of labour ( $X_1$ ), capital ( $X_2$ ), operational costs ( $X_3$ ), fishing experience ( $X_4$ ) and number of years spent in school by household heads ( $X_5$ ) were all significant at 5%. Coefficient of household size ( $X_6$ ) has a positive sign and suggests that the output of fishermen/women and their household size are moving in the same direction. The t-value is however not significant at 5% level. This suggests that an increase in the available labour source from household members will not necessarily facilitate output increase.

The coefficient of labour ( $X_1$ ) is significant at 5% and positive showing that labour is directly related to fish output indicating that increased and efficient labour increases fish output. Capital ( $X_2$ ) and operational costs ( $X_3$ ) are significant at 5% and positive. This suggests that these two factors are important determinants of fish output. It means the more the investment, the higher the fishing output. Fishing experience ( $X_4$ ) was significant at 5% and positive. This implies that fishing experience is directly related to the output of the enterprise. This result is not surprising because fishing experience appears to be an important human capital for increasing fishing productivity. Number of years spent in school by household heads ( $X_5$ ) was significant at 5% and positive. This suggests that number of years spent in school is directly related to the output of fishermen/women. According to Tasie *et al.* (2017) and Tasie (2013) education increases the capacity and efficiency of labour and makes labour skilled and adaptable to the needs of a changing economy. It helps to unlock the natural and hidden talents and inherent enterprising qualities of a fisher man or woman. It enhances the fishing folk's ability to understand and evaluate new production techniques. Unongo (2010) in his own study on "Economic analysis of artisanal fishing enterprises in Guma LGA of Benue State in Nigeria", also stated that formal education will facilitate the keeping of proper fishing records, ability to read instructional materials and effectively communicate with extension agents. This will give fishermen/women the knowledge of how to use their inputs effectively.

The significant variables and their signs are in line with a-priori theoretical expectations. The implication of these findings for the fishing folks is that future policies on fishing folks and fishing communities should take adequate consideration of these variables which have significant effect on the fishing folks.

### Conclusion

Artisanal fishing business in Degema Local Government Area of Rivers State is profitable and can provide employment for people in the fishing

communities. The regression analysis also revealed that the output of individual fishing households is significantly influenced by variables, namely, capital, labour, operating costs, fishing experience and education.

The study also revealed that most respondents have no access to credit facilities to enable them purchase fishing crafts and gears whose prices have gone beyond the reach of an average fisherman.

### Recommendation

It is therefore, recommended that those variables which significantly influenced artisanal fish output be manipulated to strengthen artisanal fish output. Relevant agencies, public and private should encourage this fishing folks by providing the needed capacities to boost fish production to curb hidden hunger, promote food and nutrition security and alleviate poverty.

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