

Effect of Crude Oil Pollution on Artisanal Fishing in Asari-Toru, Akuku-Toru and Degema Local Government Areas of Rivers State, Nigeria

¹Mefo, U. ¹Ekine, D.I., ²Ifeanyi-Amos, E., ¹Okidim, I.A. & ¹Okuduwor, A.A.

¹Department of Agricultural and Applied Economics, Rivers State University

²Department of Agricultural Economics and Extension, Ignatius Ajuru University

D.O.I: 10.56201/ijaes.v8.no6.2022.pg15.22

Abstract:

This study analyzed the effect of crude oil production on artisanal fishing in selected local government areas of Rivers State. Purposive and random sampling technique were used in selecting respondents for the study. The sample size for 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 regression were used for the 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 equipment for their operations. Also, majority (66.7%) were members of cooperative society while majority (71%) reported incidence of oil spillage 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 oil spill. There is the need for policies that could compel oil companies to minimize oil spill in the farmers' fishing environment.

Keywords: Artisanal. Fishing. Crude Oil Production, Effect, Pollution

Introduction

Agriculture is the major economic activity, accounting for about 90% of economic activities in the Niger Delta Region of Nigeria (Federal Department of Fisheries, 2005). In this regards, fisheries resources represent the foci of livelihood activities in the region. Fish supplies more than 87% of the animal protein in Nigeria, and more than 90% of coastal communities depend solely on fishing and fishery related activities for their survival. Artisanal fishery is however, fast depleting in Nigeria. It is obvious that domestic demand for fish in Nigeria has never been met by dependence on output from available aquatic source. However, one of the major factors responsible for the declining supply of fish, from capture fisheries is oil spills. Oil exploitation in Nigeria has, no doubt, contributed enormously to the country's economic growth, but it has also left profound adverse impact on the natural environment. When oil spills occur, they cover the

surface of the water. This reduces oxygen exchange thereby causing death of fishes because the oil coats the gills of the fishes preventing them from inhaling oxygen. In the same vein, oil spills endanger fish hatcheries in coastal waters, and contaminate commercially valuable fish (Nwilo, *et al.* 2008). Also, oil slicks prevent sunlight from reaching deeper levels of water where coral life thrives, thus limiting food production by plants (photosynthesis). Hence, it brings a set-back to households whose main source of survival is fishing and consequently a decrease in their income earning capacity, intensifying hunger and poverty among them. This has also increased the spread of different types of diseases among the fishers and their household such as conjunctivitis, cholera, dysentery etc. Inoni and Oyaide (2007) noted that oil spillage is one of the more pervading dynamic forces modifying the farm production relationship through its effect on the structure and income of the producing households; it alters the agricultural production process by affecting the physical and value productivities of farm inputs. The capacity of artisanal fisheries to play its triple role of food supplier, employment provider and income earner for the coastal communities in Rivers State will therefore depend on the adoption of appropriate management strategies that will ensure their efficiency and sustainability in the face of intensive oil exploitation activities. This paper examined the effect of crude oil pollution on artisanal fish production in three selected local government areas of Rivers State, Nigeria. Several studies have reported efficiency estimates, especially among small holders' farmers (Ajibefun & Aderinola, 2003; Ogundari & Ojo, 2009; Ike & Inoni, 2006) but little or no empirical studies exist on the effect of crude oil production on artisanal fish production in selected local government areas of Rivers State, Nigeria. The major problem facing the artisanal fishing sector remain low, production costs remain unacceptably high, thus, adequate quantity and quality of fish cannot be afforded by many poor rural fishing households This situation is aggravated by losses that occur because of environmental problems such as oil spillage and gas flaring in the oil-producing region of Nigeria especially Rivers States. The exploitation activities have adversely affected the artisanal fishing households by reducing aquatic lives, economic, social and environmental benefits. Oil exploration and exploitation has at least over the last decade (2000-2010) influenced the socio-economic wellbeing of artisanal households and physical environment of the Niger Delta oil producing communities, threatening the subsistent economy and their entire livelihood. It is obvious that domestic demand for fish in Nigeria has never been met by dependence on output from available aquatic sources. Ekwueme (2019). Supply of fish by capture from artisanal household is decreasing due to oil spills. FAO (2005) maintained that the World fish catches appear to be leveling off below the estimated maximum sustainable yield of 100 million metric tons per annum. For example, it was projected that developing countries like Nigeria needed an additional 22.5 million metric tons of fish by the year 2000, which highlighted the need to increase fish production by artisanal households. The study therefor analyzed the effect of crude oil production on artisanal fishing output in selected local government areas of Rivers State, Nigeria. Specific, objectives were to; describe the socioeconomic characteristics of the artisanal fish farmers in the study area; determine the effect of crude oil production on artisanal fishing output in the study area and identify the constraints faced by artisanal farmers in the study area.

Methodology

The study effect of crude oil pollution on artisanal fishing was carried out in Buguma, Obuama and Abonemma communities respectively in Asari Toru, Degema and Akuku Toru Local Government Areas of Rivers State, Nigeria. These areas are surrounded by large water bodies and the natural vegetation in this area varies from the mangrove to the freshwater swamp forests.

The prevailing climate hydrographic conditions thus favour a thriving fishery, artisanal and aquaculture activities with several local and international oil production companies caring out oil exploitation in the area thus spilling oil on the natural environment. 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.

Sampling Procedures and Sample Size

Purposive and random sampling technique were used for the study. Three local government areas were purposively selected for the study; these are Asari Toru, Degema and Akuku Toru Local Government Areas of Rivers State, Nigeria which is greatly impacted by the negative effect of oil production. From each of the local government areas, thirty respondents were randomly selected to give a total sample size of 90.

Data Collection

Primary data were used for the study. A set of structured questionnaires were 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. Data were also collected on labour, capital, operating cost, fishing experience, oil spillage, 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 Analysis

Descriptive Statistical technique such as mean, frequency distribution and percentage were used to achieve the objectives of the study. OLS regression model was used to analyze the effect of crude oil production on artisanal fishing activities in selected local government area of Rivers State.

Model Specification

The Regression models were specified as follows:

Linear function:

$$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + ei$$

Semi Log:

$$\log Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \beta_5x_5 + b \beta x_6 + ei$$

Double-log function:

$$\log y = b_0 + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + b_6 \log x_6 + ei$$

where:

Y = Artisanal Fishing Output (₦),

X₁ = Cost of Labour (₦),

X₂ = Capital (depreciated) (₦)

X₃ = Operating cost (₦)

X₄ = Fishing experience (Years)

X₅ = Household size (Number)

X₆ = Incidence of Oil Spill (1= yes, 0= otherwise)

Results and Discussion

Socio-Economic Characteristics of Respondents

The socio-economic characteristics analyzed in this section include; sex, age, household size, educational status, fishing experience, use of credit, cooperative membership and incidence of oil spillage.

Table 1: Socioeconomics Characteristics of Artisanal Fish Farmers in the Study Area

Variable	Frequency	Percentage
Age (Years)		
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
Gender		
Male	78	86.7
Female	12	13.3
Marital Status		
Single	11	12.2
Married	63	70.0
Widowed	5	5.6
Divorced	11	12.2
Household Size		
1 – 5	41	45.6
6 – 10	48	53.3
11 – 15	1	1.0
Fishing Experience		
1 – 5	2	2.2
6 – 10	7	7.8
11 – 15	31	34.4
Above 15	50	55.6
Level of Education		
No formal education	19	21.1
Primary education	38	42.3
Secondary education	30	33.3
Tertiary education	3	3.3
Credit Facility		
Yes	36	40
No	54	60
Cooperative Membership		
Yes	60	66.7
No	30	33.3
Incidence of Oil Spillage		
Yes	64	71.1
No	26	28.9

Source: Field Survey, 2021

Sex plays a very important role in artisanal fisheries operations. The Table 1 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.

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).

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 activities; 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 enterprise, 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.

Table 1 indicated 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. The distribution of the respondents based on their cooperative membership show that 66.7% belong to cooperative society, while 33.3% do not belong to any

cooperative organization in the study area. Distribution of the respondents according to incidence of oil spillage as shown in Table 1 show that majority (71%) of the respondents had incidence of oil spillage while 29% recorded no significant oil spillage last year.

The Effect of Crude Oil Production on Artisanal Fishing Output in Rivers State

Table 2: Regression Estimate of the Effect of Crude Oil Production on Artisanal Fishing Output

Variables	Linear	Semi-Log	Double-Log
Labour	1.732 (0.234)	0.066 (3.914) ***	0.1645 (2.46) **
Capital	0.2256 (3.546) ***	1.453 (0.842)	1.2612 (3.111) ***
Operating Cost	1.421 (2.927) *	1.641 (3.875) *	0.0708 (3.795) ***
Fishing Experience	0.714 (2.980) ***	0.051 (3.154) ***	1.0514 (2.43) **
Household Size	0.119 (0.605)	0.1753 (0.426)	0.6245 (0.687)
Oil Spill	0.374 (2.53) **	0.765 (3.71) ***	0.874 (4.20) ***
Constant	35.67 (1.98) *	36.15 (3.88) ***	17.794 (4.78) ***
R-Squared	0.684	0.765	0.858

Source: Stata Computation, note; figures in parenthesis are the t-values, *, **, * are significant at 10%, 5% and 1% respectively**

Analysis of the effect of crude oil production on 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%. From the regression result also, the coefficients of labour, capital, operational costs, fishing experience and oil spillage were all significant at varying levels. Coefficient of household size 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. This suggests that an increase in the available labour source from household members will not necessarily facilitate output increase. The coefficient of labour was significant at 5% and positive showing that labour is directly related to fish output indicating that increased and efficient labour increases fish output. Capital and operational costs were positive and significant at 1% respectively. 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 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. The coefficient of oil spillage was negative and significant at 1% level. This implies that oil spillage reduces the output of artisanal fishing in the three selected local government areas of the state. Also, when oil spills occur, they cover the surface of the water. This reduces oxygen exchange thereby causing death of fishes because the oil coats the gills of the fishes preventing them from

inhaling oxygen. This is in line with the findings of (Gbigbi *et al.* 2015) stated that oil spill brings a set-back to households whose main source of survival is fishing and consequently a decrease in their income earning capacity, exacerbating hunger and poverty among them.

Table 3: Constraints faced by artisanal fishermen in Some Selected Local Government Areas

Factors	Standard Deviation	Mean
Religious barriers	0.00	1.0
Conflict amongst farmers	1.15	3.4
Militant activities hinder fishing	1.17	5.0
Type of instrument	0.00	3.2
Shortage of man-power	0.99	3.1
Increased pressure on fisheries resources	0.94	2.0
Inadequate finance	1.06	4.6
Poor storage facilities	0.77	3.9
Poor sales	1.10	4.4
Lack of extension services	0.72	1.7
Oil spillage around depots	0.00	4.4
Unfavorable union activities and levies	1.23	2.1
High cost of instruments	1.05	3.9

Source: Field Survey, 2021

Constraints Faced by Artisanal Fish Farmers in Some Selected Local Government Area of Rivers State, Nigeria

Table 3 shows the constraints faced by artisanal fish farmers in Some Selected Local Government Area of Rivers State, Nigeria. The Table shows that out of the thirteen variables used to capture the constraints artisanal fish farmers face in the fishing activities only four were not seriously affecting the farmers namely; religious barriers, increased pressure on fisheries resources, lack of extension services and unfavorable union activities and levies. While others were all significant as shown in table 3 above.

Conclusion

Oil Spillage around depots, Militant activities, inadequate finance and lack of extension services around depots were the factors affecting artisanal fishing in Rivers State. These factors need to be addressed to improve productivity of artisanal fishing in Rivers State. 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 oil spillage. 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.

Recommendations

Based on the findings therefore recommended that;

There is need to enforce fishing laws and regulations to avoid illegal exploitation of fishing grounds by trawlers and the destruction of artisanal fishing gears and Small-scale fisheries should also be upgraded in National agendas. There is also the need for policies that could

compel oil companies to minimize oil spill in the farmers' fishing environment.

Those variables which significantly influenced artisanal fish output be manipulated to strengthen artisanal fish output.

Better access to relevant information should be enhanced by making extension services available to artisanal fish farmers in the various depots.

fisher folks should be encouraged to form cooperative societies that will assist them in procuring modern day fishing gears that would boost their fish production

Banks, Financial institutions and Government agencies should encourage the practicing fishers by granting credit facilities at a reduced interest rate. Collateral for accessing such credits should be made easy by allowing the fishers and their relatives as guarantors for securing such credits.

References

- Brummet, R.E., Youaleu, J.L.N. & Tiani, A.M. (2010). Women's Traditional Fishery and Alternative Aquatic Resource Livelihood Strategies in The Southern Cameroonian Rainforest. *Fisheries Management and Ecology*, 17, 221-230.
- Ekwueme, I.A., (2019). Economic analysis of pond fish production in Rivers State. unpublished M.Sc. dissertation of the Rivers State University Port Harcourt
- Federal Department of Fisheries (2005). Report of Presidential Committee on Fisheries and Aquaculture Development. Federal Department of Fisheries, Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria.
- Food and Agricultural Organization (2017). Fishery and Aquaculture Statistics. Global Production by Production source 1950–2015 (FishstatJ). In: FAO Fisheries and
- Gbigbi, M. T. (2013). Fishing in oil spillages zone: A case study of Burutu local government area of Delta State, Nigeria. *African Journal of Agricultural Research* 8(16):1563-1569.
- Inoni, O. E & Oyaide, W. J. (2007). Socio-Economic Analysis of Artisanal Fishing in the South Agro-Ecological Zone of Delta State, Nigeria. *Journal of Agricultura tropica et subtropica* 40 (4): 135-149.
- Nlerum, F.E. & Bagshaw, A. (2015). Role of Women in Artisanal Fishery. Implication for Food Security in Rivers State, Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology*. 4(2): 137 – 145.
- Nwilo, P.C. & Badejo, O. T. (2008). Oil Dispersion and Trajectories on Nigerian open sea. *The Conference Proceedings of the International Conference on the Nigeria State, Oil Industry and the Niger Delta*, 164–192.
- Ogundari, K. & Ojo, S. A. (2006). An examination of technical, economic and allocative efficiency of small farms: The case study of cassava farmers in Osun State of Nigeria. *Journal of Central European Agriculture*, 7(3):423-432.
- Tasie, C.M., Ejiogu, A.O., Onubuogu, G.C., and Wilcox, G.I. (2017). An Appraisal of Artisanal Fishery Enterprises in Andoni Local Government Area of Rivers State, Nigeria. *Proceedings of the International Conference and Silver Jubilee of the Faculty of Agriculture and Veterinary Medicine, Imo State University, Owerri*. Pp. 135– 147.
- Unongo, T. (2010). Economic Analysis of Artisanal Fishing Enterprises in Guma Local Government Area of Benue State, Nigeria. An M.Sc Thesis Submitted to the Department of Agricultural Economics, UNN. Retrieved online At www.unn.edu.ng/publications/files/images/unon_gothomas on 01/04/18.